

# Caltech News

Volume 29, No. 3  
Autumn 1995

The familiar smoggy skyline of Downtown Los Angeles may look quite unfamiliar in years to come, if the RECLAIM program implemented by the South Coast Air Quality Management District lives up to expectations. Designed by the SCAQMD in collaboration with a group of Caltech economists, RECLAIM represents the most comprehensive attempt to date to use market mechanisms to promote compliance with air quality standards.



© Richard Fukuhara Westlight

## Working to RECLAIM air quality

By Colleen Chien

Anyone who has ever tried to purchase opening-night tickets to an Andrew Lloyd Webber show on Broadway or to any other limited-seating, limitless-fan entertainment event has experienced firsthand the problem of allocating a scarce resource. Sometimes, even waiting in a ticket line overnight is not enough to guarantee a fan entrance to an event like the Eagles' "Hell Freezes Over" concert. The expenditure of time and human patience used to obtain tickets is often the result of an inefficient, and sometimes unfair, system of distributing the goods.

A group of Caltech economists has sought to improve the systems used to allocate goods that are arguably more in demand and even scarcer than Barbra Streisand concert tickets. Their recent work involves the distribution of some rare commodities that could only be categorized as "specialty items"—licenses to emit air pollution in Southern California. Although the markets for these items differ slightly from those for concert or sports tickets, the basic issue surrounding them remains the same: how can a limited resource or good be allocated in the most efficient and least wasteful way?

Based on years of studying how markets work, both in theory and practice, the Caltech researchers think they may have some answers to this question. For the past two decades, they have been designing markets for uncommon goods ranging from barge rights on the Mississippi River to bands on the electromagnetic spectrum.

In the case of pollution permits, the

Caltech economists have assisted in the creation of a market system whose purpose is to reduce not losses of time and patience, but the high costs to industry and consumers often associated with complying with air-pollution regulations. At the request of the South Coast Air Quality Management District (AQMD), they have helped the district change its approach to pollution control, which has traditionally consisted of command-and-control measures that require businesses to use specific pollution-abatement technologies or reduce their emissions by a certain percentage.

Teaming up with economists from the Pacific Stock Exchange (PSE), faculty members John Ledyard, Charles Plott, David Porter, and Anne Sholtz have worked with the AQMD to design the Regional Clean Air Incentives Market (RECLAIM), an innovative program that relies on market-based incentives to achieve pollution reductions. This new approach is designed to combat pollution by viewing clean air or, alternatively, the limited right to pollute it, as a commodity.

The Caltech researchers brought a wide range of knowledge and expertise to their role as AQMD consultants. Ledyard, professor of economics and social sciences and chair of the Institute's Division of the Humanities and Social Sciences, and Porter, a Caltech visiting associate in economics, are specialists in organizational management and innovative auction designs.

Their work has found applications in such areas as project management and

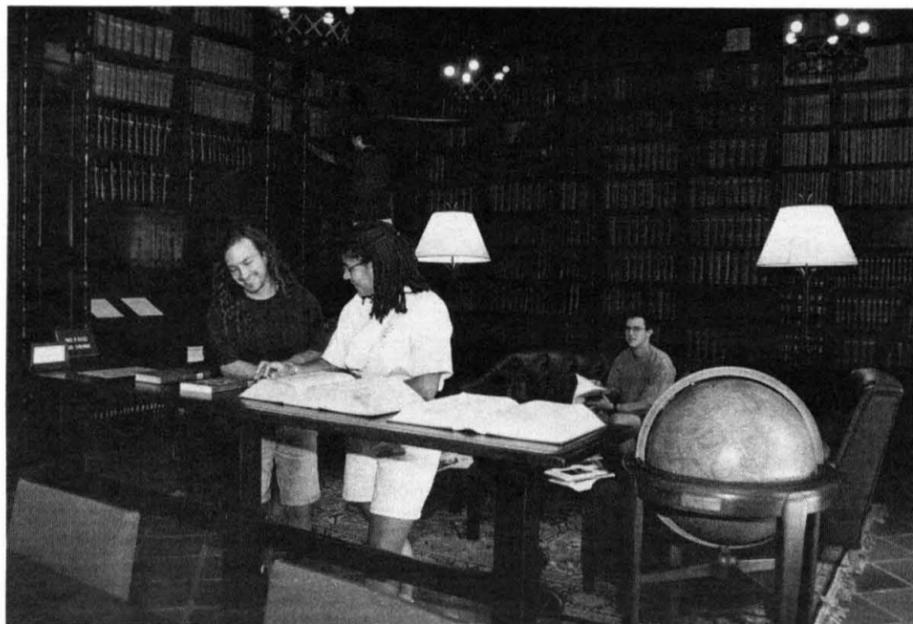
science resource allocation on JPL's Project Cassini. Plott, the Edward S. Harkness Professor of Economics and Political Science, is a pioneer in the field of experimental economics and is widely known for his work in the area of antitrust regulations and in the development of environmental and other nonstandard markets. The research of Ledyard, Plott, and Porter has also recently been used in the Federal Communications Commission's auctions of the airwaves for telecommunications applications. Sholtz has extensively studied the regulatory framework and economic implications of pollution control.

The Caltech group's expertise was complemented by the practical experience of the PSE economists, whose hands-on familiarity with the day-to-day running of markets provided, in Porter's words, "an invaluable contribution to the effective design of RECLAIM."

The use of market-based methods like RECLAIM to improve air quality has become possible only recently, with the passage of the Clean Air Act Amendments of 1990. Although the program is not the first attempt by regulators to control air pollution using such incentives, it "is arguably the most significant attempt at an open environmental market to date," says Sholtz. Adopted in October 1993 and implemented for the first time at the start of 1994, RECLAIM is the first of a growing number of such programs.

Continued on page 6

## CAMPUS UPDATE



**New and returning students are being greeted by the sight of a newly restored Gates Library, already seeing use from, among others (left to right) graduate students Keith Rickert, Duncan Odom, Chantal Morgan, and Grant Walkup. Built in 1927, the library is considered a classic example of the "Spanish colonial" style pioneered by the renowned architect Bertram Goodhue, who designed much of the early Caltech campus. Funded by a grant from the Annenberg Foundation, the library has received a complete makeover intended to return it both to its historic appearance and to its original purpose as a research library.**

## Institute welcomes the class of '99

A former U.S. Army officer who served as an Arabic-language translator in the Persian Gulf War, two holders of black belts in the martial arts, a breeder of dairy goats, and a pianist who took first place in the High School Division of the Young Musicians' Competition are among the 218 talented young men and women who make up Caltech's class of 1999, the next to last class to graduate from the Institute in this century.

The new undergraduates include 52 women, or 25 percent of the class, the same ratio as last year; 46 Asians; and 9 Hispanics. This class is as academically talented as their upperclassmates, reports Caltech's director of admissions, Charlene Liebau. "This year, the students' SAT scores averaged 754 for mathematics and 651 for verbal." (The national averages are M482 and V428). "They also scored extremely well on their achievement tests."

Many of the new freshmen should feel right at home at Caltech, because they will still be living in their home state. Forty-one percent of the new students are from California. Students from overseas make up 5 percent of the class, which is about the same percentage as last year.

The overwhelming majority of the entering students—80 percent—graduated from public high schools. "Last year's 231 students came from 207 high schools," says Liebau. "I expect that the statistics on this year's class will be similar." She notes that unlike many institutions, Caltech does not draw its students from so-called feeder high schools—schools that prepare students to attend particular colleges and universities.

In order to get word about the

Institute out to high school students, Liebau and her staff have started a new program, called Back to School. This month, more than 80 current Caltech undergraduates will be visiting high schools in their home towns and talking to science teachers and guidance counselors about their Caltech experiences. "Not only is it a wonderful recruiting tool," says Liebau, "but the students are getting valuable experience in their public speaking and presentation skills."

As Caltech's newest students arrived the Institute, Admissions staffers took to the road. In early September, the office held the first of 20 regional receptions across the country, in partnership with the Caltech Alumni Association. In cities that include Boston, Atlanta, Houston, Chicago, Minneapolis, and Seattle, Admissions Office representatives and local alumni will meet with invited high school students and their families to discuss such topics as undergraduate research opportunities at Caltech, student life, the academic curriculum, and the admission process.

Closer to home, on September 24, the Admissions Office held a similar get-together on campus for area students and their families. The four-hour program featured campus tours and presentations designed to familiarize students and their parents with various aspects of campus life—and to give the Admissions Office an opportunity to spread the word about Caltech to prospective members of the class of 2000 and beyond. "Competition for the nation's brightest students," notes Liebau, "continues to be very keen."

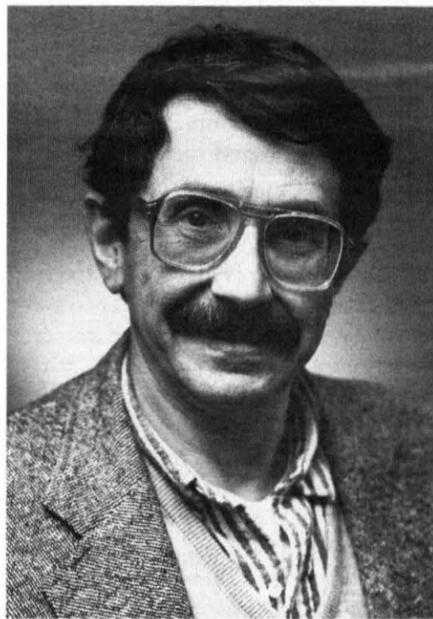
## Mel Simon named chair of Biology

Mel Simon, Caltech's Anne P. and Benjamin F. Biaggini Professor of Biological Sciences, became the new chair of the Institute's Division of Biology on July 1, succeeding John Abelson, the George Beadle Professor of Biology, who stepped down after six years in the position.

"I assume the chairmanship of this division at a most propitious time," Simon said, "when biology is on the verge of an era of growth and expansion. Current research breakthroughs have provided enormous amounts of data on the mechanisms that underlie the function of all living systems. At Caltech, working together with our colleagues in the other divisions, we are ideally positioned to apply these new insights and to generate a deeper understanding of the processes that control growth, development, evolution, and cell function as well as the operation of the nervous system and human behavior."

Simon earned his BS in chemistry at the City College of New York and his PhD in biochemistry at Brandeis University. He held a postdoctoral appointment at Princeton University and then joined the biology department at the University of California, San Diego, in 1965. He came to Caltech in 1982 as a full professor, and was named the Biaggini Professor of Biological Sciences in 1986.

Simon studies how organisms, ranging from microscopic bacteria to mammals, detect chemical changes and



**Mel Simon**

respond in an appropriate fashion. His work includes studies of the mechanisms involved in sensory cell function and the nature of the biological circuits that process information from a variety of cell surface receptors including those involved in the senses of smell, taste, and sight.

Simon is a member of the American Academy of Arts and Sciences and the National Academy of Sciences. In 1991 he received the Waksman Award in Microbiology from the National Academy of Sciences.

## New Caltech videos available

Two new videos—one highlighting the Institute past, present, and future, the other a recording of the Caltech Public Forum on Alzheimer's disease, held on campus this past spring—are now available for purchase and may be ordered through the Institute.

The two-hour Alzheimer's Forum video covers the May 31 panel discussion in which biomedical researchers from Caltech, USC, and UC San Diego, and Alzheimer's Association spokesperson Shelley Fabares, spoke about the current status of Alzheimer's research, the personal challenges facing caregivers, and the progress that is being made toward finding effective treatments for this devastating illness. To purchase a video, at a cost of \$39.95 each, please contact the Caltech Office of Public Events at 818/395-4652 to order the tapes directly or to request an order form.

"Caltech: Moving Toward the 21st Century" describes the unique intellectual climate at the Institute and highlights some of the cutting-edge research currently under way. The video offers a 15-minute portrait of Caltech through historical vignettes, scenes of contemporary campus life, and commentary by, among others, President Tom Everhart, Provost Steve Koonin '72, and Archivist Judith Goodstein. The video, which costs \$15.95, may be ordered by calling the Caltech Bookstore at 818/395-6161.

## Faculty, students reap recognition

Caltech's Graduate Student Council has recognized excellence in classroom instruction and mentoring by presenting GSC Teaching Awards to Yaser Abu-Mostafa, PhD '83, professor of electrical engineering and computer science; Chris Brennen, professor of mechanical engineering; George Rossman, PhD '71, professor of mineralogy; and Edward Zukoski, PhD '54, professor of jet propulsion and mechanical engineering, emeritus. Outstanding Teaching Assistant Awards went to graduate students Patrick Chuang of environmental engineering science and Sanjoy Mahajan of physics.

Clarence Allen, PhD '54, professor of geology and geophysics, emeritus, has been chosen as the recipient of the 1995 Medal of the Seismological Society of America, which is given only when someone worthy is identified, as has been the case for three previous Caltech winners since 1976. Allen's work has had a significant impact on "our understanding of seismotectonics and the importance of incorporating geologic information in the assessment of seismic hazards."

Pamela Bjorkman, associate professor of biology, and associate investigator

for Howard Hughes Medical Institute, has won the Paul Ehrlich Prize for her research into cancer and AIDS. She shares the prestigious \$62,000 German prize with two other scientists.

*Thomas Caughey*, PhD '54, the Richard L. and Dorothy M. Hayman Professor of Mechanical Engineering, has been named the 1995 recipient of the J. P. Den Hartog Award by the American Society of Mechanical Engineers. Presented at the ASME's Vibrations Conference in September, the honor recognizes Caughey's "lifetime contributions to the teaching and practice of vibration engineering."

*K. Mani Chandy*, professor of computer science, has been chosen to receive the 1996 Koji Kobayashi Computers and Communications Award from the Institute of Electrical and Electronics Engineers, Inc., scheduled to be presented at an International Parallel Processing Symposium of aeronautics and applied physics in April 1996.

*Alexander Grunewald*, a postdoctoral scholar in neuroscience, has received a three-year, \$105,000 grant from the McDonnell-Pew Program in Cognitive Neuroscience, to study how the brain processes sounds and localizes them in space, and how space is represented in the cortex of the brain's parietal lobe. The McDonnell-Pew Program in Cognitive Neuroscience supports innovative, interdisciplinary research of the highest caliber that is unlikely to be funded from traditional sources.

*George Housner*, PhD '41, the Carl F. Braun Professor of Engineering, Emeritus, has been given the 1995 Lifetime Achievement Award at the Los Angeles Area Chamber of Commerce's annual construction industries luncheon.

The 1995 ASCIT Teaching Awards have been given by the undergraduate students to *Paul Dimotakis*, Northrop Professor of Aeronautics and professor of applied physics; *Barbara Imperiali*, associate professor of chemistry; *Jeremy Kahn*, assistant professor of mathematics; *David Rutledge*, professor of electrical engineering; and *Jonas Zmuidzinas* '81, assistant professor of physics. Honorable mentions went to *Jim McCarthy*, PhD '88, assistant professor of astronomy; *Moshe Slubovskiy*, instructor in history; and *Alan Weinstein*, associate professor of physics.

*William Johnson*, PhD '75, the Ruben and Donna Mettler Professor of Engineering and Applied Science, will receive the 1996 William Hume-Rothery Award in February from the Minerals, Metals & Materials Society, in recognition of his contributions to the science of alloys.

*Wolfgang Knauss* '58, PhD '63, professor of aeronautics and applied mechanics, has been awarded the 1995 Murray Medal from the Society for Experimental Mechanics. Knauss studies



**The Athenaeum, site of many testimonials to groundbreaking research, paid tribute to a different sort of pioneering achievement on August 18, as Caltech hosted a dinner honoring the "Fighting 99th," the first squadron of African American fighter pilots, who battled both racial prejudice and the Nazis to compile a sterling record of service during World War II. The dinner was followed by a preview screening of "The Tuskegee Airmen," an HBO movie about the much-decorated combat pilots. From left, airman Robert Williams, a recipient of the Distinguished Flying Cross, who spent years working to bring the story of his unit to the screen, is greeted by former Air Force Chief of Staff and retired JPL Director Lew Allen (center) and Air Force Lieutenant General Lester Lyles.**

the origin and expansion of cracks that arise from defects in plastics, rubber, composite materials, and adhesives.

Professor of Physics *Harvey Newman* and an international team of physicists working with him on the MARKJ experiment at the Deutsches Elektronen Synchrotron (DESY), in Hamburg, Germany, have been awarded a special prize by the European Physical Society "for establishing the existence of the gluon." Theirs was the first direct observation of gluons, the fundamental quanta responsible for binding together quarks (the basic building blocks of matter) within more complex particles such as protons and neutrons.

*Paul Patterson*, professor of biology, has been appointed to an advisory panel of the American Paralysis Association's new Consortium on Spinal Cord Injury. He and three other advisers will interact with eight principal investigators, who are striving to characterize the spinal cord at the cellular and molecular levels, identify ways to promote recovery of nerve cell function and axon regrowth, and investigate strategies to replace nerve cells destroyed by injury.

*Erin Schuman*, assistant professor of biology, has been named a 1995 Pew Scholar by the Pew Scholars Program in the Biomedical Sciences. Schuman, who will receive \$200,000 to support her research over the next four years, will use the funding to explore what effect neurotrophic factors—proteins that foster the growth of neurons—have on the transmission of signals across synapses—the junctions between neurons.

Professor of Electrical Engineering *P. P. Vaidyanathan* has been named the recipient of the 1995 Frederick Emmons Terman Award, sponsored by Hewlett-Packard and presented at the American Society for Engineering Education's November conference.

*Ahmed Zewail*, the Linus Pauling Professor of Chemical Physics and pro-

fessor of physics, has received the Order of Merit, First Class, from Egyptian president M. Hosni Mubarak, an honor, akin to knighthood in Britain, for those who have reached the highest levels in the arts and sciences. Zewail, born and educated in Egypt and now an American citizen, is the first nonresident of Egypt to receive this honor. Zewail has also won the Leonardo da Vinci Award of Excellence, for achievements of great international significance. An international jury chose him and two others for the award, sponsored by the Moët Hennessy-Louis Vuitton Foundation of France.

Other names in the news this season include Peter Goldreich, the Institute's Lee A. DuBridge Professor of Astrophysics and Planetary Physics, and Edward Lewis, PhD '42, Caltech's Thomas Hunt Morgan Professor of Biology, Emeritus, who as *Caltech News* was going to press, were named the recipients, respectively, of the National Medal of Science—the nation's highest scientific honor—and the Nobel Prize for physiology or medicine. Goldreich is Caltech's 19th National Medal of Science winner, and Lewis, who shares the Nobel Prize with two other researchers, is the 22nd faculty member or alumnus to be so honored. Expanded coverage will appear in the next *Caltech News*.

## Curry appointed to business and finance post

Caltech has a new vice president for business and finance: he is John Curry, administrative vice chancellor and chief financial officer at UCLA since 1993. Curry, who brings to the job more than 20 years of experience in financial administration at UCLA, the University of Southern California, and Stanford, started his job in September.

Curry succeeds David Morrisroe, who stepped down last year after more than 20 years as vice president for business and finance. Former provost Paul Jennings served in the interim as acting vice president for business and finance. Morrisroe has also recently retired as vice president and treasurer, and Curry will serve as acting treasurer while a search for a successor is made.

"I am delighted that an individual of John Curry's exceptional background and experience has accepted our invitation to come to Caltech," said President Tom Everhart. "Everyone who met him in the search process found him to be a very talented and astute individual, and is convinced that he will be a superb addition to Caltech's administration."

Curry holds a BA in physics and an MA in mathematics from West Virginia University. He completed the coursework for a doctorate in mathematics at Carnegie Mellon University in 1967, where he also served as instructor in mathematics from 1965 to 1967. From 1967 to 1973, he was a lecturer in mathematics at Pittsburgh's Chatham College.



**John Curry**

In 1973, Curry went to Stanford, where he was a National Institutes of Mental Health Fellow, pursuing studies in organizational research and serving as a lecturer in sociology. In 1975, he joined the office of Stanford's provost, as an intern in university financial management.

He went to USC as assistant to the university's executive vice president in 1976, and was appointed director of management planning in 1978. He was named executive director of the university budget in 1980 and became USC's vice president for budget and planning in 1986, a position he held until 1993, when he moved to UCLA.

The author of more than a dozen articles on academic finance and organizational management, Curry is a member of the National Association of College and University Business Officers, and a member of the board of trustees of Pasadena's Chandler School, where he served as chair of the finance committee from 1992 through 1994. He has been a management consultant to a large number of institutions, including Columbia, Indiana University, Southern Methodist University, the University of Michigan, and the University of Miami.

A Pasadena resident, Curry is married to Kristine Dillon, USC's associate vice president for student affairs, and the couple has two sons.

## FRIENDS

### *Institute elects four new Board members*

Caltech's Board of Trustees has elected four new members, including the Institute's second Young Alumni Trustee. The new trustees are Gordon M. Binder, chairman and CEO of Amgen; Mike R. Bowlin, chairman, president, and CEO of Atlantic Richfield Company (ARCO), Los Angeles; and Arthur L. Goldstein, chairman, president, and CEO of Ionics, Inc. Joining the Board as a Young Alumni Trustee is Philip M. Neches '73, MS '77, PhD '83, group technical officer for the AT&T Multimedia Products and Services Group.

Gordon Binder was elected CEO of Amgen in 1988, after serving as chief financial officer for six years, and was elected to the additional post of chairman of the board in 1990. Founded in 1980 and located in Thousand Oaks, California, Amgen develops, manufactures, and markets biotechnology products, primarily for preclinical and clinical testing, and sale to the scientific research community.

Before joining Amgen, Binder was employed by Systems Development Corp. as vice president, finance, and treasurer for 10 years. From 1964 to 1969, he held various financial management positions at Ford Motor Company, in Dearborn, Michigan.

In addition to his involvement with Amgen, Binder serves on the boards of directors of the Biotechnology Industry Organization, the Pharmaceutical Research and Manufacturers Association, Pepperdine University, the California Health Care Institute, and the American Cancer Society Foundation. He also serves as a member of the Ronald Reagan Presidential Foundation. Binder received his bachelor's degree in electrical engineering from Purdue in 1957 and an MBA from Harvard in 1962, where he was a Baker Scholar.

Before joining ARCO in Los Angeles, Mike Bowlin served as executive vice president, then as president of ARCO International Oil and Gas Company; as senior vice president of Inter-



**President Tom Everhart took the Institute's story to Washington, D.C., this summer, as he and Caltech Trustee Admiral Bobby Inman hosted a breakfast for House members to discuss the merits of fundamental research. From left are Congressman Steve Horn, Everhart, and Congressmen Ken Calvert, Ray Thornton, and Carlos Moorhead, whose district includes Caltech. The meeting included a presentation by Everhart and the screening of a video detailing Caltech research efforts, which Congressman Horn offered to send to all 75 newly elected members of the House.**



**Mike Bowlin**

national Oil and Gas Acquisitions; and as president of ARCO Coal Company. He has been with ARCO for over 25 years. Bowlin's interests outside the company focus on education, youth, and health care. He is a member of the board of directors of the University of North Texas Foundation, the Amateur Athletic Foundation, and the National Board of Junior Achievement. He sits on the advisory board of the University of North Texas and is a member of the board of trustees of the Committee for Economic Development and the Aspen Institute for Humanistic Studies. His California community involvements include serving as a member of the board of directors of the Boy Scouts of America, Los Angeles Area Council; the Gene Autry Museum; and the Los Angeles World Affairs Council. He received a bachelor's of business administration in 1965 and an MBA in 1967, both in personnel administration and both from the University of North Texas.

Arthur L. Goldstein is chairman, president, and CEO of Ionics, Inc., in Watertown, Massachusetts. An international, publicly held company founded in 1948, Ionics, Inc., manufactures, sells, and leases systems for the purification, treatment, and supply of water and other liquids. Goldstein has worked at Ionics, Inc., for 35 years.

Goldstein is a member of the Visiting Committee at Harvard Business School and Harvard School of Public Health. He is also a member of the Cardiovascular Advisory Council and the Environmental Health Council at Harvard School of Public Health. He serves as director of the Massachusetts High Technology Council and is a member of its executive



**Arthur Goldstein**

committee. He sits on several boards, including the State Street Bank, Cabot Corporation, Massachusetts General Physicians Organization, Inc., the Board of Overseers at the Boston Museum of Science, the Executive Committee for CEOs for Fundamental Change in Education, and the Inner-City Scholarship Fund.

The recipient of many awards, Goldstein holds eight U.S. patents in areas related to the purification and processing of liquids. He received a BS degree in chemical engineering from Rensselaer Polytechnic Institute in 1957, an MS in the same field from the University of Delaware in 1959, and an MBA from Harvard in 1960.



**Philip Neches**

As the group technical officer for the AT&T Multimedia Products and Services Group, Philip M. Neches is responsible for architectural, technical, and strategic direction for AT&T's multimedia business units, cross-company activities, and investments. He also serves on the AT&T Bell Laboratories Council.

In 1979 Neches cofounded Teradata Corporation, where he held the title of vice president and chief scientist. In 1989 he went to work at NCR Corporation (now AT&T Global Information Solutions) as senior vice president and chief scientist.

Neches has contributed to the information-processing industry as a consultant, university faculty member, and scientist. He also holds a number of patents in computer systems architecture. He is a member of the Institute of Electrical and Electronics Engineers, the Computer Society, and the Association of Computer Manufacturers, and a trustee for WDPR—Dayton Public Radio. A native of Los Angeles, Neches received his three Caltech degrees in computer science.

## *Caltech establishes Moser Scholarship*

A friendship forged over antique cars has now benefited Caltech's ongoing undergraduate scholarship drive. Caltech has received an initial gift of \$250,000 to establish the B. Paul Moser Undergraduate Scholarship Fund. The scholarship, which will assist students with financial need within the Institute's Division of Engineering and Applied Science, is from the estate of mechanical and hydraulics engineer B. Paul Moser. A widower who died without children, Moser stipulated in his will that the bulk of his estate—which included 18 rare vintage cars—be directed to supporting education.

Moser named his longtime friend and fellow antique-car enthusiast, Caltech alumnus Keith Coulter '50, executor of his estate. In carrying out Moser's wishes, Coulter earmarked part of the estate for selected colleges. He thought Caltech would be a good choice because both he and Moser had engineering backgrounds. "I was an engineering manager, so I can see the value of a good product," says Coulter, who spent most of his career working as an electronics engineer for the Santa Barbara Research subsidiary of Hughes Aircraft. "Caltech has a good product."

Coulter and Moser first met at an antique car club gathering in the early 1970s. Both had an interest in vintage cars dating back to boyhood. Coulter bought and restored old cars in his spare time; Moser had essentially given up the engineering profession in the 1950s to devote his full time to automobiles and real estate. Over the next 20 years, the two worked together, says Coulter, on "dozens and dozens of cars. He was a mechanical guy and loved mechanical things, just as I did."

Moser was particularly interested, says Coulter, "in classics with a flair, cars that were turning points in design." These included a 1935 Auburn Supercharged Model 851 Speedster, featuring sleek lines and a pointed tail, and Moser's most prized acquisition—a 1912 Rolls Royce Silver Ghost London Edinburgh Tourer, which he had tracked down in Argentina.

At the time of Moser's death, about half of his cars needed major restoration work, which Coulter oversaw, in preparation for auctioning the vintage models in August 1993, in Solvang, California. The auction was held by the famed Sotheby's Auction House.

Having sent four daughters to college, Coulter has a firsthand appreciation of the value of undergraduate scholarship support—another interest he shared with Moser. "He wanted his estate to benefit tax-exempt charities—scholarships specifically—and I'm trying the best I can to follow his instructions," Coulter says. "Undergraduates really do need the support."

## By land and by sea

What do Colorado and Alaska have in common besides towering mountains and towering novelistic treatments by author James A. Michener? Well, this past summer, both were destinations of the Caltech Associates, and in the case of Alaska, of members of the Alumni Fund. Led by Caltech professors of geology Clarence Allen, PhD '54, and Lee Silver, PhD '55, 42 Associates spent a week in July amid the Colorado Rockies, exploring the region's geology and colorful history (natural and otherwise) on a journey that took them to Denver and Aspen, through historic mining towns, and to the top of Independence Pass, one of the highest passes in the United States. In August, a crew of 29 Associates and Alumni Fund members set sail with Professor of Geology Jason Saleeby on a voyage into a world of "fire and ice"—the glacial and volcanic lands of Arctic Alaska and the Russian Far East. Cruising for 12 days through the Bering Sea, the group visited Alaskan wildlife preserves and the Pribilof and Aleutian islands, and experienced the unique blend of Russian and indigenous cultures that characterize eastern Siberia.

## Gifts by will

*Trusts and bequests provide welcome support to Caltech's operating and endowed funds. The following are recent gifts received by the Institute.*

Margaret Bolger Pleasants, wife of deceased alumnus J. Gibson Pleasants, has made a bequest of \$1,275,271 to the Institute, to be used to establish the Dr. J. Gibson Pleasants Scholarship Fund in electrical engineering, the field in which Pleasants received his PhD in 1933. Dr. and Mrs. Pleasants were members of the Caltech Associates.

Warren G. Koerner, a Caltech alumnus who received his Engineer's degree in 1948 in aeronautics, has made a bequest to Caltech in the amount of \$927,717. One third is to be used as a scholarship fund in aerospace engineering, and the balance comes as unrestricted funds.

George W. Clapp has made a \$46,467 bequest to Caltech to be used in the study of earth sciences. A Caltech alumnus who received his BS in physics in 1926, Clapp has made this bequest in memory of his father, Professor W. Howard Clapp, who came to Caltech (then Throop Polytechnic Institute) in 1911 in the field of mechanical engineering. He retired as professor emeritus in 1945.

For information about wording for bequests to the Institute, call the Office of Gift and Estate Planning, at 818/395-2927.

## ASSOCIATES ALMANAC

**October 13, West Los Angeles Luncheon**, with guest speaker Kerry Sieh, professor of geology: "An Exposé of West Los Angeles Faults."

**October 16, President's Circle Faculty Dinner**, with guest speaker Fred Culick, professor of mechanical engineering and jet propulsion: "Aeronautics 1900 to 1909: The French-American Connection."

**October 24, Special Event for Associates With Prospective Members.** Campus Tour, Reception, and No-Host Dinner.

**October 30, Associates' Annual Black-Tie Dinner**, with guest speaker I. Michael Heyman, secretary, Smithsonian Institution: "The Private Sector and the Smithsonian: Saviour or Seducer?"

**November 3-5, "Sedona and Beyond"—President's Circle Trip to Arizona**, led by Thomas Ahrens, professor of geophysics, and Fred Culick, professor of mechanical engineering and jet propulsion.

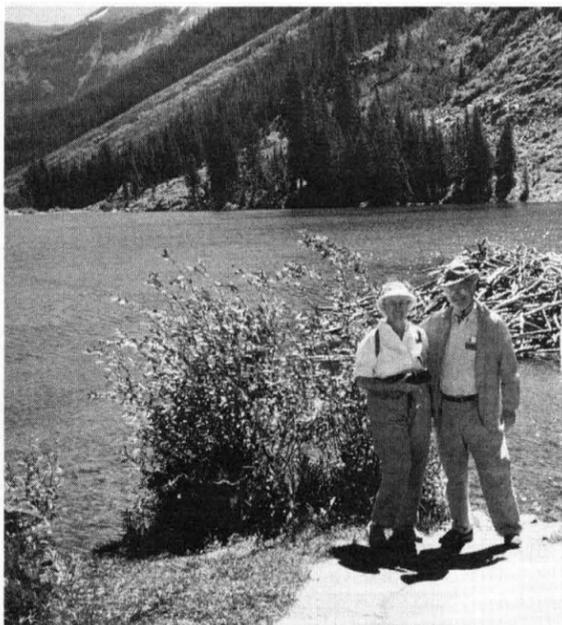
**November 28, Associates/Faculty Dinner**, with guest speaker Erin Schuman, assistant professor of biology. "How We Learn and Remember: Encoding and Storing Information at Synapses in the Brain."

**January 21-February 9, 1996, All-Associates Trip to Rajasthan, India**, led by Peter Fay, professor of history.

**April 9-13, 1996, "Telescopes and Volcanoes"—All-Associates Trip to Hawaii**, led by Thomas Soifer, professor of physics. Visits to the W. M. Keck Observatory, the Caltech Submillimeter Observatory, and Volcanoes National Park.

**September 13-25, 1996, President's Circle Trip to Switzerland**, led by Brian Wernicke, professor of geology.

For more information about the Caltech Associates, call the Associates' office at 818/395-3919.



**Photo left:** Enjoying the scenic tranquility of Maroon Lake, famous for its wildflowers, Associate Mary Johnson and Clarence Allen discover that, yes, they'd rather be in Colorado, and Allen (next picture) gets together with fellow Caltech geologist Lee Silver and Associate Caryl Otto, PhD '54, to put on a roadside geology attraction. **Third Photo:** Members of the Alaska expedition cast off in a Zodiac raft for a trip around St. Paul's Island in the Bering Sea, south of Siberia, and (bottom picture) back on their cruise ship off Seward, Alaska, pose for a commemorative group photo on the last day of their Arctic adventure.



## RECLAIM

continued from page 1

Similar proposals are currently under review in Massachusetts, Illinois, Wisconsin, Texas, Ontario, and British Columbia, reflecting, says Ledyard, "a clear trend away from command and control in environmental and other areas."

At the federal level, to combat acid rain, Congress and the Environmental Protection Agency have established the widely publicized trading market for sulfur dioxide. This program, whose structure has been extensively studied and critiqued by Plott and Sholtz, held its first market auction in 1993; its success has yet to be determined.

Why are markets being considered as a means of controlling pollution? One reason is that more conventional approaches to pollution have been less than overwhelmingly successful. "The

AQMD was having trouble achieving the pollution reductions it needed under command and control," says Ledyard, adding that "cities like Los Angeles are pretty desperate to try to achieve better results at lower cost."

Although Los Angeles is one of the few districts where the command-and-control approach has actually brought about a significant reduction in air pollution levels from the 1970s, the region continues to have the most days "out of compliance" with federal air quality standards. "Even tough emission standards—and L.A.'s are the toughest in the country—have a nasty habit of being ratcheted down after businesses have made significant investments in pollution-control equipment," explains Sholtz.

The prospect of easing this adver-

uncertainty associated with achieving pollution reductions, the AQMD aims to make improvements in air quality more viable in the fragile Southern California economy.

The goals of this market system are thus twofold: to realize pollution reductions that are the same or better overall as those provided by command-and-control measures, and to give companies more flexibility in how they make emissions reductions, thereby diminishing their costs. The basic way the program aims to do this is by giving businesses an allocation of credits, or licenses, that cover the years 1994 through 2010.

Known as RECLAIM Trading Credits (RTCs), these licenses allow their holders to release one pound of pollution per RTC during a specific year.

each year. As only a fixed number of credits will be issued for use during a given year, an increase in pollution at one facility must be accompanied by an equivalent decrease at another facility.

Currently, 431 Southern California facilities, each producing more than four tons of either nitrogen oxides or sulfur oxides per day, are required to participate in RECLAIM. Together they emit 65 percent of the total nitrogen oxide and 85 percent of the sulfur oxide released by stationary sources in the South Coast Basin. Stationary sources account for 24 percent and 37 percent of all South Coast Basin nitrogen and sulfur emissions, respectively.

By gradually decreasing the number of the RTCs available in the "market," the AQMD hopes to lower the amount of nitrogen oxide emissions by an average of 8.3 percent per year and sulfur oxide emissions by an annual average of 6.8 percent, for a reduction of approximately 70 percent from these sources by 2003.

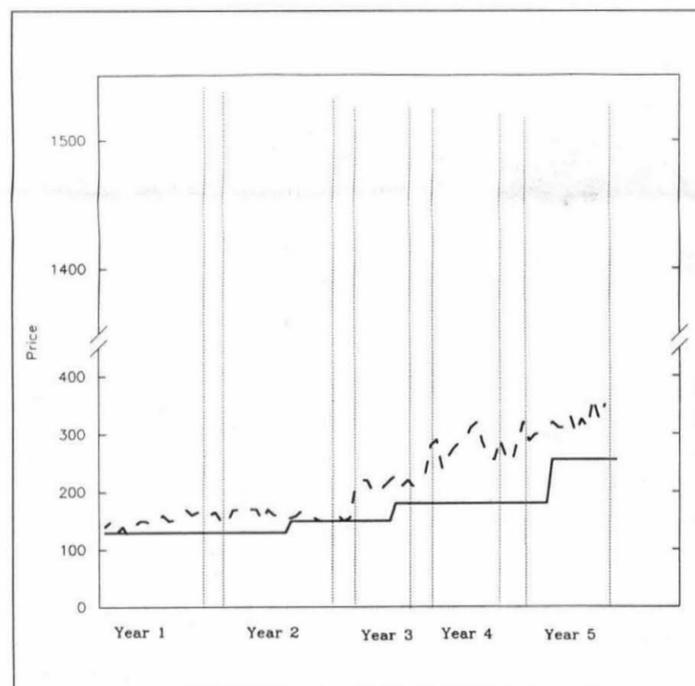
According to Sholtz, RECLAIM's main feature is "the way in which the program aims to drive down costs by allowing emissions reductions to be made by the facilities that can cut their pollution cheapest or most economically." The ability of tradable permits to reduce compliance costs has already been demonstrated on a small scale in the regulation of some large facilities, which may release emissions from many sources. Rather than mandating that specific technologies be applied to each source of pollution within a given plant, the AQMD has in some cases regulated the total amount of pollution emitted from a facility, allowing companies, in Ledyard's words, to "shuffle emissions around the facility." Requiring a facility to reduce pollution by a total amount, distributed in any way, has allowed for intrafacility trading to occur, and for the cheapest reductions to be made.

RECLAIM expands this concept to interfacility trading, allowing companies to decide among themselves where in the Los Angeles basin it is most cost-effective to control pollution. The program contains safeguards to ensure that emissions in any given locality do not increase above previous levels, and that emissions are not shifted around in such a way as to intensify smog beyond current levels in the event of unfavorable meteorological conditions.

How might such a scenario work in practice? Suppose that Billy's Bike Factory and Rachel's Riveting Plant both need to reduce their emissions by an amount equivalent to 50 pounds of pollution just in order to stay within their allocated levels. Billy can reduce its emissions by 50 pounds each in two ways—by putting on new scrubbers and by tightening all its valves. Together, these two relatively low-cost solutions could reduce emissions by 100 pounds and free up 50 RTCs for Billy to sell.

Rachel, however, relies on a manufacturing process for which there is

### Time Path Prices: Staggered Credits



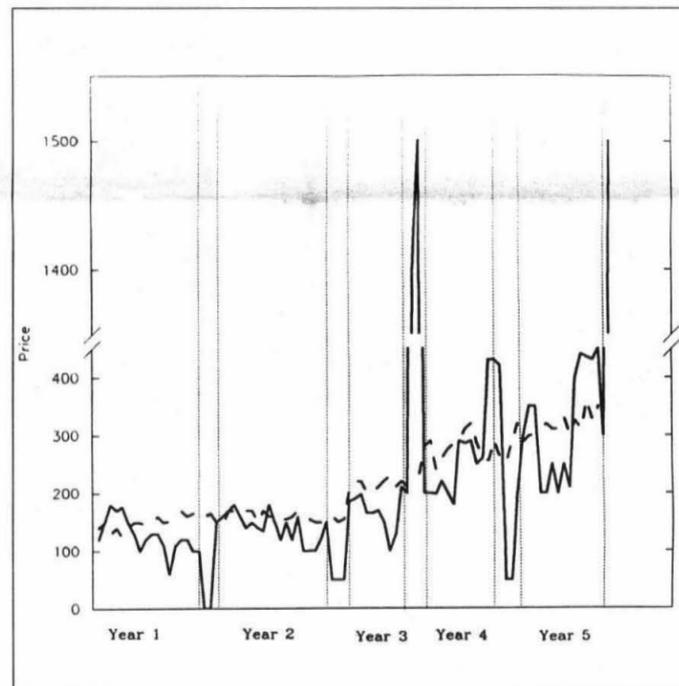
— — — — — Prices, staggered credits  
 ———— Theoretical Prediction

**These data sets from simulations carried out in Caltech's Experimental Economics Lab helped convince the South Coast AQMD of the importance of staggering RECLAIM credits, so that half the program's available credits expire at midyear and the other half at year's end. The lefthand figure shows the results of simulations held under staggered-schedule conditions. The five-year price path for credits (broken dashed line) remains stable and conforms closely to theoretical predictions for performance (solid line). The righthand figure reflects what happened during simulations in which all the credits expired simultaneously at year's end. Prices, denoted by the solid line, fluctuate wildly from year to year, creating pronounced market instability.**

serial relationship between businesses and regulators is the most compelling feature of RECLAIM. The AQMD hopes that the program will offer a respite to businesses from the high compliance costs typically associated with traditional command-and-control policies and encourage them to actively seek out and invest in cost-effective forms of pollution control. From the perspective of the regulated, a program that employs market incentives may alleviate what they perceive as the unpredictable, almost arbitrary nature of pollution control.

"As businesses operating under command and control often see it, they have invested their money in a particular technology and are following what they've been led to believe is the right approach, when along comes a regulator who proclaims, 'You shalt not do it this way but rather that way,'" says Ledyard. By lowering the costs and

### Staggered versus nonstaggered



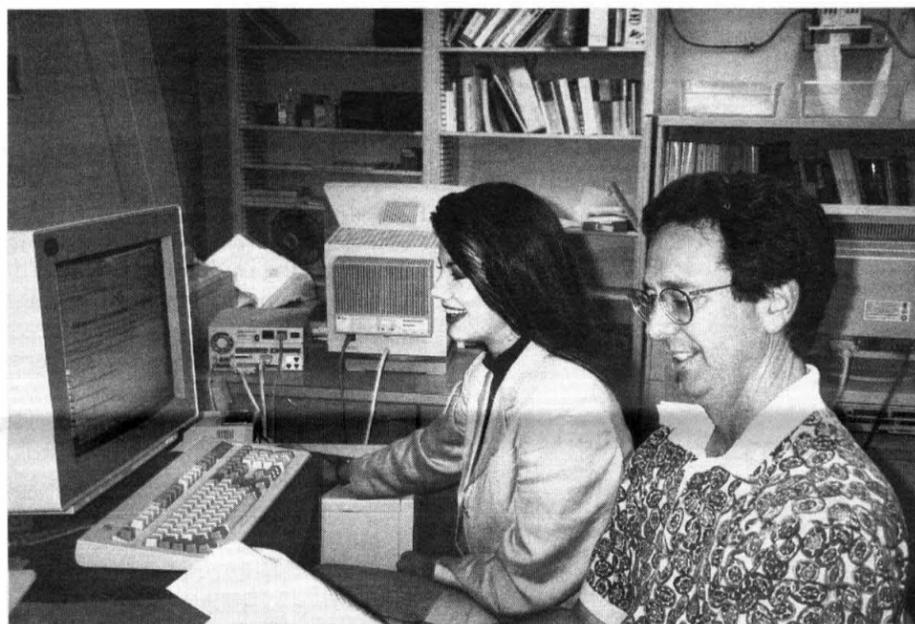
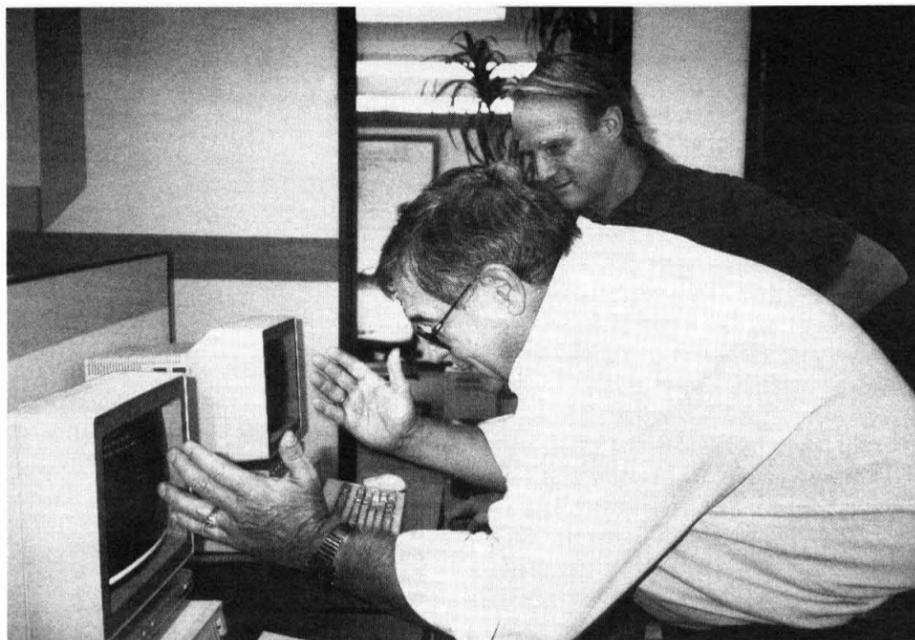
——— Prices, uniform annual credits  
 - - - - - Staggered credits

Every year, the total number of allotted credits falls, systematically reducing the allowable amount of aggregate emissions over the next 16 years. At quarterly intervals throughout the year, each company must redeem enough credits to the AQMD to cover its emissions of nitrogen oxide or sulfur oxide for that period.

By allowing companies to buy, sell, and trade their credits, RECLAIM gives facilities the incentive to reduce pollution even further when economically feasible, so that they can sell excess credits to other businesses for a profit. At the same time, companies that cannot make inexpensive pollution reductions have the option of purchasing credits from another business.

Through such transactions, emissions will effectively be transferred from one facility to another, but the amount of total pollution will stay within allowable levels that decline

**Their role as AQMD consultants completed, Harkness Professor Charles Plott (foreground) and Humanities and Social Sciences Division Chair John Ledyard find that the experience of devising a market to help clear up L.A.'s air offers few insights into how to clear up a computer snafu in Caltech's Experimental Economics Lab. Meanwhile junior colleagues and co-AQMD consultants David Porter and Anne Sholtz appear to be having an easier time reclaiming their data. Porter is currently a visiting associate at the Institute; Sholtz, formerly an instructor on campus, now teaches environmental policy at USC Law School.**



only one type of expensive abatement equipment available, although it appears that new, more effective, and perhaps cheaper technology is just down the road. Under the RECLAIM program, Rachel has the choice of either buying the costly current technology, or, alternatively, of buying unused credits from Billy, who, by installing both of the relatively inexpensive technologies, ends up with an excess of 50 credits, which can then be sold to Rachel. The cost of the credits will be somewhere between the high cost of the equipment that Rachel has avoided buying and the lower cost of Billy's abatement technology.

The same situation under command-and-control regulation could yield a considerably different outcome. Without the ability to sell its 50 extra pollution credits, Billy's Bike Factory would not have the economic incentive to make the additional reductions. Rachel's Riveting Plant would face the tough choice of either purchasing the existing technology or paying the non-compliance fees. If this technology is both expensive enough and likely to become obsolete in the near future, a company in Rachel's position might well choose the noncompliance route, either paying the penalty or leaving the state altogether for less-regulated pastures. Under these conditions, the market scenario clearly appears more attractive.

Besides reducing compliance costs, "RECLAIM provides huge incentives for technological investment and development," says economist Plott. He notes that under command-and-control schemes, companies had no immediate incentive to invest in technologies to make pollution improvements beyond the minimum level mandated by law.

Under RECLAIM, however, a company mapping out its pollution-control strategy will be able to take into account the potential financial benefits reaped from selling credits on the market. More expensive but cleaner technologies may appear more attractive because their higher costs can ultimately be offset by the profit the com-

pany gains from the sale of its credits, which will accrue as long as the pollution technology continues to operate above required compliance standards. Because such reductions can yield tangible financial benefits, companies may also be motivated to actively seek out or develop new ways of reducing pollution, rather than passively waiting to follow regulatory mandates. "In a number of ways," says Plott, "new technologies can get a boost from RECLAIM."

These scenarios may sound pretty straightforward, but ensuring that they can actually take place as planned is no easy task. Stresses Porter, "The way in which a market is organized can have a profound effect on the way prices are set and on the way resources are allocated among the market participants."

One issue that provoked heated debate among RECLAIM planners and critics concerned what would happen if, for example, companies in one part of the L.A. basin ended up buying a high percentage of all the available RTCs, effectively shifting much of L.A.'s pollution to a single area and causing severe problems for that region and its residents. In response to these concerns, the AQMD has since introduced provisions into the program that it says will greatly reduce the possibility of "inequitable distribution" of air pollution.

Another issue that the Caltech and PSE economists addressed involved

how the RTCs would operate in the market. The AQMD's original plan called for all the credits to become valid at the beginning of the calendar year, and then to expire together at the end of the year, a scenario that the Caltech economists recognized could bring about all sorts of unintended and potentially negative consequences.

Explains Sholtz, "We saw that with all of the credits expiring at the same time, facilities that had held on to their credits, perhaps because they could not forecast at the start of the year what their total emission output for that year might be, would face a 'use it or lose it' proposition. They would scramble to redeem any excess credits before they became useless at the year's end."

One consequence might be that, if many businesses found themselves with excess credits at the end of the year, this could create a market glut of unwanted RTCs. Alternatively, in the event of an economic upturn, businesses could simultaneously increase production, possibly bringing about a dramatic and undesirable end-of-the-year spike in emissions and producing a shortage of credits, as companies scrambled to secure the credits needed to cover emissions.

"In either case the market would be subject to significant price volatility at the end of the term, which would destabilize the whole system," says Ledyard. To lessen the possibility of these

undesirable outcomes, the economists proposed "staggering" the RTCs, that is, making half of them valid from January to December, and the other half valid from July to June of the following year.

Although the problems with this aspect of the RTCs seemed pretty clear to the economists, they were not entirely obvious to the officials at the AQMD. Says Ledyard, "It was difficult for them to see why this was a problem—they just couldn't see that what we predicted could actually happen." The Caltech contingent responded by bringing the AQMD staffers data from the lab—the Institute's Experimental Laboratory of Economics and Political Science. Led by Porter, who designed a series of experiments to simulate the RECLAIM market, the economists invited subjects, generally students, to act as facility managers, using Caltech's computers. Motivated by the real incentive of money, the "managers" were able to apply, buy, and sell their pollution credits on the computerized RECLAIM market to other managers.

In testing how each instrument would perform under a particular set of real-world conditions, the experimenters established all of the basic parameters of the market and then let the subjects make their own decisions.

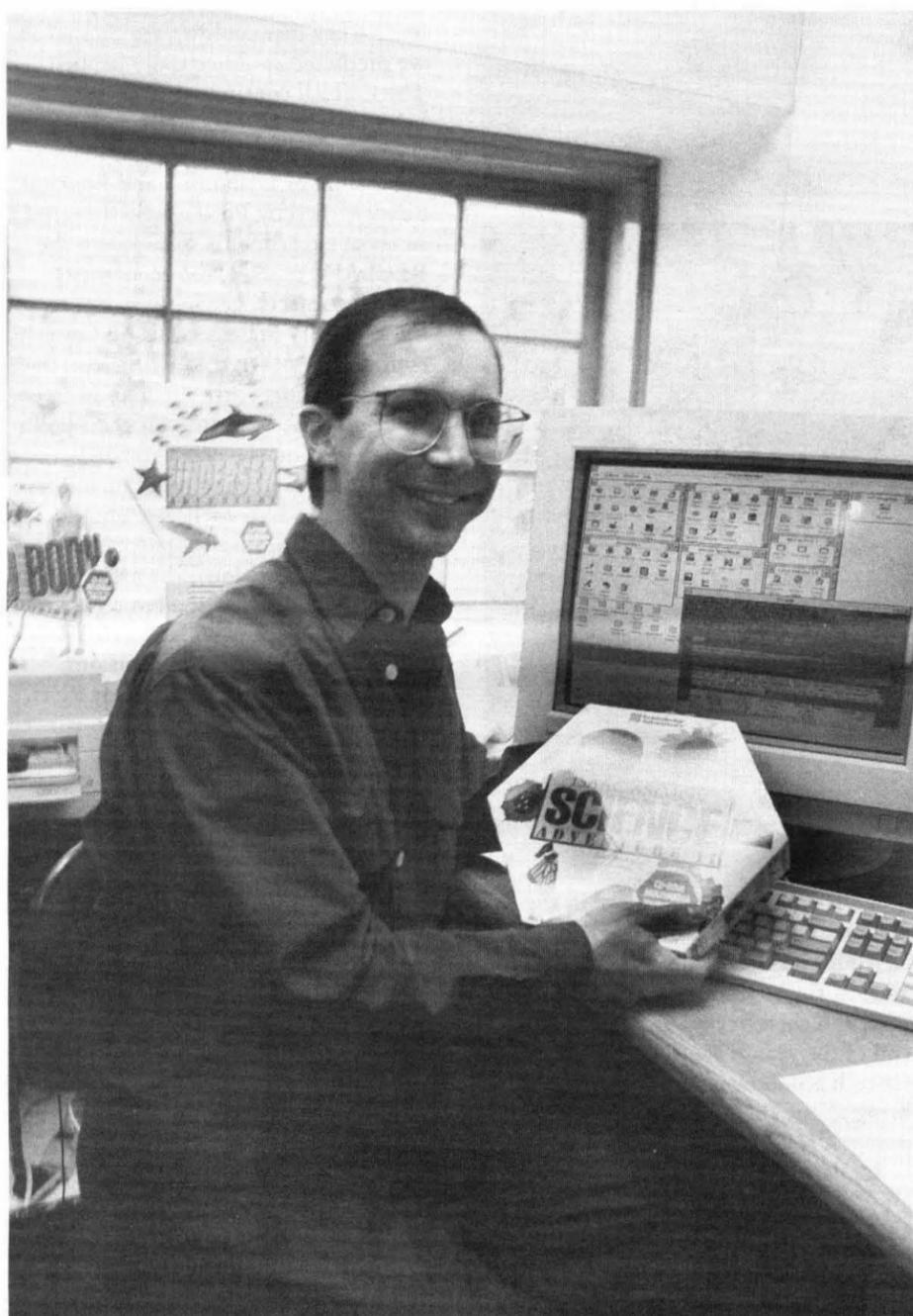
The results, says lab director Plott, "were dramatic. The computer-assisted simulations showed clear-cut differences in market behavior under conditions of nonstaggered versus staggered credits. The experimental runs using nonstaggered credits produced a consistent flurry of year-end trading activity, accompanied by either a rapid drop or a rapid increase in the RTC market price. When the staggered credit approach was adopted, the market was buffered significantly from the price and trading volatility of the nonstaggered credits. (See figures on page 6.) Watching and observing the trading process in action was a crucial factor in convincing the AQMD to incorporate the staggered feature into RECLAIM."

The researchers also studied the conditions placed on trading, and their potential impact on market behavior. In its original plan, the AQMD had stipulated that every market trade take place through a complex administrative process. The Caltech group foresaw that putting such a process in place could transform the "open" permit market into a bureaucratic nightmare and severely discourage trading. This kind of problem was not new to the economists. "A disturbing feature about market-based policies is the number of ways that bureaucratic tinkering can completely ruin them," says Plott. The AQMD subsequently removed a number of restrictions that had the potential to obstruct the trading process without yielding environmental benefits.

*Continued on page 14*

## Bill Gross's excellent adventure

By Michael Rogers



Earlier this year, Bill Gross '81 was kicked out of his old office at work and reassigned to one that's not much bigger than a closet. Normally, this would not presage long-term job security. But Gross is the boss, and his move to cramped digs signaled a booming business at Knowledge Adventure, the hugely successful producer of interactive computer products that he started in 1991. After all, when he moved out of his old modest-sized office, five people moved in.

At 36, Gross has already started four companies, sold two of them, struck a deal with director/producer Steven Spielberg, and been featured in *BusinessWeek*, *Fortune*, and the *Wall*

*Street Journal*. At nearly every step of his career, he doubted whether he could keep his head above water. But not long after he'd get his feet wet, he'd find himself awash in success.

The recipe for Gross's meteoric rise in business is very simple. First he discovers a product that intrigues him but doesn't live up to his expectations. Next he builds a far superior product for about the same amount of money as the original product. Then he starts a business built around the new product. Finally, just as the business is thriving, he gets out of it after discovering another interesting item that he's sure he can improve.

Gross's career as an entrepreneur began when he was a junior in high school in Encino, California. An avid

**Ensnored in his Knowledge Adventure Office, Bill Gross '81 can already look back on a body of work that testifies to the science he's made out of venture capitalism.**

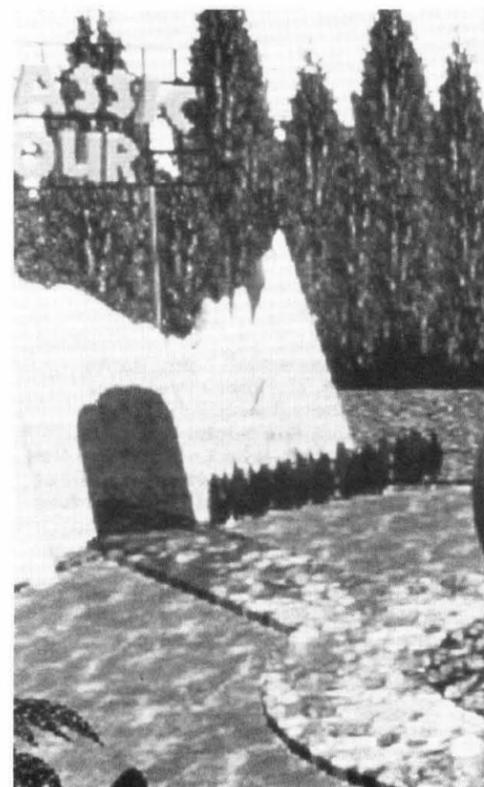
reader of *Popular Science*, he became interested in solar energy after reading about it in the magazine, and decided to use his knowledge of mathematics to build a low-cost parabolic dish. "A parabolic dish is a tricky shape, and I came up with a number of different ways of cutting cardboard to make a paraboloid automatically bend into a parabolic dish. When you cover the cardboard with tin foil, you've got a reflector. Once I saw how useful that was for heating, boiling water, and cooking, I started designing the dishes out of Plexiglas and aluminum."

Rather than get involved in manufacturing parabolic dishes, Gross took out an ad in the back of *Popular Science*, offering to sell his plans for the devices. "I sold plans for \$4 each, and did really well. I ended up saving enough money to go to Caltech."

Selling plans for the solar energy collector would also prove to be an important influence on his later ventures. "It was my first taste of the power of intellectual property, because I was able to make much more money on the idea than I would have selling metal and parts," Gross says. "I put in a lot of work up front, and then had a low-cost thing to duplicate."

Gross took a detour into manufacturing at the end of his freshman year at the Institute. After buying a pair of \$150 speakers for his stereo, he brought them back to Ruddock House only to discover that they didn't measure up to a senior's \$1,000 pair. So Gross took them apart, saw how uncomplicated they were, and wondered whether he couldn't build a better pair for the same amount of money. The speakers had a seven-day return policy, and after listening to them for a week and considering the problem, Gross got his money back, bought components for \$140, and purchased \$10 worth of particle board to make cabinets.

"I spent a few weeks building that first pair in the Caltech student shop in the basement of the Winnett Center," Gross recalls. "They sounded much better than the pair I had returned, because now they had superior, preci-



sion components," unlike the original speakers, which had cheap parts since the \$150 price included the costs of advertising, showroom space, and overhead. "Someone down the hall in Ruddock heard the speakers and asked me to help him build a pair. So I helped him build a pair for \$150. Then someone else said, 'These sound great. Will you help me build a pair?' And before I knew it, that summer I had built 10 pairs of speakers," still working out of the student shop.

During his sophomore year, Gross began taking courses in acoustical engineering, and applied his growing knowledge to speaker design. "It felt unbelievable that you could take raw materials and turn them into something so compelling after just a day in the shop," he says. "But just as I had studied everything that I needed to know about solar energy to build collectors, I decided to get passionate about this. I felt that there had to be more science to it than just putting speakers in a box." Word of his "experiments" spread, and requests for speakers came in from more students and also from faculty members. Gross charged Caltech students and faculty the cost of materials and used each new order to experiment with different components and designs. He tried to organize students into groups to build speakers for themselves, but many faculty members and some students who didn't have the time or desire to build the speakers just paid Gross to do all the work.

Students and faculty, Gross says, were happy to get the speakers at cost, while his professors were pleased to see that he was applying his engineering studies to a practical purpose. After building about 100 pairs of speakers, working primarily at night and on weekends, Gross settled on cylindrical speakers packed with lead, which eliminated much of the speakers' noise by reducing their vibrations. He called them Valkyries, after Richard Wagner's the "Ride of the Valkyries," which is traditionally played by Caltech students on the first day of finals week.

"No one had put speakers in cylindrical enclosures before, and they sounded beautiful," Gross says. By the end of his sophomore year, he had got-



**The gateway to the world of *Dinosaur Adventure*, an interactive trip through a prehistoric park, also proved to be Gross's gateway to the world of CD-ROM.**

ten so many orders that the Winnett student shop began looking like his private factory. He had so many back orders that he took the next logical (and atypical) step of putting his education on hold while opening his own Pasadena manufacturing facility and retail store, which he called Gross National Products and later renamed GNP Loudspeakers.

"I got this 600-square-foot place on Walnut Street at Sierra Madre Boulevard, and signed a six-month lease with a six-month renewal option," Gross recalls. "I was scared to death, because I had never made a financial commitment to anything for more than six months, except for Caltech. I divided the store with a curtain, put together the speakers in the back, and sold them in the front. People heard about this guy making speakers and they came in. I'd put music on for them, sit with them, and all of a sudden business boomed. Within six months, I completely outgrew the store and moved to another one on Colorado Boulevard at Chester Avenue that was eight times as big." By this time, Gross was selling not only his speakers but also other manufacturers' top-of-the-line stereo equipment. He stayed out of school for one year to develop the business, and earned enough money to pay for his last two years at Caltech. Even after returning to school, however, he continued to run the business, riding his bicycle between campus, his apartment, and the store, often setting erratic business hours to accommodate his class schedule. "It prepared me for the business world, that's for sure, because I don't remember sleeping too much," he quips.

While he was developing GNP into a \$5 million business, patenting his speaker design, and selling speakers to other dealers across the country, Gross got an idea for another venture. In 1984, three years after he graduated from Caltech, he bought an IBM personal computer for his store. But rather than buy software, he wrote his own programs. By 1985, with the help of three other Caltech graduates, including his brother Larry, who had graduated from the Institute in 1983, he had created a way of simplifying Lotus 1-2-3, the spreadsheet software program.

The program, called HAL (for Human Access Language), replaced the complex technical commands of Lotus 1-2-3 with simple English phrases, allowing users to learn and master the program faster. Since there was no similar product on the market, Gross decided to take it to a computer trade show to try to sell it. Lotus Development Corporation executives saw it and liked it since it didn't replace their product, but just enhanced it. One week later they offered to buy the program from Gross. The one condition was that Gross sell his speaker business and come to work for Lotus writing software.

Gross sold GNP Loudspeakers to two friends and stayed at Lotus for six and a half years. He says that he would still be there if it hadn't been for his son David, born in 1986. In 1991, David started kindergarten. Like many parents, Gross was concerned with the quality of his child's education. "With schools getting more crowded and kids getting less individualized attention, there's less chance for a student to get inspired than when I was growing up," Gross says. "Even in a classroom with few students, a teacher has to talk to the average."

Around the same time, Gross found himself thinking about Beethoven. For all the years he had spent building speakers and running an audio business, he says, "I had only focused on the technical aspects of the sound." All that changed—along with, of course, Gross's career—when he happened on a program called *Multimedia Beethoven*. One of the first computer videos to utilize CD-ROM technology, the program combined personal computers with high-quality sound and pictures, and featured just enough interactivity to hook consumers weaned on video games.

"It was a beautiful, wonderful product," Gross recalls, "but it was really geared toward adults." The program was basically an electronic primer on Beethoven's Ninth Symphony, featuring music and background information on the composer. Although the graphics were fairly crude, the experience of listening to the symphony and learning

about Beethoven gave Gross a new appreciation for the music, and of CD-ROM's potential as an educational tool.

If a CD-ROM could inspire an adult, Gross figured that it could make an equally strong impression on children, who were increasingly being exposed to computers at home and in school. "Because computers speak the language of these children, they're willing to give them their full attention," Gross says. Just as the CD-ROM had given him a new appreciation for music, he suspected that it could also be used to get kids interested in science and other challenging subjects, and could be more individualized and potentially more engaging than a teacher delivering a lecture. While it wouldn't replace school, especially school's social functions, it could certainly be an important supplement, Gross reasoned.

"I thought, wouldn't it be great to make CD-ROMs, not as esoteric as the Beethoven one, but really geared toward young children, that would make it so that David, when he grows up, can have a better appreciation for music, art, literature, and science?" Having

David, who one day asked his dad to make something about dinosaurs. Coincidentally, a few months after *Dinosaur Adventure* appeared in stores, Steven Spielberg's film *Jurassic Park* was released. With the help of a national craze for anything having to do with dinosaurs, sales of *Dinosaur Adventure* soared, making Knowledge Adventure a strong player in the CD-ROM business.

Recently relocated to an office park in Glendale, Knowledge Adventure has a disarmingly casual corporate culture. The dress code is strictly jeans and T-shirts. In this collegial atmosphere, Gross and his staff have produced a wide range of award-winning products, including *3-D Body Adventure*, an exploration of the human anatomy that includes movies of the brain and circulatory system, and *Science Adventure*, an introduction to several science disciplines. Gross recently hooked up with Random House to produce an interactive encyclopedia for kids from the ages of seven through 12. It includes 2,000 text entries, movies, music, and games. And last year, he and Steven Spielberg



**The light of inspiration already burned brightly for Caltech's future Young Alumni Trustee, when he appeared in the Institute's 1981 yearbook, *Big T*.**

learned everything about the software business at Lotus, Gross figured he'd just adapt his knowledge to the kids' market. Even so, he never expected to make money doing it.

"I didn't see it as a growth market. I just saw it as something I wanted to do. I figured I would lose my money doing it, so I decided to do it for a year and then go back to Lotus or start another company. I never expected it to take off. That wasn't part of the plan."

Not for the first time, Gross was happily proved wrong, as the home market for CD-ROMs boomed, along with Gross's new business, Knowledge Adventure. Assisted by his brother, several other Caltech graduates, and other colleagues, Gross started making a line of CD-ROMs, including *Dinosaur Adventure*, an interactive trip through a prehistoric park, designed to teach children about prehistoric life and, at the same time, entertain them. The product was inspired by Gross's son

signed a deal to collaborate on CD-ROMs. Spielberg, interested in expanding into the interactive educational software business, chose to work with Gross and invest in Knowledge Adventure after he saw his kids playing with *Body Adventure*. The duo's first products are coming out this year, and one program includes footage shot by Spielberg, the first time he's stepped behind a movie camera since he directed *Schindler's List*.

Knowledge Adventure's sales have tripled every year it has been in business, while its staff size, now 150, including 20 Caltech alumni, has doubled annually. Despite its recent move from an unfashionable section of La Crescenta to bigger quarters in

*Continued on page 12*

## ALUMNI

### Chapter activities

#### San Franciscans return to Space Mountain

The San Francisco chapter continues to have stars in its eyes: a capacity crowd of 40 members and their guests made their way up Mt. Hamilton east of San Jose this past summer to take part in the chapter's latest "Evening at Lick Observatory." Treated to a private tour of Lick and its premier instrument, the 120-inch reflector telescope, the group also learned about the observatory's latest research and viewed the skies through the 36-inch refractor telescope.

#### And Orange County takes space walk

Not even the Caltech Alumni Association can arrange travel programs to other parts of the solar system, but it can do the next best thing—visit JPL. More than 100 alumni and guests turned out for a tour of the lab, sponsored by the Orange County chapter and led by alums and JPL technical staff members Pete Mason, Bill Whitney, and Bob Bunker. Their itinerary included a visit to the JPL space museum, the spacecraft-assembly and space flight operations facilities, and a multi-media presentation, "Welcome to Outer Space," which provided a look at possible tourist traps of the future.

#### New Mexico learns about science-education reform

What's the relationship between Mrs. Bray's third-grade classroom and Caltech's Bi/CNS 162 class? About 30 alumni and their guests found out the answer when Associate Professor of Biology Jim Bower, the cofounder of the Caltech Pre-College Science Initiative (CAPSI), spoke to the New Mexico chapter on "Scientists and Science Education Reform: Myths, Methods, and Madness." Bower discussed CAPSI's efforts to reshape science teaching nationwide, and talked about science education in the next century.

#### Boston Alumni get down with "Big Dig"

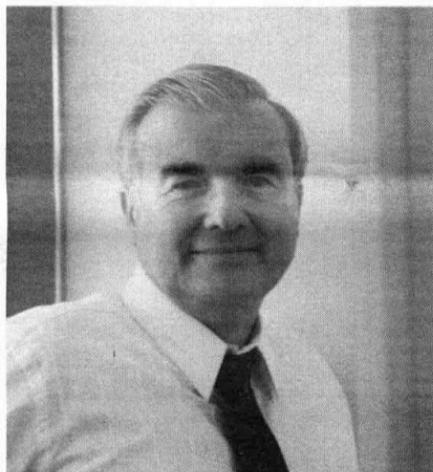
"No sneakers, and no dresses or high heels for women" warned the flier that invited Caltech alumni to take part in a tour of Boston's nearly completed Third Harbor Tunnel or, as it's known to local residents, "Big Dig." So many alumni felt equal to the sartorial challenge that the Boston chapter wound up arranging two excursions to the Dig, both of them featuring a slideshow overview of the project, a site visit to a half-mile-long approach tunnel, and a "rugged, hard-sole shoe" walking tour of one of the 4,000 foot main tunnels, which will connect South Boston with the city's Logan airport.



It's not Mariner from *Waterworld*, so it must be Rich Arrieta '88 plunging down the Slip 'n' Slide in the Gradiators' Competition. The August event brought together graduate students, alumni, staff, and faculty for a day that was, frankly, all wet.

### Letter from the Association president: On the brink of change?

By Frank Dryden '54, MS '57



Frank Dryden

The cycle of seasons in the life of the Alumni Association starts again with this issue of *Caltech News*. As you are aware, *Caltech News* is the main vehicle that the Institute and Association rely on for communicating with alumni and Caltech's many friends and supporters. It is therefore worth noting that there will be only four issues this year rather than six. Although each issue will have more pages, this appears to be a cost-cutting measure on the part of the Institute, and it reflects a concern that should be shared by all alums. In spite of the excellent efforts and sound planning of the Institute, the climate of financial support for research and fundamental scientific endeavors such as those carried out by Caltech is relatively chilly. The country is still struggling to pull itself out of an extended recession, and the new congress is dedicated to cutting federal spending on all fronts. All alumni who are in a position to remind our political leaders of the importance of fundamental science and sound engineering education for the economic future of our country should let their representatives know how they feel.

As Past President Pete Mason reported in detail in prior issues, this is the year that the Alumni Association and the Institute are taking a long,

hard look at the degree to which the needs of all Caltech alumni are being met by the Institute and the Association. The Alumni Relations Task Force (ARTF) has been hard at work since last spring and hopes to have a report and recommendations ready by the end of the academic year.

The Association will be prepared to respond to those recommendations and has begun to look at new ways we might reorganize or become more effective. This year is therefore going to be a year of trying to maintain our existing programs and services in an efficient manner while analyzing our priorities, mode of operation, and future role in concert with the efforts of the ARTF.

One of the services that will be improved this year is the access to the Alumni Server. A new and larger-capacity server is being connected. This will assist Alumni Association members in accessing the Internet through their email accounts with the Association. There are also improved instructions being implemented by the Electronic Communications Committee to make it easier for those who are not true computer junkies to find help and utilize the system.

It is a pleasure for me to serve as president of the Association and to work with an outstanding group of officers, board members, committee members, and staff. In my opinion, the main purpose of the Association is to serve the Institute—its students, faculty and alumni—in unique ways and from the special vantage point of those who attended Caltech in some capacity as students. The annual dues or life memberships paid to the Association help to make that service possible. The Association's efforts are pointed toward assuring that our alma mater is always a leader in the scientific and technical world and that we remain proud of the fact that we participated in building that tradition.

## ALUMNI ACTIVITIES

October 12, *Santa Cruz Area Monthly Luncheon*, Peachwood's at Pasatiempo Inn, noon. For reservations, call Bob Shacklett at 408/722-6021. Lunches take place on the second Thursday of each month—the next two dates are November 9 and December 14.

October 15, "*Goldilocks and the Cabernet Sauvignon; The Role of Wine in Health and Pleasure*," presented by Paul Saltman '49, at the Robert Mondavi Wine & Food Center in Costa Mesa.

October 19, *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 are on November 16 and December 21.

October 23, *Boston Chapter Dinner Meeting*, with guest speakers Greg Bearman, member of the technical staff of the Infrared and Analytical Instruments Systems Section, JPL; and Sheila Spiro, former director, Ancient Biblical Manuscript Center, Claremont.

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

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

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

March 19, *Portland Chapter Dinner Meeting*, with guest speaker Judith Goodstein, university 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.

June 21–30, *Alaska Travel/Study Program*, led by Bob Sharp, the Robert P. Sharp Professor of Geology, Emeritus; and Leon Silver, the W. M. Keck Foundation Professor for Resource Geology.

## Phil Albert takes on presidency of S.F. chapter—with no strings attached

Reminiscing about his undergraduate days at Caltech and in Fleming House, San Francisco chapter president Philip Albert '83 remembers best "the ability of the people around me to think of ways of doing things that had never been done before, both at school and in the larger world." In the working world this intellectual skill has served Albert well in his position as an intellectual-property attorney. But in referring to school . . . well, one's thoughts immediately turn to that ever-present ritual for Caltech students—the prank.



Intellectual property attorney Phil Albert embraces the bust of his intellectual role model, former patent clerk A. Einstein, at the latter's birthplace in Bern, Switzerland.

Admitting that there are several pranks that he isn't going to 'fess up to, Albert is willing to recall the time during spring break when he and his fellow Flems decided that the proper welcome home for a fellow student was to fill his room with paper. "We had discovered that the computer center had lots of paper, so we spent a couple of days looping about half a mile of string around all the furniture and into the closet, to make it harder to get the paper out, and then wadding up paper, filling the room to the ceiling."

The honoree was suitably impressed, and after cutting all the strings he shoved the paper out his second-floor window. It formed a mound so impressive—about 25 feet high says Albert—that the students immediately improvised their next stunt: taking turns jumping out of the second-floor window onto the pile.

Beyond the pranks, Albert remembers his four years at Caltech as being academically hard and intense. But, he says, "I grew to appreciate my Caltech education when I realized how much more I had learned than people at other schools." After graduation, he worked at JPL for three years in the telecommunications group before leaving to start his own software company. A short while later he became intrigued with the idea of justice and the rule of the law, and enrolled in law school at USC.

Albert says that his Caltech training both helped and hindered his studies in law school. "At Caltech, the solution to a problem is guided by peer review and constrained by the laws of nature. By the time the scientific collaborative process is finished, one answer is pretty well agreed upon. But in law there is no real answer, and in school I had to

learn to think about both sides. Sometimes law questions are not resolved. But I think that my engineering background does help me to think problems through logically."

Currently an associate attorney specializing in patent law at the firm of Townsend and Townsend and Crew in San Francisco, Albert and his wife, Mary, a structured settlement consultant who helps design large monetary settlements from law suits, enjoy "doing the tourist thing and touring the wine country and historic gold country." Some of this knowledge may come in handy as Albert and his fellow board members—vice president Richard Rairden '76, from Lockheed; secretary Stephanie Charles '73, a computer consultant in Mountain View; and treasurer Joseph Yang '86, PhD '91, a law student at Stanford—plan activities for the 1,100 members of the San Francisco chapter.

"We're working on some speakers for the fall," says Albert. "We hope to have activities that will appeal to those who like to attend lectures, and also to plan some events for those who are interested in outings. Perhaps we'll also hold a happy-hour kind of thing where alumni can get to know each other."

In conclusion Albert says, "We want to give all the alumni a chance to remember their Caltech roots, as well as to offer some interesting programs."



Historic rivers and prehistoric ice flows beckoned this summer to Caltech alumni and members of their families. Above, traveling with Bob Sharp on the Association's recent trip to Montana's Glacier Park, Janet and Carroll Lindholm '51 enjoy the view from the back of the red touring cars. Left, cruising down the Rhine on the Association's Three Great Rivers of Europe travel/study program, Esther McClain, wife of John McClain '42 receives a demonstration of glassblowing from master craftsman Reinhard Herzog of Wertheim, Germany.

## Alumni Relations Task Force will conduct survey

The Alumni Relations Task Force, chaired by Institute Trustee Ronald K. Linde (MS '62, Ph.D. '64), is conducting a special telephone survey this fall to learn more about current attitudes of Caltech alumni toward their alma mater. The survey is being conducted by the Daniel Yankelovich Group (DYG), a professional survey firm specializing in university interests.

Earlier this year, President Everhart called for the creation of this Task Force to assess the relationship between Caltech and all of its alumni. The Task Force believes that the information produced by this survey will greatly assist in accomplishing its goal in providing recommendations on the qualities and attributes of an alumni relations program that will carry Caltech and its alumni into the 21st century.

Out of a pool of approximately 18,000, a demographically representative cross-section of 800 alums will be contacted and asked to share their opinions and ideas. If you are not contacted directly to respond to this survey, but are still interested in expressing your thoughts about how the Caltech-alumni bond can be improved, please correspond with the Task Force by letter (ARTF, c/o Jonathan Schwartz, Caltech, 105-40, Pasadena, CA 91125) or e-mail (artf@cco.caltech.edu). The results of the survey will be presented to President Everhart and others at the Institute who hold primary responsibility for strengthening the relationships in the Caltech family.

# Caltech ProNet ... it works.

## OVER \$38 MILLION WORTH OF POSITIONS HANDLED THIS YEAR

Whether you're currently job searching or not, keep in mind that offers come along that are too good to refuse. Caltech ProNet keeps you abreast of challenging opportunities in a variety of fields, including high-tech, banking and finance, general management, sales and marketing ... and many more.

It's easy and confidential. For more information, contact Caltech Alumni Association, 345 S. Hill Ave. MC 1-97, Pasadena, CA 91125, Tel. 800-758-1944.

*Matching Experience  
With Opportunity*

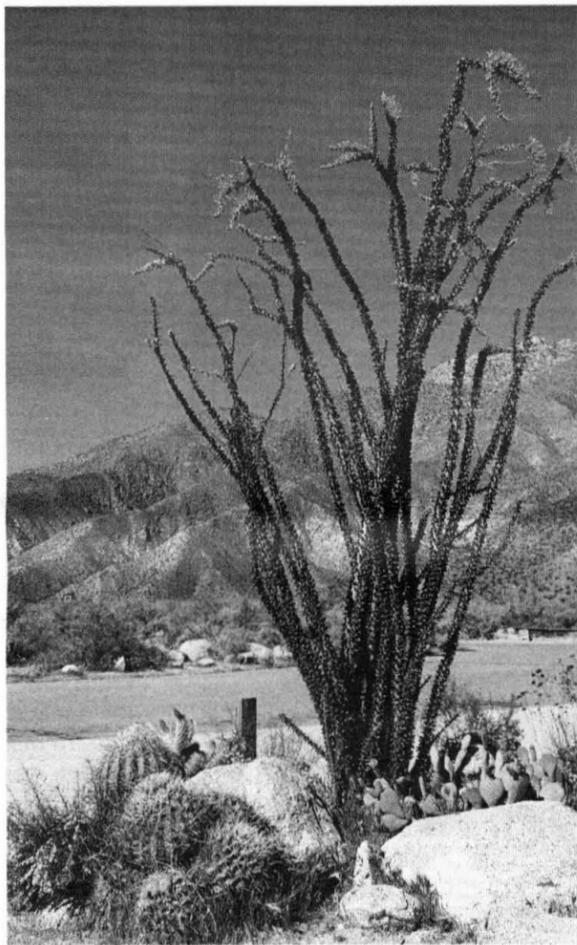
## Back by Popular Demand

### The Caltech Alumni Association presents the second run of the "Geology, Flora, and Fauna in the Low Desert of Southern California" Travel/Study Program

The Alumni Association invites you to join Leon T. Silver, PhD '55, the W. M. Keck Foundation Professor for Resource Geology, to explore the Salton Depression and Anza-Borrego State Park. The three-day trip, Monday, March 25, through Wednesday, March 27, 1996, will examine the geological processes and their consequences that are tearing North America apart along the great San Andreas plate boundary. Our overview will start high on San Jacinto Mountain at the head of the Palm Springs Tramway (elevation 8,500+ feet). Visits to the shorelines of the modern Salton Sea and of its much larger predecessor, Lake Cahuilla, will be followed by interesting tours and moderate hikes in the great Anza-Borrego State Park. Accommodations for the two nights will be in the well-appointed luxury resort La Casa Del Zorro, in Borrego Springs. On the third day, geology and history will be investigated at the unique Warner Hot Springs Ranch in northern San Diego County, followed by an introduction to the geology and engineering of a major new reservoir for emergency water storage for Southern California. The dates have been chosen to optimize our access to the beautiful spring desert flower displays and possible Big Horn sheep-sightings that can enliven this region.

The total cost of the trip will be \$500 per person (double occupancy) or \$625 (single occupancy), and includes all meals, accommodations, and travel by motor coach departing from and returning to Caltech.

If you have questions, please call Arlana Bostrom at 818/395-8363.



#### REGISTRATION FORM

I/we wish to receive additional information about the Alumni Association's travel/study program to explore the geology, flora, and fauna of the low desert, March 25-27, 1996.

Name: \_\_\_\_\_ Class year: \_\_\_\_\_

Home address: \_\_\_\_\_

Phone: (home) \_\_\_\_\_ (daytime) \_\_\_\_\_

## Explore the Yucatán, Land of the Maya

Mexico's Yucatán peninsula, realm of the Maya, Olmec, and Toltec, defies easy characterization of its history and culture. As an authority on Meso-American civilizations and one who has studied their glyphs and artifacts, William Schaefer—senior research associate in chemistry, emeritus—is just the person to explain the complexities of these remarkable civilizations to alumni participating in our travel/study program to the land of the Maya. Please join us from February 24 through March 8, 1996, for a journey into another world and time, as Bill takes us to the sites of Chichén Itzá, Uxmal, and Palenque, as well as to the lesser-known Labná, Sayil, Kabáh, Chicanná, Becan, Cobá, and Tulum. Our itinerary is expressly designed to introduce you to civilizations that have fascinated and puzzled researchers for centuries.

If air arrangements are made by our tour operator, the cost of the program is \$2,790 per person (land only), for persons sharing twin-bed accommodations. For those wishing to make their own air arrangements, the land tour fee is \$2,890 per person (double occupancy). The supplement for single accommodation is \$460. Should you have no traveling companion but desire a twin room, we will try to select a roommate for you at your request. A deposit of \$400 per person is required to hold a space for this program; full payment is due December 24, 1995.

If you are interested in participating in this program, or wish to receive more information about it, please call Judy Amis, executive director of the Alumni Association, at 818/395-6594.



## Gross

Continued from page 9

Glendale, Gross doubts that it will be able to stay there for more than a year before it needs more room again.

Ask Gross what makes Knowledge Adventure's products different from the competition, and he singles out their sense of humor. Characters in the programs often talk back to the users or crack jokes. And one product, *America Adventure*, is recommended for ages 6 to 106. "We think our products have a

little more of an attitude," Gross says. "They're a little more hip, more cool for kids, and are not trying to be as safe as traditional reference products."

While Gross credits much of his success to his Caltech education, he says that the science and engineering knowledge he gained was not the most important aspect of his experience.

"The biggest lessons I learned at Caltech were the ones that helped me succeed in business, especially the discipline that I learned," he says. "The ability to pull off a successful finals week is very similar to carrying out a successful product introduction." Along the way, many Caltech students and faculty have provided Gross with advice, moral support, financial support, and contacts. "I had a great college experience," Gross says. "I had fun, I learned a lot, and a lot of people I met at Caltech helped me later on."

Recently named Caltech's first Young Alumni Trustee, Gross would like to give something back to the Institute, and is considering establishing a scholarship, a grant, an internship at his company, or another program to help students become entrepreneurs. "Students should understand that when they graduate, the only option isn't to take a job offer—they might want to do something different, like start a business," he says. Ever on the lookout for new challenges, Gross says he wouldn't mind teaching a course at Caltech in the future, but right now he has his hands full with Knowledge Adventure.

With the company doing so well, one almost expects Gross to bail out. After all, the pattern of his career has been to leave a venture at the height of its success, after stumbling onto another potential commercial bonanza. But Gross says he's in no hurry to leave Knowledge Adventure. For one thing, he has just become a father again. His second son, Andrew Peter, was born May 30, but several months before then, the prospect of having another child inspired Gross to design new products aimed at the 18-month to three-year age bracket.

"I've usually stuck with things for two or three years, but I think the reason why I'm going to stick with this one for a very long time is that there's so much left to do," he says. "I mastered the parabolic dish pretty fast. I perfected speakers fairly fast. I think I mastered business software quickly. But to really motivate a child's brain is not as easy as solving the calculator function of a spreadsheet. We've made good educational software products, but we have a long way to go before we make the really ultimate individualized tutor. I think that this is going to challenge me for a long time."

## PERSONALS

1929

T. H. (TOM) EVANS, MS '30, writes, "After my wife's death last year I seem to have lost touch with Caltech and my old friends of many years. At last I feel in touch again with the *News* coming regularly. My three children live in California and are very helpful to me. I now live in a retirement residence called Mission Commons, located in Redlands, where one daughter lives. I am now 89 years old and in good health, but cannot drive because of macular degeneration. With a closed-circuit TV, however, I can read most anything."

1936

RICHARD W. DODSON, who founded the chemistry department at Brookhaven National Laboratory in Upton, New York, in 1947, received an honorary doctor of science degree from Lawrence University on June 11. He served as the Brookhaven chemistry department's chairman until 1968, elevating the department "to a leadership position among research departments in the country," and as senior chemist from 1968 until his retirement in 1982. While working at Brookhaven, he also taught chemistry as an associate professor (1947-53) and a professor (1953-82) at New York's Columbia University. After graduating from Caltech, he received his PhD in chemistry from Johns Hopkins University in 1939. He was a National Research Fellow at Caltech in 1940, then served as a staff member of the National Defense Research Committee at both Caltech and Northwestern University. In 1943 he was appointed a group then division leader at Los Alamos Scientific Laboratory, where he helped develop the atomic bomb. It was after spending 1946-47 as an assistant professor of chemistry at Caltech that he joined the staff at Brookhaven. Now 80, he resides in Santa Rosa, California.

1938

WILLIAM REES SEARS, PhD, professor of aerospace and mechanical engineering at the University of Arizona, has received the NAS Award in Aeronautical Engineering "for his significant and enduring contributions to education, aerodynamics, and aircraft design, including the optimal Sears-Haack body and the original Northrop flying wing." The National Academy of Sciences award includes a prize of \$15,000. Sears received Caltech's Distinguished Alumni Award in 1988.

1941

JOSEPH W. LEWIS and his wife, Anne, write that, after 48 years in San Marino, California, they have moved 22 miles east to Mt. San Antonio Gardens, in Claremont. They chose the Gardens "because we think it's so beautiful with its parklike 'campus,' where we will have our own 2-bedroom, 2-bath cottage, with large living room and patio, dining area and fully equipped kitchen for entertaining. But we're looking forward to being served 3 meals a day (in the lounge dining room), with open seating among the attractive and interesting residents of the Gardens, 30 of whom are already long-time friends."

1950

ROBERT H. KORKEGI, MS, PhD '54, writes, "There is life after retirement! I was recently elected Chairman of the Senior Scientists and Engineers, a volunteer organization that also includes medical doctors and operates under the aegis of the American Association for the Advancement of Science. It presents a wonderful

opportunity for retired professionals to involve themselves in activities in support of government, education, and communities. In the Washington area, out of an active data base of some 200, we have 50 or 60 people working on studies or projects at any one time. In the future we expect to expand the SSE activity to other metropolitan areas. As a second retirement activity I am a Visiting Professor on a part-time basis in the Aerospace Engineering Department at the University of Maryland, College Park. I continue to enjoy teaching and working with young people."

1959

WILLIAM L. KO, MS, PhD '63, an aerospace engineer at NASA's Dryden Flight Research Center, in Edwards, California, was awarded the Exceptional Service Medal during the 1995 NASA Honor Awards Ceremony held in the Dryden auditorium on April 24. He received the honor "in recognition of exceptional performance in the field of solid mechanics including fatigue and fracture mechanics of composite materials and for the development of the theory for innovative semi-circular and semi-elliptical composite fatigue test specimens used for delamination analysis of composite materials." Ko has been at Dryden since 1977.

1962

C. ROLAND HADEN, MS, Texas A&M University System vice chancellor and dean of engineering, and professor of electrical engineering, has been named chair of the Professional Engineers in Education division of the Texas Society of Professional Engineers (TSPE). He will also chair the Texas Deans of Engineering, the 19 deans of engineering from Texas universities and colleges who serve on the TSPE education advisory committee. In addition, he serves as director of the Texas Engineering Experiment Station, a state research agency. After earning his master's from Caltech, Haden received his PhD from the University of Texas at Austin in 1965. In 1969, he taught electrical engineering and was director of the Institute for Solid State Electronics at Texas A&M. He later served as dean of the College of Engineering and Applied Science at Arizona State University, and then as vice president for academic affairs, before going to Louisiana State University, where he was vice chancellor for academic affairs and provost. He returned to Texas A&M in 1993. He was named a fellow of the American Society of Engineering Education in 1994.

1963

DONALD E. KNUTH, PhD, a professor in Stanford University's computer science department, has received one of this year's two Harvey Prizes, "for his outstanding contributions to the science of computers." He "has done pioneering work in the theory of computation, software, programming languages, mathematics and typesetting. He has also developed TEX and METAFONT, both popular and practical advances to computer-aided typesetting." Awarded by the Technion-Israel Institute of Technology, Israel's premier science and technology university, the Harvey Prize was established in 1972 by the late Leo M. Harvey of Los Angeles, "to honor major contributions to human progress in science, technology, literature of the Middle East and the advancement of peace in the Middle East." The prize comes with a \$35,000 cash award and the opportunity to spend a month as a visiting scholar at the Technion, and, in receiving the prize, Knuth joins such past recipients as Albert Einstein, Niels Bohr, and Edward Teller. In his acceptance speech to the Technion International Board of Governors, Knuth "voiced strong disapproval for computer scientists' emphasis on proprietary rights and patents on their programs. 'People have the right to be paid,' he

said, 'but there must be a good balance. In software design you must use the ideas of many people. If you have to compensate all these people, you can't do it. Ideas are the world's heritage.'" Professor Knuth, according to the American Society for Technion, has "placed his own highly successful program, TEX, in the public domain."

1964

CHARLES "CHUCK" H. HOLLAND, JR., has been elected chief operating officer of American Savings of Florida. He joined American Savings as a consultant in 1991 and, in 1992, was elected executive vice president—corporate strategy and support. Previously he had been the principal of Holland Consulting, and for 19 years he held various senior management positions with Citicorp, both domestically and overseas. After graduating from Caltech, he received his MS and PhD Candidate degrees from UC San Diego, and he is also a graduate of the Executive Business Management Program at Columbia University. He is active in Rotary International and is both district chairman of the Boy Scouts' South Broward (Seminole) District and a South Florida Council Executive Board Member. He is past president of the Caltech Alumni Association, a life member of the Caltech Associates, and a member of the Chancellor's Associates of the University of California, San Diego.

1967

THOMAS J. BUCKHOLTZ announces that he has completed a book, *Information Proficiency: Your Key to the Information Age*, which has been published by Van Nostrand Reinhold. In it, he provides "a strong mutual agenda for general managers, empowered employees, and information technologists" and covers "improving decision-making and overall corporate effectiveness, integrating technologists into an organization's strategic future, managing information resources, and acquiring technology." He received his PhD in physics from UC Berkeley, and he served as the Commissioner of the Information Resources Management Service, U.S. General Services Administration, from 1989 to 1993. He currently is a consultant living in Portola Valley (near Stanford), California.

BING M. FUNG, PhD, a member of the University of Oklahoma's department of chemistry and biochemistry, has been named the George Lynn Cross Research Professor, which is the university's highest honor.

NAVIN C. NIGAM, PhD, having recently completed his term as director (president) of the Indian Institute of Technology, Delhi, has undertaken his new assignment as vice-chancellor, Goa University, which is in its "early stage of development and is poised for a major expansion." He has also coauthored a book, *Applications of Random Vibration*, with a former PhD student, Professor S. Narayan; the book was released in December 1994 by Springer-Verlag/Addison-Wesley. He adds, "Goa is a major tourist attraction in India, with beautiful beaches and green countryside. It will be a pleasure to host Caltech faculty and alumni who wish to combine pleasure with scientific interaction with the University."

1972

JOHNNIE B. CANNON, MS, PhD '75, has been appointed director of the Office of Planning and Management at the Department of Energy's Oak Ridge National Laboratory; previously he had served as associate director of the Energy Division. He is president of the Oak Ridge Chapter of Sigma Xi and a member of the Fuel Recycle and Waste Management Division, Low Level Waste Technical Operating Commit-

tee, American Nuclear Society. He is the author or coauthor of more than 50 publications.

1976

J. WAYNE MILLER, PhD, manager of Unocal's fuels technology division, has joined Sun Company as vice president in charge of technology and development. He spent 19 years at Unocal, holding a variety of research and technology positions.

1978

DWIGHT W. DECKER, PhD, vice president and general manager of Rockwell's Digital Communications Division, has been appointed president of Rockwell's telecommunications businesses. In this position, he will serve as a member of Rockwell's Senior Management Council. Decker joined Rockwell in 1989.

ERIC W. KALER, professor of chemical engineering at the University of Delaware, has received the 1995 American Society for Engineering Education's Curtis W. McGraw Research Award, which includes a \$1,000 prize. Sponsored by the society's Engineering Research Council in conjunction with the McGraw-Hill Book Co., the award honors outstanding early achievements by young engineering college research workers under the age of 40. Kaler earned his doctorate at the University of Minnesota, and he joined the University of Delaware faculty in 1989, after teaching at the University of Washington. His research interests are surfactant and colloid science, statistical mechanics, and thermodynamics. In 1984, he was one of the first recipients of the National Science Foundation Presidential Young Investigator Awards.

1981

NICHOLAS P. JONES, MS, PhD '86, has been promoted to professor in the Johns Hopkins University department of civil engineering. A member of the Hopkins faculty since 1986, he became an associate professor in 1991. He studies the performance of buildings during earthquakes and the relationship between structural damage and human injuries, as well as the effects of wind on long-span bridges, and his work has been recognized with an NSF Presidential Young Investigator Award, undergraduate teaching prizes, and, in 1988, the Maryland Young Engineer of the Year Award. He lives in Monkton, Maryland.

PAMELA LOGAN, MS '82, submits the following via Chinese postcard: "I'm writing this on the heels of a successful expedition to the Tibetan plateau, where I took 10 people to Baiya Monastery to repair its 270-year-old Buddhist murals. Fringe benefits of this job include being toasted by government officials, attacked by dogs, blessed by a rinpoche, trapped by a landslide, and watching the faces of fabulous gods emerge from layers of soot and dirt. There's more to do; I'll be returning in the fall. Meantime I'll be in Tuva digging up a Scythian tomb together with some Russian archeologists and one crazy American. This work doesn't pay much, but I feel I'm living well."

CHUCK NICHOLS and CONNIE SENIOR, MS '79, PhD '84, have become the parents of Carolyn Armstrong Nichols, born May 30, 1995. Carolyn and her brother, Alexander, reside with their parents at 7 Old Tadmuck Road in Westford, Massachusetts.

1983

WAHID HAMID has been elected vice president of the Boston Consulting Group, Inc. Based in the group's New York office, he is an active member of the firm's high-technology practice, and he recently completed an analysis of the evolution and impact of multimedia

technologies on various industries. He is also a member of the firm's operational effectiveness and consumer and retail practices. He joined the Boston Consulting Group in 1988, after working for Siemens USA, initially in new product software and hardware development and subsequently in strategic planning activities. His Caltech degree in electrical engineering was part of a dual degree, the other part being a bachelor's in liberal arts from Occidental College, plus he has an MBA from the Wharton School.

1984

MARY BARSONY, MS, PhD '89, assistant professor of physics at UC Riverside, has been awarded a five-year grant from the National Science Foundation's Faculty Early Career Development (CAREER) program to pursue her research in star formation and for her efforts to improve the astrophysics curriculum and the computing environment for physics education. Before assuming her current position, Barsony was a Smithsonian Postdoctoral Fellow at the Harvard-Smithsonian Center for Astrophysics (1990-93) and a President's Fellow in the astronomy department of UC Berkeley (1988-90).

1986

ROBIN WILSON writes, "I now live 50 feet from the Bay of Fundy—at least when the tide is in. After much procrastination, my husband and I finished our PhDs in genetics at Cornell. Last fall, he became an assistant professor at the University of Maine, Machias; I taught botany, technical writing, and algebra (!) at UMM this spring. Next fall I'll begin my new position as an assistant professor of biology at Husson College in Bangor. If you pass through coastal Maine, listen for my voice on the community radio station WERU-FM Blue Hill, 89.9."

1992

FREDERICK SLONEKER and MICHELIN ALDRIDGE, BS '95, were married on April 8, 1995. They are currently living in the San Francisco Bay area.

## RECLAIM

*Continued from page 7*

Having created the RECLAIM permits, the AQMD subsequently opted out of setting up the RECLAIM market, preferring to let free enterprise take its course. Thus far, three privately financed alternatives have sprung up to facilitate the buying and selling of RECLAIM credits: two are offered by brokers and one is an Internet-based auction market system. Several auctions have already been held, with two of the firms planning to hold future auctions on a quarterly basis.

The emergence of these RECLAIM markets also promises to redress what the Caltech economists had considered a serious shortcoming in the program's original design. As envisioned by the AQMD, the system primarily accommodated the market activity of current RTCs and did not allow for any future contingent trading of permits. But

now, trading mechanisms established by at least one of the new markets will allow companies to trade off long-term investments against streams of credits and make it possible to plan ahead of the one-year time horizon of current permits.

With RECLAIM up and running in the area of nitrogen and sulfur oxide pollutants, the AQMD has plans to expand the program to cover volatile organic compounds (VOCs), a class of petroleum-based gases that combine with nitrogen oxides to produce ozone. Recently, however, questions have arisen concerning what some are now calling the program's overly generous emission allowances. In its original design, RECLAIM had pegged beginning VOC allocations—the baseline figure that determines how much pollution firms will be permitted to emit through the year 2010—to the years 1989 and 1990, allowing companies to select either year. Since 1990, however, emission levels throughout the L.A. basin have declined by as much as 40 percent, largely as a result of the recession and massive cutbacks in the aerospace industry.

Critics of the proposed VOC expansion contend that by returning to pre-recession levels, RECLAIM in its present form could lead to a systematic increase in emissions through the year 2005, when companies would have to begin cutting their pollution output dramatically to achieve the reductions mandated for the year 2010.

Although the nitrogen and sulfur oxide programs, which the Caltech economists were instrumental in establishing, are unaffected by these developments, implementation of the VOC phase, originally scheduled for December 1995, has now been put off until at least March of next year, while these concerns are studied.

Emphasizes Plott, "We're in for the long haul with RECLAIM and similarly designed markets. This is all groundbreaking stuff, and we're still working through the kinks in the system. The good news is that our experimental capabilities now allow us to move faster along the growth curve, in terms of fine-tuning the system to real-world market conditions. Our ability to see the intersection of theory and experiment, data and policy, in this unprecedented way makes this really an exciting time in economics."

From the standpoint of the AQMD, the news looks equally exciting. By working through the kinks, and by seeing that RECLAIM lives up to its promise and potential, the AQMD believes the program will significantly reduce the costs of air-pollution abatement in Los Angeles over the next 20 years.

*Stanford University student Colleen Chien's last article for Caltech News, "An Interview with Arati Prabhakar," appeared in March 1995.*

## OBITUARIES

1925

WALTER B. JONES, of San Francisco, California, on July 4, 1993. He is survived by a daughter, Jan.

1926

THEODORE C. COLEMAN, of McMinnville, Oregon, on April 28; he was 91. A nephew of Alice Coleman Batchelder, who founded the Coleman Chamber Concerts, and the grandson of a Throop College history teacher, he was a member of the Gnome Club and the Caltech Associates. Early in his career, as a securities broker at Banks Huntley (Blyth & Co.), he was instrumental in the original financing of Northrop Aircraft. Later, he served at Northrop as a founding director and vice president of sales. In 1945, he and his family moved to Brazil, where he imported and sold small aircraft for two years. Then he accepted the position of assistant treasurer of Standard Oil of California. In 1950 he founded the Coleman Engineering Company. Upon retiring, he became city manager of South Pasadena, California. He also undertook a speaking tour at age 83 when his book, *Jack Northrop and the Flying Wing*, was published. He spent much of his life in Southern California, before retiring to Monterey, California, and then to Oregon, and, besides his Caltech affiliations, he was a member of the Rotary Club, the Twilight Club, Pasadena NOW, the Pasadena Historical Society, and the Conquistadores del Cielo. He was also an emeritus member of the Valley Hunt Club. He is survived by his wife, Anne Sharpe; a son, T. Samuel; a daughter, Mrs. James P. Mackel, Jr.; four grandchildren; and a great-grandson.

ALFRED L. FOSTER, of Berkeley, California, on December 24, 1994. He is survived by his wife.

1929

RICHARD G. ROFELTY, of Clarkston, Washington, on April 30; he was 87. He was a retired engineer of the Guy F. Atkinson Company of California. Much of his engineering work was done in the western states and involved dams and bridges. After the company completed the Pine Flat Dam east of Fresno, California, it was invited by the Hazama-Gumi Company of Japan to duplicate the dam at Sakuma, Japan. Rofelty also participated in the construction of the *Queen Mary's* permanent docking place at Long Beach, California, and, later, in the building of another dam in Japan. After his retirement, he and his wife moved from Long Beach to Leisure World, Laguna Hills, California, and then, in 1991, to Clarkston. He was a member of the Torii Masonic Lodge of Nagoya, Japan. He is survived by his wife, Ruth.

1930

GEORGE A. ROSS, MS '31, of Clearwater, Florida, on January 29. He received his Massachusetts Professional Engineer's certificate in 1947. He taught in the Arizona State University industrial arts department before joining General Electric, in Schenectady, New York. "Later he was transferred to the Lynn Works and moved his family to Marblehead and later to Topsfield, Massachusetts. He was a member of the Elfun Society and the Presbyterian Church, where he served on the Board of Sessions as an elder and a deacon. He was in charge of the sound system. Tributes by his superiors are as follows: George stood out not only for his sense of integrity and excellent personality, but he was loved by all who knew and worked with

him. He was an unusual GE manager and leader who promoted skills in people and leadership in new areas of engineering." He is survived by Gail, his wife of 61 years, and by two sons, Gilbert and Richard.

1931

LAWRENCE L. FERGUSON, of Scottsdale, Arizona, on March 12. He contributed to the nation's nuclear development and had "a personal acquaintance with such familiar names as Einstein, Oppenheimer, and Feynman." He and his late wife, Audrey, enjoyed travel, mountaineering, hiking, and bird watching. He is survived by a cousin, Freida Reish.

1932

ANTON W. FRAPS, MS, of Indianapolis, on March 30, 1994. He is survived by his wife.

1937

HUGH M. GILMORE, JR., Ex, of Jacksonville, Florida, on February 20; he was 79. A veteran of World War II, he was a retired lieutenant colonel, U.S. Air Force. He was employed with the Atlantic Coast Line Railroad. An active Mason, he was a 32nd degree Mason in the Scottish Rite of Freemasonry in Jacksonville. He is survived by his wife, Alice; a sister, Sara; and a niece and several nephews.

1938

THOMAS V. DAVIS, MS '47, Eng '48, of Altadena, California, on July 7; he was 79. After receiving his BS from Caltech, he went to work designing earthquake-safe structures for the Imperial Valley Irrigation District, and then he spent the early years of World War II with Vega (Lockheed). Later, he served as assistant chief engineer on the Manhattan Project, in Los Alamos, New Mexico. After the war, he joined Boeing Aircraft, spending 37 years with that company as an engineering manager in both Seattle and Southern California. He retired in 1985. He was actively involved in the Caltech Alumni Association; the Caltech Associates, including the President's Circle; and the Gnome Club, of which he was a past president. He was also active in the Pasadena First Baptist Church and in several Chamber of Commerce committees. He is survived by his wife, Mid; a daughter, Peggy Sue; two sons, Tom and Jim; and two grandchildren. Those wishing to make donations in his memory are asked to contribute to the Gnome Scholarship Fund. Send donations, payable to Caltech, to the Gnome Club, c/o Caltech Alumni Association, 1-97, Pasadena CA 91125. Please indicate that the donation is in memory of Thomas V. Davis.

1939

HARRY A. GOODIN, JR., of Eugene, Oregon, on January 5. He is survived by his wife.

1940

GILBERT W. HOFELLER, of Pacific Palisades, California, on April 28, 1993. He is survived by his wife.

ADAM R. WASEM, of Bonsall, California, on January 13; he was 78. He is survived by his wife.

1941

JOSEPH F. ROMINGER, of Prescott, Arizona, on November 7, 1994; he was 74. He served as a naval radar officer in World War II, and after the war earned an MS in geology from both Northwestern University and Harvard. He received his PhD from Northwestern in 1953. He worked for Exxon and became chief geologist in Bogotá, Colombia, and then in Tripoli, Libya; in Libya, he and his team brought in one of the largest oil fields in the world at that time. His first wife died in North Africa. He returned to the United States in 1964 and remarried in

1965. He loved tennis, and he continued to work as a consultant until disabled by Alzheimer's disease. He is survived by his wife, Elizabeth.

1942  
ALEXANDER S. JERREMS, of Los Angeles, on March 17. He spent World War II at the MIT Radiation Laboratory and then went to Hughes Aircraft, from which he retired in 1985 as staff vice president for technology. He is survived by his wife, Eva; his son, Brian; and a sister, Sydney Keller.

1943  
EDWARD P. FLEISCHER, of La Jolla, California, on March 13, 1994. He received his MBA from Stanford in 1951. He retired from the position of vice president of manufacturing, Data Electronics, Inc., and he was a board director of Scope Industries. A past president of the Alumni Association, he was also chairman of his class's 40th-reunion gift committee and a member of the 45th-reunion gift committee. He is survived by his wife, Sally.

1948  
GEORGE L. HUMPHREY, MS, of Morgantown, West Virginia, on October 18, 1994; he was 73. He received his PhD from Oregon State University in 1950, then worked as a physical chemist for the U.S. Bureau of Mines until 1952, when he joined the faculty of West Virginia University as an assistant professor of chemistry. He was acting chairman of the chemistry department from 1963 to 1965, was appointed full professor in 1964, and served as associate chairman of the department from 1965 until his retirement in 1982. He was a member of many organizations, including Phi Beta Kappa, Sigma Xi, the American Chemical Society, and the West Virginia Academy of Sciences. He is survived by his wife, Jane, and his children, Denton, Melissa, and Alita.

1950  
DUANE H. COOPER, PhD '55, of Champaign, Illinois, on April 4; he was 71. He was an associate professor emeritus of electrical and computer engineering at the University of Illinois, as well as an associate professor of physics at UI and a research associate professor in UI's Coordinated Science Laboratory. He joined the UI Control Systems Laboratory—subsequently the Coordinated Science Lab—in 1954, and then the electrical and computer engineering department, contributing to the ongoing development in computer-based instruction and co-inventing the plasma display panel. In the 1960s he became interested in audio engineering and acoustics, and over the years he published extensively in the field and earned more than 40 patents and pending applications in the United States and abroad. He was made a fellow of the Audio Engineering Society in 1966, receiving its Emile Berliner Award in 1968 and serving as its president from 1975 to 1976. He was elected to honorary membership in 1976 and received the society's Gold Medal Award in 1982. He was also a fellow of the IEEE, including its Acoustics, Speech, and Signal Processing Society, and a member of the American Physical Society and the Acoustical Society of America. He served as a consultant to Consumers Union as well as a number of businesses. He is survived by his wife, Phyllis; two daughters, Victoria Gallup and Kathleen Pixler; four grandchildren; a brother, Emil; and two sisters, Roberta Boatman and Jo-Anne Crutcher.

1953  
JAMES A. HENDRICKSON, MS '54, PhD '57, of La Crescenta, California, on February 17; he was 63. He was an engineer at the Jet Propulsion Laboratory, in the applied mechanics and technologies section. Prior to joining JPL in

1981, he had worked for several companies, including Union Oil and the earth-sciences firm Dames & Moore, in which he was a partner. He is survived by his wife, Doris; a daughter, Holly; and a son, Philip.

MORTON E. JONES, PhD, of Richardson, Texas, on December 12, 1994. He is survived by his wife, Pat.

1959  
J. PHILIP BROMBERG, MS, of Pittsburgh, Pennsylvania, on December 8, 1992. He was a chemistry professor, a consultant on environmental/energy issues and laws, and a partner in the interdisciplinary law firm of Bromberg & Miller. He received his PhD in 1964 from the University of Chicago, where he was a U.S. Rubber Company Fellow, then continued his research as a professor at Carnegie Mellon University and as a scientist at Westinghouse Electric Corporation and at the Environmental Protection Agency. He studied law while working as a full-time professor, obtaining his JD from Duquesne University in 1977. A prolific author, he wrote in both the legal and scientific arenas. His textbook on physical chemistry was widely used around the world. He authored the *Clean Air Act Handbook*, and he frequently contributed articles and essays to legal journals on environmental issues and laws. He also received many awards for his speaking presentations, including the Best Presentation Award of the Society of Mining Engineers for his paper entitled "The Migration and Ultimate Fate of SO<sub>2</sub> Discharge in the Atmosphere," as well as awards from the Association of Trial Lawyers of America Environmental Law Section Essay Competition for his essays on environmental law. When not working, he enjoyed building ship models from architectural renderings, buying and refurbishing antique clocks, and, as an author and performer, contributing to the annual University of Chicago faculty roasts. He also served as a vice president of the Zionist Organization of America. He is survived by his wife, Nancy; his daughter, Ronna Pachefsky; his son Mark; two grandchildren, Joel and David Pachefsky; his brothers, Efrum and Jonathan; and his mother, Lillian.

1964  
ROGER F. DASHEN, PhD, of La Jolla, California, on May 25; he was 57. He was a physics professor and former department chairman at UC San Diego. He began his teaching career at Caltech, ultimately holding the position of professor of theoretical physics. In 1966 he joined the Institute for Advanced Study in Princeton, New Jersey, as a five-year member, and was made a professor and permanent member three years into his term. During the same period he served as a visiting scientist at Rockefeller University, in New York City. In 1981, he went to the Weizmann Institute of Science in Israel as the Amos de Shalit Lecturer, then joined the UC San Diego faculty. He was named department chairman two years later. Recognized as a leading researcher in elementary particle physics, he served on a variety of academic, research, and government committees and advisory boards, including the Los Alamos National Laboratory, the Alfred P. Sloan Foundation, and JASON, an organization of scientists who consult with the government on national security affairs. He chaired the U.S. Navy's top-level committee on the security of missile-carrying submarines and other issues involving antisubmarine warfare. He also served on numerous scientific committees in the University of California system and, more locally, on several UC San Diego campus review committees and at Scripps Institution of Oceanography. An associate editor of the *Journal of Mathematical Physics*, he had published many papers. He is survived by his wife, Mary, and

two daughters, Melissa and Monica.

1966  
LORELLA M. JONES, MS, PhD '68, of Urbana, Illinois, on February 9; she was 51. A professor of physics at the University of Illinois, she was the first woman at UI to attain tenure and a full professorship in that field. She also served as director of the computer-based Education Research Laboratory (the PLATO/NovaNET project) from 1992 to 1994, the last years of its UI sponsorship. Her physics research dealt mostly with the phenomenological description of high-energy experiments, and her early work in Regge pole phenomenology is considered seminal. It was followed by important contributions to the parton model and jet calculus, and recently she had collaborated with an Australian physicist in the use of Grassman variables in a grand unified theory. Her work led to a steady series of publications that included 64 papers, and her 1979 textbook for advanced undergraduates, *An Introduction to Mathematical Methods of Physics*, is still in use today. Known as a dedicated teacher, she was particularly interested in the application of computers to physics education, and she spearheaded the development of computerized quizzes and homework for large physics courses and collaborated on an NSF-funded project to develop computer lessons incorporating digitized video of lecture demonstrations. She was also responsible for initiating a project with the Urbana schools to develop materials and curricula to introduce physics to elementary-school students. At UI, she served on the university's Conflict of Interest Oversight Committee, in the University of Illinois Senate, and as president and secretary of the local chapter of the American Association of University Professors. She is survived by a sister, Irene.

1986  
ROBERT L. DOW, JR., on April 16; he was 30. The victim of a bicycling accident, he had been working since 1989 at the Naval Air Warfare Center, China Lake, where he was a mechanical engineer in thermoanalysis. He enjoyed hiking in the Sierra Nevada, and he was active in the China Lake Mountain Rescue Group, with which he had been on 23 operations in the past four years—"not practice ops, they were the real thing," according to the chair of the group's qualifications committee. Dow is survived by his parents, Dr. and Mrs. R. L. Dow, Sr., and a sister, Lucia.

As *Caltech News* went to press, the Caltech community was saddened to learn of the death of two of its members: Arrola DuBridg, the wife of the Institute's late president, Lee DuBridg; and Professor of Mathematics, Emerita, Olga Tausky Todd. DuBridg, 95, died in Hingham, Massachusetts, on September 30. Tausky Todd, the wife of Caltech professor of mathematics, emeritus, John Todd, died in Pasadena, on October 7, at the age of 89. Obituaries will appear in the next issue of *Caltech News*.

## Howard G. Vesper

### 1902–1995



Howard G. Vesper

Howard G. Vesper, a Life Trustee member of Caltech's Board of Trustees, died on July 10 in Northern California. He was 93.

A native Pasadena, Vesper earned his BS in chemical engineering in 1922 from Caltech, where he took part in student affairs, the Glee Club, the Gnome Club, and athletics. In 1950 he established the Howard G. Vesper Trophy in basketball, which is awarded annually.

From Caltech Vesper went directly to work for the Standard Oil Company of California. He started at the El Segundo refinery near Los Angeles, and advanced quickly, first in research and development, and later in the marketing department.

By 1930, Vesper was manager of the El Segundo Branch of Standard Oil's Research and Development Department. He was transferred to the home office in San Francisco in 1931, and spent the years 1933 to 1937 on the East Coast in the post of general technical representative. In 1938, Vesper returned to California and became Standard Oil's manager of marketing for lubricating oil, and in 1942 he assumed the same role for gasoline and fuel oil.

In 1946, Vesper returned to his scientific roots, when he was named president of the California Research Corporation, Standard's subsidiary responsible for all research and development. This organization established the installation that later became the Lawrence Livermore Laboratory.

In 1952, Vesper was elected vice president of the Standard Oil Company of California, and in 1957 he also became a director of Western Operations, Inc., a division of Standard Oil Company of California. He became president of Western Operations, Inc., in 1958, and retired in 1967 as director and vice president of Standard Oil Company of California.

Vesper's first wife, Ruth Harriet Cawthorne Vesper, died in 1982. He is survived by his second wife, Frances Boradori Hickey Vesper.

# Caltech News

California Institute of Technology  
Pasadena, California 91125

ADDRESS CORRECTION REQUESTED

NON-PROFIT ORG.  
U.S. POSTAGE  
PAID  
PASADENA, CA  
PERMIT NO. 583

---

Issued four times a year and published by the California Institute of Technology and the Alumni Association, 1201 East California Blvd., Pasadena, California 91125. Third class postage paid at Pasadena, California.  
Postmaster: Send address changes to:  
*Caltech News*  
Caltech 1-71  
Pasadena, CA 91125.

Frank D. Dryden  
*President of the Alumni Association*  
Thomas W. Anderson  
*Vice President for Institute Relations*  
Robert L. O'Rourke  
*Assistant Vice President for Public Relations*  
Jane S. Dietrich  
*Director of Periodicals*

*Executive Editor* – Heidi Asparurian  
*Production Artist* – Kathleen Thorne-Thomsen  
*Copy Editors* – Michael Farquhar, Danielle Gladding, Julie Hakewill  
*Photographer* – Robert Paz  
*Contributors* – Hillary Bhaskaran, Colleen Chien, Michael Rogers, Betsy Woodford  
*Circulation Manager* – Susan Lee

California  
Institute of  
Technology

# Caltech News

Volume 29, No. 3  
Autumn 1995



---

In this issue

*Buying and selling the right to pollute: How Caltech economists helped the South Coast Air Quality Management District create an environmental market.*

**Page 1**

*The Institute welcomes a new biology chair and a new vice president for business and finance into its fold.*

**Pages 2 and 3**

*When Bill Gross spots a challenge, watch out, industry! The Caltech graduate in engineering has already launched four companies.*

**Page 8**

*From pranks to the presidency, Phil Albert brings a sense of adventure to San Francisco alumni programs.*

**Page 11**