

Caltech *News*

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Despite appearances, Tom Everhart hasn't really been posing for a new cover to "The Hitchhiker's Guide to the Galaxy" or moonlighting as a director, under a slightly assumed name. Left, the Institute's president gives the "thumbs up" as Caltech's 1991 centennial celebration gets under way. Below, a filming session on campus hints at the existence of a presidential doppelgänger.

"Change in the right direction"

Thomas E. Everhart last held an interview with *Caltech News* shortly before he assumed his current office in October 1987. Some time has elapsed since then, and Caltech's president reflects on that fact, and on a number of other topics, in this wide-ranging question-and-answer session.

Caltech News: *This will be your eighth year on campus since you arrived in 1987. What do you see as some of the major changes and developments that have occurred during your time here?*

Thomas E. Everhart: If I can begin on a personal note, one of the most important changes for me is how much I've learned about Caltech. That is significant, I think, because Caltech is unique in the way it deals with faculty, staff, and students, and in the mission it has set out for itself, compared with other educational institutions that I know. Within that context I certainly think there are areas in which we're making improvements. The quality of life for everybody on campus has, I

hope, improved somewhat; that's certainly been one of my objectives. I hope staff and female students feel a little more comfortable now than they did eight years ago, and that students get along a bit better with one another. We have certainly tried, without changing our standards of quality, but by being more aggressive, to recruit more underrepresented minority students. We've definitely been successful in recruiting more women.

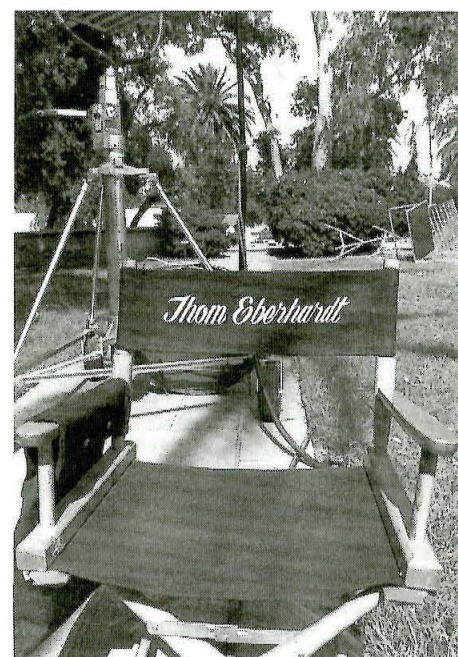
These are all developments that I think should have a significant, long-term impact on the campus. They're not dramatic, overnight changes, but it's never been my style to try to have a revolution. Revolutions overturn the existing order very quickly; and they in turn can be overturned just as quickly. I think that if you have systematic, persistent change in the right direction, you get a lot farther in the long run.

Another significant development is the quality of the work that Caltech is now doing with Institute relations and public relations. That's a tribute to the Institute Relations team, headed by Tom Anderson, and to our Assistant

Vice President for Public Relations Bob O'Rourke, our Director of Government Relations and Community Affairs Hall Daily, and to our Assistant Vice President and Director of Development and Alumni Relations Jerry Nunnally. We are getting good coverage in the media. In general, we are in better contact with our donors, friends, and alumni, and we're working hard to improve our relationships with all three of those constituencies, and with our alumni in particular. I think we are also working to be more proactive in the government relations area; certainly, we have a much better knowledge of what's going on in Washington now than we did when I came.

As for other developments, certainly, we've done some building—we now have the Beckman Institute, the Braun Athletic Center, and the Moore Laboratory of Engineering, and will be breaking ground for the new student residence—Avery House—and the Sherman Fairchild Library later this year. The Braun Center, in particular, was meant for everyone on campus, and it

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CAMPUS UPDATE



Clair Patterson in his Caltech laboratory in 1971, shortly after Congress enacted the Clean Air Act, which for the first time imposed strict restrictions on lead emissions from gasoline. Both the content of the legislation and its passage were greatly influenced by Patterson's research.

Clair Patterson receives Tyler Prize

The world's top honor in environmental science, the \$150,000 Tyler Prize, has been awarded to Clair Patterson, Caltech professor of geochemistry, emeritus, for his groundbreaking work on lead pollution—research that has raised public awareness of the dangers of lead exposure and played a major role in the last two decades of legislation regulating lead levels in food and the environment. Initially greeted with skepticism and even some derision in scientific circles, Patterson's work is now considered a landmark contribution to both science and the human condition. Those nominating him for the Tyler Prize called attention to this connection between the scientific and the humanitarian sides of Patterson's work, describing the link as "stronger than may ever have been the case in [nonmedical] scientific research."

Patterson first gained international recognition in 1953 as a research fellow at Caltech when, with the help of geochemistry professor Harrison Brown, he determined that the earth was 4.6 billion years old through an analysis of lead from an iron meteorite. Over the next decade, he turned his attention increasingly from lead in rocks to lead in the environment. He tracked down traces of lead in the laboratory (to achieve uncontaminated experimental results), in polar ice caps (to measure the levels of airborne lead throughout history), and in living organisms. His findings that lead had reached dangerously high levels in the environment had a significant impact on government and industry regulations in both the United States and abroad, as medical researchers linked lead pollution with such consequences as decreased intelligence in children.

As noted in an award-nomination letter, in the years following Patterson's discoveries, "the use of lead in paint was discontinued. High octane gasoline without lead was rapidly developed and marketed . . . Very recently, the use of lead in the food canning process was stopped almost completely."

Born in 1922 in Mitchellville, Iowa, the son of a rural mail carrier, Patterson studied physical chemistry at Grinnell College and the University of Iowa and received his PhD in chemistry from the University of Chicago in 1951. The following year, he was one of several of University of Chicago geochemists recruited to the Institute, part of a raid that resulted in a group in geology known as the "Chicago Mafia."

Elected to the National Academy of Sciences in 1987, Patterson is a recipient of the Academy's J. Lawrence Smith Medal and the Geochemical Society's V. M. Goldschmidt Medal. He has had an asteroid named after him, as well as Patterson Peak in the Queen Maude Mountains of Antarctica. Patterson's determined, and for many years lonely, crusade against lead pollution was made the basis of a fictional character in the Saul Bellow novel *The Dean's December*.

The Tyler Prize for Environmental Achievement was established in 1973 by John Tyler, founder of the Farmers Insurance Group, and his wife, Alice. Its first recipients were Arie Jan Haagen-Smit, the Caltech scientist who first described the mechanism of photochemical smog; ecologist G. Evelyn Hutchinson; and Maurice Strong, founding director of the United Nations Environmental Programme. The prize is now administered by the University of Southern California.

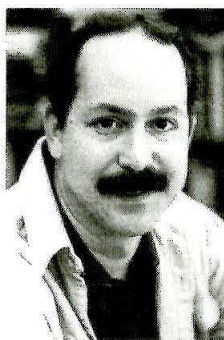
Eight faculty and alumni named to NAS

Researchers with Caltech affiliations make up more than 10 percent of the 60 scientists elected this year to the National Academy of Sciences (NAS) in one of the highest honors that can be bestowed on an American scientist or engineer. Three Institute faculty and five alumni were named to NAS membership in April.

The new NAS members on the Caltech faculty are Professor of Biology Elliot Meyerowitz, Professor of Astronomy Anthony Readhead, and the Howard and Gwen Laurie Smits Professor of Cell Biology, Alexander Varshavsky. Their election brings to 65 the number of Institute faculty who currently hold NAS membership.

Caltech alumni joining the NAS this year are Clyde Hutchison, PhD '69, the Kenan Professor of Microbiology and Immunology at the University of North Carolina; Lily Yeh Jan, PhD '74, professor of physiology and biochemistry, UC San Francisco and investigator with the Howard Hughes Institute; Vernon Smith '49, the Regents' Professor of Economics, University of Arizona; Richard Stanley '66, professor of mathematics, MIT; and Bruce Winstein, PhD '70, professor of physics, the University of Chicago.

A Caltech faculty member since 1980, Meyerowitz has carried out pioneering studies in developmental genetics, many of them with the common mustard weed *Arabidopsis thaliana*. His

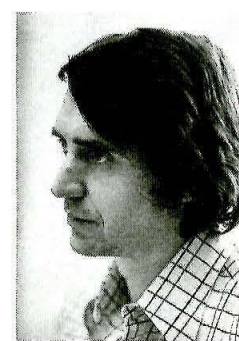


Elliot Meyerowitz

work has helped to illuminate the fundamental mechanisms by which genes govern the pattern of development not only in flowering plants but also in many other organisms, and has led to new insights into how these processes can go awry. A graduate of Columbia University (AB '73) and Yale (PhD '77), Meyerowitz was elected in 1991 to the American Academy of Arts and Sciences, and he is the author of numerous papers in his field, including an article in the November 1994 *Scientific American*, in which he sets out in some detail his research into the genetics of flower development.

Anthony Readhead is well known in the astrophysics community for his work in Very Long Baseline Interferometry (VLBI), a field of radio astronomy in which a worldwide network of telescopes functions as a radio dish essentially the size of the globe. He has used VLBI to investigate and characterize some of the most powerful and mysterious objects in the cosmos, including quasars and active galactic nuclei. More recently, he has headed a team that has carried out detailed observational studies of the cosmic microwave background radiation, searching

for temperature fluctuations in what is sometimes referred to as the afterglow of the Big Bang. The group's finding—subsequently borne out by the COBE (Cosmic Background Explorer) satellite—that the temperature is extremely uniform has played a significant



Anthony Readhead

role in shaping and refining theories about the evolution of the early universe and the birth of galaxies. A native of South Africa, Readhead earned his B.Sc. in 1968 from the University of Witwatersrand and his PhD from Cambridge in 1972. He joined the Caltech faculty in 1974.

Born and educated in Moscow, Alexander Varshavsky spent 15 years on the MIT faculty before coming to Caltech in 1992 as the Smits Professor of Cell Biology. At MIT, he and coworkers made a series of important discoveries about the nature of chromosomes, including the finding that a chromosome possesses an intricate, "punctuated" structure, in which specific regions such as the beginnings of active genes and the sites that initiate DNA replication are much more unfolded ("exposed") than the rest of the chromosome. His laboratory also deciphered the mechanism by which DNA molecules separate during chromosome replication, and described the phenomenon of induced gene amplification—the means by which cancerous cells exposed to chemotherapy may ultimately thwart the



Alexander Varshavsky

treatment by generating extra copies of the targeted gene or genes in such large numbers as to render otherwise toxic doses of the drugs ineffective. More recently, Varshavsky's laboratory discovered the first intracellular degradation signal and produced direct evidence that ubiquitin, a small protein present in all organisms from fungi to humans, is required for the degradation of short-lived intracellular proteins.

Four faculty named to endowed chairs

Four professorships—three of them new and one with two emeriti faculty already to its credit—have recently been awarded to Caltech professors. The new occupants of endowed chairs are Paul Dimotakis, David Goodstein, Philip Saffman, and Bradford Sturtevant.

Paul Dimotakis '68, PhD '73, professor of aeronautics and applied physics, has been named the John K. Northrop Professor of Aeronautics and professor of applied physics. He is the first holder of the chair, which has been established with funds remaining after the dissolution of Northrop University. The corporate charter of Northrop University indicated that if the school were ever dissolved, then its assets would be transferred as a gift to Caltech.

After receiving his three degrees from the Institute, Dimotakis joined the faculty in 1973 as a research fellow. He was appointed assistant professor of aeronautics and applied physics in 1975 and named full professor in 1986.

Dimotakis conducts research on turbulent flows, specifically the mixing of liquids and gases in turbulent transport; flows that react chemically; and turbulent-flow phenomena that occur during combustion. His studies have led him to several unusual projects—he helped design the fluid mechanics for the "Leap-Frog Fountain" in Epcot Center at Disney World, and recently he contributed to the

sail design for the America's Cup competitor America³. Dimotakis is an associate fellow of the American Institute of Aeronautics and Astronautics, and a fellow of the American Physical Society.

David Goodstein, the Institute's vice provost and professor of physics and applied physics, has been named Caltech's first Frank J. Gilloon Distinguished Teaching and Service Professor. The new chair was endowed from the estate of Frank J. Gilloon, who served as an instructor in civil engineering at Caltech in 1919–20. A longtime Institute supporter, Gilloon died last year at the age of 99.

A member of the Caltech faculty since 1966, Goodstein is known to a worldwide audience as the creator, producer, and host of *The Mechanical Universe*, a 52-part college physics telecourse, which first debuted on PBS in 1985. Based on Goodstein's popular introductory physics class, which he has taught for more than two decades at Caltech, the series has been adapted for use in high schools and has had an international distribution that has seen



A gathering of optoelectronic specialists might be expected to feature luminaries, and indeed a large number of the world's leading experts in optical and quantum electronics came to San Diego last spring to honor one of their field's brightest lights—Caltech's Thomas G. Myers Professor of Electrical Engineering and Professor of Applied Physics Amnon Yariv—on the occasion of his 65th birthday. Among the many Yariv associates who paid tribute to their colleague and mentor's numerous teaching and research contributions during his 30 years at the Institute were many of his former graduate students, including conference organizers Tom Koch, PhD '82 (at left, in photo) and Kam Lau '78, PhD '81 (at right), professor of electronics and computer science at UC Berkeley. Pictured next to Koch, from left, are Ivan Kaminow, of Bell Labs, Fran Yariv, and Amnon Yariv.

it translated into ten languages. *The Mechanical Universe* has received more than a dozen awards in both the United States and abroad, including the 1987 Japan Prize for television.

Goodstein's research focuses on condensed-matter physics, especially two-dimensional matter and phase transitions. He has published more than a hundred articles in this field, and a book, *States of Matter*, first printed in 1975 and reissued in 1985. Goodstein also frequently contributes articles and editorials on science and science policy issues to newspapers and journals throughout the country.

A 1960 graduate of Brooklyn College, Goodstein received his PhD from the University of Washington in 1965. He joined the Institute as a research fellow in 1966, was appointed assistant professor in 1967, and full professor in 1976. He became Caltech's vice provost in 1987.

Professor of Applied Mathematics Philip Saffman has been named the Theodore von Kármán Professor of Applied Mathematics and Aeronautics. A member of the faculty since 1964, Saffman conducts research in fluid mechanics.

After receiving his BA in 1953 and his PhD in 1956 from Cambridge University, Saffman held various faculty positions at both Cambridge and the University of London before joining the Caltech faculty as professor of fluid mechanics. In 1970 he was appointed professor of applied mathematics, and from 1985 to 1988 he acted as executive officer for that department.

Saffman has conducted research on various types of fluid interactions, including viscous fingering, the interaction of molecular and macroscopic mixing in a turbulent fluid, and the

dynamics of homogeneous turbulence.

The third holder of the von Kármán Professorship, Saffman succeeds Anatol Roshko, PhD '52, who held the chair from 1985 until last year, when he became von Kármán Professor of Aeronautics Emeritus. The professorship,



Phillip Saffman

first awarded in 1984 to Hans Liepmann (also a von Kármán Professor, Emeritus), was endowed by a group of aerospace corporations, foundations, and individuals, many of whom were friends of von Kármán, a Caltech professor from 1929 until 1949.

A fellow of the American Academy of Arts and Sciences and the Royal Society of London, Saffman was honored with the Otto Laporte Prize of the American Physical Society in 1994. A member of four editorial boards, Saffman has also written more than 170 articles and a book, *Vortex Dynamics*.

Professor of Aeronautics Bradford Sturtevant, PhD '60, has been named to the new Hans W. Liepmann Professorship, established in 1993 by the Boeing Company in recognition of Liepmann's numerous contributions to aeronautics and aerospace research and development.

Sturtevant, who has been associated with Caltech for nearly 40 years, specializes in the study of shock waves, which includes research into such varied phenomena as volcanic eruptions and pyroclastic flows, vapor explosions, and engine noise from motorcycles and airplanes.

The Institute's first Liepmann Professor came to Caltech as a graduate student, after earning his BE from Yale in 1955. In 1960, he received his PhD

and was named a research fellow. He was appointed assistant professor in 1962, associate professor in 1966, and professor in 1971; and from 1972 to 1976, he served as executive officer for aeronautics.

Sturtevant has been a visiting instructor at institutions around the world, including Harvard and universities in West Germany, India, and England, and has served as the secretary-treasurer of the Division of Fluid Dynamics of the American Physical Society. He is also a member of the Acoustical Society of America, and the Society of Automotive Engineers.

The establishment of the Hans W. Liepmann Chair is the latest of many honors that have come to Liepmann in



Bradford Sturtevant

the course of his long and distinguished career. These include the National Medal of Science and the Guggenheim Medal, both awarded in 1986, the National Medal of Technology in 1993, membership in

the National Academy of Engineering, the National Academy of Sciences, and the American Academy of Arts and Sciences, and an ASCIT teaching award.

Second SanPietro scholarship endowed

Alumnus Craig SanPietro '68, MS '69, has given the Institute \$250,000 to endow a second undergraduate scholarship and "give something back to Caltech for the many benefits it has provided me." His new gift becomes part of the SanPietro Scholarship Fund, which he established in 1994 to provide full tuition support to a student, with preference given to those who have lost one or both parents. SanPietro's parents died before he came to Caltech, where he was supported by a Sloan Foundation Scholarship and a Hertz Foundation Fellowship.

Environmental engineering major Christina Edwards '98 was awarded the first SanPietro Scholarship. She will be joined by a second recipient in September. SanPietro notes that "helping young people in need will always be crucial to Caltech's ability to attract the best and brightest students."

SanPietro is founder and president of Craden Peripherals Corporation, which designs and builds computer printers. Since 1983 the company has installed 30,000 printers in banks, hospitals, and government offices in more than 60 countries.

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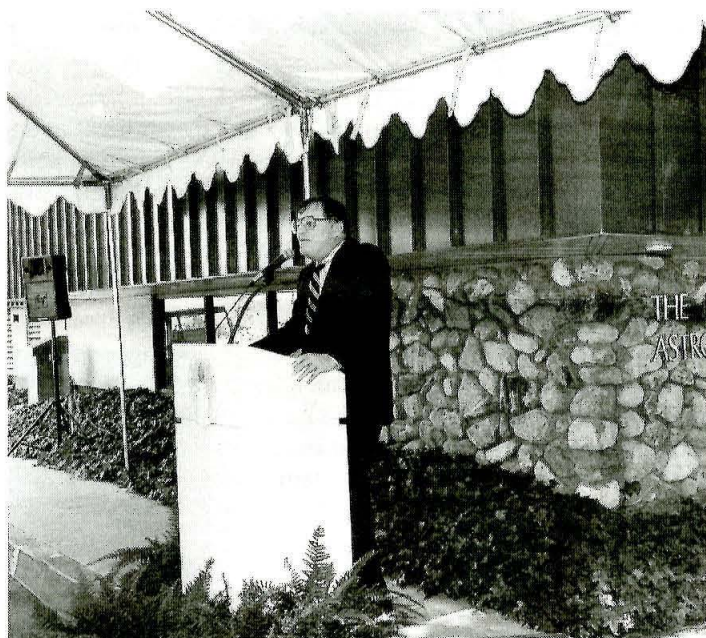
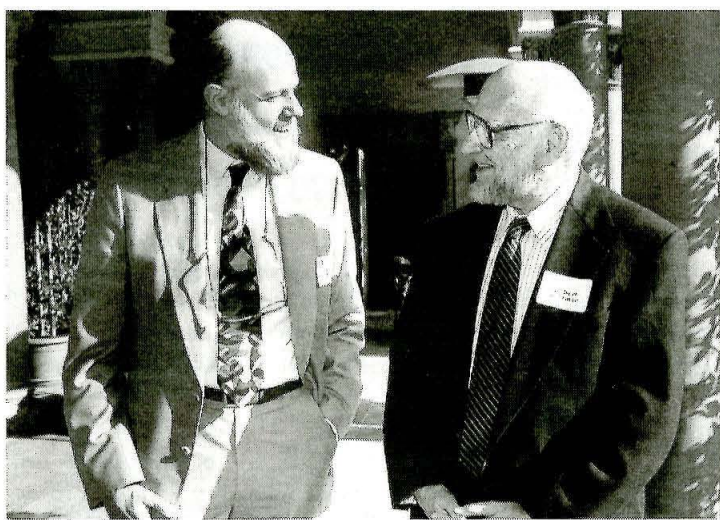
Landscape evolves even as we speak



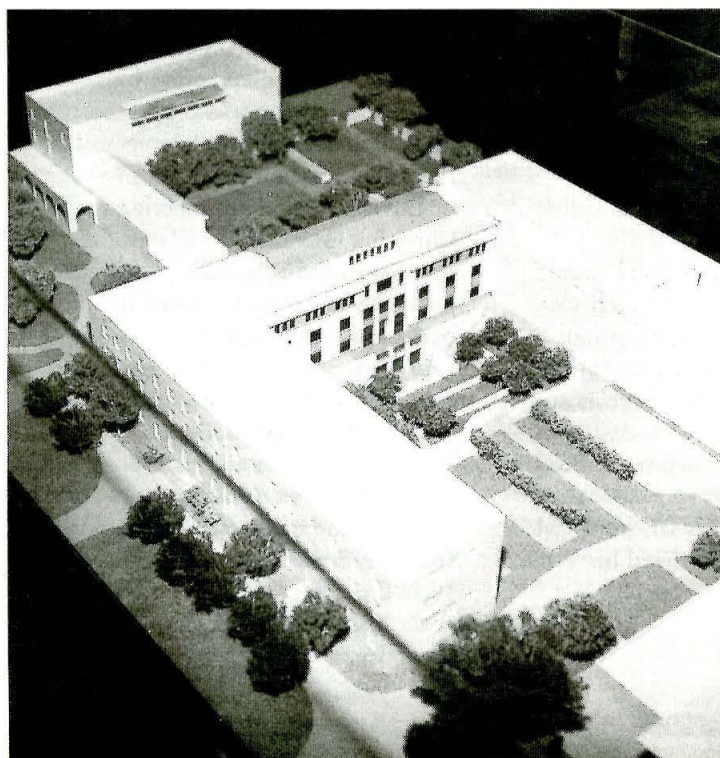
It's not a UFO landing site but a down-to-earth artwork that has grown to a height of six feet just west of Beckman Behavioral Biology Laboratories. The volcanic-rock sculpture rose along with the Moore Laboratory of Engineering, fulfilling a Pasadena ordinance that requires a work of public art to accompany academic and administrative buildings beyond a certain size. In the words of its artist, Lloyd Hamrol, the work "establishes a territory of changing relationships meant to be physically explored."



This spring, two public forums brought visitors and campus members together with the goals of improving media coverage of science and understanding Alzheimer's disease. At the science and media symposium held in April (top photo, from left), journalists Deborah Blum and K. C. Cole and Caltech Vice Provost David Goodstein participated in a seven-member panel discussion. The following month, talk turned to the causes and effects of Alzheimer's as neuroscientists Caleb Finch of USC (below, left) and Robert Katzman of UC San Diego headed to a forum with Caltech researchers and Alzheimer's Association spokesperson Shelley Fabares.



Rising to meet the research and residential needs of the future, Caltech broke ground this spring for both the Sherman Fairchild Library of Engineering and Applied Science (model at left) and Avery House, an interactive residence for students and faculty (directly above, under the admiring gazes of Vice President for Student Affairs Gary Lorden, left, President Everhart, and Ernestine and R. Stanton Avery). The Institute also added a second floor to the Infrared Processing and Analysis Center, thanks to a donation from Arnold Beckman, and renamed the building the David W. Morrisroe Astroscience Laboratory in honor of Caltech's long-time vice president for business and finance (above, at podium).



A summary of summer honors

Allan Acosta '45, PhD '52, the Richard L. and Dorothy M. Hayman Professor of Mechanical Engineering, Emeritus, and K. Mani Chandy, professor of computer science, have been elected to the National Academy of Engineering, one of the highest honors that can be bestowed upon a U.S. engineer. They join 75 newly elected members and 26 Caltech faculty members in the academy. Acosta was commended for his "contributions to the understanding of turbomachinery, particularly cavitation and rotodynamics." Chandy was honored for his "contributions to computer performance modeling, parallel discrete-event simulation and systemic development of concurrent programs."

In November, Professor of Geophysics Tom Abrens, MS '58, will receive the 1995 Arthur L. Day Medal and be given a life fellowship in the Geological Society of America in honor of his "outstanding contribution to geologic knowledge through the application of physics and chemistry to the solution of geologic problems."

Abrens is joined by Paul Jennings, PhD '63, acting vice president for business and finance and professor of civil engineering and applied mechanics, and Anthony Readhead, professor of astronomy, as a newly elected member to the American Academy of Arts and Sciences. They are among 162 new academy members and 72 Caltech members of the AAAS, which strives to gather together "the country's leading figures from universities, government, business, and the creative arts to exchange ideas and to promote knowledge for the public interest."

Lew Allen, senior faculty associate and former director of JPL, has received the 1995 Goddard Astronautics Award "for distinguished contributions to the nation's advancement in space and aeronautics."

Frances Arnold, associate professor of chemical engineering, has been selected by the University of Pittsburgh's Chevron Science Center to participate in the 1994-95 Chancellor's Lecture Series Honoring Distinguished Women Scholars.

Jacqueline Barton, professor of chemistry, was given the Alumna of the Year Award by the Columbia University alumni association. Barton received her PhD from Columbia in 1978.

Zackary Berger, a senior in biology, has been granted a Thomas J. Watson Fellowship to pursue an independent study project in Spain, Lithuania, Russia, and Ukraine. He'll consider the use and preservation of Spanish minor-

ity languages in light of the path that Yiddish has followed in Central and Eastern Europe.

Caltech Trustee *Eli Broad*, chairman and CEO of SunAmerica Inc., has received the insignia of the Chevalier de la Legion d'Honneur from the French government, honoring both his business and cultural activities.

Jehoshua Bruck, associate professor of computation and neural systems and electrical engineering, has been selected to receive a Sloan Research Fellowship. He is one of 100 outstanding young faculty members engaged in research at the frontiers of physics, chemistry, computer science, mathematics, neuroscience, and economics to receive \$30,000 each for a two-year period beginning in 1995.

Thomas Caughey, PhD '54, the Richard L. and Dorothy M. Hayman Professor of Mechanical Engineering, has been elected a fellow of the American Association for the Advancement of Science.

Assistant Professor of Biology *Ray Deshaies* has been named a 1995 Searle Scholar. He and his research group will use the three-year, \$180,000 grant to further their investigations into the mechanisms of cell division in *Saccharomyces cerevisiae*, or baker's yeast, which could lead to a better understanding of human cell cycles and possibly the development of novel chemotherapeutic treatments for cancer. The Searle Scholars Program supports research in medicine, chemistry, and biological science by "outstanding individuals" in the first or second year of their first appointment as an assistant professor.

Jeffrey Dubin, associate professor of economics, has been awarded a 1995 Haynes Foundation Faculty Fellowship of \$8,000 for his proposed study on "Comparing and Contrasting Absentee and Precinct Voters." Fifteen fellowships have been granted this year.

Sam Epstein, the William E. Leonhard Professor of Geology, Emeritus, and *Hugh Taylor* '54, PhD '59, the Robert P. Sharp Professor of Geology and executive officer for geology, have received the European Association of Geochemistry's Urey Medal, together with alumnus *Robert Clayton*, PhD '55, professor of cosmochemistry at the University of Chicago. The award recognizes the scientists' "application of stable isotope geochemistry to the solution of problems ranging from the chemistry of the interstellar medium... to the circulation of groundwater in the earth's crust, to determining the diets of prehistoric peoples."

Harry Gray, the Arnold O. Beckman Professor of Chemistry and director of the Beckman Institute, has been elected a Foreign Member of the Royal Society of Arts and Sciences in Sweden. He has also been awarded honorary doctoral degrees from Sweden's Göteborg University, the University of Pennsylvania, and Bowling Green State University.

Gregory Hjorth, Bateman Research Instructor in Mathematics, has been awarded the first Sacks Prize in Mathematical Logic for the best dissertation in the field in 1993-94.

Rudy Marcus, Nobel laureate and Arthur Amos Noyes Professor of Chemistry, has been much honored
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Recent article rings a bell with alumni

Dear Editor:

I have been reading with much interest the article in the March '95 issue of *Caltech News* on E. T. Bell. Having him as my major professor for my PhD program in the mid 1930s was one of the most fortunate breaks in my whole professional career. Indeed he was a character but he was a generous friend and supportive in every possible way.

I noted the comments on his love for colorful cars even though he could not possibly drive. I had the pleasure of driving him many places particularly out into the desert which he loved. There were certainly two convertibles which I drove—one red and one orange—this long before the days of the bright colors of recent years. His son, Taine, for a long time drove the red one to UCLA where he was a student. One day he had the chance to drive the orange one. As he was returning to the parking lot in the afternoon the attendant accosted him saying that Taine should take in the orange convertible which quite outdid his red one. To which Taine happily responded that this was his dad's other car.

Bell's lack of mechanical sense was impressive. Once while I was driving him he tried to use the lighter in the car to light his cigarette. The lighter became unscrewed. After some futile attempts on his part I had to stop, pick up the pieces, and screw them together. Toby told me more than once that she always went around after he had been looking at some of his paintings hanging on the wall to make sure that they had been replaced properly so they would not fall off.

His jungle and his garden house was the place where his most creative work was done. Anyone who had the opportunity to visit him at work there could appreciate the atmosphere of inspiration that was present. I regretted its disappearance.

The very few of us who as graduate students were invited to work with him closely and intensively were fortunate.

—*Newman A. Hall*
PhD '38
New Hartford, CT

A small postscript to that beautiful article on E. T. Bell. I was a graduate student in aeronautics in 1936-1938. One day I returned to my car (a 1927 Chevy convertible!) that I had parked a few hours earlier, to find that, inexplicably, the car had "moved" a few feet forward, and was now in front of a fire hydrant. There was a note attached to my windshield. The note stated that the writer had seen another car bump me from the rear and move my car forward, and to contact him if I was ticked. The note was signed E. T. Bell. Unfortunately, I did not get a ticket, and so lost the opportunity (excuse) to call Professor Bell. What a

shame, especially since I had discovered only a few days earlier that E. T. Bell and John Taine, a favorite science fiction writer of mine, were one and the same. To add to the mystery of the color of Mrs. Bell's car I definitely recall an occasional glimpse of a yellow convertible, and being told that the driver was Professor Bell's wife.

—*Irving Berler*
MS '37, MS '38
Syosset, New York

I write to add a detail to the story of E. T. Bell and the Heavenly Light Bulb. At the end of Bell's debate with Eugene Carson Blake, a light bulb was lowered from the ceiling of Bridge Lecture Hall, and a voice, which I learn from your story was the voice of Al Hibbs, intoned, "Dr. Bell, if I am not God, who am I?"

Without an instant's hesitation, Bell shot back, "I will answer You out of Your own mouth: 'I AM THAT I AM.'" Al may not have heard him, and Constance Reid, although she was told the words, obviously didn't understand the allusion, but to those of us who recognized what God said to Moses out of the burning bush (Exodus 3:14, King James Version), it was Bell's best riposte of the evening.

Because of Bell's well-known antipathy toward religion, and because of his long interest in Fermat's Last Theorem, it was said that when he died, he would be given a pencil and a pad of paper and sent to purgatory to settle FLT by trial and error. Perhaps the recent proof of FLT has got him off the hook, unless he takes the view that he once took toward a proof in van der Waerden's *Moderne Algebra*. (In 1945 he was still teaching out of the German edition of that classic text.) At one point, van der Waerden concludes a proof with the words, "Damit ist alles bewiesen." Bell's rendering was, "Dammit! Everything is proved."

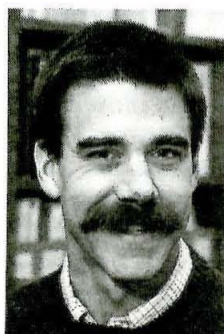
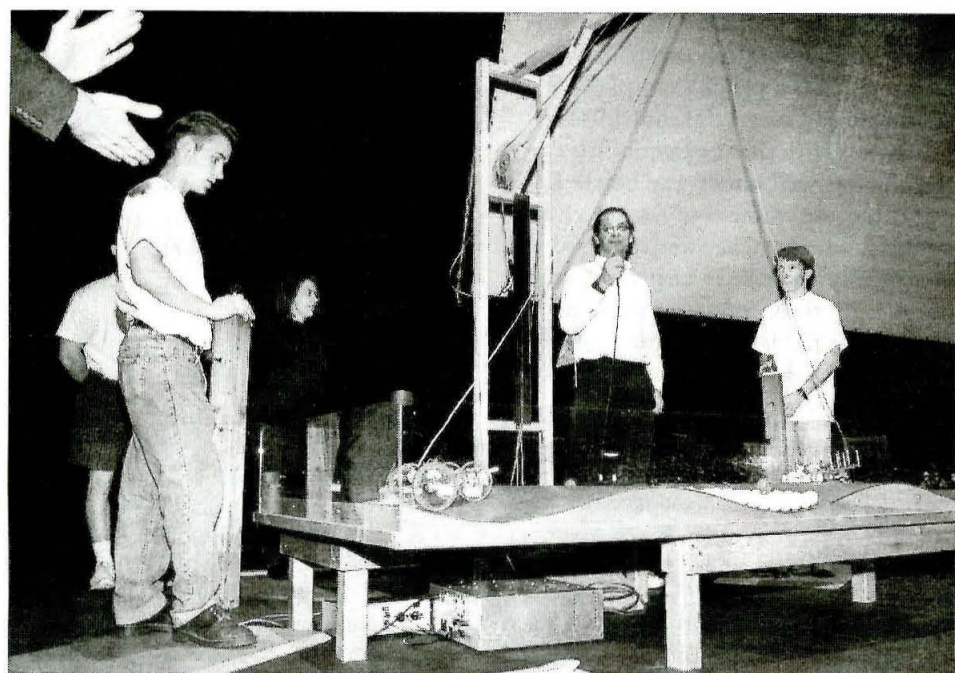
—*Samuel P. Morgan*
'43, PhD '47
Morristown, NJ

I very much enjoyed the article about E. T. Bell by Laura Marcus. Like Al Hibbs I was also present on the night of the famous debate on the existence of God and I well remember the descent of the light bulb. There was another memorable quote that night that Ms. Marcus did not include. Toward the end there was a question-and-answer period. A Pasadena matron sitting near me repeatedly raised her hand, and when she was recognized, directed her question to E. T. Bell. "Dr. Bell, do you believe in the existence of the Devil?" to which the great man replied "Unfortunately, madame, No."

I have always enjoyed and profited from reading his books on mathematics and mathematicians. But he also wrote a remarkable book entitled *The Search for Truth*, which I own and treasure.

Again, many thanks.

—*Garman Harbottle '44*
Setauket, New York



Applauding his students from the sidelines (above), Erik Antonsson, associate professor of mechanical engineering, came to center stage more recently to accept Caltech's second annual Richard P. Feynman Prize for Excellence in Teaching. Antonsson teaches the class that culminates in the annual ME 72 design contest pictured here, which the award committee noted "brings a sense of adventure and fun that Richard Feynman would have especially appreciated." An endowment from Ione and Robert Paradise supports the cash award plus an increase in the awardee's salary. Nominations are welcome from alumni, faculty, students, and staff, who can contact the Provost's Office at 818/395-6320 for details. For a glimpse of Antonsson, see the photo at left or catch the contest, held seven days after Thanksgiving.

Everhart

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has fostered more of a spirit of community than we would have had without it. The Moore Lab, of course, will provide a quantum increase in high-quality space for many of our engineering programs. Over time, Avery House and the Fairchild Library of Science and Engineering should have a major impact on the campus too.

CTN: *How about the evolution of your own role? Are you doing the type of job you expected to be doing when you accepted this position?*

TEE: Well, there are a number of answers to that question. Because Caltech is so small, and its administration is so lean, I find myself doing things here, in terms of detail, that I haven't done since I was a department chair at Berkeley. For example, when I was chancellor of the University of Illinois, I did not review research proposals to the same depth that I do here. I didn't sign nearly as many letters as I now do, thanking donors and friends for their support.

And I've found that this more personal, hands-on element extends into nearly all areas of campus life. For instance, I think a major advantage of being Caltech's president is that I've had many more opportunities to interact with the faculty than I would have had at a larger institution. And because of the interests and abilities of our faculty, the quality of those interactions, in terms of research and conversation, are richer than they would be at many other schools.

This type of close-knit environment also bears on decision making. It can be simpler in the sense that there aren't so many different people to talk with, but



Doris and Tom Everhart begin to meet the campus in October 1987.

it can also be more complicated, because instead of talking with big constituent groups, as I did at Illinois, at Caltech I almost always find myself dealing with the individual faculty members who have a stake in the issue under discussion. These are also extremely competent people, many of whom have no doubt that they are extremely competent and no hesitation expressing their confidence about it. That can make these interactions very exciting and stimulating, but not necessarily . . . Let me put it this way—I would never say that the president manages Caltech's faculty. That would be a falsehood.

In other respects, I'm doing about the amount of fund-raising that I thought I would do when I came. Cer-

tainly, we had good success with our recent campaign—we came in over our goal in times that were, as we all know, economically depressed for California. I think most people certainly feel good about that.

CTN: *And you've recently appointed Caltech's seventh provost—Steve Koonin.*

TEE: That's right. I'm looking forward to working with Steve because I think he has some fine ideas and, in a sense, he really represents a new generation of leadership for the Institute. He's about the same age, roughly, as President Clinton, and he's 20 years younger than I am. I think that having that combination of experience on the one hand and youthful vitality on the other will be stimulating and beneficial. It may be challenging for me and frustrating for him occasionally, but I think that overall it will be good for the institution. I have a great admiration and respect for him, and I think that we will work well together.

CTN: *You've said that one of the key challenges as president is working with the provost, the division chairs, and the faculty to hire the best new professors. Have Caltech's criteria for hiring faculty changed much in recent years?*

TEE: I don't think they've changed a great deal. We want people who will be the leaders in important new fields, or in older fields that will continue to be significant for a long time to come. Caltech has always been noted for developing pioneers and, in particular, people who can work across disciplinary boundaries and bring a broad range of disciplinary perspectives to bear on research problems. Since I've been here, there's been a lot more emphasis on computation and neural systems, which is a prime example of a tremendously successful multidisciplinary activity that began on this campus. It was well under way before I came, but the number of faculty and students who have become involved has continually increased. Last year it was one of only three research programs nationwide to be selected for a major engineering center grant from the National Science Foundation.

Another interdisciplinary effort that comes to mind is the supercomputing activity. Our present effort was started by a group of faculty called the Gang of N, who wanted to have very high quality computing resources. And we have made really great strides. Just last week, I heard someone say that Caltech is now third in the world in the supercomputing resources available to its faculty.

The situation is similar with our astronomical observatories. We have a relatively small astronomy faculty, but when they use the Keck or Palomar telescopes or the observatories at Owens Valley or Big Bear, they are able to take advantage of a huge resource, relative to their numbers. And because

they use these instruments very wisely and creatively, they can do groundbreaking research that is virtually impossible for people at other institutions to do. So we look for that sort of leverage as we think about new fields to go into and new faculty to hire, and I think we've made some exceptional choices.

One of the critical issues I've faced since coming to campus has been about whether Caltech should make a real effort to grow or should stay about the same size and continue to have a great amount of support per faculty member. We made a conscious decision not to grow dramatically, but really to concentrate on being the best in the fields that we elect to work in, and not to try to cover every field that there is. And we don't.

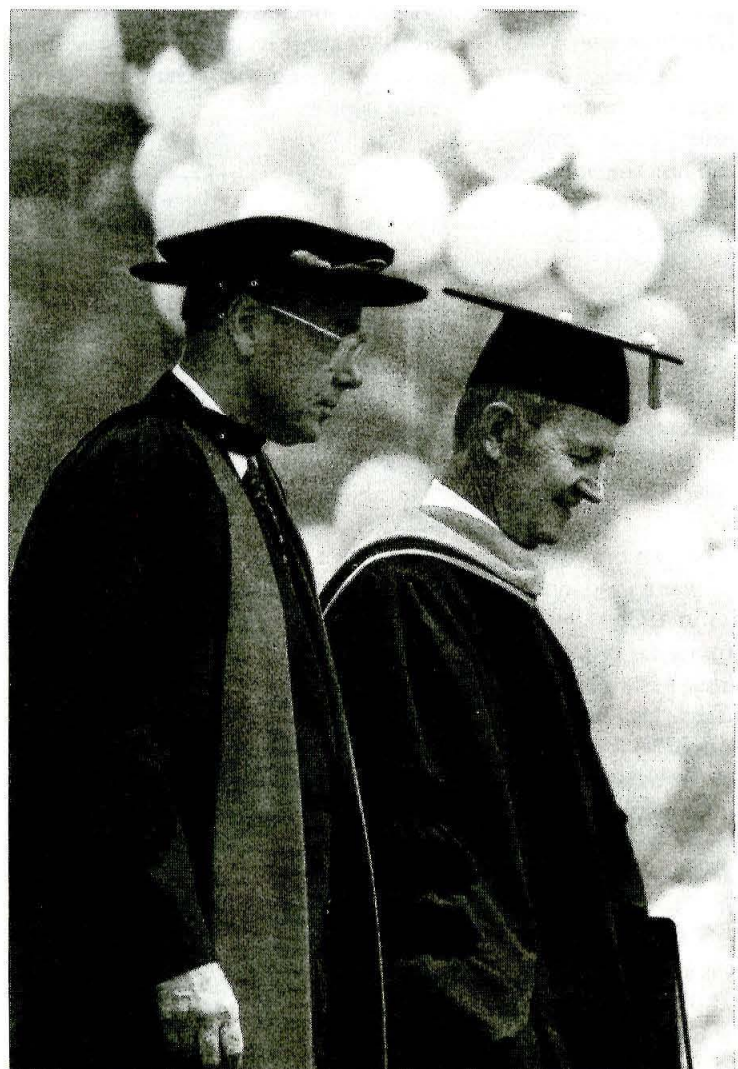
CTN: *Have there been any drawbacks to that decision?*

TEE: There are some. Since our focus is narrower than at some other places, there are always going to be some outstanding people whom we can't attract to the Institute because they don't see it as offering enough scope for their interests. But today, when the federal government is cutting back on the money it puts into research, our history of picking and choosing our research areas carefully and concentrating our resources there is also turning out to be a distinct advantage. Today, we find that many other institutions are following Caltech's lead in this respect; we're just way ahead of most of them. So I think we are doing the right thing.

CTN: *As Caltech's president, you have frequently served as a spokesperson on various aspects of science and technology policy. Have you enjoyed that?*

TEE: Yes. I find that when you have to speak out about specific issues it means you have to educate yourself on those topics, and that can be a stimulating and valuable process. I should add that it's a lot easier to do that at many other universities than it is here. It comes back to the size question. Some universities have three or four staff people reporting to the president whom you can ask to study up on this or that topic when you're preparing a speech. This is not the case at Caltech. So, every time I need help of that sort, I have to take somebody who has another important line operation and essentially use that individual as a staff person. If they're interested in the project, I feel better about it, but I hate to impose on people too much. So, I write a lot of my own speeches. I'm sure they would be better if they had more points of view from different sources, but again, this situation comes with the territory.

CTN: *What was your reaction when Harvard's president, Neil Rudenstine went on a sudden sabbatical, saying that the pressures of being a university president had just gotten to be too much for one person to handle?*



Six months after assuming office, Tom Everhart is formally inaugurated as Caltech's president in a ceremony that includes a personal escort from Trustee Chair Ruben Mettler '44, PhD '49, and an avalanche of balloons. The Institute's fifth chief executive, Everhart is the fourth to hold the title of president.



In one of the white-knuckle moments that invariably accompany high office, Caltech's president awaits the call on a crucial play in a Caltech versus Pasadena Police football game. Sharing the suspense are (foreground, left to right) Beckman Professor of Chemistry Harry Gray and Institute Professor of Chemistry, Emeritus, John Roberts.

I think there are several other important issues that universities are going to have to consider very carefully. We need to continue an era of partnership with the federal government without being seen as somehow trying to take advantage of that relationship—yachts at Stanford and perhaps other instances of that sort. I think these reported incidents have contributed to a feeling that universities have gone beyond an era of partnership into one of entitlement; the current public and government sentiment is very strongly against creating entitlements.

Another thought that has occurred to me in recent months is that while universities are not-for-profit institutions, they don't necessarily conform to the popular perception of what a not-for-profit entity should be. Most such institutions, such as public schools and the majority of churches, are not wealthy, and the people who work for them aren't wealthy either. If you look at research universities, faculty members are, in terms of average per capita income, reasonably well off. And this apparent discrepancy, I think, has of-

as favorable as it was perhaps 30 years ago.

Nonetheless, I think universities are still in reasonably good shape. But we have to work hard to keep them there. We have to do a lot of explaining about our role and mission to make sure that Congress and the public understand that an investment in education is one of the best investments society can make.

CTN: On several occasions, you've expressed the hope that science and technology graduates would play a greater role in shaping public perceptions about their fields, perhaps through taking leadership posts in government. How do you think this scenario is playing out at Caltech?

TEE: Ten or 15 years ago, most Caltech students went on to careers in research labs or major corporations, because that's where most of the jobs were. Nowadays, more of our students are going off in different directions. Many of them are joining, or founding, small, start-up companies, particularly in the computer areas, and they are making their mark—and maybe their fortune—there. We have some PhDs in physics who have gone to Wall Street. I don't know that their faculty mentors think that's such a great idea, but Wall Street obviously does; it's been hiring them for their analytical skills. And we've certainly had some students struggle, for want of a better word, into the science policy arena, where they have made a considerable impact. One of our graduates, John Andelin, was until quite recently deputy head of the Office of Technology Assessment in Congress. We've had other alumni working in high positions in Washington—probably the most visible right now is Arati Prabhakar, who received her PhD from Caltech in 1985 and is now, at the age of 35, head of the National Institute for Standards and Technology. Recently, of course, we also established an undergraduate major and graduate minor in Science, Ethics, and Society, which may encourage more students to consider such an area as a career option.

Overall, I think today's students are perhaps just more adventuresome and diverse in the way they move out into the workplace than they were 15 years

ago. Part of it has to do with different economic conditions, but part of it also has to do with changing times. We have always had students who have gone on to medical school and law school, and that trend is certainly continuing today.

CTN: You've also said on various occasions that as part of their science and engineering education, students at Caltech and elsewhere should gain some experience that would enhance their ability to communicate to the public about their fields. Do you see progress in this area?

TEE: I do think students at Caltech are learning to converse about their fields better. One development that has helped is that one of our alumni, Bob Perpell (BS '52, MS '56), has established a fund that awards a financial prize each year to the three students who make the best oral presentation of their SURF (Summer Undergraduate Research Fellowships) projects. Each October, we have a SURF Seminar Day at which all the SURF students speak about their research, and the top ones among those compete for this prize in a series of competitions. It was my honor to help judge that competition this past year, and the talks were extremely good. Those students in particular



The Everhart-Thornley secondary-electron detector, a key component of the imaging electronics of the scanning electron microscope, grew out of work Everhart began as a PhD student at Cambridge University and continued as a professor at UC Berkeley.

would do very well in explaining what they're doing to the general public. My guess is that all the students who took part in that competition, even the ones who didn't win the prizes, will now be better prepared to talk about their research, because they now have a better understanding of what it means to present their work to a lay audience and have had some practice in actually doing so. Also, for several years, a class on communicating effectively about research has been part of the SURF program. I think that has had and will continue to have an impact.

Continued on page 8

TEE: It can be a very wearing job, and there are times when you do get quite tired. I'm normally pretty exhausted by the end of the year after commencement, looking forward to a bit of R and R. My personal sense is that Rudenstine may have been trying to do too much—he's back from his leave now. One of his colleagues, Henry Rosovsky, wrote a book called *The University: An Owner's Manual*, and one piece of wisdom in it is that when the press asks university presidents to comment on a subject they know nothing about, they should feel no obligation to comment.

My own policy is only to speak out on issues that I think I know something about and on which it will serve Caltech's purpose for me to speak. That has been a disappointment to some people, who feel the president should speak out on many issues. But each time you speak out, you make some friends and some enemies; and, in general, the people who disagree with you remember your comments far better than the people who agree with you. So there's always the risk that if you say too much, particularly about topics with which you're not very familiar, you manage over time to alienate a good number of people whom you would prefer not to alienate. An institution like Caltech needs lots of friends and as few adversaries as possible.

CTN: How would you assess the public's current attitude toward higher education?

TEE: Universities are certainly coming under closer scrutiny today, and I think that's a trend we can reasonably expect to continue and must be prepared to deal with. I think there's a fairly widespread perception that, while higher education has been doing its job quite well, there are some concerns that it



Everhart updates campus managers at a State of the Institute breakfast, an annual briefing he has instituted since becoming Caltech's president.

has not been addressing. For example, there's been a drift toward more research and less emphasis on teaching in most research universities. I do not think that the population in general agrees with this trend. We must help them to understand that both teaching and research are important.

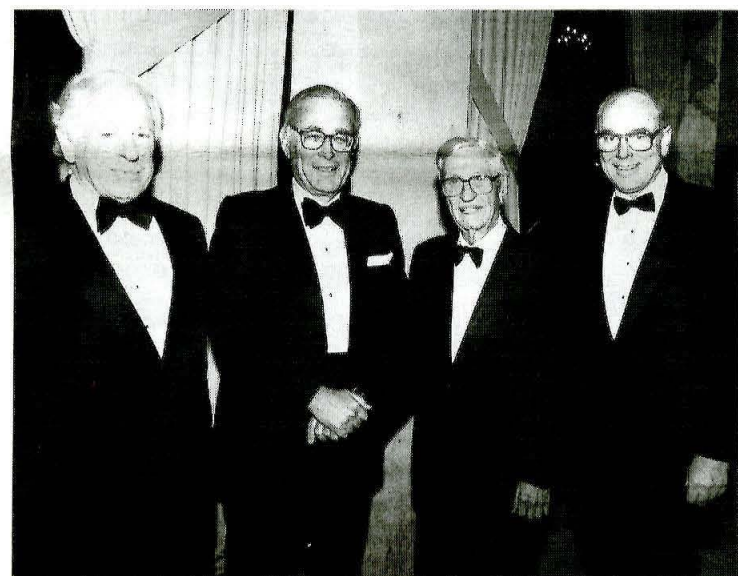
fended some members of the population. I think we are in an era when universities are perceived to be rich, perhaps arrogant, increasing their requests for funds faster than the nation can pay for research and the parents can pay for tuition, and that in general the public perception of universities is not

Everhart

Continued from page 7

CTN: As Caltech's president, what have you personally found to be the most enjoyable aspects of your job?

TEE: I think what I like most is dealing with people on topics that I believe are important for the nation and that are interesting to me—issues that I believe can have a real impact on science and technology and on society. The other exciting challenge is trying to make an institution that is already unique and very well known in the world even better. I think there need to be a few institutions that stand head and shoulders above the others in their own special way and set an example for all of the others. I think Caltech has



The president shares a moment with his predecessors: From left, the foursome are Murph Goldberger, Harold Brown, Lee DuBridge, and Tom Everhart. Can a carving on Mount Wilson be far behind?

done that in the past, is doing it now, and I hope will do it even better in the future. That's exciting.

CTN: What should Caltech's role and priorities be, looking toward the first decade of the next century?

TEE: I think that as we look forward, we have to remember what has stood us well in the past. I think that our emphasis on quality, seeking out the best talent and the greatest creativity, and then maintaining an environment that challenges people to exercise these abilities to do great things for the world—and by the way, for the Institute—is very important.

If you ask what specifically we should do, it's natural to look back for a moment at what we've already done. There are so many major advances that have come out of Caltech—in astronomy, chemistry, physics, the applied sciences; and right now of course, we're all very conscious that the earthquake engineering techniques developed here have probably saved countless lives in California. I think some of the work we've done and are currently doing with integrated circuits and computing has made a huge difference in the information revolution. You could go on and on, but let me just say that I think

we are investing in the same way in the future. Just to give you one example that I find particularly fascinating, we have three faculty members who in a variety of ways are working on making very small structures. One, Michael Roukes, is basically using these devices to study very fundamental questions in physics; the second, Axel Scherer, is developing very small electrical and optical devices; and the third, Yu-Chong Tai, is designing and building very small electromechanical devices. These are all vitally important new fields; they are laying the foundations for exciting new applications in a host of ways.

At the same time, we have to be aware that we can't do everything. We choose a few things and do them very well. And I think we have to realize that when we look toward the future and say, what will be the important fields, one of the reasons we don't know with certainty is because we don't

know what people will do. If brilliant, innovative people go into a field and develop it in an important direction, it takes on far more significant implications for society and for the future than anyone might have predicted. And one of the magic qualities of Caltech is the emphasis we place on creating an environment that encourages and challenges extremely talented people to do just that. When you have a John Hopfield and a Carver Mead, for example, teaming up to work in computation and neural systems, you can be sure that the results are likely to be very important, because of the caliber of those scientists. And one can say that with great confidence about many other people exploring new areas here on campus. And as we pursue these new directions, I would say, let's not lose our way. Let's understand that the emphasis on excellence and discovery, the culture that we've developed here, and the resources that we're able to provide for faculty and students have been instrumental in our success; and let's not move away from that. Let's continue to use our resources and our insight to identify the most important fields and make a big difference in them. That's really what this institution is all about.

FRIENDS

Alumni Fund honors top volunteers for 1994–95

Each year, the Alumni Fund recognizes outstanding volunteers in a variety of categories, including achieving the highest percentage of dollars contributed and the highest level of donor participation. Volunteers who reach 100 percent participation from their assigned group are also recognized. This year, for the first time, the Fund is also honoring volunteers based upon recommendations by their volunteer leaders or colleagues. All of the alumni listed here have demonstrated outstanding commitment and service to the Fund, and they will be honored with awards at the volunteer Leadership Conference on September 9th.

In the Regional Campaign, the oft-honored Robert W. DeGrasse '51, representing Region 5 (San Francisco), has once again attained the highest donor participation—51.3%—for a Regional Chair Inside California. Among Regional Chairs Outside California, Suzanne O. Rosenberg, PhD '75, and Robert S. Williams '62 take top honors, realizing a 55.2% participation rate from Region 11 (D.C.-Virginia).

Robert M. Phillips '52 heads the list of Area Chairs Inside California, with a 78% contribution total from Area 240 (Stanford). Representing Area 560 (Southeastern New York), Frank R. Johnson '69 takes top honors among Area Chairs Outside California, with a donor rate of 69.2%.

Volunteers who achieved 100% participation for their areas this year are Larry G. Whitlow '57 and Pedro P. Rodriguez '84, Area 100 (Pomona-Claremont); Horace M. Higgins '44, Area 115 (Palos Verdes); Darrell R. Jackson, PhD '77, Area 351 (University of Washington); Jeffrey D. Sanders '76, Area 361 ("Big Sky"); Franklin S. Harris, Jr., PhD '41, Area 365 (Utah); Thomas A. Turner '49, Area 366 (Nevada); Yuan C. Lee '38, Area 445 (Minnesota); Michael B. D'Amore, PhD '72, Area 525 (Delaware); William M. Kern '58, Area 550 (New York City).

The Highest Percent of Dollar Goal Attained category sees, once again, Suzanne O. Rosenberg, PhD '75, carrying off the prize as the Regional Chair Outside CA, with a 131.1% contribution total from Region 11 (D.C.-Virginia). Among Regional Chairs Inside California, Malcolm C. Morrison '64 attained the highest participation rate—118.6% from Region 02 (South Coast Counties).

As chair of Area 515 (Northeast Virginia), John R. Rempel '44 took highest honors for an Area Chair Outside California, with a 248.8% participation rate; while Robert L. Shacklett, PhD '56, excelled in the Area Chair Inside California category, achieving 141.5% participation.

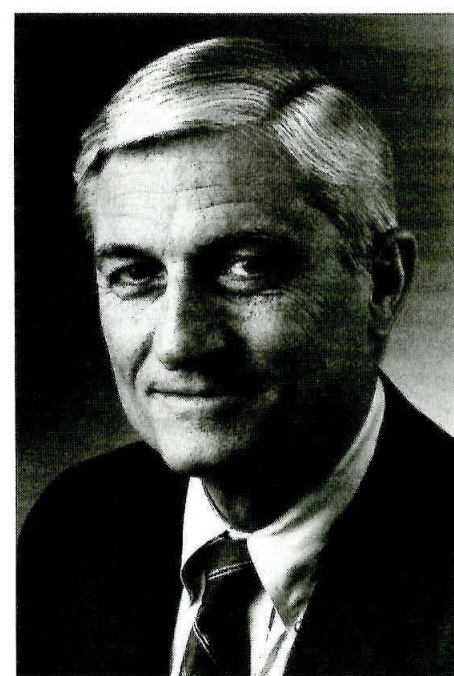
participation from Area 210 (Monterey-Santa Cruz).

Singled out this year for Special Volunteer Recognition are Carol Watkins '75, Area 365 (Utah); Shirley Whitmore Sherrill, MS '86, Area 100 (Pomona-Claremont); Eric Laue '40, Area 010 (San Marino); Suzanne O. Rosenberg, PhD '75, Region 11 (D.C. - Virginia); Kiran Bakshi, MS '72, Area 533 (West Pennsylvania); and Don Berry, PhD '84, James Clovis, PhD '63, Karen Greif, PhD '78, and Alfred Knudson '44, all representing Area 526 (Philadelphia).

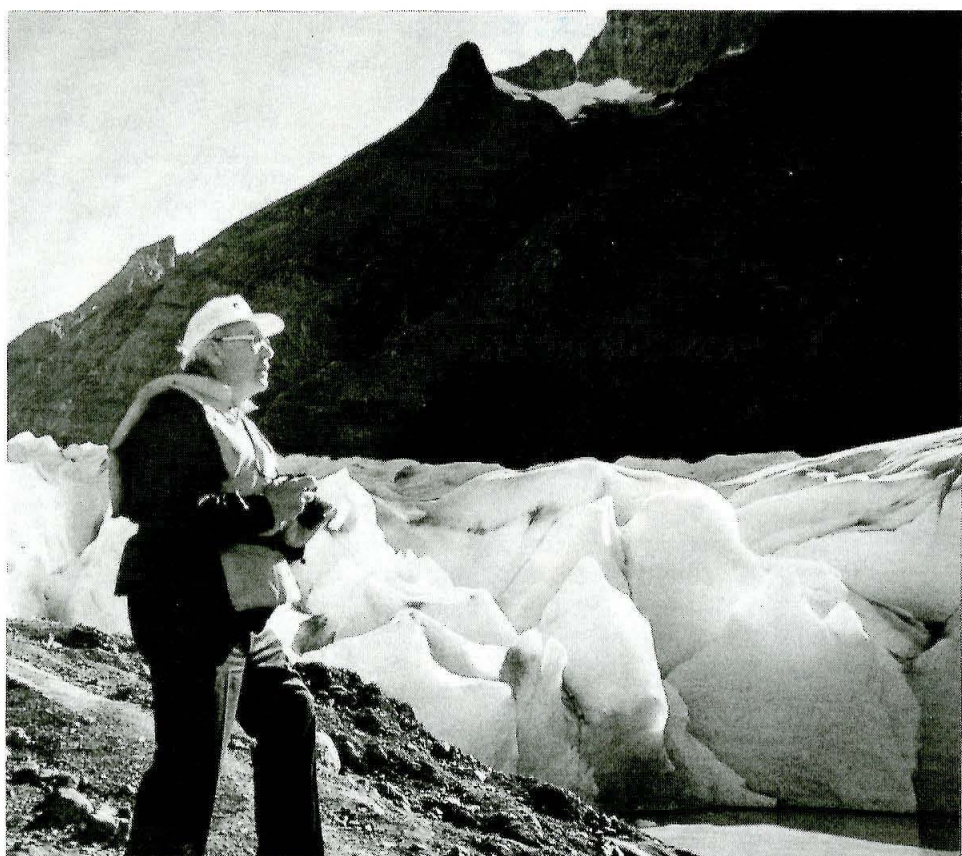
In the Young Alumni Campaign, the Highest Donor Participation Rate honors for a House Chair and Class Chair, respectively, go to Brian P. Daniels '88, with a 48.1% return from Fleming House, and to Jack L. Prater '91, who realized 87% participation from his fellow class members in Page House.

Singled out for the Highest Percent of Dollar Goal Attained are House Chair Andrew C. Hsu '89, who achieved a 155.3% participation rate from Blacker House; and Class Chair Jennifer E. Tritschbach '94, who spearheaded a 904.6% return from the Class of '94, Page House.

Receiving Special Volunteer Recognition for their work in the Young Alumni Campaign are Matt Himmelstein '91—1991 Fleming Class Chair; Taletha M. Derrington '93—1993 Fleming Class Chair; Celina Mikolajczak '91—1991 Ruddock Class Chair; Doug Gray '86—1986 Ruddock Class Chair; and Anne Jaeckel '92—1992 Ruddock Class Chair.



Contributing to the wealth of accomplishments and commendations of Caltech's trustees, Albert Wheelon has received the R. V. Jones Intelligence Award from Director of Central Intelligence R. James Woolsey. Wheelon, a member of the board of trustees, worked at the CIA in the sixties, between his years at TRW and his rise to the position of CEO and chairman of the board at Hughes Aircraft. As the CIA's first deputy director for Science and Technology, Wheelon "developed the United States' posture in space, [demonstrating] scientific acumen, applied with art, in the cause of freedom . . . in the best tradition of the renowned British physicist, Reginald Victor Jones."



An impressive glacier captures the attention of Warren Schlinger, president of the Associates, as he participates in the group's President's Circle trip to Chile.

Associates president Warren Schlinger devotes time, energy to Caltech connections

Most Caltech graduates from any class can say that their experience at the Institute helped shape their careers, but how many alumni from the 1940s can say that they met their wives here too? After all, the school had only male students then. Luckily for Warren Schlinger '44, PhD '49, Caltech at least employed female staff members in his student days.

Schlinger met his wife, Katharine, in the mid-1940s while he was a graduate student studying chemical engineering. His advisor was Bruce Sage, who was conducting studies on the thermodynamic properties of hydrocarbons. Katharine, known as Katie, was Sage's secretary.

"I used to see her a lot because Sage kept her working until seven at night and I was there three nights a week operating Sage's specialized thermodynamic equipment from 4 p.m. until midnight," Schlinger recalls. "The turning point came when I got her to type my master's thesis and I took her out to dinner as thanks. After that, we saw each other quite a bit." After they married in 1947, Schlinger says, "Katie put me through the last couple of years of graduate school."

He spent four more years at Caltech as a chemical engineering faculty member, teaching courses and doing research on hydrocarbons and heat and mass transfer in turbulent flow, before deciding to work in industry. His plan was to get a couple of years of experience with a petroleum company and then return to academia. Sage, who was a consultant for Texaco, helped him get a job at the company's research facility in nearby Montebello. Schlinger enjoyed working for Texaco so much that he stayed there until he retired in 1987. "I turned down several offers to come back to Caltech," he says. "I was having too much fun where I was."

At Texaco, Schlinger worked his

way up from a job as a chemical engineer at the Montebello Research Laboratory to manager of the lab and then associate director of gasification. Along the way, he received nearly 70 patents in gasification and related fields. The laboratory pioneered a process for converting residual oil into synthesis gas (a mixture of carbon monoxide and hydrogen), which could then be used to make ammonia, methanol, synthetic crude oil, and other chemicals. The lab also developed an environmentally sound way to convert coal to synthesis gas and electric power, which looked like a significant contribution to solving the nation's energy crisis in the mid-1970s. Although the subsequent drop in oil and gas prices made this less attractive, Texaco built several coal gasification plants for special situations, including making acetic anhydride, a key component in the manufacture of cellulose acetate, the primary material used in photographic film. Schlinger has won numerous awards for his research, and was elected to the National Academy of Engineering in 1991.



Joining Schlinger (front, right) on the Associates' 1995 executive committee are treasurer Elizabeth Loucks Samson, (from left) ex-officio John Glanville, vice presidents Carl Larson '52 and Milt Mohr, and secretary Tom Tyson '54, PhD '67.

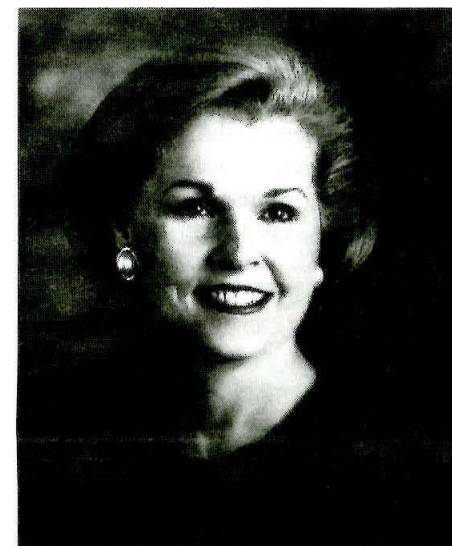
Although Schlinger never did rejoin the Caltech faculty, he has maintained a wide range of Institute connections. While at Texaco, he served as the company's liaison to the Caltech Industrial Associates. He has also continued to be an advocate for chemical engineering at Caltech. In 1989, he and his wife made a lasting impact on the Institute's chemistry and chemical engineering division when they established the Warren and Katharine Schlinger Professorship in Chemistry and Chemical Engineering, one of the earliest major gifts of the Campaign for Caltech. (Professor Mark Davis was named the first Schlinger Professor last year.) In December 1992, as the campaign was nearing its close, the Schlingers endowed two fellowships in chemical engineering. And last December, they pledged \$400,000 to modernize chemical engineering laboratories at Caltech. "The department always needs good researchers and that's what I'm trying to promote," he says. "This funding helps keep them here."

Besides playing golf, skiing, and maintaining his homes in Pasadena and Pebble Beach and his condominium in Mammoth Lakes, Schlinger devotes much of his time to the Caltech Associates, which he joined in 1973. The Schlingers became life members of the Associates and members of the President's Circle in 1981, and, since 1991, they have gone on several Associates' trips, including journeys to Scotland, New Zealand, and Chile. "It's a lot of fun to go on these trips, when you know half the people to start with and are friends with everyone when you finish," he says.

Schlinger was appointed to the board of directors of the Associates in 1992, and was elected president of the Associates earlier this year. During his one-year term, Schlinger hopes that the group can continue to increase its support for Institute programs. "Caltech, along with many other universities, will lose a lot of government research funding in the years ahead," he says. "It's just inevitable, with all the federal budget cuts. Private funding and support of higher education is more important now than ever before."

California's first lady named to Board of Trustees

Gayle Wilson, the wife of California governor Pete Wilson, has been elected to Caltech's Board of Trustees. A longtime advocate for volunteerism, the welfare of children, and science education, Wilson was appointed by President Bush to serve on the board of the National Commission on Community



Gayle Wilson

and Volunteer Service and served as chairman of the board of trustees for the Center for Excellence in Education in 1993 and 1994.

"Gayle Wilson brings to Caltech's Board of Trustees years of valuable experience working to improve education," says President Tom Everhart. "Her knowledge of educational issues both locally and nationally will be a wonderful asset to the Institute."

Wilson's interest in education, and particularly science education, dates back to her high school days, when she was one of 40 winners nationwide of the Westinghouse Science Talent Search. Valedictorian of her graduating class, she went on to earn her bachelor's degree in biology at Stanford, where she was elected to Phi Beta Kappa. She is a founding member of the San Diego chapter of Achievement Rewards for College Scientists (ARCS) and currently acts as honorary chairperson for the California State Science Fair and the California 4-H Foundation.

Often described as a career volunteer, Wilson became involved in a variety of volunteer activities while raising her two sons, Todd and Philip Graham, in San Diego. During this time, as a member and later president of the Junior League of San Diego, she took a leadership role in helping learning-disabled children and in children's mental health. In her commitment to public policy issues affecting children, she has placed particular emphasis on proactive efforts aimed at problem-prevention, including prenatal care, preventing child-abuse, safety in schools, and antigang and antigraffiti activities.

Will their degrees hold water? 1995 graduates get a chance to find out

The opening remarks had been made and the keynote speech given when the audience rose to hear the Caltech Glee Clubs' rendition of the "Hallelujah" chorus from *Messiah*. As the choir sang the line, "And He shall reign forever and ever," the unplanned excitement of Commencement '95 began.

What had been an innocuous gray sky was now yielding raindrops that were becoming more and more persistent. The 2,400 people seated from one end of the Beckman Mall to the other began to stir. "Surely it will pass," whispered the optimistic. "It never rains during graduation," pronounced the experienced. But other

to receive their diplomas and shake President Everhart's hand. "They look like drowned rats," opined one observer, not out of mockery but rather sympathy for the robed celebrants. "Borrow my umbrella," urged audience members who were escaping to drier ground. Susan Davis, division administrator in Humanities and Social Sciences, lent her umbrella to one set of parents after another, who would sprint toward the stage just in time to get a glimpse and perhaps a snapshot of their graduate.

Dean of Students Rod Kiewiet had a few words of advice for the new graduates. "Upon receipt [of your diploma], seek shelter," he said.

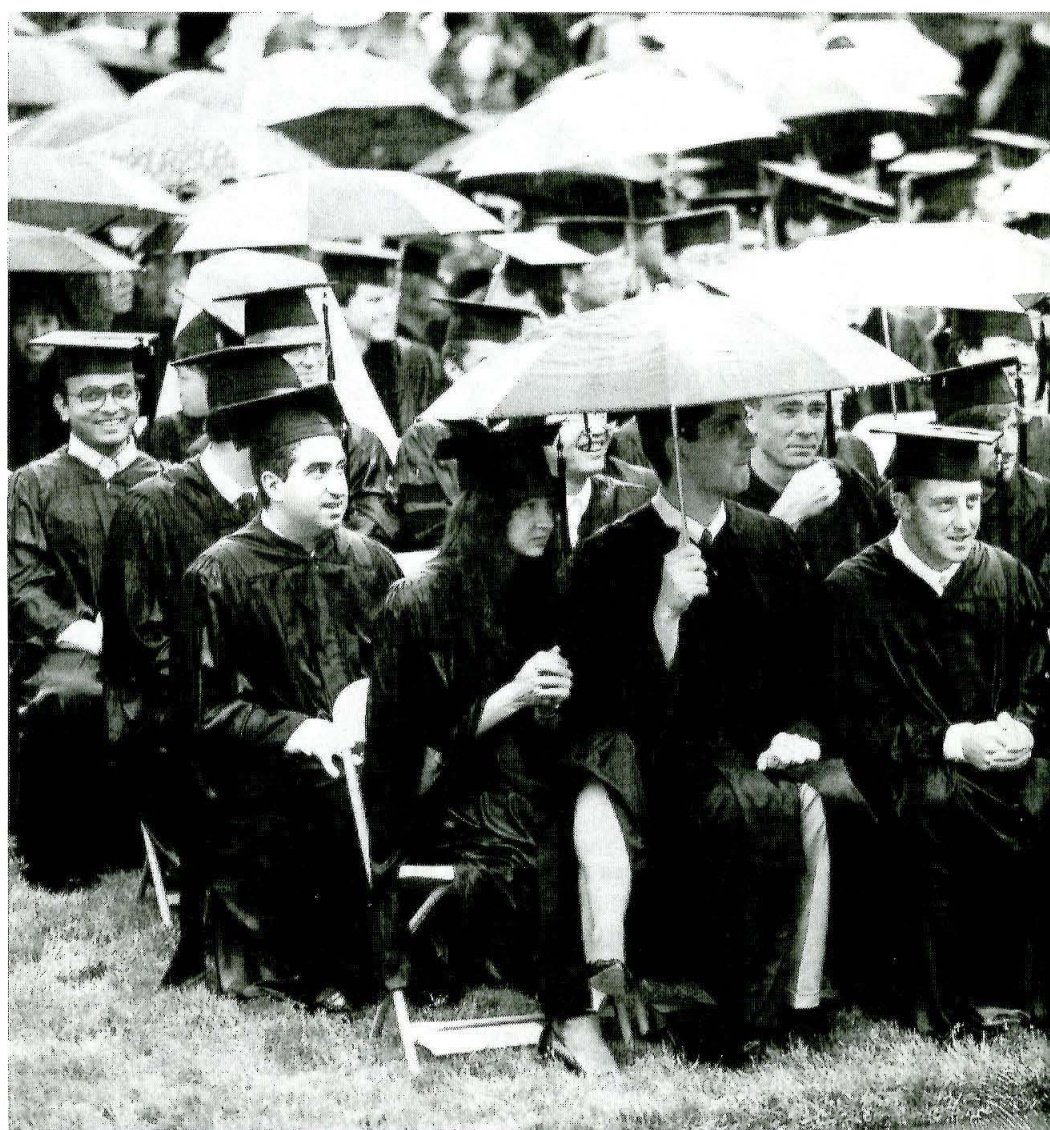
"It was chaotic, but it *was* unique," said graduate Sateesh Pillai. "I hear we set a record," said Wenge Xu, the last (and very damp) doctoral candidate to cross the stage. Their June 16 event was reportedly the first Caltech graduation to see rain since 1949.

Like a Shakespearean play, the ceremony could be studied for foreshadowings that hinted at the coming downpour. Consider the invocation, as many audience members did. First the Reverend Thomas Edwards of Knox Presbyterian Church urged graduates to cherish their dreams—"dreams planted and given water over many years." He couldn't have intended for .17 inches to fall over the next hour and a half. (The figure comes courtesy of Norman Brooks, the James Irvine Professor of Environmental and Civil Engineering, who, since 1954, has looked after the L. A. County rain gauge stationed at Caltech.)

Reverend Edwards proceeded to quote from Numbers 6:25: "The Lord make his face shine upon thee." There were chuckles from among the faculty even as he spoke, seeing as how the sun was not cooperating at all.

Still, as Caltech's chair of the board of trustees noted when he gave the opening remarks, Californians are forever the optimists. Gordon Moore, PhD '54, pointed out that he saw more people with sunglasses than umbrellas on his way to the podium, and he hoped that the majority was right. As it turned out, the Caltech Bookstore sold 120 umbrellas to the sunglass-sporting, rain-drenched crowd.

Attendees could nonetheless be thankful that Caltech has a small student body, and thus a small graduating class. Even before rain entered into the



Exhilaration, anticipation, contemplation . . . precipitation, as Caltech's newest graduates

picture, commencement speaker Mark Wrighton, PhD '72, drew comparisons between Caltech's class of almost 500 and MIT's class of 2,000. Wrighton is the Ciba-Geigy Professor of Chemistry and former provost at MIT and chancellor-designate at Washington University in St. Louis. He told the story of how MIT's former president, the late Jerome Wiesner, gave his blessings to each member of the class, also one at a time in the Caltech tradition.

"Despite the time involved, observers noted that President Wiesner shook everyone's hand firmly and had brief words of advice to all. Curious, one parent asked Jerry after the ceremony, 'What advice did you give my daughter?' Jerry responded, 'I give them all the same advice: keep on moving!'" Wrighton encouraged the Caltech students to do the same, both literally and figuratively.

A little later President Everhart, preparing to shake hands with 491 individuals, would add, "In view of the weather, I recommend the graduates follow Jerry Wiesner's advice."

Wrighton encourages graduates to get their feet wet

The skies had not yet begun to open when commencement speaker Mark Wrighton stepped up to the podium, and so the Caltech alumnus and outgoing MIT provost took the opportunity to indulge in a bit of poignant comparison between his graduation experience and that of his audience. Twenty-three years ago, Wrighton told his listeners, he found himself sitting where they now sat, getting ready to accept his doctoral degree in chemistry and preparing to mark the occasion by exchanging one of his most prized possessions, "a beautiful bamboo and ivory K&E slide rule" for a state-of-the-art calculator. Back then, Wrighton

reminded the graduates, many of them had yet to be born. The computer revolution, too, lay some small distance in the future. Its harbinger, the HP35 calculator that Wrighton subsequently purchased, cost nearly \$400—enough with inflation factored in, he estimated, to buy a powerful laptop today. The moral? "I am old," said the 47-year-old speaker, "and technology is changing rapidly."

On the former point, audience members who had a chance to examine Wrighton's biography in their commencement programs must have noticed that it hardly bore testimony to the travails of advancing age. After receiving his Caltech degree, Wrighton decamped to MIT as assistant professor of chemistry, becoming a full professor a mere four years later. Not long after, at age 32, he became one of the youngest faculty members in the university's history to be appointed to a named professorship. By 1987 he was chair of the chemistry department, and in 1990

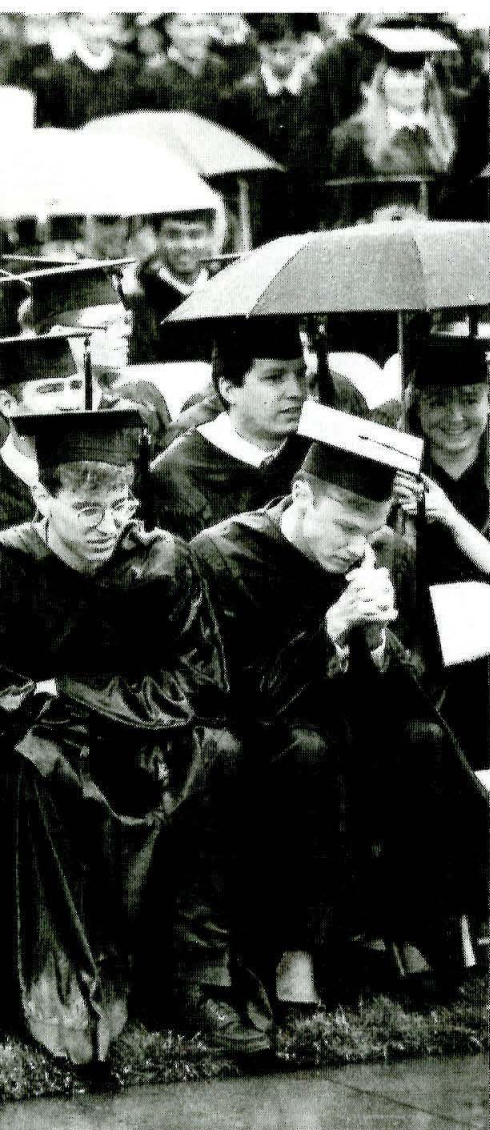


Some participants came prepared.

words would soon be heard as the candidates for bachelor's degrees, then for master's, engineering, and finally doctoral degrees, filed across the stage one by one.

As umbrellas went up and a good portion of the crowd ran for shelter under and inside the nearby Baxter Hall and Beckman Laboratories, the soon-to-be graduates waited patiently





t the awarding of their degrees.

he assumed the title of provost, a position he is now relinquishing to become chancellor of Washington University in St. Louis.

As a commentator on technological progress, Wrighton clearly stood on more persuasive ground. He holds 14 patents resulting from his research into chemical processes that mimic photosynthesis, and has published more than 400 articles on both this work and his more recent forays into the possible application of molecular electronics to sensor devices. The MacArthur Foundation has bestowed on him a prestigious "genius" fellowship, and the Institute named him to its Distinguished Alumni roster in 1992.

As provost at MIT, where in addition to many other honors, he has won two awards for excellence in teaching, Wrighton has focused particular attention on the role and responsibilities of science and the scientist in society. He sounded a similar theme in his commencement address, reminding his

listeners that in an increasingly interdependent, post-Cold War world, scientists and engineers must look beyond their laboratories to actively address the needs and expectations of the larger public. "You are leaving one of the finest institutions in America," he told his audience, "and to fully realize the benefits of your education, you must do more than solve focused problems in science and engineering."

Calling American science and technology, "the unassailed envy of the world," Wrighton singled out five reasons why U.S. leadership in this area will continue to be of paramount importance: the preservation and proliferation of peace; the improvement of human health; preservation of the environment; ensuring economic security; and enhancing the quality of life. As future leaders of the U.S. scientific enterprise, he urged the Institute's newest graduates not to lose sight of the "complex, human dimension" that marks all these endeavors.

Said the speaker, "The Caltech educational experience is one that prepares us for contributions to these areas of national, and indeed, international importance. However, the 20th-century education many of us have received may not be all that we need to make the 21st-century achievements that will allow us to look back 50 years from now and conclude that society's investment in us was a good one. The transforming achievements of the 21st century will be those that involve deep knowledge of social and political issues."

Added Wrighton, "The problems we face and the achievements needed to address them are not limited to science and engineering. We have the technical capability to observe an object the size of a basketball 25,000 miles from the surface of the earth, but we have not mastered the ability to bring peace to Europe. . . . We have launched an all-out war to cure AIDS, but do not have effective measures to cope with the discriminatory behavior toward those afflicted with this disease. . . ."

Reminding the graduates that their Caltech education has given them unique opportunities to help shape the future, Wrighton called on them to use their training and talents to help create a better tomorrow for all.

"I challenge you," he said, "to draw on your considerable educational background and your remarkable abilities to learn new areas to contribute to solving global-scale problems with science and technology. May you be blessed with the physical ability to continue to work hard, the intellect to work creatively, and the generosity and humanity to apply your talents to benefit society."

Awash in recognition

Wrighton's speech was heard by a commencement crowd of 204 graduating seniors, 117 MS students, 4 recipients of Engineer's degrees, and 166 PhD candidates. Eleven doctorates were awarded in biology; 47 in chemis-



Commencement speaker Mark Wrighton leaves the stage after indulging in a bit of dry humor. "I'm a chemist but I'm a merciful man," he told the graduates. "So I won't speak to you about chemistry."

try and chemical engineering; 58 in engineering and applied science; 14 in geological and planetary sciences; 7 in the social sciences; and 29 in physics, mathematics and astronomy.

As happens every year, a number of students walked off with more than their diplomas. Of the three prizes announced at commencement, the Milton and Francis Clauser Doctoral Prize,

deans has made the greatest undergraduate contribution to the welfare of the student body, and whose qualities of leadership, character, and responsibility have been outstanding," was presented to Stanley Grant III, who received his BS in physics, and to Flora Kou Ho, who graduated with honors in biology. A new-minted biologist also carried off the Mabel Beckman Prize: Gisela Maria Rodriguez Sandoval, graduating with honors, received the award, presented annually to an undergraduate woman—junior or senior—in recognition of demonstrated academic and personal excellence, contributions to the Institute community, and outstanding qualities of character and leadership.

Parents test the waters of campus life

For the first time, on the afternoon before commencement, a team of faculty and students presented parents with a glimpse of what their kids had been up to while earning undergraduate degrees. The visiting parents were joined by other interested parties to view three videos in Ramo Auditorium. Two by Erik Antonsson, associate professor of mechanical engineering, showed not only his students participating in the popular ME 72 contest, but also some of the work and thought that goes into the engineering design challenge.

The videos are a good example of the freedom and responsibility that students are given here, said Morgan Kousser, professor of history and social science, and chair of the convocations committee. It's a freedom that is coupled with attention, he added, "something that makes the Caltech undergraduate education distinctive."

The parents were also treated to a compilation of video clips from one of



Dedicated audience members hold their ground.



New trustee Gayle Wilson offers shelter to Dean of Graduate Studies and Professor of Geology Arden Albee.

awarded annually to the doctoral candidate whose research is judged to exhibit the greatest degree of originality, was presented this year to Eric Cummings, whose thesis "Laser-Induced Thermal Acoustics" also earned him a PhD in engineering and applied science.

The Frederic W. Hinrichs, Jr., Memorial Award, given to the "senior who in the opinion of the undergraduate

Caltech's most time-honored traditions, Ditch Day. The scenes of Ditch Day '95 came with a few words of much-needed explanation by junior-class

Continued on page 16

ALUMNI

Sports and broccoli jokes aside, Caltech's homecoming is a winner

Eager to land a seat in the crowded arena, hundreds of fans hurry through the doors as the clock signals the start of play. No sooner are they seated than someone mentions football, and the loyal alumni proceed to cheer on the stars from their alma mater. After all, it's homecoming weekend, and this is the main event.

If that sounds more like a Pac-10 school than Caltech, note that the arena

"The Yang of Nutrition . . . The Yin of Food." Incidentally, the audience will soon find out that Saltman was a basketball star during his undergraduate days.

But referring to that other game, President Tom Everhart tells the Seminar Day crowd what a joy it is to see people come back "to learn, and to applaud the faculty, rather than to cheer a football team."

A total of 1,639 alumni, friends,

good number of the 18 lectures and 20-some exhibits in the space of eight-and-a-half hours and still have time for lunch. During five lecture periods, visitors learn about the origin of the earth's atmosphere from Kenneth Farley, assistant professor of geochemistry; the fabrication of microelectronic "laboratories" from Associate Professor of Physics Michael Roukes; the importance of handedness in the synthesis of new drugs from Mark Davis, the Warren and Katharine Schlinger Professor of Chemical Engineering; the use of synthetic aperture radar (SAR) to study the earth's environment from Diane Evans, SIR-C project scientist from JPL; the dynamics of cardiac blood flows from Professor of Aeronautics Morteza Gharib, PhD '83; the controversy over "racial gerrymandering" from Morgan Kousser, professor of history and social science; a method for measuring the absolute velocity of galaxies from Professor of Physics Andrew Lange; and more.

All-star lineup

Together in Beckman Auditorium at 11 a.m., Seminar Day attendees hear from the five recipients of the Distinguished Alumni Awards: Gordon Eaton, MS *Ge* '53, PhD *Ge* '57; Jerry Nelson, BS *Pb* '65; Arati Prabhakar, MS *EE* '80, PhD *APb* '85; Charles Trimble, BS *Eng* '63, MS *EE* '64; and Max Williams, MS *Ae* '47, Eng *Ae* '48, PhD *Ae* '50. Accepting "the highest honor awarded by Caltech," as Everhart calls it, the recipients seem happy to recount their character-building college years from the comfort of the Beckman stage.

As the director of the U.S. Geological Survey, Gordon Eaton speaks of the "unrelenting demand" on the Caltech student's intellect, which "instills a habit of mentality that never leaves one throughout life." Eaton has drawn on his Institute-trained intellect to achieve the posts of provost and vice president for academic affairs at Texas A&M University, president of Iowa State, and director of the Lamont-Doherty Earth Observatory of Columbia University.

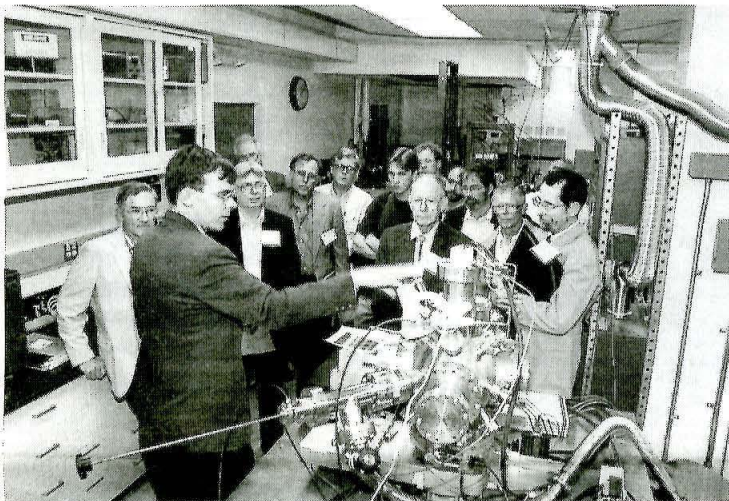
Among the many faculty mentors thanked by the recipients, Richard Feynman is eulogized by distinguished alumnus Jerry Nelson, project scientist for the Keck Observatory and designer of the Keck's innovative segmented mirrors. As Nelson recounts, "Feynman taught me that freshman physics can explain everything . . . giving me the courage to tackle impossible problems." So Nelson went into astrophysics and is now a professor at UC Santa Cruz. As project scientist for the observatory, he's involved in the design of an adaptive optics system for the Keck telescopes.

Arati Prabhakar, director of the National Institute of Standards and

Technology, spends her moments on stage recalling when alumni would visit campus and tell students like her about those "best years of their lives" spent studying at Caltech. Says Prabhakar, "My response was, 'Lord, tell me it ain't so.' But those years launched me into an enormous amount of career advancement that has been very satisfying," she adds. That includes her positions in the Defense Department's Advanced Research Projects Agency from 1986 to 1993, where Prabhakar created and directed DARPA's Microelectronics Technology Office until her presidential appointment to head NIST.

Charles Trimble credits Caltech with "providing me with a sense of humility . . . and a basis for understanding a rapidly changing world." After 14 years working in entrepreneurial engineering positions at Hewlett Packard, Trimble became one of the four founders of Trimble Navigation, Ltd. He is president of what has become a leading producer of Global Positioning System instruments, and he oversees the world's largest team of GPS scientists and engineers.

The winning lineup is completed by Williams, dean emeritus of the University of Pittsburgh's School of Engineering. He says he's "honored to join such an illustrious set of colleagues in receiving this award." Since serving as a Caltech research fellow and professor into the seventies, Williams has been dean of the University of Utah's engineering college and the holder of the



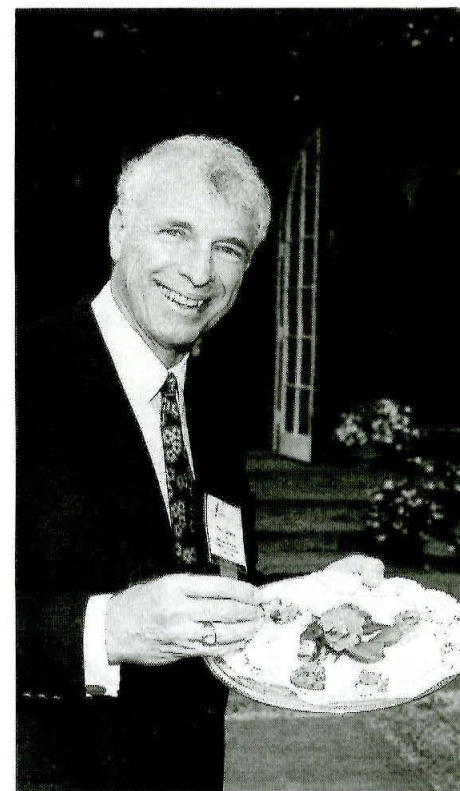
While some Seminar Day participants savored their noon meal, many hungered to visit exhibits on the Nanofabrication Laboratory, the alumni computer system, and Robert Lang's amazing origami art, among the halftime attractions. In the top photo, Associate Professor of Electrical Engineering Axel Scherer explains how a chemically assisted ion-beam etching system makes the smallest possible semiconductor devices. Meanwhile, Gary Stuplan '61 (left in center photo) brings Riley Holly '58, Sally Holly, Chrissy Folsom, and her father, Blair, PhD '74, into the Internet fold. Stuplan chairs the Alumni Association's Electronics Communication Committee. And (below, right) Lang '82, PhD '86, tells Nathan Glatt-Holtz and his father, David Holtz '64, how the origami bug bit him when he was six.



is Beckman Auditorium, the occasion is Alumni Reunion Weekend, and the main event is Seminar Day and its mid-morning presentation of Distinguished Alumni Awards and a keynote speech. Soon to speak is Paul Saltman '49, PhD '53, who is giving his keynote talk on

and family have turned out for the May 12-13 weekend of events, the earliest graduate being from the class of '23. People have come from as far away as Japan, notes Alumni Association President Pete Mason '51, PhD '62.

After the 8:15 a.m. kickoff for Seminar Day, the challenge begins: how to schedule the day so as to see a



Nutrition guru Paul Saltman says, If only 15 percent of the population has bad kidneys and needs to limit sodium intake, "What the hell are the other 85 percent doing running around looking for pretzels without salt?" Enjoy food, urges the keynote speaker.

General Lew Allen Research Chair at the U.S. Air Force Institute of Technology, among other positions.

Saltman takes on fad diets

Racing the clock as the lunch hour approaches, a past recipient of a Distinguished Alumni Award comes to the floor to discuss "The Yang of Nutrition . . . The Yin of Food." Paul Saltman studied chemistry and biochemistry at Caltech before becoming a faculty member at the USC School of Medicine, and then a professor of biology at UC San Diego. In his 28 years at UCSD, he has served as provost of Revelle College and vice chancellor of academic affairs. The popular professor has developed a series of courses called "Frontiers of Science" and made a number of public television programs. His research focuses on the nutritional value and chemical properties of iron, zinc, and other trace-metal elements.

Saltman begins his speech with a few reminiscences of his own. "I want to thank the Institute for the opportunity to play basketball here," he says. "I learned how to lose." He adds that he also learned how to enjoy scientific challenges as well as enriching pursuits in the humanities and social sciences.

Now he gets to the meat of his talk. At times a diatribe against low-fat, low-salt, low-iron, low-calcium, low-enjoyment diets, Saltman's lecture is well-flavored with wit and passion for his subject and can be boiled down to one central message: "Choose the foods you like, and get what's in the bag."

The "bag" refers to total parenteral nutrition (TNP), a solution given intravenously to some patients in lieu of food. It contains all the necessary life-sustaining ingredients (44 chemical nutrients) including water; calories from glucose, lipoproteins, and especially fat; seven minerals; eight essential amino acids; 13 vitamins; and 11 trace elements. Saltman recommends such a mix for regular diets, adding only fiber to the list. To meet the list's requirements, people should take vitamin and mineral supplements, he says.

Saltman challenges his students (and today's audience) on the amount of calcium and iron they get, or more likely don't get, when they skimp on meat and dairy products. "They say, 'Oh Dr. Saltman, don't worry about it. We do a lot of dark-green leafy vegetables.'" Sure, he says, but "do you do four-and-a-half pounds a day?" That would meet the U.S. RDA for calcium, but to cover iron too would require



Five cheers for Caltech's Distinguished Alumni—(from left) Max Williams, Charles Trimble, Jerry Nelson, Arati Prabhakar, and Gordon Eaton—are heard from President Everhart (center) and campus crowds.

increasing the quota to eight-and-a-half pounds, say, of broccoli, a prospect that would surely give one past U.S. president nightmares. "I tell you, you can get a lot of reading done on that kind of a diet," says Saltman, "you'd get through my book in one day." (He's speaking of *The University of California San Diego Nutrition Book*, 150 copies of which he brought to campus. They went like hotcakes at the Caltech Bookstore, selling out by midday.)

"You know what the greatest thing about a vegetarian diet is?" he jokes. "You can't eat enough of it to make you fat."

Team nutrition

To coach his audience on the basics of weight gain and loss, Saltman evokes the first law of thermodynamics, saying, "If you eat it and you don't burn it, you sit on it." So his advice to the overweight is simply to "eat less and run more." Saltman has developed a strong appreciation for the benefits of exercise in the many years he's worked with athletes, "from my old jock days

at Caltech till the present time," as he puts it. In fact, he's seen Tour de France bicyclists expend as many as 10,000 calories a day who obviously had to eat extraordinary quantities of food just to maintain their weight.

Speaking of nutrition on a national scale, Saltman notes the nutritional policy that he presented to the Chinese government last year. He says that every nation should seek the following: "an adequate food supply; adequate nutritional knowledge; a way to meet the special needs of the pregnant, of children during growth, of women as opposed to men, of young and old, of diseased conditions that need to be treated; and personal responsibility for health."

In addition, Saltman wants everyone to "celebrate food and culture," as was so tastefully done in the recent movie *Eat, Drink, Man, Woman*. "The issue is not one of extending life, but of the quality of life. . . . For me, that means sharing good wine and good food with people you love who love you, free of pain, sound of mind, and sound of body. May you be so blessed."



When the class of 1945 met for the Half Century Club reunion on May 12, members had a ball receiving yet another Caltech certificate, this time in celebration of their long-term alumni status.

Honors

Continued from page 5

lately, accepting the Honorary Professorship of Fudan University in the People's Republic of China, receiving the Lavoisier Medal of the French Chemical Society as well as an Honorary Citizenship of Winnipeg award, and being named both Honorary Fellow of the Chemical Institute of Canada and Honorary Member of the International Society of Electrochemistry. More recently it was announced that Marcus has been selected to receive the Treasure of Los Angeles award from the Central City Association, been named an honorary fellow of University College, Oxford, and received an honorary degree from the University of Oxford.

Charles Plott, Harkness Professor of Economics and Political Science, has been presented with an honorary doctoral degree from Purdue University.

Professor of Mathematics *Dinakar Ramakrishnan* has been inducted into the Johns Hopkins Society of Scholars. Ramakrishnan specializes in algebraic number theory and algebraic geometry.

Douglas Rees, professor of chemistry, has been awarded the 1994 Johnson Foundation Prize for adventurous and innovative research in structural biology, by the Johnson Research Foundation of the University of Pennsylvania Medical School.

Ares Rosakis, professor of aeronautics and applied mechanics, has been elected a fellow of the American Society of Mechanical Engineers. Rosakis has developed techniques to analyze fracture behavior, among other endeavors.

The latest Caltech students to receive Fulbright awards to study abroad are graduate students *Susan Rubin* and *Mark Walter* and undergraduate *Charles Sharman*. Rubin and Sharman will conduct research in chemistry and applied mechanics, respectively, at the Weizmann Institute in Israel. At the University of Karlsruhe in Germany, Walter will study the mechanical behavior of ceramic and other materials.

Erin Schuman, assistant professor of biology, has been selected as the 1995 recipient of the AAUW Recognition Award, presented by the American Association of University Women in honor of Schuman's exceptional achievements in the field of neuroscience.

Edward Stone, vice president, director of JPL, and David Morrisroe Professor of Physics, has been awarded a NASA Outstanding Leadership Medal.

Ahmed Zewail, the Linus Pauling Professor of Chemical Physics, has been selected by the American Physical Society as the recipient of the 1995 Herbert P. Broida Prize.

ALUMNI

Continued from page 13

Year marked by many new projects and initiatives, says Association president

By Pete Mason '51, PhD '62

As I end my year as president of the Alumni Association, I look back with a feeling of pride on our many accomplishments, mostly by the Association staff, our Board, and our dedicated committee members. Starting June 8, the Association will be in the capable

class of 1945 joined the Half Century Club with a special luncheon on May 12. In addition a special War Years Reunion was held at the Ritz-Carlton Hotel (the Huntington Hotel to many of us) for the classes who graduated in the years 1940 through 1949. Dr. William Pickering '32, PhD '36, Caltech professor emeritus and former head of

staff, presented 25 chapter events this year, and a new chapter has been established in Santa Barbara. The Financial Affairs Committee has carried out the recommendations of the Long Range Planning Committee by formalizing our procedures in a financial policies manual.

Our travel/study programs this year included a safari to Botswana and Zimbabwe with Ted Scudder, professor of anthropology; a trip to explore the Anza-Borrego area of the Southern California low desert, led by geology professor Lee Silver; and a second program to Montana's Glacier Park, led by Professor Emeritus Bob Sharp.

Let me note a few things yet to be accomplished and remind Association members that in each case we can use the help of alumni volunteers.

While we have improved our instructions and interface for the alumni server, the Internet and World Wide Web are changing rapidly and we must catch up.

The work of the Alumni Relations Task Force is well begun, but the major job of formulating a questionnaire that will be sent to all alumni is not yet complete. Alumni responses to this questionnaire, whether or not the alumni are Association members, will be vital to improving the relationship between alumni and the Institute.

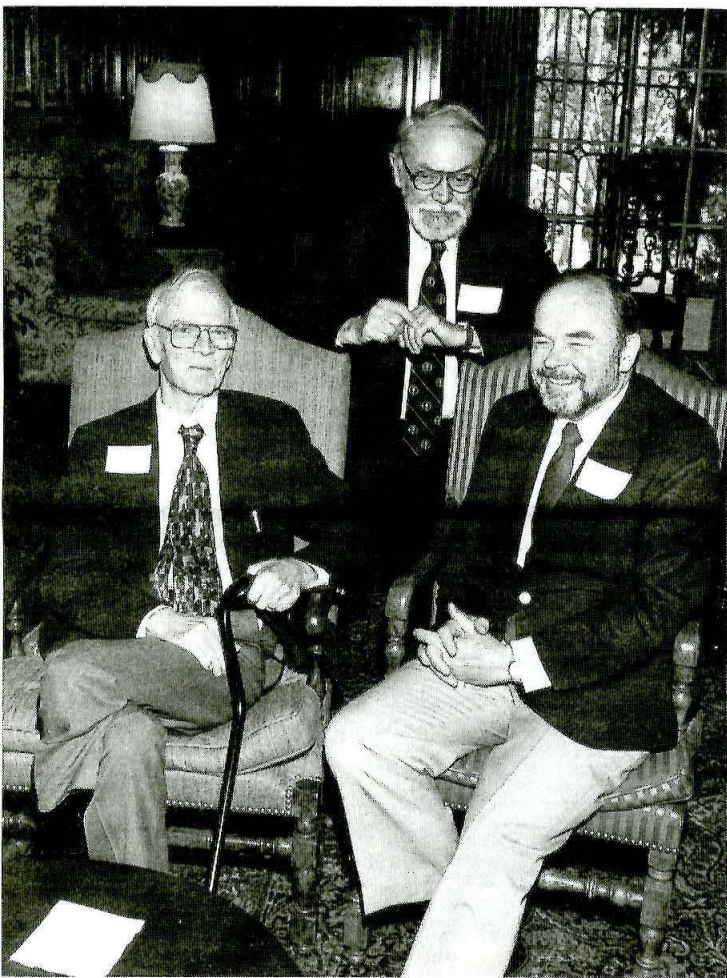
The Alumni Relations Task Force has been charged with finding more effective ways to reach undergrads, graduate students, postdocs, and especially alumni who are not members of

the Association. The group will complete its deliberations and make recommendations on this and many other areas at the end of the year—calendar or academic as the case may be.

We are also working to increase the number of low-cost travel/study programs. Your opinions on where to go and what you want to learn will help shape these programs.

On June 8, we held our last event of the year—our Annual Meeting and Honorary Alumni dinner. On that occasion, it was our pleasure and privilege to acknowledge two new honorary members of the Alumni Association: Senior Research Associate in Chemistry, Emeritus, William Schaefer, and *Los Angeles Times* columnist Jack Smith. In addition to his research and teaching accomplishments, Schaefer has served Caltech as former assistant director of admissions (1968–1973), director of financial aid (1973–1977), and registrar (1971–1977), and has been the leader of extremely well received Association travel-study programs to Ecuador and Guatemala, as well as a planned trip to the Yucatán peninsula in 1996. In his widely read columns, Smith has often written of Caltech with style, understanding, and humor.

As I close my last column as Association president, I would like to extend my thanks to the Alumni Association staff, the Caltech staff with whom I dealt, the many Association volunteers, and to all of you who made my task pleasant, interesting, and challenging.



Pete Mason (center) welcomes Los Angeles Times columnist Jack Smith (left) and Caltech Senior Research Associate in Chemistry William Schaefer (right) into the ranks of the honorary members of the Alumni Association at the Association's annual dinner on June 8.

hands of Frank Dryden '54, MS '57.

Seminar Day and the associated reunions are the climax of the year for the Association staff and board of directors. I have heard at every turn that "this was the best Seminar Day yet." It is with a great deal of pleasure that I offer my congratulations to Fred Eisen '51, seminar day chair, and John McCourt '52, program chair, and to the Association staff.

Paul Saltman '49, PhD '53, professor of biology at UC San Diego, did a superb job of convincing us that nutrition is a reasonably exact science, a part of our enjoyment of life as human beings, and a fascinating and amusing subject. Many thanks to Paul for giving the only lecture on nutrition that I have ever found too short.

We also honored five Distinguished Alumni, whose notable achievements are described elsewhere in this issue (see article and photo, pages 12–13). The Association offers its congratulations and thanks to them for bringing honor to Caltech and its alumni.

Finally, there were reunions of the classes of 1940, 1945, 1950, 1955, 1965, 1970, 1975, and 1985. The

the Jet Propulsion Laboratory, told us about the major but largely unheralded part Caltech played in the war effort, particularly in developing the barrage rockets that were used in the Pacific as a predecessor to amphibious landings.

As part of an attempt by the Alumni Association and the Caltech Development Office to reach more alumni, we will add reunions for the 5th, 15th and 60th year classes next year. Over the next several years, we will also be organizing graduate student reunions along division lines, starting with Biology and Social Sciences in 1996.

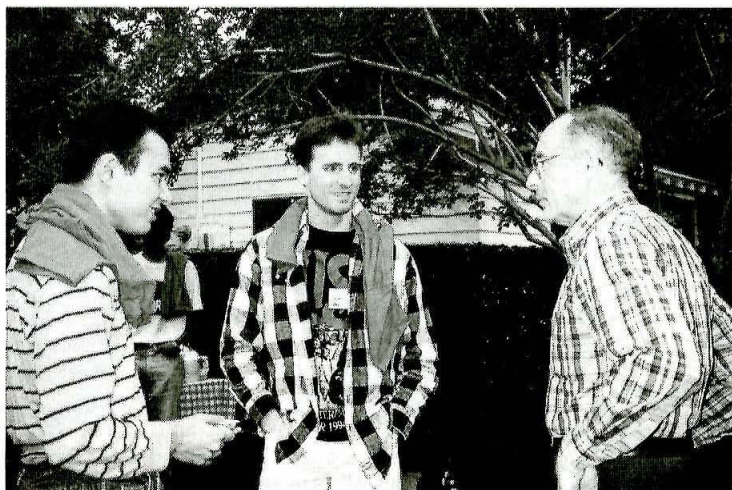
Let me list some of the other things we accomplished this year: we established the Caltech Signature Award, which will recognize talented high school students and will raise awareness of Caltech among high school students, teachers, and career counselors.

We are purchasing a new alumni computer that will reduce the delays caused by its popularity, provide better access to the World Wide Web, and offer more home pages for topics of interest to our alumni. The alumni server now offers improved instructions, which will be welcomed by new users.

Our nationwide network of chapters, with assistance from the Association



Getting a feel for the seismological research that goes on at Caltech are chapter presidents and undergraduate admissions support volunteers. They came to campus to attend the Alumni Association's annual leadership conference in February.



Only weeks away from achieving alumnihood themselves, undergraduates attend the senior barbecue at the Alumni House to meet with Association Past President Bill Whitney '51 (right) and other alums.

Chapter News

Phoenix/Tucson chapter tour Mayo Clinic

The study of human diseases using gene transfer technology was the subject of a talk given by alumnus James Lee (PhD '86) at the March 23 meeting of the Phoenix/Tucson chapter. Lee, a physician, also led the group on a tour of his workplace—the Mayo Clinic in Scottsdale. The clinic, funded by the Mayo Foundation, engages in basic research tightly interwoven with clinical studies and patient care. Several of the research programs under way use gene transfer technology in studies of cancer, cystic fibrosis, early embryological development, allergies, and asthma.

The politics of politics

Members of the Tri-State chapter learned that it is not always politics as usual from J. Morgan Kousser, professor of history and social science. Kousser spoke about the drawing of congressional district boundaries in his talk entitled "Color-Blind Redistricting: Has It Been? Should It Be? Could It Be?" Kousser has studied several majority-minority districts created prior to the 1992 elections that allow minority voters to elect the candidates of their choice. In his talk, Kousser examined questions such as "Is racial gerrymandering new? Does it make a difference if a member of Congress is a minority or Anglo?" And, "Would there be political and racial consequences if the courts prohibited redistricting authorities from providing this type of special protection to minorities."

Marching toward a new era in robotics

March was mechanical engineering month for the Washington, D.C., chapter as Greg Chirikjian, PhD '92, explained a trio of robotic technologies to alumni and guests. Studying with Caltech Associate Professor Joel Burdick propelled Chirikjian to further develop highly articulated, or "hyper-redundant," robotic structures in his current position as assistant professor at Johns Hopkins University. He told chapter members about his interests in the analysis, design, and implementation of hyper-redundant, metamorphic, and binary manipulators.

Association to explore "El Mundo Maya"

Join the Alumni Association on a travel/study program through the land of the Maya, scheduled for February 24–March 8, 1996. Led by Dr. William Schaefer, Caltech senior research associate in chemistry, emeritus, and amateur Maya archaeologist, the program will take us through the ruins of sixteen Mayan cities as we wend our way down and around the Yucatán peninsula in Mexico. On our journey, we will compare the architecture of the Puuc region—Uxmal, Sayil, Kabáh, and Labná—with the Río Bec style farther south and the more Toltec-influenced buildings of Chichén Itzá, as well as learning about the history and politics of the Maya states. Combining the Mayan aspects of this tour with visits to the modern cities of Mérida, capital of Yucatán; Akumal, south of Cancún on the Caribbean coast; and

Villahermosa, the main city of the state of Tabasco, we will contrast today's bustling city dwellers with descendants of the region's original Mayan citizens, who still dress in traditional costumes and live less harried lives.

Because of the recent great strides made in interpreting the Maya writings, or glyphs, it is now possible to construct histories of many of the Maya states and to gain insights into their political and economic relationships. We will try to understand this broader picture of the Mayan world as we journey through the beautiful Yucatán peninsula.

If you are interested in participating in this program, please complete and return the form below. If you have specific questions, please call Judy Amis, executive director of the Alumni Association, at 818/395-6594.



Caltech Alumni Association Travel/Study Interest Form

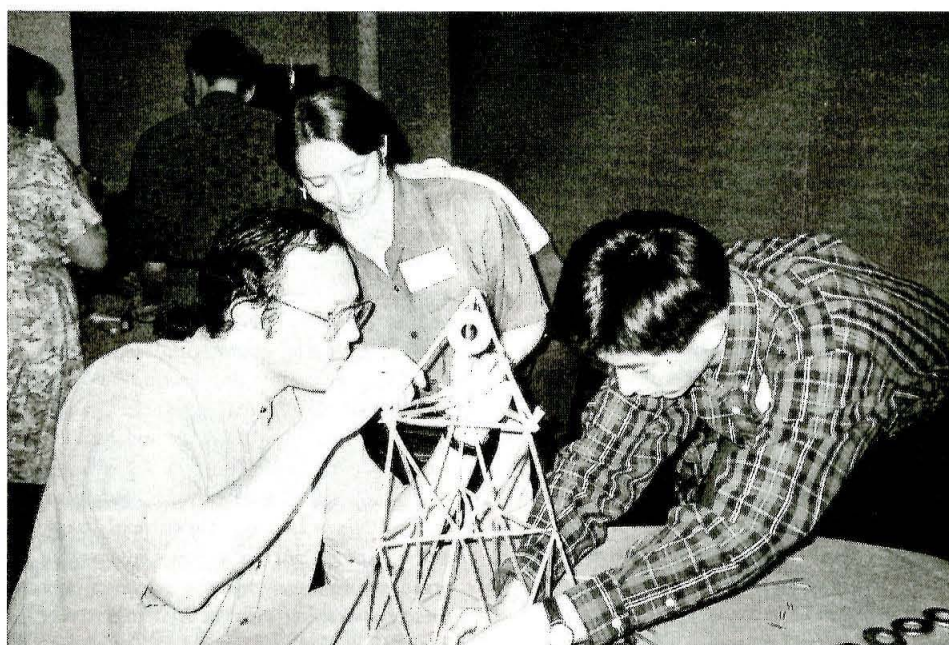
I/we wish to receive additional information about the Alumni Association's travel/study program to the Yucatán peninsula of Mexico, February 24–March 8, 1996.

Name: _____

Address: _____

Phone: (home) _____ (business) _____

Please return this form to
Caltech Alumni Association, Mail Code 1-97, Pasadena, CA 91125



They had a tall order to fill, but members of the Oregon and Seattle/Puget Sound chapters took on the challenge presented by Associate Professor of Biology Jim Bower, cofounder of SEED (Science for Early Educational Development) and CAPSI (Caltech Precollege Science Initiative). From left, Ray Lischner '84, his wife, Cheryl Klipp, Ex, and prospective student Andrew Ling, all from Oregon, try to build the tallest, strongest structure with a science kit in a demonstration of the power of hands-on learning.

ALUMNI ACTIVITIES

July 13, Santa Cruz Area Monthly Luncheon, Peachwood's at Pasatiempo Inn, noon. For reservations, call Bob Shacklett at 408/722-6021. Lunches are held on the second Thursday of each month—the next two dates are August 10 and September 14.

July 15–28, Three Great Rivers of Europe Travel/Study Program, led by Norman Brooks, the James Irvine Professor of Environmental and Civil Engineering. Cruise through Germany and Austria. Joint trip with Pomona College and the University of Redlands.

July 20, San Francisco Peninsula Monthly Luncheon, Ming's Restaurant in Palo Alto, noon. For reservations call Hugh Dubb at 415/362-3800 or 408/773-9100. Lunches are held on the third Thursday of each month—the next two will be August 17 and September 21.

September 22–October 1, Rio Grande del Norte, Geology and Culture of the Rio Grande Travel/Study Program, led by Leon Silver, the W. M. Keck Foundation Professor for Resource Geology.

November 2, New Mexico Chapter Dinner Meeting, with guest speaker Ellen Rothenberg, professor of biology.

January 1, 1996, Tournament of Roses Parade Event. Includes reserved parade seating and lunch at the Athenaeum.

February 24–March 8, Yucatán, Land of the Maya Travel/Study Program, led by William Schaefer, senior research associate in chemistry, emeritus.

March 18, Seattle Chapter Dinner Meeting, with guest speaker Judith Goodstein, Institute archivist and faculty associate in history.

March 19, Portland Chapter Dinner Meeting, with guest speaker Judith Goodstein, Institute archivist and faculty associate in history.

March 25–27, Geology, Flora, and Fauna in the Low Desert of Southern California Travel/Study Program, led by Leon Silver, the W. M. Keck Foundation Professor for Resource Geology.

For information regarding the above, please contact Judy Amis at 818/395-6594 for travel/study programs, and Arlana Bostrom at 818/395-8363 for chapter programs.

Commencement

Continued from page 11

president Nestor Ocampo.

In order to better explain the tradition whereby Caltech seniors create elaborate "stacks" and then ditch classes while their subordinates endeavor to tackle physical and intellectual problems and get into their rooms, seniors welcomed visitors into their houses and showed them some well-preserved stacks.

For example, a three-level maze enticed adventurous parents to enter from one student's window, crawl through the cardboard-and-wood structure, and emerge (maybe) at the window of another student's room down the hall. They could imagine themselves as investigators from the Centers for Disease Control escaping through the ventilation system of a small company that turns out to be the breeding ground for an international "biohazard" conspiracy. Senior James Holton told how one of his Ditch Day partners, Scott Van Essen, had wanted to build the maze since he was a freshman.

In Fleming House, senior Brian Cooper gave his parents and others a thorough explanation of the senior-class kidnapping of Hobbes and the rescue by a number of underclass Calvins. A "Jurassic Stack" was revealed in Page House, an Indiana Jones adventure unfolded in Ricketts, and a ghost story materialized in Ruddock, to round out the tour.

Watch for a similar series of events next year, open to all. Kousser is already working on arrangements for better weather.



Getting in touch with the monastic roots of his profession or just keeping dry? Professor of Geology Peter Wylie is thankful that his graduation hood from St. Andrew's in Scotland is functional as well as symbolic. It's just ironic that he had to come to California to appreciate its practicality.

PERSONALS

- 1927
TED COMBS and Viva O'Haver were married in an open-air ceremony on February 12 in the Glanville Courtyard of Caltech's Beckman Institute. After graduating from Caltech, Combs established his own civil-engineering and construction company, and during World War II served with the Army Corps of Engineers, rising to the rank of colonel. He was president of the Alumni Association 1940-41.
- 1937
EDWARD PRICE, professor of geography, emeritus, at the University of Oregon, reports the "recent publication of my book, *Dividing the Land: Early American Beginnings of Our Private Property Mosaic*, University of Chicago Geography Research Paper No. 238, by the University of Chicago Press." It deals with land division in parts of the United States that did not have the federal rectangular survey, mostly on the Atlantic coast, and examines the process by which the land was parceled out, and the resulting geometric patterns.
- 1946
LAURENCE O. HAUPT, MS '47, of Fort Lauderdale, Florida, writes that he and his wife, Dorothy, whom he met in 1940 as a Ricketts House blind date, "have been letting someone else do the driving and sailing for the past five years." They took a month-long container-ship cruise in 1991, from Miami to Valparaiso, Chile, and back, making ten port calls along the way; it was "a great way to learn about container ships," but the ship was not organized for providing the best sightseeing ashore. In 1992, they took a two-week, round-trip summer cruise from Vancouver, British Columbia, to Anchorage, Alaska, on a ship "staffed with a dozen college professors who did a great job of making this an educational experience." Then, he reports, "we spent a week aboard an 84-foot sailboat exploring the Galápagos Islands in 1993. This ketch was exactly twice as long as our sailboat, *Hauptsache*, in which we made two Atlantic crossings in 1977-1981 and explored the Mediterranean and Caribbean. It was great to have someone else hoisting the anchor and sails, steering, navigating, cooking, maintaining the engine and enjoying all the other pleasures of cruising to distant ports in your own sailboat." During summer 1994 they toured Australia and New Zealand in luxury buses. "I have long wanted to see the Kiwi land, which gave Caltech Dr. Pickering, who was my favorite professor." This summer they will be visiting China.
- 1948
BRUCE D. GAVRIL retired from IBM on May 31, 1993, after an association spanning 29 years. In his last position, as a senior engineer at the Thomas J. Watson Research Center, he wrote the two invention disclosures for the internodal communication architecture of IBM's first massively parallel processing system, the IBM 9076 SP1, announced in March 1993. Both disclosures resulted in patent applications, with one disclosure being filed as written. He continues to live in Chappaqua, New York, with his wife, Jean Van Leeuwen, a writer of children's books. They have two children—

- Elizabeth, a senior at the University of Rochester, and David, who graduated from Hampshire College in May 1994. After graduating from Caltech, Gavril received his SM '49, ME '51, and ScD '54 from MIT.
- BENOIT B. MANDELBROT, MS, Eng '49, the Abraham Robinson Professor Adjunct of Mathematics at Yale University, has been selected by the Honda Foundation of Tokyo as the recipient of the 1994 Honda Prize, which was awarded on November 17, 1994, the birthday of the founder of Honda Motor Company. The award includes a 10 million yen (\$100,000) grant. He was cited for "contributing to the establishment of a harmony between mathematics and science and culture and the environment that surrounds human activities, and to a better understanding worldwide of science and for new tools to solve the problems induced by modern progress." This is the second international prize that Mandelbrot, who pioneered fractal geometry (and who coined the term *fractal*), has received in as many years. His work on fractals earned him Israel's Wolf Prize in physics for 1993.
- 1953
Allan Rex Sandage, PhD, an astronomer with the Observatories of the Carnegie Institution of Washington and a senior research scientist at NASA's Space Telescope Scientific Institute, was elected to the American Philosophical Society on April 21. According to the society, "Allan Sandage combines an enormous fund of knowledge with outstanding scientific judgment and with an extraordinary ability to discern new concepts that are ripe for development. An indefatigable observer, he has shown throughout his career the ability to apply his talents to the core of a research problem, and to avoid secondary commitments that might detract from the advance of basic research. His enthusiasm for astronomy is readily transmitted to others, and has resulted in numerous collaborations." Best known for his extended work regarding the rate of expansion of the universe, he has been the recipient of many awards, a few of which are the Eddington Medal of the American Astronomical Society (1963), the Gold Medal of the Royal Astronomical Society (United Kingdom) (1967), the National Medal of Science (1971), and the Crafoord Prize (1991). He is a member of the American Astronomical Society, the International Astronomical Union, the Lincoi National Academy (Rome), and the Royal Astronomical Society (Britain and Canada). He was Homewood Professor of Physics at Johns Hopkins University, 1987-89.
- 1955
GEORGE E. MADSEN, MS '58, former public-works director and city engineer for Costa Mesa, California, received three honors during Engineering Week activities in Orange County. He was named Engineer of the Year 1994 by the American Society of Civil Engineers, Orange County Branch, of which he is a past president and on whose history and heritage committee he is currently serving. He also received the 1995 Outstanding Engineering Merit Award of the Orange County Engineering Council at its banquet, held February 25 at the Grand Hotel in Anaheim. Finally, he was installed as a Fellow in the Institute for the Advancement of Engineering, this at a banquet held at the Richard Nixon Library; he is currently treasurer of the institute. Active in many engineering organizations during his 40-year career, he is presently working with the civil-engineering firm Williamson and Schmid (one of whose partners is RICHARD SCHMID '55), of Tustin, which has just merged with Huitt Zollars of Texas. He has served Costa Mesa's Presbyterian

- Church of the Covenant in many capacities, including ordained elder, president of the board of trustees, superintendent of the church school, and chairman of the building committee, as well as chairman of numerous other committees. He was a commissioned officer in the U.S. Public Health Service in Washington and Alaska and retains an inactive commission as sanitary-engineer director (with the rank of colonel).
- JIM MCCLOUD, MS '56, reports that he is facing heart bypass surgery. "I hate taking the time off from my tutoring and writing short stories," he writes, but "better now, so I can have more energy." When he told someone this, he says, the person replied, "If you have any more energy than you now have, they will have to handcuff you." His doctor tells him, "What is maddening is that my blood pressure is fine, my cholesterol is low, I'm not diabetic, don't smoke or drink, and my weight is the only thing against me. It has caused me to lose 12 pounds at this writing, and I hope to continue." He adds, "I hate putting my sweet wife of two years, Bertha, through the ordeal, but I'm thankful that I have her." He would enjoy hearing from fellow alums. "I've been on a continuous honeymoon for the last two years and have lost touch, I'm sure. I'm so happy, and actually feel better than I've ever felt." He expects to feel even better with time. "Til then, keep us in your thoughts . . . and prayers."
- 1958
RICHARD L. VAN KIRK, a former president of the Alumni Association, has been appointed president and chief executive officer of the California Special Olympics. Currently a management consulting partner of Ernst & Young LLP in Los Angeles, he brings to his new position an extensive background in financial management, development, and special-event management, as well as in sports. Prior to joining Ernst & Young, he worked for Proctor & Gamble and Riverside Cement Co., and he was vice president-technology for the Los Angeles Olympic Organizing Committee and has provided consulting services to World Cup Soccer and to cities bidding for the Olympic Games. He is also coauthor of *The Complete Guide to Special Event Management*, published by J. Wiley & Sons. After graduating from Caltech, he earned a master of business economics from the Claremont Graduate School, and he competed in track and field as a member of the Southern California Striders.
- 1959
YOUNG C. KIM, MS, chair of civil engineering at California State University, Los Angeles, has been named one of that institution's Outstanding Professors for Academic Year 1993-94; this honor is the highest academic award the university bestows and is granted for continuing excellence in teaching, research, and contributions to higher education. Kim has been with Cal State L.A. for three decades, carrying out research in hydrodynamics and coastal and hydraulic engineering. He has served as a consultant to the U.S. Naval Civil Engineering Laboratory and, since 1986, has been director of HCO Engineering Consultants in South Pasadena. In 1990, he was appointed executive committee chair of the American Society of Engineers—Waterway, Port, Coastal and Ocean Division. He has been honored as a NATO Senior Fellow in Science, a Ford Foundation Fellow, and a member of the International Symposium on Ocean Energy Development International Scientific Committee. In 1983, he was selected as a U.S. delegate to the 20th Congress of the International Association for Hydraulic Research in Moscow, and he has been the recipient of numerous research grants. He lives in South Pasadena, California.

1968

MARTIN L. PALL, PhD, has recently accepted the position of coordinator of sciences at Washington State University Vancouver. While maintaining his position as professor of genetics, cell biology and biochemistry, he will be moving to Vancouver, Washington, in June to develop the sciences on WSU's brand-new campus there, just north of Portland, Oregon. He writes, "This position will be a major challenge. We will be hiring faculty in a number of areas of the sciences, concentrating initially in the life sciences. The new campus is being built in a stunning location in one of the more livable areas of this country. I am looking forward to developing a quality science program from scratch."

1969

SEBASTIEN CANDEL, MS, PhD '72, is a professor at École Centrale Paris. He was elected as a corresponding member of the French Academy of Science in June 1994.

1970

RONALD J. POGORZELSKI, PhD, of Santa Barbara, has been elected a fellow of the Institute of Electrical and Electronics Engineers for his "contributions to the techniques of analytical and computational electromagnetics." He is currently a technical group supervisor at JPL. Pogorzelski has chosen to receive his certificate at the 1995 IEEE Antennas and Propagation Society Symposium, to be held in Newport Beach, California, this June.

1972

BERNARD SCHUTZ, PhD, has been appointed a director of the new Max Planck Institute for Gravitational Physics (the Albert Einstein Institute), which opened on April 1 in Potsdam, Germany. He will retain his professorship at the University of Wales Cardiff for at least the next three years, commuting between the two institutions on a regular basis.

JAMES G. SMITH, MS, has joined Kimley-Horn and Associates, Inc., as regional vice president of its Atlanta office; the company is an engineering, planning, and environmental consulting firm. A registered professional engineer in 11 states, including Georgia and North Carolina, he has practiced environmental engineering in Atlanta and the Southeast for the past 17 years and will assist with the establishment of Kimley-Horn and Associates' Georgia practice. During his 23-year career as a consulting environmental engineer, he has been responsible for the planning, design, construction, operation, and permitting of water, wastewater, solid-waste, and hazardous-waste facilities. A member of and diplomate in the American Academy of Environmental Engineers, he is also a member of the American Society of Civil Engineers, the American Water Works Association, the Consulting Engineers Council of Georgia, and the Water Environment Federation.

1979

JOHN CHEN, MS, has been promoted to chief executive officer at Pyramid Technology, a Siemens Nixdorf Company. He was previously president and chief operating officer, as well as a member of Pyramid's board of directors. Prior to joining Pyramid, he spent 13 years at Unisys, where he was vice president and general manager of the UNIX systems group. He joined Pyramid in July 1991 as executive vice president and assumed the role of chief operating officer in October 1992. He was appointed to the additional post of president and elected to Pyramid's board of directors in June 1993.

1989

CHRISTOPHER CHU has been selected a member of the charter class of Kauffman Fellows, according to the Center for Entrepreneurial Leadership Inc. at the Ewing Marion Kauffman Foundation. The fellowship will take him from his position as a Wharton/Medical Center technology transfer intern, Office of Venture and Industry Relationships, University of Pennsylvania Medical Center, to Chemicals & Materials Enterprise Associates in San Francisco, where, through a two-year program, he will study with mentors in venture funds to understand the process of finding and investing in growth companies. After graduating from Caltech, he earned an MS in electrical engineering from Stanford, and he is currently pursuing an MBA at the University of Pennsylvania's Wharton School. In 1993 he operated his own company, CMC Engineering, in Irvine, California, and in 1994-95 he was awarded the Dosberg-Wharton-Recanati Multinational Partnership, allowing him to study business strategy in Israel. He holds a U.S. patent for electronic circuit design.

DEAN ELZINGA has written Don Caldwell, head of the Men's Glee Club at Caltech, saying, "I have some good news from an audition tour I made to New York. I decided to sign with Shaw Concerts artists' management after they expressed a strong interest. And the Met flew me back for a stage audition. I sang a strong audition, and they faxed me an offer the next day. It's small parts, but it's to sing, not cover. And it's 11 weeks at the Met. So good stuff is happening. I am sure looking forward to the *War Requiem*." Caldwell adds, "To have a Caltech grad singing at the Metropolitan Opera is *indeed* an accomplishment worthy of considerable note. Shaw management is also one of *the* agents. His final sentence refers to performing as a featured soloist with the Orange County Master Chorale's performance of Britten's *War Requiem*. (This is a major professional engagement)."

1990

AMI RINTOUL (formerly Choksi) writes, "Danny [MARK DANIEL RINTOUL III '89] and I got married on May 22, 1994, in West Lafayette, Indiana. Danny received his PhD in physics from Purdue University in August 1994. He is now working as a research associate in the Civil Engineering and Operations Research Department at Princeton University. I will be starting my third year of medical school at Indiana University in June. The two of us are trying to remain optimistic that we will be together again soon."

1991

JEFF "SKIPPY" HAGEN and STEVE MCLAUGHLIN, both of Lloyd, write that they "recently met in Anchorage, Alaska, for an outdoor winter extravaganza. They spent four days skiing in the back country of Denali National Park. The weather was beautiful, unlike most of their trips, and the Alaska range provided spectacular 360 degree mountain views. Following the trip to Denali they headed south to the Kenai Peninsula for five days of camping, hiking, and hanging out in all the cool cafés in Seward. The huge Kenai moose population provided some great close-up encounters on the trail, and the weather turned to the more usual steady rain and clouds. Comfortable in Skip's million dollar Bibler tent, Steve handed out multiple crushing defeats at canasta during the rainy nights. All things considered, a truly excellent trip. They next plan on either skiing the entire 1,200-mile Iditarod Trail in winter or taking a seven-day Carnival cruise to the Caribbean. Jeff is currently working as an analyst for the think tank RAND in Santa Monica. You can see him

riding his bike to work every day along the PCH and frequenting the local bars and coffee houses. Steve is finishing medical school in May and will be starting a residency in Emergency Medicine at the University of New Mexico in June. He would certainly like to get a real job one of these days."

1992

SHENDA BAKER, PhD, Clare Boothe Luce Assistant Professor of Chemistry at Harvey Mudd College, has received from the Research Corporation a Cottrell College Science Award of \$34,000, to fund her research in the interface structure and electron properties of Langmuir-Blodgett phthalocyanine thin films. The Research Corporation is a foundation for the advancement of science. "Certain phthalocyanine thin films make excellent chemical sensors," Baker says. "My students and I are examining the structural and electronic properties of the films, particularly at the surface, to try to understand this extraordinary effect." The funds will support the purchase of new equipment, and two summer students for the next two years.

OBITUARIES

1922

GEORGE H. CLEVER, of Tracy, California, on October 1, 1990. He is survived by a son, John.

1924

FREDERIC A. HOUGH, of Orange, California, on March 6; he was 93. A recipient of the J. Hall Taylor award for his contributions to the natural-gas industry, he was vice president of the Southern California Gas Company until 1954, when he went to work designing gas-pipeline projects for Bechtel Corporation. He loved classical music, woodworking, and fishing and hiking. He is survived by Emily, his wife of 69 years; three daughters, Marian Walters, Carol Jordan, and Peggy Cooper; a son, Allen; 16 grandchildren; and 12 great-grandchildren.

1927

C. KENYON WELLS, of Long Beach, California, on December 30, 1994; he was 89. An employee of the Long Beach Water Department for 42 years, he retired in 1970 as its general manager and chief engineer. He was active in Rotary International, the Boy Scouts of America, the Salvation Army, and Long Beach Masonic Lodge #327, and he was a member of the California Heights Methodist Church and, later, the Grace Brethren Church. He is survived by two sons, Don and Robert; five grandsons, Mark, Gregory, Don, David, and Stephen; a granddaughter, Juli Safer; and nine great-grandchildren. His wife, Mary, whom he married in 1927, died in 1979.

1929

CHARLES R. DAILY, PhD, on July 10, 1994. He is survived by a niece, Roberta Speer.

ALBERT C. REED, of Santa Monica, California, on December 13, 1994; he was 88. He had a long and varied career in science and aviation, starting as a test pilot in the 1930s; most recently, he was employed at Santa Monica College, where he assisted students in the student computer lab. He is survived by his nephews and nieces, Jason C. Reed, Donald B. Reed, Philomene Reed Smith, and Christine Reed Franco; eight grandnieces and grandnephews; and a great-grandniece and great-grandnephew.

1930

LOREN P. SCOVILLE, MS, of San Diego, California, on May 5, 1994. He is survived by his wife.

1932

JAMES E. LIPP, MS '34, PhD '35, of Coronado, California, on August 13, 1993. He is survived by his wife, Frances.

BEHREND C. "DUKE" SCHULTZ, Ex, of San Gabriel, California, on January 28; he was 83. He was an electrical engineer with Acme Signal Company, Los Angeles, and was self-employed with A-1 Signal Company for 40 years. He was a member of San Gabriel Mission Parish and active at Mater Dolorosa Retreat Center in Sierra Madre. He is survived by Dorothy, his wife of 57 years; his daughters, Janet Stevens and Marian Hauerwaas; nine grandchildren; four great-grandchildren; and a brother, Roland.

1934

ADIN E. MATHEWS, MS, of Los Angeles, on July 5, 1994; he was 94. He taught at UCLA until his retirement in 1965, and he often mentioned the importance of having had "the privilege of attending Caltech." He is survived by his wife, Lois, and his daughter, Elinor Morgan.

1936

ROBERT G. HEITZ, of Concord, California, on February 7; he was 79. He was a retired Dow Chemical Company research fellow. Immediately after graduating from Caltech, he went to work at Dow's Midland laboratories, then transferred to the newly formed Western Division in Pittsburg, California, in 1939. He became divisional research director in 1952 and technical director in 1971. He was named research fellow in 1977. He is credited with the invention of the hollow-fiber artificial kidney and with expanding the applications of hollow-fiber technology to a variety of other areas, including artificial-lung devices, medical analysis systems, desalination units, gas separators, and the sodium-sulfur battery. His early work in thermal chlorination led to commercial processes for the manufacture of solvents, and under his direction a new family of agricultural chemicals was synthesized based upon the thermal chlorination of nitrogen-containing heterocyclic compounds. His many awards from the American Institute of Chemical Engineers (AIChE) and other organizations include the Fritz Medal (1978) and the Chemical Engineering Practice Award (1974), and he was one of the founding members of the AIChE's Northern California Section. He is survived by his wife, Janice; two children; and four grandchildren.

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OBITUARIES

Continued from page 17

1939
HUBERT A. ARNOLD, PhD, on October 20, 1994. He is survived by a nephew, Thomas Davies, Jr.

WILLIAM H. BONELL, MS, of Irvine, California, on January 15; he was 78. After graduating from Caltech, he went to work for Lockheed, where he remained for 35 years before retiring as engineering facilities manager. He then worked for William Pereira and Associates, and was later a partner in Association Services of Irvine. He was active in Episcopal churches in Brookings, Burbank, Eagle Rock, La Cañada Flintridge, and Corona del Mar, and he was a 15-year member of the Newport/Irvine Rotary Club, during which time he was made a Paul Harris Fellow. He is survived by his wife, Blanche; his son, John; his brother, John; and his sister, Marie Bonell Johnson.

RICHARD A. LAVINE, Ex, of Los Angeles, on December 31, 1994; he was 77. He received his BA in political science from UCLA, and his JD and LLM degrees from USC's law school. During World War II he served in the U.S. Army Air Corps, in the China-Burma-India theater, and he rose to the rank of major while serving with the U.S. Air Force during the Korean War; he had a particular interest in the study of military history. He served as assistant United States attorney in Los Angeles 1954-1960 and as chief of the Civil Division 1957-1960. After many years in private practice, he accepted the post of deputy assistant attorney general in the Civil Division of the Justice Department, in Washington, D.C.; he remained there 1974-1976. In 1980 he was appointed to the Superior Court of Los Angeles County, where he served for over 10 years, including two as supervising judge of the Family Law Departments. During his tenure, he presided over both civil and criminal cases and sat by designation on the California Court of Appeals. He was coauthor of *Federal Civil Practice*, which became the *Manual of Federal Practice*. He was cofounder and president of Legion Lex American Inn of Court and a member of the National Board of Trustees, American Inns of Court. He served for many years on the Executive Board of the American Jewish Committee. He is survived by his wife, Ruth; a daughter, Catherine Unger; a son, Raymond Lavine; three grandchildren; and a sister, Evelyn Kozberg.

WARREN E. WILSON, MS, of Rapid City, South Dakota, on April 12, 1994. He is survived by a son, James.

1941
ROBERT H. EHRKE, MS, of Sun City, Arizona, on June 9, 1994. He is survived by a sister, Ruth McBride.

LIVINGSTON E. "BUD" PORTER, JR., of Salem, Oregon, on November 15, 1994; he was 74. He served in the Navy during World War II, then worked as a geologist for Chevron Overseas Petroleum. After 1980 he owned and operated a consulting firm and gave seminars on economic evaluations pertaining to the petroleum industry. He was a member of the American Association of Geologists and the Squires Club, and he enjoyed travel and computers. Survivors include his wife of 48 years, Patricia; three sons, Lawrence, Daniel, and James; a daughter, Barbara Louise Helser; three sisters; 14 grandchildren; and one great-grandchild.

JOSEPH W. TRINDLE, MS '49, of Pryor, Oklahoma, on October 19, 1993. He is survived by his wife.

1942
JOHN A. BROCKMAN, PhD '48, of Jupiter, Florida, on December 20, 1994; he was 74. Before relocating, he lived in Woodcliff Lake, New Jersey, and he worked for 36 years at Lederle Laboratories doing pharmaceutical research. While there he discovered leucovorin, an important drug in cancer chemotherapy. He enjoyed playing the trumpet. He is survived by his wife, Mary; three daughters, Marilyn, Roberta, and Nancy; a son, James John; and four grandchildren.

1943
HOLLIS B. CHENERY, MS, of Boston, Massachusetts, on September 1, 1994. He is survived by a daughter, Teresa Seamster.

PETER DEHLINGER, MS, PhD '50, of Issaquah, Washington, on June 25, 1994; he was 76. An immigrant from Germany and a naturalized citizen, he was emeritus professor of geology and geophysics at the University of Connecticut and a nationally recognized expert in marine geophysics; Dehlinger Seamount, an underwater peak 600 kilometers off the coast of Oregon, was named in his honor. "He was really a great guy and dearly loved." He is survived by his wife, Jean; a son, Peter; and a daughter, Margaret Ann Wildenthal.

ROY L. HILLYARD, MS, of Lakewood, Colorado, on November 18, 1994; he was 77. He served with the Army Air Forces during World War II, and he was a production manager for Prudential for more than 30 years. He is survived by his wife, Irene; a son, Keith; a sister, Bernice Wheeler; and three grandchildren.

1944
JOHN H. "JACK" FAGAN, CAVU, of Shawnee, Oklahoma, on June 10, 1994; he was 71. One of a group of students during World War II who received certification after completing an accelerated training program in meteorology—and who referred to their group as Ceiling and Visibility Unlimited—he went on to serve in the Army Air Forces during the war and, in 1949, to receive a degree in mechanical engineering from Oklahoma State University. He worked for Unit Rig and Equipment Company in Tulsa, Bethlehem Supply Company in Texas, and Homer Luttrell in Texas, and he owned and operated Fagan Engineering Company in Oklahoma for 40 years. He was a member of St. Paul's Methodist Church. He is survived by a number of cousins, including Vadene Foresee, Murrel Newsom, and Mary Fasken.

LEROY SANDERS, JR., of San Marino, California, on December 6, 1994; he was 72. He served in the U.S. Army Signal Corps during World War II, specializing in radar operations, and he taught radar technology at MIT. He was the publisher of the *Huntington Park Daily Signal* and the *Southeast News* and sold the papers in 1975, after which he formed Signal Realty Company, for developing industrial properties in California and Arizona. He and his family have been residents of San Marino for 45 years, and he was a member of the San Marino Board of Education for eight years, was elected board president in 1964 and 1968, and received the

Founders Day honorary service award from the PTA for service to the schools and community. He was also a noted expert in the rules of golf and was an official for the PGA and SCGA; he taught golf rules and officiating at local high schools and at the Annandale Golf Club. An enthusiast for mathematical problems, he published three volumes of his favorites—*Sleep Slayers*, *More Sleep Slayers*, and *Quick Questions*. He was a member of the Athenaeum, and also belonged to the San Marino City Club, the Annandale Golf Club, the Smoke Tree Ranch Colonists Association in Palm Springs, and the Society of the Cincinnati. He is survived by Marie, his wife of 47 years; two sons, L. R. Sanders III and Rick Sanders; a daughter, Joy Sinclair; and eight grandchildren.

1945
BERTRAM KEILIN, MS, PhD '50, of Irvine, California, on September 21, 1994; he was 71. After teaching for two years at USC and working as a jet-fuels expert at Aerojet-General Corporation, he discovered a water purification process. With a partner, he started his own business on the East Coast, and then after four years returned to California to head a soft-water-industry trade association. At the age of 58 he began a new career, returning to school and earning a master's degree in psychology from Pepperdine University in 1983. Particularly interested in helping people overcome difficulties due to alcohol and drug abuse, he worked in private practice with the Newport Therapy Group in Irvine, continuing as a counselor until shortly before his death. His many interests included politics, travel, square dancing, bowling, crossword puzzles, chocolate, and the San Francisco 49ers. In 1991 he helped establish the Henry David Thoreau Society, and he also served as president and a board member of the Orange Coast Unitarian Universalist Church in Costa Mesa. He is survived by his wife, Lynn Charron; his daughter, Anita; and his sons, Gregory and Robert.

1946
DALE E. BEMENT, of Monrovia, California, on September 12, 1994; he was 69. A graduate of the U.S. Navy's V-12 program at Caltech, he took a "temporary" job with Meadow Gold Dairies of Pasadena, but ended up staying in the dairy industry for 48 years, specializing in providing food services to schools, and spending his last nine years with Driftwood Dairy. He was a member of and volunteer for the First Baptist Church of Monrovia, as well as a volunteer for Little League, the Duarte High School Boosters, and the City of Hope, among others. He and his wife enjoyed camping and bowling. He is survived by Ramona, his wife of almost 48 years; two daughters, Brenda Mitten and Barbara Purdy; a son, Kenneth; a brother, Arthur; two sisters, Doris Tucker and Rosemary Ayres; and seven grandchildren.

ROBERT F. BLOCKER, of Pasadena, California, on January 25. A product of the U.S. Navy's V-12 program at Caltech, he served with the Navy's Seabees, then received his bachelor's degree from Caltech in 1946. A member of the Naval Reserve, he also served in the Korean War. He joined what is now Caltrans in 1946 and worked there until his retirement in 1985 as chief of project development and construction. He was a Little League coach and enjoyed golfing, and he was active in the Alumni Association. He is survived by his wife, Kay; four sons, Tom, David, Mark, and Bob, Jr.; a daughter, Judi; and nine grandchildren.

KENAN CLARK CHILDERS, JR., MS, Eng '46, of Hilton Head Island, South Carolina, on November 23, 1994; he was 77. A 1939 graduate of the U.S. Naval Academy, he was a carrier fighter pilot during World War II and a

recipient of the Silver Star, two Air Medals, and a Navy Commendation medal. In 1945 he entered the Naval Academy's postgraduate school, then attended Caltech. In 1949, after a two-year stint as instructor at the Guided Missile School at Fort Bliss, Texas, he joined the Navy Department's Bureau of Aeronautics, in Washington, D.C., where he headed missile-development programs. In 1953 he undertook the testing and evaluation of new naval missiles at the Air Missile Test Center at Point Mugu, California, and from 1956 to 1961 he served as the Polaris project officer at Cape Canaveral, Florida, for which service he received the Legion of Merit medal. He then became commanding officer of the missile center at Point Mugu. From 1964 to 1969, he served in the Washington, D.C., area, first in the Office of Naval Materiel, then as assistant commander of the Naval Air Command. From 1969 until his retirement in 1972 with the rank of rear admiral, he was the Atlantic Naval Air Representative. After his retirement, he worked as a department manager for Cerberonics Inc., of Falls Church, Virginia. He moved to Hilton Head in 1979, where he was an avid golfer and active in community affairs. He is survived by his wife, Elizabeth; two daughters, Virginia DeLuca and Susan Childers; a son, Kenan Clark Childers III; five grandchildren; and four great-grandchildren.

1947
CLYDE R. MURTAUGH, MS, of Ann Arbor, Michigan, on January 26, 1994. He is survived by his wife.

JOHN C. RIEDEL, MS '48, of Laguna Beach, California, on February 21; he was 72. Prior to attending Caltech, he served with the U.S. Navy during World War II. After graduating, he worked as a design engineer for Consolidated Electrodynamics, in Pasadena, and as a project engineer for Endevco, in Pasadena and San Juan Capistrano. In the late 80s he was chief engineer for Screening Systems, in Alicia Viejo, California. He is survived by his partner, James Day; his sister, Virginia; a niece, Elizabeth Dawkins; and a nephew, Daniel Riedel.

1948
JAMES C. FLETCHER, PhD, of McLean, Virginia, on December 22, 1991. He is survived by his wife.

DOUGLAS C. OGILVIE, MS, Eng '49, of Newport Beach, California, on April 25, 1994. He is survived by his wife, Mary Ann; a son, George; and a grandson, Ian.

1949
JOSEPH M. CONOVER, of Seattle, Washington, on July 22, 1994. He is survived by his wife.

ROBERT R. WATERS, MS '50, of Fallbrook, California, on July 19, 1994. He is survived by his wife.

1951
LOUIS G. STALLCAMP, pastor, Sacred Heart Church, Covina, California, on August 29, 1994. He is survived by a brother, John.

SANFORD S. SWEET, of Seal Beach, California, on January 29; he was 64. He pastored in the United Methodist church for 39 years, and he was a member of the Kiwanis Club of Long Beach and the Leisure World Community Church choir. He is survived by his mother, Pearl; a brother, Van; three sons, Dan, Mike, and Andy; and six grandchildren.

1952

ETALO G. GNUTTI, MS, of Hobe Sound, Florida, on January 26, 1994; he was 74. He received a law degree from the University of Virginia and set up practice on Main Street, in Stafford Springs, Connecticut. Known to his friends as "Pick," he and his wife lived for 36 years in Stafford Springs, where he served on the advisory board of the former Connecticut Bank and Trust Co., as a probate judge, as counsel for the borough and the town corporator, and as director of the Stafford Library Association. He was also active with the Methodist Church and the Chamber of Commerce, and he held many positions with Johnson Memorial Hospital, which elected him a trustee emeritus in 1985. He became a member of the Stafford Rotary Club in 1949, was elected president in 1953, and was made a Paul Harris Fellow. He is survived by Lydia, his wife of 46 years.

RAYBURN G. PYLE, MS, of Alexandria, Louisiana, on November 27, 1992; he was 75. He had been a broker for Pacific Mutual Life Insurance and worked at Barksdale Air Force Base, in Shreveport, Louisiana, retiring as a lieutenant colonel in the Air Force Reserve. He also developed considerable expertise as a genealogy specialist, helping libraries in Shreveport and in Atlanta, Texas, develop genealogy libraries. He was a deacon at the Broadmoor Baptist Church in Shreveport and devoted much of his time to performing volunteer work. One of his more remarkable experiences was that of surviving the Wichita Falls tornado of the early 1980s, during which "he was chased in his car by a twister and watched the roof of a barn fly over the road, sending hay, manure, and roofing debris through his station wagon. The arthritis he had in his elbow forever disappeared after that experience!" He raised "four people into bright, productive, caring adults. Being a single parent is a challenge." He is survived by two sons, Edward and Stephen; two daughters, Beverly Tolbert and Cathy Pyle; five grandchildren; a sister, Marie; and a brother, Weldon. His wife, Ruby, died in 1966, and his son Ray Pyle III, in 1959.

1958

MARTIN L. CONNEALLY, MS '59, of Lombard, Illinois, on December 16, 1994; he was 57. He was a Professional Engineer designate and a senior product engineer for the Sears, Roebuck and Company Testing Laboratories. He began his career as a mechanical engineer for General Electric (1959–1969), and, while there, his "Applications of Multiple Regression Analysis to Metallurgical Data" was published in *Computer Applications in Metallurgical Engineering*, and he taught a company course on probability and statistics. From 1971 to 1975, he was engineering manager for Ardco, a Chicago firm, where he established a model shop and testing facilities for commercial glass and freezer doors. In 1975, while still at Ardco, he earned his first U.S. patent, for a refrigerator door closure system. From 1969 to 1971 and again from 1975 to 1994 he worked for Sears, where he received the Distinguished Excellence in Action Award in 1988 and his second and third patents, one for a tool-adjustment mechanism in 1987 and the other for a single-handed can opener in 1989. A proponent of the Professional Engineering designation, he taught the Triton College review course for Illinois PE registration from 1977 to 1990. Also,

initially through the Sears lab (which had responded to a request by the Hill Arboretum Apartments Project of Evanston, Illinois) and ultimately on his own time, he initiated development of—and finally himself made many of the components and machining and assembly fixtures for—a transfer lift to allow physically handicapped adults the independence of getting in and out of bed alone. For this effort he received, in 1992, the Over the Rainbow Association's First Annual Special Service Award. "He was an exceptionally good man who made the most of what was given to him in his own precise, talented way. And he did so, partly by his own beliefs, and partly by [his] education, unique to Caltech." He is survived by his wife, Joan, and by four sons ("all of whom chose to be engineers, graduating either from the University of Illinois or Caltech").

1962

CLAUDE M. A. FUGERE, MS, of Woodland Hills, California, on July 28, 1994. He is survived by his wife.

1963

ROBERT L. LUTTERMOSER, PhD, of Dearborn, Michigan, on March 3, 1994.

1969

KATHLEEN E. ABBOTT, MS, of Warren, Oregon, on July 11, 1994; she was 47. She had spent her career working for Weyerhaeuser Company, the James River Corporation, and the Trojan Nuclear Power Plant. A member of the Mazamas mountain-climbing club and the Willapa Hills Audubon Society, and the author of the book *High Points of Oregon*, she loved hiking, mountain climbing, horses, horseback riding, and her cats. In March 1994, she was the subject of a local newspaper story about an accident that had left her in a wheelchair, and her subsequent struggle with ovarian cancer. She is survived by a sister, Diane Dadian; a nephew, Jim Dadian; a niece who was her namesake, Kathleen "Jr." Dadian; her stepmother, Myrtle Abbott; and numerous aunts, uncles, and cousins.

1970

E. WILLIAM GOODELL, PhD, in July 1989. He is survived by his wife.

1972

JAMES R. CARL, MS, of Pittsburgh, Pennsylvania, on January 14; he was 46. He was assistant professor of ophthalmology and neurology at the University of Pittsburgh School of Medicine, and director of the visual testing service at the Eye and Ear Pavilion; he had been acting chief of the National Eye Institute's neuro-ophthalmology section at the National Institutes of Health. He had received his medical degree from the University of Southern California, and he was a member of a number of professional societies, including the American Academy of Neurology and the Association for Research in Vision and Ophthalmology. He is survived by his wife.

1974

JAMES W. BROWN, PhD, of Pasadena, California, on January 14; he was 48. He served in the U.S. Air Force, worked for Bell Labs, and was employed as a physicist at JPL from 1977 until his death. He helped develop Seasat, TOPEX/Poseidon, and the Pilot Ocean Data System (PODS), and most recently had served as manager of the NSCAT science data processing system. He is survived by Macrine, his wife of 22 years; his daughters, Teresa and Christine; his mother, Rose; and his brothers, Bill and Richard.

William A. Fowler, 1911–1995

William A. Fowler, PhD '36, Institute Professor of Physics, Emeritus, who shared the 1983 Nobel Prize in physics for his research into the creation of chemical elements inside stars, died on March 14, in Pasadena. He was 83.

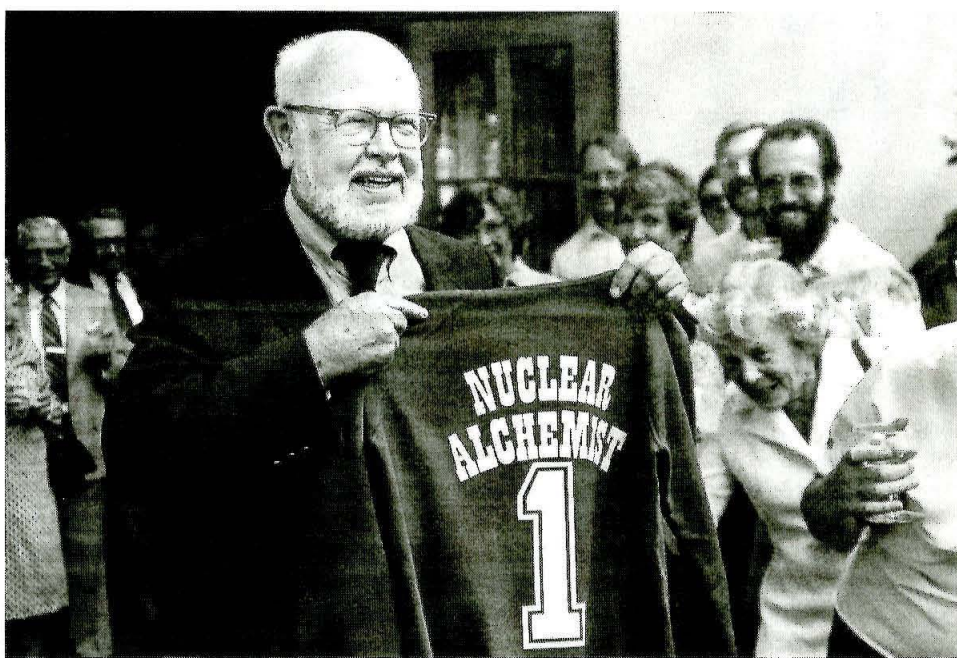
"Willy" Fowler, as he was known worldwide, was born in Pittsburgh, and raised from the age of two in Lima, Ohio. He received his bachelor's degree in 1933 from Ohio State University and earned his Caltech doctorate in 1936 under the supervision of Charles Lauritsen, whom Fowler considered the greatest influence in his life.

Upon finishing his PhD, Fowler promptly joined the Caltech faculty as a research fellow, and was appointed an assistant professor in 1939. During World War II, he carried out research and development on rocket ordnance and proximity fuses—fuses that would detonate only when close to aircraft or

able to understand the universe in the early stages of its evolution, even during the first three minutes of its existence," observed Fowler several years ago.

Fowler's research was of two kinds: theoretical studies to calculate fusion rates for a wide variety of elements, and experiments with accelerators to guide the theoretical calculations. His research career was marked by this continual feedback between theory and experiment. Although Fowler was not directly involved in astronomy, his work had special relevance to astronomy, and astronomical observations both supported his results and often stimulated new investigations.

Outside of academia, Fowler had a lifelong passion for steam locomotives and steam traction engines. During his boyhood summers, his family returned to Pittsburgh during his father's vaca-



The T-shirt says it all: Willy Fowler, shortly after receiving the 1983 Nobel Prize.

airborne bombs. He was appointed associate professor in 1942, professor in 1946, and Institute Professor of Physics in 1970, a chair he held until his retirement in 1982, when he became Institute Professor of Physics, Emeritus.

During his career in nuclear physics and nuclear astrophysics, which spanned more than 60 years, Fowler was primarily concerned with studies of fusion reactions—how the nuclei of lighter chemical elements fuse to create the heavier ones in a process known as nucleosynthesis. In 1957, Fowler coauthored with Fred Hoyle and Geoffrey and Margaret Burbidge the seminal paper "Synthesis of the Elements in the Stars." In it, they showed that all of the elements from carbon to uranium could be produced by stellar nucleosynthesis.

This work, much of it carried out with colleagues at Caltech's Kellogg Radiation Laboratory, put Fowler and his collaborators at the forefront of some of the central issues in modern physics and cosmology: the creation of the chemical elements; the Big Bang origin of the universe; and the current "dark matter" debate over the composition of the cosmos.

"It is a remarkable fact that humans, on the basis of experiments and measurements carried out in the lab, are

tions, and the young Fowler spent many hours in the switch yards of the Pennsylvania Railroad, not far from his family home. As an adult, Willy Fowler sought out passenger trains still pulled by steam locomotives, and in 1973 he rode the Trans-Siberian Railroad from Khabarovsk to Moscow because, among other reasons, the train was powered by steam for almost 2,500 kilometers. On his 60th birthday, during a conference held in Cambridge, England, Fowler's colleagues and former students presented him with a working model of a British Tank Engine, a type of steam locomotive. He named it Prince Hal and considered it his pride and joy.

Among his many honors, Fowler received the National Medal of Science from President Gerald Ford in 1974, and the Legion d'Honneur from President Mitterrand of France in 1989. He was also proud of his membership in the Los Angeles Live Steamers and the National Association of Railroad Passengers.

Fowler is survived by his second wife, Mary Dutcher Fowler, and two daughters, Mary Emily Fowler Galowin, and Martha Summer Fowler Schoenemann. His first wife, Ardiane Fowler, died in 1988.

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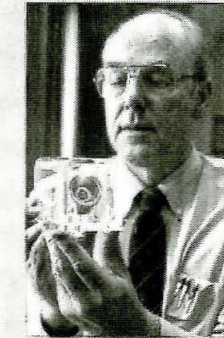
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