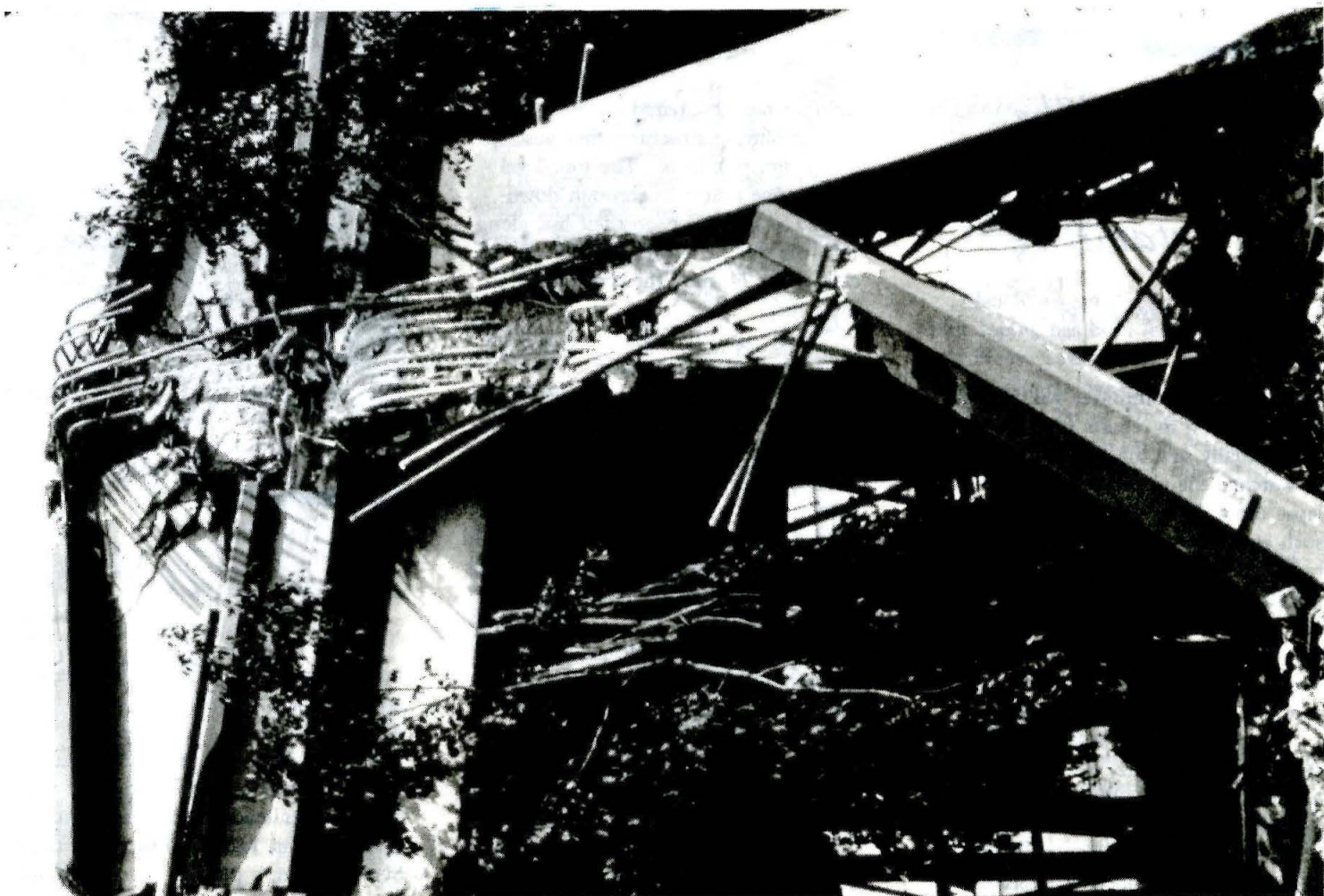


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A segment of the
Nimitz Freeway
(I-880), which col-
lapsed during the
7.1 Loma Prieta
earthquake in the
Bay Area.



The dean of earthquake engineering

By Heidi Aspaturian

Two days after the 7.1 Loma Prieta earthquake struck the Bay Area on October 17, the *Times* of London surveyed the extent of the damage and contrasted it with the devastation caused by the 1988 quake in Soviet Armenia. "If California can count itself fortunate," the *Times* said, "it is due in large part to one man—Professor George Housner, the father of earthquake engineering." Lest anyone miss the point, the *Times* titled its article "The Man Who Kept Frisco Standing."

California's governor, George Deukmejian, evidently agreed. On October 26, at the dedication of the Beckman Institute, Deukmejian announced that he had asked Housner, Caltech's Braun Professor of Engineering, Emeritus, to head an independent inquiry into why a stretch of the Nimitz Freeway (I-880) and 50 feet of San Francisco's Bay Bridge collapsed during the quake, killing more than 40 people. (Deukmejian's first appointee, Ian Buckle, had been asked to step down after he published an article exonerating California's Department of Transportation, Caltrans.)

The dedication of a new building was an appropriate occasion to announce Housner's appointment. There are almost no modern buildings, not to mention dams, bridges, and roads, in California that do not bear the mark of

the man his colleagues call "the dean of earthquake engineering." For more than 50 years, Housner, 79, has been in the forefront of efforts to keep humanity's imposing monuments to itself from



George Housner

crumbling whenever nature decides to practice a bit of assertive geology. Innovations in earthquake-motion studies and engineering design that he pioneered at Caltech, first as a student and later as a member of the faculty, are today the basis of earthquake

engineering research throughout the world. In 1988, President Reagan recognized his achievements with the National Medal of Science.

The governor also sought Housner's advice on naming the eight members to the committee, which includes Paul Jennings, Caltech's new provost and professor of civil engineering and applied mechanics. John Hall, Caltech associate professor of civil engineering, will serve as the panel's secretary. The group held its first meeting November 28 in Sacramento. Housner expects there may be up to half-a-dozen such meetings before the committee presents its final report in June 1990.

"When the governor spoke to me, he made it clear he wants to know what caused the collapse from a structural standpoint," says Housner. "I view it as our committee's responsibility to set up a clearly stated report that explains what happened, what the situation was before, why it happened, and what one might do to prevent this happening in the future."

Housner expects the board of inquiry to rely substantially on engineering and structural data now being compiled by Caltrans, but he also plans to commission several independent studies and has recommended to the governor the names of people he thinks should be

Continued on page 2

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Housner: "The man who kept Frisco standing"

Continued from page 1

involved. The committee will also pay close attention to reports from people who actually saw the Bay Bridge buckle or watched the upper deck of I-880 collapse onto the lower. Housner calls such eyewitness accounts "very important," adding, "If we can find out where a collapse started—which span people saw fall first, and so on—that helps us determine which mechanism of failure was most likely. I don't foresee any problem getting this information."

Housner says he was surprised by the failure of the Nimitz, which is located more than 50 miles from the quake's epicenter, but assesses the overall level of damage in the San Francisco area as "about what I would have expected. Mainly old, weak buildings suffered. The modern houses and buildings—with the possible exception of the Marina district—seemed to come through very well."

He adds, "We don't of course have the complete story on the damage. In the multi-storied structures, we had many strong-motion instruments taking records of the ground and building motion. Those will be studied and should throw more light on the performance of the structures during quakes. It could be that as a result of that, there will be further changes to the earthquake code."

The seismic safety provisions of California's building code were given a major overhaul after the 1971 Sylmar earthquake, which damaged vulnerable structures throughout the San Fernando Valley. Following that quake, the Los Angeles County Board of Supervisors appointed a commission, headed by Caltech's then-president Harold Brown, to evaluate the county's earthquake preparedness and to make recommendations on what needed to be done. Housner, who served on that panel, along with the late Caltech seismologist Charles Richter, said he has urged Deukmejian to authorize a similar, state-wide study in the wake of the Loma Prieta quake.

The Sylmar quake also prompted Caltrans to begin a program to evaluate and upgrade the state's freeway grid. In this respect, Housner notes, the Nimitz was a casualty of scheduling, as well as structural flaws: Caltrans simply had not gotten to it yet. The first phase of the Caltrans project, which was recently completed, focused on fastening down freeway spans that rest on abutments—the type of construction used, for example, where the 210 Freeway crosses over a city street. In the second phase, which is just getting under way, Caltrans plans to strengthen the columns

that support elevated freeway spans. Phase three, says Housner, is the one Caltrans has designated for evaluating and retrofitting structures that pose special design problems. The four-level interchange that runs through downtown Los Angeles is on their list, along with the double-decker Nimitz. In the case of the Nimitz, the earthquake got there first.

"These plans have been in place for years," Housner emphasizes. "The speed with which they are carried out in the future will depend on financing." But trained manpower is also a consideration. "Even if there was the money to do all the studies and retrofitting that Caltrans wants, it would take several years. There are simply not that many qualified engineers for this kind of work."

Housner is not sure what lessons the Loma Prieta quake may hold for the Southland, still awaiting the "Big One" and any number of destructive smaller ones. Since 1971, he says, considerable progress has been made in preparing dams, schools, and single-family homes to withstand a major shaker. The worst preparation has been in the area of earthquake insurance—"a problem that simply hasn't been faced up to yet." Another ongoing concern is official foot-dragging in many cities, among them Pasadena, over what to do about hazardous old commercial buildings and apartments, which must either be torn down or strengthened, often at considerable expense. "The State Seismic Commission has told officials in these cities what they ought to do—they just didn't bite the bullet. Maybe this will finally wake them up."

For Housner and his colleagues, the good news out of San Francisco is that the engineering and testing techniques they have developed and implemented since 1971 have passed their toughest test to date in California. Housner was watching the early evening news reports from San Francisco on October 17, when he learned that the city had closed down the Bay Area Rapid Transit System (BART), the urban rail system that runs under the bay between Oakland and San Francisco. "I served as an earthquake consultant on the design of BART," he says, "and my first thought was, 'Oh my God, has something happened to it?' But the next morning he learned that BART had not only survived the quake unscathed but had reopened in a matter of hours. "We put a lot of thought into how to design BART so that it would come through just this kind of strong shake," Housner recalls. The news that it had, he says, "gave me a lot of satisfaction."

Ed. note: This article originally appeared in the Caltech publication, *On Campus*.



Sam Epstein greets his first graduate student, Robert N. Clayton (PhD '55), now professor of chemistry at the University of Chicago (center); and Harry Thode, an eminent chemist who was president of McMaster University in Ontario, Canada (left). Epstein worked with Thode many years ago. Photographer: Bill Youngblood.

Paying tribute to Sam Epstein

It was very much a mixture of science and sentiment. Arms 155, where the 47 scientific papers were presented, was strung with balloons and poster-size photos of the honoree. And there was a huge banner made by the geochemistry grad students, reading: Epstein Birthday Symp¹⁸osium, a play on the symbol for heavy oxygen, an element that has figured prominently in Epstein's research.

Some 185 colleagues, friends, and family members had gathered here on the weekend of December 1-2 to celebrate the 70th birthday, the 50-year scientific career, and the pending retirement of Sam Epstein—PhD, LL.D.—Caltech's Leonhard Professor of Geology. The speakers came from Finland, Australia, Italy, France, England, Germany, and Taiwan; from all across the United States and Canada, and, of course, from the Caltech campus, where Epstein has been a faculty member for 37 years. Their ties with Epstein reached back to his student days at the University of Manitoba and McGill University, his early years with the Canadian Atomic Energy Project, and his tenure at the University of Chicago, from 1947 to 1952.

The range of papers they presented was a tribute to the breadth of Epstein's research, which includes paleotemperatures, high-temperature geothermometry, origins of natural waters, paleoclimatology, glacier research, biologic and geobiologic processes, meteorology, oceanography, and studies of the origin of igneous, metamorphic, and sedimentary rocks, lunar rocks, meteorites, and tectites.

Someone referred to the scientific guests as "the most distinguished group of isotopic geochemists ever to be assembled in one place." Testimony to the accuracy of that statement came in the reactions of Caltech graduate students at the welcoming reception: "Do you realize who that is over there?" "Do you know who that is?"

That the ties with Epstein were affectionate as well as professional was obvious. At the Friday evening banquet, Caltech Professor Hugh Taylor, who was the Institute host for the event, was stricken with a voice break when he

started to talk about the man who has been his collaborator and colleague for the past 32 years—beginning when Taylor was a Caltech undergraduate. Other of Epstein's "scientific grandsons" (as they called themselves) spoke of his influence on their lives and careers. And Epstein's *real* sons (as they referred to themselves) rounded out the tributes.

On the wall in Epstein's office now hangs a plaque, presented to him at the banquet. It is an arrangement of items representing his research—a cross-section of a meteorite, a piece of bristlecone pine wood, a chert, a belemnite, and a mold of a foraminifera—around a photograph of Sam at his mass spectrometer.

The 47 papers will be published by *Geochimica et Cosmochimica Acta* in 1990 as a special Epstein volume. A brief sketch of Epstein's career will be included, beginning with his birth in 1919, in Poland, and his family's move to Winnipeg, Canada, when he was seven. After his university years, Epstein worked for the Canadian Atomic Energy Project, where he was introduced to mass spectrometry by Harry Thode, former president of McMaster University in Hamilton, Ontario, who also attended the symposium.

Later, at the University of Chicago, working with Harold Urey (and living in an apartment above his garage), Epstein became more and more involved in his pioneering work in isotope geochemistry. Among his many other accomplishments, Sam developed the world-famous "paleotemperature method" for determining the temperatures of the ancient oceans. Then in 1952, when Harrison Brown moved from Chicago to Caltech and invited Epstein along, they brought isotope geochemistry to Caltech. In the 37 years since (in the words of Hugh Taylor), "not only have Epstein's own research contributions been overwhelming, but he has set the highest example for the many graduate students and post-doctoral fellows who have learned their craft in his laboratory." PB

Skyscrapers respond to space-shuttle sonic boom

When the Space Shuttle Columbia returned to Earth on August 13, 1989, all of Los Angeles heard the twin sonic booms typical of a shuttle landing. These sonic booms also registered on seismometers throughout the Los Angeles basin, but in examining the record from a special high-fidelity seismometer in Pasadena, scientists from Caltech and the USGS noticed something very odd: the seismometer recorded a long-period ground motion 12.5 seconds *before* the sonic boom hit. Their interpretation of this phenomenon, which had never been noticed before, may have implications for the performance of Los Angeles's skyscrapers in the event of a large earthquake.

The authors of the study are Hiroo Kanamori, the John E. and Hazel S. Smits Professor of Geophysics at Caltech; Jim Mori, seismologist, of USGS; Don L. Anderson, the Eleanor and John R. McMillan Professor of Geophysics at Caltech; Tom Heaton, scientist-in-charge of the USGS Pasadena office; and Lucy Jones, seismologist, of the USGS.

"When we looked at the pattern of sonic-boom arrival times recorded on standard seismographs through the Los Angeles basin, we were able to calculate Columbia's approximate speed and trajectory as it swept northeast across the Los Angeles basin, decelerating toward its landing at Edwards Air Force Base," said Kanamori. "But at first we were puzzled by the long-period pulse we recorded on a high-dynamic range seismometer based in Pasadena. We could see that the pulse came from the southwest at a distance of approximately 9 miles. We looked at a map and realized that downtown Los Angeles is approximately 9 miles southwest of Pasadena. After some thought we came up with a solution: We believe that the sonic boom pushed almost simultaneously against the 400 high-rise buildings in downtown Los Angeles and the Wilshire District. The high-rises, in turn, pushed against the relatively soft sediment of the L.A. basin, and it's this ground motion we recorded in Pasadena. It appears 12.5 seconds before the sonic boom in our Pasadena record because pressure waves travel faster through the ground than through the air."

In agreement with this interpretation is a seismographic record the researchers obtained from an instrument located at USC. In the USC record, the ground motion appears 3 seconds *after* the sonic boom. Since USC is located a bit southwest of downtown, the sonic boom would have arrived there before it pushed against the downtown high rises.

The high-dynamic-range seismometer in Pasadena is part of the new Caltech TERRAscope array, funded by the L. K. Whittier Foundation. By next year there will be four of these stations operating in southern California. "We seismologists expect that the TERRA-

scope will bring many more exciting discoveries about earthquakes as well as sonic booms," said Anderson.

In analyzing the power spectrum of the ground pulse, the seismologists found that the dominant components of the motion had periods of between two



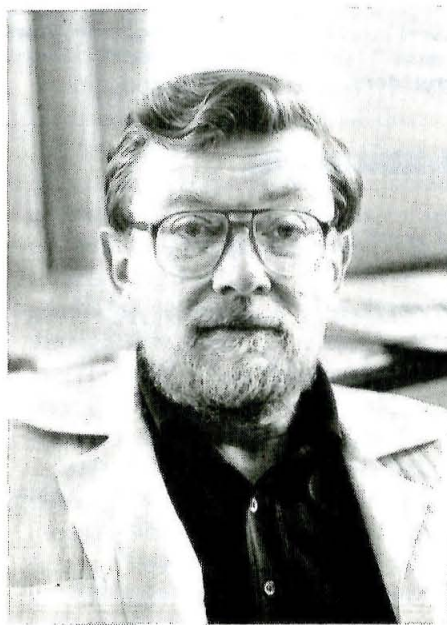
Hiroo Kanamori

and three seconds. This means that the Los Angeles basin, which is filled with soft sediment to an average depth of about 2 kilometers (about 1.25 miles) preferentially transmits pressure waves with two-to-three-second periods. Buildings that are 20 to 30 stories tall also have primary resonant periods from two to three seconds. This raises the possibility that in an earthquake, the Los Angeles basin would preferentially amplify ground motion of these frequencies, giving 20-to-30-story buildings more shaking than if they were founded on crystalline rock.

But according to James L. Beck, associate professor of civil engineering at Caltech, "While these results certainly call for close study, I don't believe there's any cause for alarm. This is not a Mexico City situation, where the quake on September 19, 1985, caused so much destruction. This happened primarily because the sediments of the dry lake bed on which Mexico City sits amplified ground motion by a factor of more than ten for seismic waves, with periods around two seconds. That situation isn't operating to anywhere near the same extent in the Los Angeles basin, but we need to develop detailed computer models of the L.A. basin to determine exactly what the amplification would be."

Beck also notes that the Sylmar quake of February 9, 1971, was, in essence, a natural experiment that provides a certain amount of reassurance. "We saw no intense ground-motion amplification in the downtown area during the Sylmar quake. However, that quake may not have generated a great deal of energy at two-to-three second periods. It's something we're going to have to examine more closely."

The Space Shuttle Columbia, like all other aircraft moving at supersonic speeds, generates a cone-shaped shock wave that is heard as a sonic boom when it meets the Earth's surface. In the case of the space shuttle, it's actually a double boom, one from the shuttle's



Don L. Anderson

nose and the other from its tail.

When the shock wave hits the ground near one of the 250 seismographic stations in southern California maintained by Caltech and the USGS, seismographs record ground motion that looks distinctively different from that of an earthquake. By examining the exact arrival times of the shock wave at many different seismographic stations, the Caltech and USGS researchers were able to determine that the Columbia was traveling at about 2,600 miles per hour (Mach 3.4) over Los Angeles, about 2,000 miles per hour (Mach 2.6) as it crossed above the San Andreas Fault, and about 1,600 miles per hour (Mach 2.1) above the Mojave desert, in its deceleration before landing at Edwards Air Force Base.

This is a relatively rare southwest-to-northeast trajectory for a space shuttle landing. The approach was mandated by the shuttle's orbital inclination and the exact location from which it began its descent. Columbia had been launched on August 8, 1989, on a classified mission for the Department of Defense. The official designation of the mission was STS-28.

Alan Donagan named Dreyfuss Professor

Alan Donagan, Caltech professor of philosophy, has been named the Doris and Henry Dreyfuss Professor of Philosophy. The endowed professorship is named after Henry Dreyfuss, an internationally known industrial designer and Caltech trustee, and his wife. They were Caltech supporters before their deaths in 1972.

Donagan came to Caltech in 1984 after 14 years at the University of Chicago, where he was the Phyllis Fay Horton Professor of Humanities. Previously he had been at the University of Illinois at Urbana-Champaign as professor of philosophy, at Indiana University as professor of philosophy and chairman of the philosophy department, and at the University of Minnesota as associate professor of philosophy and chairman of the philosophy department. Earlier, he held academic appointments in philosophy at University College, Canberra, Australia, and at the University of Western Australia.

The philosopher received his BA and MA degrees from Queen's College, the University of Melbourne, and his B.Phil. from Exeter College, the University of Oxford.

Donagan is the author of more than 100 publications, including six books. He has been president of the Central Division of the American Philosophical Association, and is a Fellow of the American Academy of Arts and Sciences. He holds an honorary degree from Ripon College.

Liepmann honored

Hans W. Liepmann, Theodore von Kármán Professor of Aeronautics, Emeritus, at Caltech, has been named an honorary member of the American Society of Mechanical Engineers (ASME). Liepmann received the award for "leadership in the fluid mechanics community, for educating scores of successful graduate students, and for important contributions to the understanding of laminar-turbulent transition and to the behavior of liquid helium."

FRIENDS

Caltech receives boost to minority enrollment

Caltech has received a grant of \$1 million from the James Irvine Foundation to fund Irvine postdoctoral and graduate fellowships for under-represented minorities. The purpose of the grant is to help increase the representation of minorities in the sciences and engineering. The Irvine Foundation grant will be used in tandem with Institute support for the same purpose.

"The Irvine grant addresses a serious problem—a lack of minority representation in the sciences and engineering," said Caltech President Thomas E. Everhart. "Caltech's programs are most attractive to outstanding students who have made early and strong commitments to science and technology. We must face the fact that the percentage of the minority population that has had the opportunity and incentive to make that commitment is extremely small.

"As a result, the pool of minority representatives from which Caltech can draw is very limited. The problem is deeply entrenched, and resolving it will require a committed and determined effort. We are prepared to make that effort, because the long-term goals are so important. One of these goals is that the minority graduate students and postdoctoral fellows whom we attract will become role models and will draw other minority young people to careers in science and technology.

"Several forecasters are projecting significant shortages of doctoral-level scientists and engineers through much of the next decade, including shortages of available faculty. We cannot afford to ignore the talented minority students in our midst. They represent an important resource to help us fill this shortfall.

"We are deeply pleased to be partners with the Irvine Foundation in this vital effort. We believe the offer of special assistance, along with determined efforts in recruitment, will enable us to be successful in attracting minority students at the graduate and postdoctoral levels."

The James Irvine Foundation is dedicated to enhancing the social, economic, and physical quality of life throughout California, and to enriching the state's intellectual and cultural environment.



Officers of The Associates for 1990 are, from left: Edmund J. (Joe) Regan II, secretary; Robert J. Banning, treasurer; Joanna (Mrs. Downie) Muir, president; and Jesse B. Graner, vice president. Not present is Doris (Mrs. Charles) Pankow, vice president.

James Bailey named Chevron Professor

James E. (Jay) Bailey has been named the Chevron Professor of Chemical Engineering at Caltech. Bailey, whose research is in the area of biochemical engineering, succeeds L. Gary Leal, who was appointed to the chair in 1986.

Much of Bailey's work has been in the field of biochemical reaction engineering, the study and optimization of chemical reactions that are found in cells used to manufacture pharmaceuticals and food components. Recently, Bailey has been a pioneer in a brand new field that he calls metabolic engineering.

"Metabolic engineering involves the application of genetic engineering techniques to alter or enhance the metabolism of cells," explains Bailey. "The goal is to overproduce specific amino acids, acetone, vitamins, certain biopolymers, or other important chemicals made in cells. Metabolic engineering problems require a far more detailed understanding of what a cell is doing than do the traditional problems of genetic engineering."

Bailey received his BA in 1966 and his PhD in 1969, both from Rice University. He served on the faculty of the University of Houston before coming to Caltech in 1980 as professor of chemical engineering. He is the coauthor (with David Ollis, now Distinguished Professor of Chemical Engineering at North Carolina State University) of two editions of *Biochemical Engineering Fundamentals*, which is the required text in almost every biochemical engineering course in the United States and much of the rest of the world.

Bailey's honors include election to the National Academy of Engineering, the Camille and Henry Dreyfus Teacher-Scholar Award, the Professional Progress Award and the Alan P. Colburn Award of the American Institute of Chemical Engineering, and the Curtis W. McGraw Award, presented by the American Society of Engineering Education.

Whittier Foundation gives \$800,000 for DNA research

The L. K. Whittier Foundation of South Pasadena has awarded \$800,000 to Caltech to support DNA diagnostics research. Leroy Hood, the Ethel Wilson Bowles and Robert Bowles Professor of Biology, will lead the research team. Hood is also head of the new Center for the Development of an Integrated Protein and Nucleic Acid Biotechnology, funded by the National Science Foundation and to be located at Caltech.

Hood's team has developed a new DNA diagnostics procedure that distinguishes normal genes from disease-causing genes. The gene fragments used in the analysis process are produced by a gene synthesizer developed at Caltech by Hood's group. The Whittier grant will be used to develop another machine—a gene analyzer—that will automate the DNA diagnostics procedure, thus dramatically speeding up the research.

Such an analyzer, according to Hood, "will present striking new opportunities for medicine." Using this technology, it could be possible to analyze variant forms of genes that are known to predispose individuals to autoimmune diseases—multiple sclerosis, rheumatoid arthritis, and myasthenia gravis, for example—as well as cardiovascular diseases, and even cancer. The results of such analyses would allow the medical profession to design strategies for living that might reduce the potential development of the diseases in vulnerable persons.

The Whittier Foundation, located in South Pasadena, was incorporated in 1955 by the late Leland Whittier and other members of the Whittier family. The Whittiers are descendants of Mericos H. Whittier, who was one of the first independent oil producers in California.

Disney president named to board of trustees

Frank G. Wells, president and chief operating officer of the Walt Disney Company and former vice chairman of Warner Brothers, Inc., has been elected a member of the Caltech board of trustees.

Wells joined Disney as president in 1984, after 15 years with Warner Brothers, Inc., the last two as vice chairman of the company. From 1969 to 1973, he was first vice president for West Coast operations at Warners; in 1973, he became the company



president; and in 1977, president and co-chief operating officer.

At Disney, Wells's principal responsibilities include overseeing theme parks, consumer products, and research and development operations. In addition to the original Disneyland in Anaheim, the company now operates Walt Disney World in Florida and Tokyo Disney in Japan, and is currently completing the development of EuroDisneyland, in Paris.

Wells, who holds a law degree from Stanford University, received his BA in 1953 from Pomona College. He then went to Oxford University on a Rhodes Scholarship, receiving an MA in law in 1955. From 1955 to 1957, he served in the U.S. Army, where he rose to the rank of first lieutenant. After graduating from the Stanford Law School in 1959, he became a partner in the Los Angeles entertainment law firm of Gang Tyre and Brown, before moving on to Warner Brothers in 1969.

Wells is also a mountaineer, who in 1983 organized expeditions which attempted to scale the highest peaks on each of the seven continents, failing only to reach the summit of Mt. Everest.

Ferry elected to board of trustees

Richard M. Ferry, president of Korn/Ferry International, has been elected to the Caltech board of trustees. Ferry cofounded an executive search firm with partner Lester Korn in 1969 that now has 41 offices in major business centers in the United States and around the world. Korn/Ferry International conducts searches for more than 2,000 senior executive positions for clients each year.

Under Ferry's direction, Korn/Ferry International pioneered industry speciali-



zation and expanded human-resource consulting in the executive search business. He is widely recognized for his managerial capabilities, which have provided the foundation for Korn/Ferry's success.

Immediately prior to forming Korn/Ferry International, Ferry was a partner in the Los Angeles office of Peat, Marwick, Mitchell & Co., an international certified public-accounting firm. Ferry's early career included positions in both private and public accounting. He received his BS degree in accounting with honors from Kent State University and is a certified public accountant.

Ferry serves as a director of Avery International Corporation, Centex Corporation, Management Compensation Group, First Business Bank, and Pacific Mutual Life Insurance Company. He is a director for United Way of Los Angeles, the Los Angeles Area Chamber of Commerce, the Music Center of Los Angeles County, Catholic Charities, and the Education Foundation of the Archdiocese of Los Angeles.

Rose float theme selection made in January

The theme for Caltech's 1991 Tournament of Roses float entry was chosen in January. Announcement of the theme chosen will be made late this month. More than 100 designs were submitted to the Rose Parade Float Subcommittee in response to an invitation that went out to the campus, JPL, and several thousand alums, asking for ideas for the float that will kick off Caltech's centennial year.

"We were impressed, but by no means surprised, by the creativity of the concepts submitted," said Hall Daily, assistant director of public relations and chairman of the subcommittee. "We expected great ideas, and we got plenty of them. It's made the selection process very difficult." Although he won't reveal details of any of the entries, Daily did say that a number of ideas involving pranks and Voyager were sent in.

Several theme concepts, put together from elements submitted as separate designs, were chosen by the subcommittee in January. These top entrants were forwarded to the Centennial Steering Committee, which made the ultimate choice.

Detailed decisions about the design will now be worked out with the float builder. Members of the Caltech community will be encouraged to participate in several stages of the float's preparation and decoration later this year as the 1991 parade nears.

Members of the Rose Parade Float Subcommittee, besides Daily, include: Roxana Anson, former president of the Women's Club; Michael Carr, Palomar engineer; Ted Combs (BS '27), liaison for the Centennial Steering Committee; Suzette Cummings, administrative assistant, dean of students' office; Charles H. Holland, Jr. (BS '64), former president of the Alumni Association; Taras Kiceniuk, engineering lecturer at JPL; Laurie Leshin, Caltech graduate student in geology; Kim Lievense, a member of the public education office at JPL; alumnus Le Val Lund, Jr. (BS '47); Stephen Onderdonk, Caltech trustee; Benjamin Rosen, Caltech trustee; Pamela Katz Rosten, Caltech undergraduate in chemistry; Barbara Wirick, production artist in the public relations department; and Lenore Freise, centennial coordinator.

Project SEED expanded

The Board of Education of the Pasadena Unified School District voted unanimously to expand Project SEED, which was created by two Caltech professors, to include five additional schools during the current school year. Project SEED was launched three years ago at the program's pilot program site, Field Elementary School in Sierra Madre.

Project SEED, which stands for Science for Early Educational Development, explores ways in which the creative use of hands-on materials and classroom computers can enhance and reinforce good science teaching in kindergarten through sixth grade. It is the product of elementary science education research led by two Caltech professors, physicist Jerome Pine and biologist James Bower.

Before the expansion, Project SEED was in use at four schools—Field Elementary School, The Sequoyah School (private) in Pasadena, the Open School in Los Angeles, and Ambler School in Carson.

As a result of the Pasadena school board's action, the district will become one of a selected group of school districts across the country that will field-test new classroom materials produced by the National Science Resource Center. The Washington-based center was created by the Smithsonian Institution and the National Academy of Sciences to advance the cause of good hands-on science teaching in elementary schools.

Faculty, alums join cast of student musical

David Goodstein may have wondered whether he had had enough contact with drama for one career through his role in the production of *The Mechanical Universe*. But now the vice provost and professor of physics and applied physics has opted for some drama of a different type: He will play the wily magician, Merlin, in the TACIT musical production of *Camelot* on February 23, 24, and 25, and March 2, 3, and 4.

Goodstein is joined in the show by Bruce McLaughlin (BS '77) as Pellinore, and Steve Kellogg (BS '78) as Castor, along with scores of other members of the Caltech community. A good time is expected by everyone.

CALTECH IN THE NEWS

• "Astrophysicists have known for decades that the sun rotates more slowly at its poles than at its equator. But to actually map its complex pattern of rotation required gathering and processing a gargantuan amount of data—a challenge recently mastered by Kenneth Libbrecht and colleagues at Caltech. Using a Cray supercomputer, they analyzed 60,000 images of the sun. These images, taken once a minute for four months, recorded vibrations on the sun's surface caused by sound waves traveling through the solar interior." *Science Digest*, November 1989.

• "Astronomers say they have discovered the oldest, most faraway object yet found in the universe, a star-like body called a quasar about 14 billion light-years or 82 trillion billion miles from Earth.

"We've found the most distant object on record," said astronomer Maarten Schmidt of the California Institute of Technology. "We are now seeing an object as it was a little over 1 billion years after the beginning of the universe." San Francisco *Examiner*, November 20.

• "A \$180-million effort to detect gravity waves—ripples that Einstein predicted would spread at the speed of light from any moving object and compress and expand space itself—will be formally proposed by a group of physicists next month.

Gravity waves have never been directly observed, but now physicists believe they have the technology to detect their faint effects, at least when they come from objects of considerable mass, such as heavy stars.

Scientists at the California Institute of Technology and the Massachusetts Institute of Technology plan to propose that two gravity-wave detectors be built that would become a national observatory for all qualified physicists to use. The Caltech and M.I.T. scientists hope their project will appear in the Bush Administration's 1991 budget for the National Science Foundation. The budget is scheduled to be sent to Congress in January." *The Chronicle of Higher Education*, November 22.



James R. Young

Reaching beyond barriers

James R. Young (MS '76, PhD '82) was accepted as a Caltech graduate student the day before a car-train accident left him with paralyzed arms and legs. Although he had to delay his enrollment for a year, he never thought seriously about giving up his Caltech dream.

"In fact," he says, "the possibility of continuing my education was one of the important factors in speeding my recovery. It gave me a goal so that I was more determined to rehabilitate myself and succeed, rather than to drop out of society and feel sorry for myself."

This fall Young proved just how well he has succeeded through the years. He was recognized for his ability to overcome physical challenges and go on to achieve personal and professional success, as he was honored as the 1989 Employee of the Year by the West San Gabriel Valley Mayors' Committee for the Employment of Persons with Disabilities. The honor was based on his work, since last December, as a senior scientist in environmental research for the Southern California Edison Company in Rosemead.

Young's dream of attending Caltech to become an environmental scientist was almost shattered one spring night in 1973 when a speeding freight train slammed into the passenger side of the car, where he was sitting. The driver was Young's roommate at St. Mary's College in Winona, Minnesota, a budding Navy pilot whose fiancée was seated between them. After a pizza celebrating Young's acceptance to Caltech, the three college seniors were returning to school. When they reached the railroad crossing, they had no warning of the impending disaster. There was no automatic barrier, there were no flashing lights.

Although there had already been two other serious accidents involving trains at the site, city regulations prohibited train lights and whistles at night in the residential neighborhood. So the train broadsided the car, pushed it 100 feet along the tracks and finally tossed it into the back yard of a home. The impact propelled Young and the driver against the car's roof. Both broke their necks and—in that instant—became quadriplegics forever. Miraculously, the petite girl riding between these muscular six-footers escaped injury. She went on to marry her paralyzed fiancé.

Young had grown up and gone to high school in St. Paul, Minnesota, where his father worked for the 3M

Company for 40 years. He has one sister, who lives in Thousand Oaks. He graduated from St. Mary's College with a degree in chemistry. Young was attracted to Caltech because of its excellent program in environmental chemistry and because he was intrigued with the idea of sampling a new part of the country.

A year after the accident, Young visited Caltech to explore the prospects of continuing with his plans to become a graduate student. He was confined to an electric wheelchair and worked a stainless-steel brace on his right hand that enabled him to grasp objects such as a pen, paper, or book. To write, he relied on an electric typewriter, but now uses a computer. He still drives the specially modified silver van he owned as a graduate student.

"I looked over the campus and met my advisers and the people in my department," Young says. "Everyone was very helpful in making sure that facilities would be accessible to me and that there would be room for me in the graduate dorms."

"I asked all 35 residents at Marks House if they would be willing to help me, and most of them agreed. That's when I made up my mind to enroll. Without their assistance I wouldn't have

been able to attend Caltech."

Young entered the Institute that September and became a resident of Marks House, where he would live for five years. He hired attendants to get him out of bed in the morning. His housemates took turns, two each day, putting him to bed at night. They also brought him meals from the basement kitchen, which was inaccessible to him, when he didn't eat in the cafeteria.

"It worked out well the first few years, but as new graduate students came, who were not part of the original agreement, it became harder to get help," Young explains. "Many of the new students were foreign. They had enough to handle in terms of their own language and culture-shock problems, and couldn't deal with my special needs, too. Eventually I moved to an apartment, where I lived for two years."

Young enjoyed attending intramural sports and Saturday night ASCIT movies, as well as occasional meals at the Athenaeum. He worked hard and enjoyed his associations with his professors and his thesis adviser, James J. Morgan (the Marvin L. Goldberger Professor of Environmental Engineering Science). Along with his other responsibilities, Young acted as an informal adviser to members of the Institute staff, who

Although an accident left him with paralyzed arms and legs, Jim Young never gave up his intention to study at Caltech.

were working to make the campus more accessible to the handicapped. The seven years he spent at Caltech were satisfying and productive.

After completing his work at the Institute, the first thing Young did was to marry Bea Meyerhofer. He had met the tall, pretty brunette at the Mayo Clinic, where she was a rehabilitation nurse. They had lost track of each other for a few years, but renewed their acquaintance when Young took a month's leave from his Caltech studies for his second trial to settle his accident claims. Seven years after the two had met, they were married. Today the couple lives in a home in the foothills of Altadena.

When he went job hunting, Young feels that he was accepted on his professional merits. "I had very positive experiences, and I don't believe I encountered any discrimination," he says. "When I finished my doctorate, I seriously pursued three job prospects, and all of the companies offered me jobs. They offered me positions commensurate with my technical training and at salaries that I think were competitive with those being offered other people with my technical skills."

Trained in environmental engineering science, Young accepted a position with Environmental Research and Technology. While employed there, he did some consulting for the Southern California Edison Company and WEST Associates, a group of utilities in 11 western states.

When Edison needed to hire an environmental scientist, they asked Young if he knew somebody who might be interested. "I'm interested," he responded.

After Edison had run ads in the *Los Angeles Times* and in scientific and technical publications all over the country, Young was one of five candidates they interviewed, and he got the job.

"Clearly, I didn't suffer prejudice in this instance," he says.

At Edison, Young is a senior research scientist working in the air-quality group

of the Environmental Research Department. He has responsibility for three key programs: acid-rain monitoring, a program to identify the sources of organic compounds that are found in aerosols in urban southern California, and a project investigating climate changes in the southwestern United States.

What are the biggest challenges that being in a wheelchair creates on the job? "There are many challenges," Young says, "that consist of a lot of small things. Just functioning as efficiently as everyone else functions. Keeping my life organized so I can do the things I need to do. Keeping track of mounds of paperwork. Being able to function so that my employers and colleagues can interact with me as they would with any individual who might be in this job, but who might not have the physical handicaps that I have. Seeing that they don't have to make special exceptions for me. My handicaps are not their problems; they're mine."

"I took the responsibility for this job and I don't see that my situation should be any different from that of anyone else who works here. This means I have the challenge of figuring out how to do a lot of things for myself that other people don't have to consider—how to get the books off the top shelf in the library, for example."

Byron Machalas, Young's boss at Edison, says, "He thinks on a broader level than most people, on a program level, not just a project level. His output is prodigious even though he has to use the computer with only one finger. He has a surprising ability to do research, to find information. And his work is of excellent quality. You forget he has a handicap."

"Of course, we've made a few modifications so that the building is more accessible to him. We installed a lower button in the elevator so that he could reach it, and lowered one of the drinking fountains. We changed a few of the doorknobs to handles so that he could pull them."

"On rainy days, he can park in the basement with the executives, but the rest of the time he parks in the outside parking lot with the other employees. We also bought a collapsible sedan chair and have it hanging on the wall in case there is an emergency and we have to evacuate the building. Jim can't use the stairs, so we could put him in this chair and carry him downstairs from the fourth floor. Although only two people are needed to carry the chair, eight volunteers are designated as backup. Everyone in the department wants to make sure he's going to be all right."

In musing about his life, the affable Young says, "A lot of good things have happened to me. I was fortunate in choosing a career that I could succeed at in spite of my handicaps. If I hadn't been in the accident, I would be doing the same job I'm doing today."

"I'm fortunate that my health has been good. There are a variety of health problems that can go along with spinal-cord injuries and make it difficult

to hold steady employment—urinary tract infections and skin ulcers, for example—but I haven't been troubled by these."

When he isn't working at Edison, Young enjoys traveling in his van. His favorite travel destination is northern California. In October, he and his wife journeyed by van to a conference in Reno, and then they continued on to San Francisco and the Napa Valley. "Driving my van makes travel so much easier," he says. "I'm lucky to live in California, where there are so many beautiful places within easy driving range."

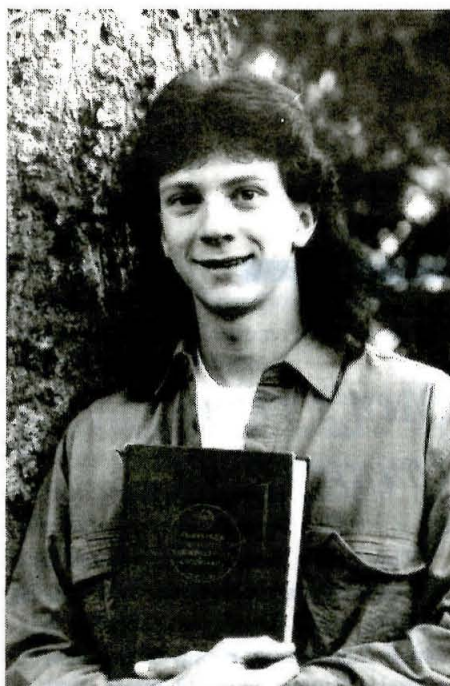
Young also enjoys playing bridge, and listening to music—"classical, jazz, pop, rock, depending on what I'm doing. I do a lot of work at home and I like jazz or classical music in the background." Additionally, he belongs to the California Association of the Physically Handicapped and the Spinal Cord Society.

Young is a member of the American Chemical Society, the American Association of Aerosol Research, the Air and Waste Management Association, and Sigma Xi. He has found the time to write journal articles and numerous technical publications—although, he laments, not as many as he would like.

Young is characteristically positive about his life. "The fact that I've been able to get through an institution like Caltech and work for two employers in technically demanding jobs—and succeed at those things—has been a very positive aspect of my life. This has all come about through the help of a lot of people—not only my family and friends, but people like the men in the Keck subbasement shops, who would drop what they were doing when I would wobble down there, my wheelchair falling apart, and fix me up and get me on my way again."

"My interactions with people have been very positive, and this has been helpful and rewarding. Given the accident, the outcome has been as positive as I could have hoped for. Of course, I was fortunate. I have had employers who based their decisions to hire me on what I could do for them, instead of what I *couldn't* do. I also had the help of a lot of people along the way."

Ed. note: This article was prepared in cooperation with Bernadette McNulty, who is under contract with the Edison Environmental Research Group as a technical editor.



Scot Fagerland

A weird way with words

Caltech alumni and friends who sat up late on Thanksgiving eve to watch "The Johnny Carson Show" saw a young man in a Caltech sweatshirt recite the Gettysburg Address with all of the letters in the words arranged in alphabetical order. Carson's guest was 18-year-old Scot Fagerland, a Caltech freshman who has a weird way with words.

Fagerland doesn't see words the same way most people do. Give him a word and in a split second he will alphabetize the letters in his mind and pronounce it that way, guided by a spate of pronunciation rules that he has devised to deal with letter combinations that don't occur in normal language. (Double *a*'s are pronounced like the *a*'s in "aardvark," for example, and *gb* like the *s* in "measure.")

Give Fagerland the words, "California Institute of Technology," and he will immediately answer, "Aacfilnor Eüinstttu fo Ceghlnooty." Ask him to spell that famous word from the movie version of *Mary Poppins*, "supercalifragilisticexpialidocious," and, in a twinkling, he will answer, "aaacccdeefgiüüüüillloopprsssttuux."

Fagerland discovered his strange talent one day when he was seven or eight years old. "I was playing with words and I noticed that some of the words had this feature of being alphabetically arranged," he says. "Ghost," for example, and "beer." I decided to see what other words would sound like if their letters were in alphabetical order. I discovered I didn't have to practice, to alphabetize them. This is a talent I was born with, I guess."

Soon Fagerland was driving his family to a mild state of distraction by speaking to them in what had become his own special language. His mother would really have preferred that he use normal words when he asked to go out and play basketball. His grandmother recalls that, on car trips, he used to annoy the family by alphabetizing all the words in road signs. His brother

and sister caught on to some key phrases and would use them in conversation with him—for example, "ehlllo" (hello), and "dgoo ghint" (good night).

Fagerland was "discovered" when he demonstrated his abilities at the New Student Camp talent show, and was suggested as a guest for the Carson show by the Caltech media relations department. A limousine came to pick him up on the evening of his performance (he shared billing with Dolly Parton and a female stand-up comic), and he had his own dressing room (Parton had two).

The Caltech freshman says he felt at ease on the show, his confidence in appearing before a nationwide television audience having been strengthened by participation in drama in high school and a summer's experience as a tour guide at a cave near his home town.

He saw very little of Carson except when they shared the stage. "Carson," he says, "is kind of a shy person. He tends to run away into his own office after the show. He doesn't socialize very much."

Fagerland concluded his appearance by saying (with the letters in alphabetical order) "Good night, everyone," "Happy Thanksgiving," and "DEI." He thought of adding this famous Caltech phrase "at the last second," and it went unnoticed by the Carson staff. Fortunately, "DEI" is naturally alphabetized.

Since appearing on the show, Fagerland has heard from two people with a special interest in his gift—a professor from New York who for years has been seeking the longest naturally alphabetized word in the English language ("billion" is a good candidate,) and a woman who can talk backwards. He's also had word that the Larry King show is interested in having him as a guest.

Fagerland has never met anyone who shares his talent. Dr. Darrold Treffert, an expert on people with rare abilities, also says he's never heard of anyone who can do exactly what Fagerland can do. While Fagerland's kind of talent is extremely rare, it's especially unusual to see it in someone of normal intelligence, says Treffert, a psychiatrist and consultant on the movie, *Rain Man*. He says 80 percent of people he's heard of with skills similar to Fagerland's have mental deficiencies.

The mentally non-deficient Fagerland, whose family moved to Rapid City, South Dakota, four years ago from southern California, is a member of Ricketts House and sings in the Caltech Glee Club. He came to Caltech because he "was looking for a good science, math, and engineering school in southern California, and Caltech was about the only school that filled the bill."

As an undergraduate, Fagerland plans to major in aerospace engineering, in preparation for graduate work in aeronautical engineering. He plans on a career in the aerospace industry. Meanwhile, he will see what other media exposure his strange talent brings him.

SPORTS



Football

With Wendell Jack as the new head coach, the battling Beaver football team completed another successful season with a record of six wins, one loss, and one tie.

Some features of the eight-game schedule included hosting the Australian National team, a trip to MIT (Mexicali Institute of Technology), and the season finale at home against the Pasadena Police, a "Toys for Tots" benefit game. A highlight of the trip to Mexico was Coach Jack trying to convince the border patrol that Caltech not only fields a football team but was in fact competing in that sport with the Mexicali Institute.

This season's roster was made up of 44 players: 22 undergraduates, two graduate students, one faculty member, six JPL staff members, and 13 members of the Caltech staff. The team captains were: Dwight Berg, wide receiver, a senior; Todd Schamberger, defensive tackle, a junior; and Don Thomas, strong safety, a staff member.

The season motto was "play as a team." The motto was well implemented in all phases of the games; four of the contests ended in last-minute Beaver victories.

Even though the end of the season found the team losing three starters to graduation, the outstanding contributions made by every member shed a bright light for success on next fall's campaign.

Men's cross country

This season will be remembered as an historic achievement for the men's cross country team. During the season, in which this scrappy group of harriers posted 12 wins against 3 losses, they also won the Caltech Invitational Meet at Lower Arroyo Park in decisive fashion with 7 other teams in attendance. However, the story becomes even more significant: For the first time in 41 years, Caltech defeated perennial SCIAC champ Occidental by a score of 25-30.

Without losing any of the seven top runners from last year's squad to graduation, the prospect of a successful campaign looked very positive. Returning veterans Mark Lyttle, Dan Flees, Scott Kister, and Chris Campo had put in high mileage during the summer. The arrival of talented freshmen John Freeman, Alan Thompson, Dan Lipofsky, and Jonah Michaud added a much-needed ingredient to this team—depth.

In SCIAC competition, this up-and-coming team posted 3 wins and 3 losses to stake claim to fourth place in the conference. The men's champion team was Claremont-Mudd-Scripps. NCAA division III regionals were hosted by U.C. Santa Cruz with Caltech placing seventh among 11 teams. Both U.C. San Diego and Claremont-Mudd-Scripps earned the right to represent Region 8 at nationals.

Women's cross country

While the women runners had a successful season, they were forced to carry on without the services of last year's freshman sensation, Jerri Martin. Due to a chronic knee problem, Martin decided to take the season off.

Some future stars appeared on the horizon as the team racked up a seasonal record of 6 wins vs. 9 losses. Freshmen Amy Hansen and Aimee Smith both displayed great potential as they steadily improved throughout the season. In most meets, Smith was running number 2; at the regionals, Hansen assumed the top spot.

Senior Margi Pollack led the charge for this youth-oriented squad whenever she was available to run; she placed first among Caltech women in four meets. However, a case of tendinitis in the knee cut her season short.

The word "parity" comes quickly to mind when describing the unusual three-way tie for first place in the conference. Coming in together were Pomona-Pitzer, Claremont-Mudd-Scripps, and Occidental.

At the NCAA III regional meet at U.C. Santa Cruz, the Tritons of U.C. San Diego dominated and easily earned a trip to nationals. The Caltech team ran well, (placing 10th among 12 teams), particularly considering the absence of Margi Pollack and Golda Bernstein from the top 5.



Water polo

For the past two years, the Caltech water polo team has had to eat some humble pie. Gone are the days of victories over larger schools such as MIT, Johns Hopkins, U.C. Riverside, Cal State L.A., and many more. This season, as last, the Beavers ran into some bad luck. The normal loss of players to graduation is usually pretty tough, but, added to that, none of this year's freshmen had ever played water polo. "The situation was difficult, trying to work together as a team, when only three of the six field players had had any previous experience," said Coach Clinton Dodd.

Starting slowly, the Techers defied the odds and began to mature into a very competitive water polo team. Early in the season, they lost to Chapman 20 to 3, but at the midpoint of the schedule they improved to 12 to 8 against the same school.

One of the highlights was an outstanding conference game against Whittier College. The Beavers scored from every position and held a 7-5 lead going into the fourth quarter, but foul trouble and a key injury with 5:00 minutes in the game rang the bell, 8-9 Whittier.

Things were looking up for the last half when the third leading scorer, Tamaki Murakami, had a freak injury and was out for the remainder of the season. Along with this setback, 6'8" Bill Swanson (as had been prearranged) left for basketball practice. To replace Swanson, freshman Dan "I've never seen polo" Smith took to the cage and repelled shot after shot.

Although the Beavers got close enough to scare several teams, they finished the season with a dismal 1-20 record.



As he runs with the ball, Vince Riley is pursued by a horde of L.A. Mustangs. Caltech defeated the Mustangs, 33-28.

ALUMNI

From the alumni president

As the Alumni Association year progresses, our programs have been enthusiastically received by alumni. The annual holiday open house in December at the Alumni House is fast becoming a tradition. Sponsored by the Student/Faculty/Alumni Relations Committee (SFAR), this year's open



Rhonda MacDonald

house was attended by 300 faculty, students, alumni, and staff—with food and good cheer for all!

The annual Rose Parade viewing on January 1 was once again sold out and enjoyed by all who attended. To begin the centennial celebration in 1991, Caltech plans to enter a float in the 1991 Rose Parade. We anticipate an overflow crowd for Rose Parade viewing next year.

In my continuing effort to share with you the work of the various alumni committees, I would like to introduce you to the executive committee of the Alumni Association board of directors. The executive committee sets the agenda for the work of the board each year, determining the scope and priorities of the board's responsibilities. Their time spent in official positions and executive committee meetings is in addition to work on several of our regular board committees. This year the entire executive committee also serves on the Alumni Centennial Committee in preparation for 1991.

Chuck Holland (BS '64), immediate past president of the association, works for Citicorp Technology Office in Santa Monica as vice president. A resident of

Westlake Village, Holland chairs the Nominating Proposal Committee and serves as a special financial consultant to the board.

Mike Boughton (BS '55), vice president, commutes from his home in Maui to attend meetings and association events. A consultant for the Hawaii Industrial Laboratory, Inc., in Maui, Boughton finds the time to serve the association as vice president, and to be a strong backup for me while looking ahead to his role as president next year.

Treasurer Gary Stupian (BS '61) a resident of Hermosa Beach, works for the Aerospace Corporation as a member of the technical staff. As treasurer, Gary monitors our financial situation on a monthly basis, and keeps the association on a sound financial footing. In addition to his work as treasurer, Gary chairs the Reunion Review Committee.

Le Val Lund, Jr. (BS '47), in his capacity as secretary, records the minutes of our board meetings. Le Val also chairs the Student/Faculty/Alumni Relations Committee (SFAR). A resident of Los Angeles, Lund, formerly with the Los Angeles Department of Water and Power, currently is a civil engineer specializing in water resources and earthquake engineering.

The staff of the Alumni Association supports the day-to-day activities of the committees and their programs. They are always eager to help alumni in any way they can. Judy Amis, executive director, has responsibility for the overall direction of the staff, programs, and the many activities of the association. Kathy Harris, assistant director, works on the coordination of Alumni Seminar Day and the association travel/study programs.

Karen Carlson, assistant director, coordinates the Undergraduate Admissions Support Program (UAS) and the Student/Faculty/Alumni Relations Committee (SFAR) in cooperation with Caltech admissions. Arlana Bostrom, assistant to the director, works with the

executive director in coordinating and supporting board activities, as well as the association Chapter Affairs and Membership Committees.

Patsy Gougeon, administrative assistant, serves as reunion coordinator and bookkeeper for the association. Jane Grace, senior department assistant, handles our front desk, coordinates the 50th reunion and Half-Century Club luncheon, and manages Alumni House use and maintenance. Diane Daw, senior department assistant, is responsible for alumni records in the Institute database and supports the computer network to better meet our needs. Marilyn Caiquo, administrative secretary, supports the executive director and assistant directors in the various aspects of their work. My sincere thanks to each of them for their dedicated work in helping us achieve our goals.

We appreciate feedback from alumni regarding any association issue. Please contact us by mail or phone: Caltech Alumni Association, Mail Code 1-97, Pasadena, California 91125, (818) 356-6592.

A new section on news about chapters

A new *Caltech News* section devoted to information about chapter events and leadership is introduced in this issue. Featured below are two chapter presidents—John P. Andelin, Jr. (BS '55, PhD '67), president of the Washington, D.C., chapter, and Alan Breakstone (BS '72), president of the San Francisco chapter.

John Andelin

John Andelin values chapter activities that bring members into closer touch with the Institute and that strengthen their ties to it. "To the extent that members only interact with each other, a chapter is of moderate value," he says. "But programs that bring them in touch with faculty members or trustees become a learning process that makes them better advocates for Caltech and its programs," he stresses. Programs that strengthen loyalty also garner support for Caltech students, through recruitment activities or offers of summer jobs, he believes. In general, chapter meetings help alumni to think



John P. Andelin, Jr.

about the Institute and possibly offer assistance for Institute activities that require field support.

All of this leads to what Andelin feels a chapter should be—not primarily a social organization, but an arm of support for the Institute. He feels it is important to bring the Caltech of today to the Washington of today, and vice versa. "Caltech takes on an insular nature if it doesn't get feedback from alumni," he says. "The population in the Washington area shifts frequently, so building personal ties isn't as important as it may be in cities where the population is more stable," he concludes.

Andelin says, "Being president is a small obligation with the potential reward of benefiting Washington alumni as well as both current and future Caltech students. Besides, being part of Caltech was fun when I was there, and being part of the Caltech community is fun now. Clearly, my feelings about Caltech are strong and positive. It's a good deal if I can do something to help the kids that are there now, and to help the Institute as a whole."

The Washington, D.C., president was particularly pleased with a dinner meeting at the National Press Club on October 4, at which President Thomas E. Everhart spoke to an audience of 216, including chapter members, spouses, and invited guests.

Andelin, who lives in Arlington, Vir-
Continued on page 10

1989-90 football season scores

Caltech 7	SFV Nomads 0
Caltech 37	Australian Nat'l 8
Caltech 33	L.A. Mustangs 28
Caltech 14	Orange Co. Cowboys 14
Caltech 14	Mexicali I.T. 8
Caltech 12	Cal Poly Pomona 22
Caltech 20	Norwalk-SFS Outlaws 19
Caltech 34	Pasadena Police 0

Won 6 Lost 1 Tied 1

News about chapters

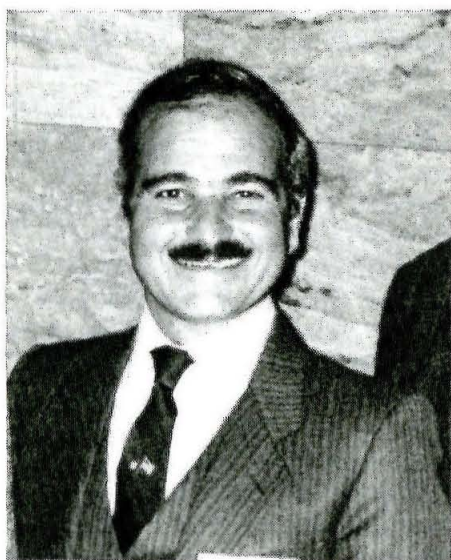
Continued from page 9

ginia, is assistant director of the Office of Technology Assessment, Science, Information, and Natural Resources, a position he has held since 1980. Previously he was concurrently staff director of the Subcommittee on Advanced Energy Technologies and Energy Conservation Research, Development and Demonstration; and science consultant to the House Committee on Science and Technology. These assignments were from March 1977 to May 1979. After that he was a free-lance consultant for a year. From 1972 to 1977 Andelin was administrative assistant to Congressman Mike McCormack.

Andelin's earlier background in science includes assignments as a research associate in solar physics at Harvard, a senior research scientist in cryogenics at Ford Scientific Laboratory, and a member of the technical staff of Hughes Aircraft Company. From August 1962 to May 1963 he was acting master of student houses at Caltech.

Alan Breakstone

Alan Breakstone believes an alumni chapter has great value in bringing alumni together and strengthening ties



Alan Breakstone

between them. Through its programs, a chapter also provides an important link between the alumni and the Institute, enabling alumni to keep abreast of research and other developments, he notes. The San Francisco chapter holds monthly luncheon meetings, as well as several special events each year. Spouses and guests are invited to the latter.

A fall program on earthquake engineering was a popular offering, and a major event was held on February 3 when a mini-seminar day and San Francisco alumni chapter dinner were sponsored. President Thomas E. Everhart was the chapter dinner keynote speaker, giving an "Update on Caltech." Faculty



Blacker House is transformed into a medieval maze for Interhouse.

speakers were John D. Baldeschwieler, professor of chemistry, on "A New Approach to Cancer Diagnosis and Therapy"; David L. Goodstein, vice provost and professor of physics and applied physics, on "High-Temperature Superconductivity"; Melany L. Hunt, assistant professor of mechanical engineering, on "Hot Topics in Thermal Engineering"; and Daniel J. Kevles, the J. O. and Juliette Koepfli Professor of the Humanities, on "Purple Cows: Political Ethics and the Patenting of Genetically Engineered Animals." The chapter is considering a spring tour of the Stanford linear accelerator for chapter members and their families.

Breakstone says he became its president because he wanted to see more activity in the chapter. Very few special events had been held over the last few years, and Breakstone felt they were a real loss to the membership. The chapter was reorganized last summer when a new slate of officers was elected.

The chapter president is a research physicist with the University of Hawaii; however, he does his research at the Stanford Linear Accelerator Center (SLAC). His group is building a state-of-the-art silicon detector using VLSI and hybrid technology to detect particles from the decays of Z^0 particles produced at the new SLAC linear collider.

Breakstone moved to Los Angeles when he was eight years old. "One of the more interesting things I did in high school was to train dolphins and pilot whales at the Marineland of the Pacific as an explorer scout," he says. At Caltech he majored in physics and lived in Fleming House. During his senior year he was a teaching assistant for the first year physics course, sharing the section with Steve Koonin (BS '72), now a Caltech theoretical physics professor. During the summers he worked for Wheeler North on his kelp habitat improvement project.

After graduating from Caltech he went on to earn his master's degree in physics at UC Santa Cruz. When he had obtained his MS in physics, he devoted his studies to experimental elementary particle physics. He did his thesis work on an experiment at the

Fermi National Accelerator Laboratory (Fermilab) in Batavia, Illinois, receiving his PhD from UC Santa Cruz in 1980. He went on to do a series of experiments at the European Center for Particle Physics (CERN), under a postdoctoral fellowship with the Ames Laboratory at Iowa State University. At the end of his four years in Switzerland, he found his position with the University of Hawaii.

"My wife and I have settled in Sunnyside, where we're experiencing all the joys of home ownership after years of living in apartments," says Breakstone, who is also area chair for the Mountain View area of the Alumni Fund.

Alumni Activities

For information about any of these programs, contact the Caltech Alumni Association, mail code 1-97, Pasadena, California 91125, (818) 356-6592.

February 13, Orange County chapter meeting, Newport Beach Country Club. Speaker: John Hopfield, the Roscoe G. Dickinson Professor of Chemistry and Biology.

March 4, Pasadena Playhouse, Flora, The Red Menace; dinner at Charleyville following the performance.

May 31, Class of 1940 50th reunion dinner in the Athenaeum.

June 1, Half-Century Club luncheon in the Athenaeum.

June 1, Reunions for the classes of 1945, 1950, 1965, and 1980.

June 2, 53rd Alumni Seminar Day on the campus.

June 24-July 1, Yellowstone travel/study program with Robert P. Sharp, Robert P. Sharp Professor of Geology, Emeritus.

Stone named to Korbel's "most romantic" list

Caltech's Edward C. Stone, Jr. has been named to Korbel Champagne's annual listing of "Top 10 Romantic People" for 1989. Stone, who is professor of physics, vice president for astronomical facilities, and Voyager project scientist, was included along with such notables as actress Michelle Pfeiffer, professional football quarterback Joe Montana, and comic strip character Charlie Brown.

According to a Korbel spokesperson, the list is "based on a definition of romance in the broadest, most noble sense of the word. Thus, this year's honorees represent a wide-ranging cross-section of individuals—both human and animated—who have, in their respective ways, given new meaning to the ideals of love and romance."

Stone was chosen, said the spokesperson, because his "proactive approach toward explaining his team's findings to the media is helping reveal the uncommon romance of the heavens to the common man." The Voyager project, she said, "this year provided yet another glimpse into the heart of the universe with its lyrical images of Neptune."

OBITUARIES

1922
FRANCES L. HOPPER, of Davis, California, on July 10, 1989.

WARREN A. SCHNEIDER, of Claremont, California.

1926
WARD W. MCKENZIE, of Huntington Beach, California, on January 29, 1989.

1931
THEODORE R. FOLSOM, of La Jolla, California, on October 7.

JOHN F. MCGARRY, of Oakland, California, in October. He is survived by his wife, Enid, his son, Michael, and daughter, Kathleen. He was retired after working for Shell Oil Company, and Bechtel Corp.

1933
COLONEL CLARENCE R. LAUBENFELS, MS, of Glendale, California, in February, 1988.

HENRY B. SUHR, of Antofagata, Chile, on February 26, 1985.

1937
TED FAHRNER, of Whittier, California in 1989.

1940
F. W. BEICHLEY, MS, of San Francisco, California.

ROBERT B. MEYER, of Sylmar, California, on July 30. He is survived by his wife, Phebe.

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Name _____

Degree(s) and Year(s) Granted _____

Address _____

Is this a new address? _____ Day phone _____ Occupation _____

News _____

the European Society for Photobiology for outstanding research and major contributions to the development of photobiology. I still have an active, ongoing research program supported by the American Cancer Society and am working almost as hard as ever. I am still married to Anne Dorland after 47 years; we have three children, six grandchildren, and one great-grandchild."

1945
CHARLES M. DAVIS, MS '46, of San Diego, California, is retiring after more than 30 years in aerospace electronics. He divides his time between a home in the Sierras and a home in San Diego and does some consulting and traveling. Davis is looking forward to his class reunion, in June 1990.

1947
GEORGE B. MELROSE, JR., MS, of Kenmore, New York, is enjoying retirement with his wife. He spent the month of April in Scotland, and August in Scandinavia. He is chairman of the planning board and director of a commission to develop a 90-mile waterfront along Lake Erie.

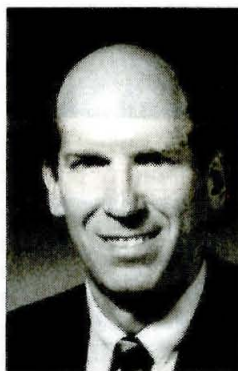
1948
THOMAS G. LANG, of Solana Beach, California, received the Intersociety Pioneer Award for SWATH (Small Waterplane Area Twin Hull) ships in June 1989 at an international meeting in Arlington, Virginia. He is currently designing SWATH ships, with the help of Peter V. H. Serrell '36, and others, as president of the Semi-Submerged Ship Corporation.

1954
WILLIAM A. NEVILL, PhD, professor of chemistry at Louisiana State University in Shreveport, has been re-elected a director from Region IV of the American Chemical Society (ACS). With about 140,000 members, the ACS is the world's largest scientific society. A member of the society since 1951, Nevill served as a councilor for the Society's Northwest Louisiana Section from 1984 to 1986 and was a councilor and past chairman of the Indiana Section from 1973 to 1984. He has served on numerous ACS committees.



William A. Nevill

1962
ROBERT G. CHAPMAN, MS, has been named a senior executive vice president of National Westminster Bancorp of New York. He will be responsible for the technology and processing activities of two subsidiary banks.



Robert G. Chapman

1967
C. LEWIS COCKE, PhD, professor of physics at Kansas State University, has been appointed an associate director of the J. R. Macdonald Laboratory. He has assumed the duties of research planning for the laboratory.

1968
STEVEN D. COLSON, PhD, associate director for chemical dynamics at the new Molecular Science Research Center, has been awarded a Senior U.S. Scientist Award by the Alexander von Humboldt Foundation. As a result, Colson will spend seven months in Munich, Germany, working with scientists who have pioneered several experimental techniques that have application in the MSRC's chemical dynamics research.



Steven D. Colson

LESLIE G. FISHBONE, writes, "My family and I have moved to Vienna, Austria, where I have just begun a temporary position as senior safeguards analyst with the International Atomic Energy Agency."

1969
WALTER M. DENEKAS, has joined Imo Industries Inc., of Lawrenceville, New Jersey, as director of finance, Instruments and Controls Business. He will be responsible for providing financial and operational analyses and support. Denekas is a certified management accountant as well as a registered professional engineer.

1973
PHILIP M. NECHES, MS '77, PhD '83, of Dayton, Ohio, was appointed senior vice president and chief scientist of NCR Corporation on April 1. He was previously chief scientist of Teradata Corporation, of which he was also a founder.

1977
WALTER J. BECKMANN, married Xiaoxing Jiang on December 30, in San Francisco, California. He is working on his MS and master of engineering degree at U.C. Berkeley.

DAVID FAULKNER, MS '78, started work at the Lawrence Berkeley Lab in the indoor environment program in January. He married Ilma Rose Bartlow on June 25, in Berkeley, California.

JOHN L. GUSTAFSON just moved to Ames, Iowa, with his wife, Denise, their 5-year-old daughter, Janice, and their 3-year-old son, David. Gustafson works for Ames Lab.

RICHARD MIAKE-LYE, has joined the systems group of Aerodyne Research Inc., in Billerica, Massachusetts, as a senior systems scientist. His work involves analyzing and modeling propulsion flow and heat transfer effects on the infrared signature of aircraft, measurement and analysis of liquid and gaseous jet combustion sources, and modeling light scattering and radiation transfer.

LAWRENCE C. PAULSON, writes, "My wife, Susan, recently gave birth to a baby boy, Nathaniel. We will be living in Edinburgh, Scotland, for six months while I am on a sabbatical leave from Cambridge."

LAWRENCE C. WEST, MS, of Freehold, New Jersey, married Annmarie E. Coyne, on August 26. The bride is a nurse at the Robert Wood Johnson Hospital in New Brunswick, New Jersey.

1984
ALICE CRONIN-GOLOMB, PhD, of Reading, Massachusetts, has been named an assistant professor of psychology at Boston University's College of Liberal Arts. Her research focuses on psychological issues of aging and age-related neurological diseases.

1988
CURTIS C. LING, is a research assistant at the Center for Space Terahertz Technology at the University of Michigan.

HUGH M. RUSH, JR., EX, of Coronado, California, on October 17, of Hodgkin's disease. He had spent his entire career with Rohr Aircraft, now Rohr Industries; retiring as manager of research & development in 1971. He is survived by his wife, Dorothy.

1942
ALFRED LANDAU, of Monrovia, California, on August 22, 1985.

1946
ROBERT A. GOLDING, of Orange, California.

1947
TING YI LI, ENG, PhD '50, of Sacramento, California, in April 1988, of heart failure. Li was a pioneer in hypersonics. He retired in 1981 as professor emeritus of aeronautical engineering at Ohio State University. Li is survived by his wife, Hwei; three daughters, Marinda, Maria, and Martha; and son, Jason; their spouses; and six grandchildren.

1948
ROBERT P. BRINKMAN, of West Bloomfield, Michigan, on September 16. He is survived by his wife, Tenney.

1949
JOHN K. HOLCOMB, ENG, of Rockville, Maryland, in July.

JAMES D. YOUNG, of Atlanta, Georgia, in September. He was professor of English at Georgia Tech. He was 63. He is survived by his wife, Elizabeth; son, Jonathan; and brother, Robert.

1950
MELVIN SPRECHER, of North Hollywood, California.

1957
JEROLD L. SWEDLOW, PhD '65, of Pittsburgh, Pennsylvania, of a brain tumor in 1989.

1960
EDWARD A. FLINN III, PhD, of Alexandria, Virginia, earlier this year.

1974
KENNETH A. MILLS, of Sunnyvale, California in 1988.

PERSONALS

1927
R. CARTER BLANKENBURG, of Alhambra, California, recently celebrated his 60th anniversary with his wife, Ruth, their son, Harry, and his family, and a dozen other relatives.

1940
CLARK HOSMER, MS, of Shalimar, Florida, has just published "Could A Rechartered United Nations Help Prevent Nuclear War?" in *International Journal on World Peace*, January—March, 1989.

1941
JOHN D. SPIKES, MS '46, PhD '48, writes, "At the end of 1988, at the age of 70, I became Professor Emeritus of Biology at the University of Utah in Salt Lake City after 41 years on the faculty. I also served as chairman of biology and dean of the college of letters and science. I had received the University's Distinguished Research Professor Award and the Utah Academy of Sciences, Arts and Letters Distinguished University Service Award. My main research activity is in the field of photobiology, and I was president of the American Society for Photobiology. This year, in Budapest, I was awarded the Medal of

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George Housner, who has been named chairman of a state committee to make recommendations about earthquake safety, has been in the forefront of earthquake engineering for more than 50 years.

Page 1



Quadruplegic James R. Young (MS '76, PhD '82) has been honored for his ability to overcome physical challenges and go on to achieve personal and professional success.

Page 6



Caltech freshman Scot Fagerland can alphabetize the letters in words and pronounce the words that way, instantaneously. His strange skill won him a guest spot on the Johnny Carson show.

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