California Institute of Technology

# Caltech News

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> **Based on data** from the 1975 Viking mission, the Explorer's **Guide to Mars** map on Arden Albee's wall will be in for some updating once **Mars** Observer begins its survey of the planet late next year. Albee keeps a replica of the spacecraft in **Caltech's Office** of Graduate Studies, where in addition to his role as Observer project scientist, he's been dean since 1984.



# Opening a new chapter in the Martian Chronicles

**By Heldi Aspaturian** 

Speaking this past August at a NASA press conference called to herald the upcoming launch of Mars Observer, Caltech Professor of Geology Arden Albee sounded at times like a man who had just been commissioned to write the lyrics for the Martian version of "America the Beautiful." "We know that Mars has a volcano, Olympus Mons, shrouded in clouds, that dwarfs anything in the Hawaiian Island chain," he said. "We know it has massive canyons, including one that on Earth would stretch from New York to Los Angeles. It has sinuous valleys that suggest there was once abundant water on the planet. We know that during certain seasons of the year there is a polar cap that waxes and wanes, and we know that in some years there are dust storms that envelop the entire planet." However, continued Albee, who is also the Mars Observer project scientist, there's a lot we don't know. From polar cap to polar cap there stretches a substantial terrain of unanswered questions about the Red Planet. What happened to the water that most experts who have studied the Viking data now believe once flowed copiously across the planet's surface? How does the Martian climate, which both resembles and differs radically from Earth's, behave over the course of the entire Martian year? Did Mars experience a greenhouse effect at some earlier period in its history? Then there's the question that's been on the minds of

many Mars aficionados ever since the Viking Lander's soil experiments came up empty in 1975: has life ever evolved on Mars? Did the planet once harbor a bacterial Atlantis that vanished, along with its water, aeons ago?

Although no one expects the Mars Observer, launched September 25 from Cape Canaveral, to fill in all the gaps, there is every expectation that this mission will usher in a new era of Martian exploration and just possibly-a suggestion that the conjugation of the dates 1492 and 1992 makes difficult to resist-a new frontier for human exploration as well. Mars has long been considered the most Earthlike of the sun's other planets. A primary aim of the Observer , mission, says Albee, will be to follow up the many tantalizing hints returned from earlier Mars missions that the planet went through an even more Earthlike period in its past. "We know from the Viking data that Mars has a vibrant past that seems in many respects to resemble Earth's," he says. "When and why this vibrancy ceased is not clear. That's one of the central questions we're hoping to answer." Observer will reach Mars next August and go into a polar orbit 250 miles above the planet. It will circle Mars every two hours over the course of one Martian year-687 days. The spacecraft carries a camera and six remote-sensing devices. Beginning in December 1993, these instruments,

working in concert like an interplanetary one-man band, will monitor and map Mars with a sweep and precision that is expected to yield more information about the planet's composition, climate, geology, and evolutionary history than all previous missions to Mars put together. This nonstop global reconnaissance is similar in scope to Magellan's radar-mapping of Venus and to Landsat and Seasat satellite surveys of Earth.

'To a certain extent, we can explain many features of Mars now, but we explain them all with only one set of data and cannot test our explanations

"It's not clear what sort of geologic dynamics might have produced this dichotomy," says Albee, although he suspects that the answer may start to emerge once it's determined whether Mars, like Earth, has a magnetic field. Current theory holds that a planet's magnetic field is generated by an "internal dynamo" deep within the planetary core-the same mechanism that drives continental plates, sculpts mountains, and engineers quakes. Mars's field, if it exists, must be very weak since all previous missions have failed to detect it, but Observer is carrying a magnetometer that should be sensitive enough to do the job. If Observer's readings show there's no field at all, says Albee, that should be an indication that Mars's central heat engine has shut down. Clues to when and why this might have happened will then be sought in the planet's surface geology. "It's also possible," says Albee, "that something is missing in our picture of what magnetic fields mean: Earth has an active field and varied topography, while Mercury has a relatively strong field and a dead surface. Mars has both dead and varied surface, and a weak or absent field." One intriguing possibility is that the Martian field goes through periods of dormancy, whose Continued on page 5

against a second set," Albee says.

"With Mars Observer, we are going to get a consistent, long-term set of data that will allow us to understand what's going on in extremely great detail."

As a geologist, Albee will be particularly interested in finding out what's going on with Mars's surface geology, which is considerably more complex than the popular image of the planet as an endless red rock desert under pink skies would suggest. Topographically speaking, Mars almost seems to be not one planet, but two. Its southern half is heavily cratered like the moon and appears to have been geologically dead for billions of years, while its far more Earthlike northern hemisphere is marked by volcanic ranges, deep canyons, and landslide basins-all thought to be signs of more recent tectonic activity.

# CAMPUS UPDATE

# Caltech meets NSF grand challenge

The National Science Foundation has announced the establishment of a \$4 million Grand Challenge Application Group at Caltech. The group will study materials-design problems critical to industry while emphasizing close collaboration between university scientists and leading industrial scientists and engineers.

"We want to bridge the gap that often remains between published research results and industrial applications," said William Goddard III, the Charles and Mary Ferkel Professor of Chemistry and Applied Physics at Caltech and one of the group's principal investigators.

Toward that end, cooperating industrial scientists and engineers will spend from two weeks to a year doing research in laboratories at Caltech, explaining key industrial problems to university researchers and working with them to extend theoretical techniques to address these difficulties.

The participating scientists will build on recent breakthroughs in quantum chemistry, molecular dynamics, statistical mechanics, and parallel supercomputing to develop the computational tools and strategies needed by U.S. industry to develop materials for the 21st century.

The group will be centered at Caltech's Beckman Institute, in the Materials and Molecular Simulations Center. The collaborative industrial projects will concentrate on biotechnol ogy, developing new polymers and ceramics for high-temperature applications, developing improved catalysts, and oil field research. In addition to Goddard, the project's principal investigators will be Richard A. Friesner, professor of chemistry at Columbia University in New York; Stephen Taylor, assistant professor of computer science at Caltech; Zhen-Gang Wang, assistant professor of chemical engineering at Caltech; and Abhinandan Jain, staff engineer in robotics at JPL. The five-year, \$4 million program will receive \$2.7 million from the NSF, \$300,000 from Caltech, and \$1 million from partners in U.S. industry. Firstyear industrial matching money will come from BP America, Chevron Corp., and B. F. Goodrich.

### NIMH establishes campus Center for Neuroscience

Caltech has received a \$7.7 million grant from the National Institute of Mental Health (NIMH) to establish a Silvio Conte Center for Neuroscience Research at the Institute. The new center will focus on the ways in which neurons send and receive information in the brain and nervous system.

"We are trying to understand the fundamental nature of the processes that go on in the brain when we think," said Caltech Professor of Biology Henry Lester, who will serve as the center's director. "We are interested in the molecules of thought."

Neuroscientists have identified and described many proteins involved in the specialized communication that goes on within and among nerve cells. These discoveries in turn are raising important new questions, such as how signal pathways are organized in different types of neurons, how mood changes and learning alter these avenues, and what pathways may remain to be discovered.

The Caltech group will be the fourth Silvio Conte Center for Neuroscience Research, named for the late Massachusetts Congressman Silvio Conte, who introduced the resolution to the House of Representatives that proclaimed the 1990s the "Decade of the Brain." Other Conte centers are based at Stanford, Northwestern, and UC San Francisco.

The center, to be based entirely on the Caltech campus, will support the his wife, Laura, were honored by the City of Pasadena in a ceremony last month. The couple, shown here in front of City Hall, will be in Stockholm this month-for yet another ceremony.

work of some 29 scientists in eight research groups. In addition to Lester, the research team leaders are Norman Davidson, the Norman Chandler Professor of Chemical Biology, Emeritus; Scott Fraser, the Anna L. Rosen Professor of Biology; Professor of Biology Mary Kennedy; Associate Professor of Computation and Neural Systems Christof Koch; Assistant Professor of Biology and Computational and Neural Systems Gilles Laurent; Melvin Simon, the Anne P. and Benjamin F. Biaggini Professor of Biological Sciences; and Assistant Professor of Biology Kai Zinn.



**Nobel Laureate Rudy Marcus and** 

## Work on Caltech Women's Center under way

Plans are under way to establish a women's center at Caltech, to be called the Caltech Resource Center for Women and Center for Women in Science and Engineering. A search committee, headed by Judith Campbell, professor of chemistry, and Mary Kennedy, professor of biology, and made up of faculty, students, and staff, has been named to conduct the search for the center coordinator.

The center's goals, according to Institute Provost Paul Jennings, are twofold. "The primary purpose," he says, "is to help female undergraduates, graduates, and research faculty embark

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Caltech seismologist Kate Hutton (right) briefed members of the media and the campus community during a tour last month of the seismo lab's new Earthquake Media and Exhibit Center, specifically designed for media use during earthquakes. The most advanced facility of its kind in the country, the center includes a studiolike room for interviews, a measuring room for seismic personnel, and an operating computer display of the CUBE (Caltech-USGS Broadcast of Earthquakes) system, developed by Caltech and USGS to measure quakes and pinpoint their epicenters within minutes. The Center was funded by the Times Mirror Foundation.

on successful careers in science and engineering, which is also part of Caltech's main mission. It benefits both the Women's Center and Caltech to have the center's focus tied directly to that of the Institute. But the center also has a more wide-ranging goal-to offer programs of interest to all women on campus. All of the center's activities will be open to any member of the Caltech community."

Adds Kennedy, "I think it will be an extremely valuable and beneficial addition to the Institute to have a central place where women can interact and discuss a wide variety of issues that are of importance to them."

Plans also call for the establishment of a committee to advise the coordinator on the center's goals and programs.



Professor Jerry Pine demonstrates a "daytime astronomy" experiment using a makeshift sundial, while Lelia Gonzalez (left) and Pasadena teachers look on.

# Caltech professors guide expansion of precollege science-education programs

Project SEED, established in 1984 with the support of two Caltech professors to introduce grade-school children to hands-on science, has mushroomed into a far larger effort to bring the same type of science education into all levels of precollege education. This new, larger undertaking has been named the Caltech Precollege Science Initiative (CAPSI), which currently encompasses four major programs, according to SEED's Caltech cofounders Jim Bower, associate professor of biology, and Jerry Pine, professor of physics.

CAPSI includes SEED (Science for Early Educational Development), the Hughes High School Curriculum Development Project, the Preservice Teacher Education Project, and Computers in Science Education.

Professors Bower and Pine have developed the SEED program in collaboration with the Pasadena Unified School District, the National Science Foundation, and a number of contributors in industry and business As part of SEED, Caltech scientists help teachers to utilize and apply the hands-on science kits that have been introduced into elementary-school classrooms throughout Pasadena. Pine explains that "teachers become facilitators of inquiry-learning," and students are encouraged to retain their natural curiosity as they increase their understanding of scientific principles. Working with Bower and Pine is Caltech liaison Leila Gonzalez, who has recruited about 50 Caltech volunteers, from students to faculty. The newest SEED project is the development of a hands-on curriculum for seventh- and eighth-grade classes in Pasadena. In addition, a special effort has begun to encourage industries and schools to collaborate on hands-on, kindergarten-through-sixth-grade science education throughout California.

As a result of a similar effort, the entire Maui (Hawaii) school district is adopting the SEED curriculum.

For older students, a new program called the Hughes High School Curriculum Development Project has been started, under a grant from the Howard Hughes Medical Research Institute. Caltech faculty, research staff, and students will be working with LA-area teachers to develop hands-on kits for the higher grade levels.

CAPSI is also collaborating with the Claremont Graduate School on a college science course for future teachers. Called the Preservice Teacher Education Project, the course is now being developed and will be implemented on a trial basis next summer. The course's originators include Pine, Bower, and Sunney Chan, Hoag Professor of Biophysical Chemistry. They have formed three development teams-with a Caltech professor, a Pasadena grade-school teacher, and a teacher-educator on each team. The pilot course will be offered to eight Claremont teacher-trainees and eight Pasadena grade-school teachers in summer '93. Then the program will be expanded in subsequent summers. Pine hopes the course will be used as "a model for collaborative efforts by scientists and educators in many other universities." He adds that all of CAPSI's programs are designed "to be used everywhere, not just here." In the fourth of CAPSI's current projects, Bower is working with Caltech students and the UCLA Graduate School of Library and Information Science to integrate computers into science education. With funding from the Sloan Foundation, student programmers are developing software to help elementary-school children access science books and other materials in school and public libraries.

# Ship honored Amos Throop in 1942

Fifty years ago this month, almost a year to the day after Pearl Harbor, the 101st Liberty ship rolled off the assembly line in Los Angeles Harbor. It was christened the S.S. Amos G. Throop during an afternoon ceremony on November 28, 1942, when Mrs. Robert Millikan did the honors by striking a bottle of champagne across the ship's bow. Also attending was Inga Howard, Millikan's secretary, who, according to tors and a few were named for cities, but I remember that one was named for Carole Lombard."

According to Coats, Liberty ships were "the Model T's of ships. They were all identical so they could be built on an assembly line. They were considered expendable, like bullet casings. If a ship made one trip it had done its job, but many of them sailed for years."

In support of the Allied war effort,



a local newspaper account, served as the "maid of honor."

The ship was built by the California Shipbuilding Company, whose shipyard in Los Angeles Harbor was the largest yard the U.S. activated for the war. The Throop was the 101st built by Cal Ship, and the time of its completion, a mere 29 days, tied the record for the fastest construction.

"A committee at the company picked the names for the ships," remembers I. Roy Coats, a former employee of Cal Ship and cofounder of the Los Angeles Maritime Museum. "They mostly picked famous men and educaLiberty ships, with a Merchant Marine crew of only 35 members, carried cargoes such as gasoline, oil, ammunition, steel, and tanks to Europe. More than 3000 were built nationwide, and Cal Ship built 300 of them.

The exact details of the Throop's years of service are not known, but Coats says that the ship was delivered to the U.S. Lines Company, which operated her until she was laid up in the Reserve Fleet at Benicia, California. In February, 1968, the S.S. Amos G. Throop was sold for scrap.



# Three men and a college

By Betsy Woodford





Angeles society, rubbing elbows with both Spanish dons and wealthy eastern émigrés. He attended UC Berkeley, earned his law degree, and opened his own law office in 1885.

Allan Balch, born in New York in 1864, attended Cornell University where he earned his degree in mechanical and electrical engineering. Balch then headed west and, after working at several power companies in the Pacific Northwest, arrived in Calibetween 1894 and 1910. One, the Pacific Light and Power Company, was sold to Henry Huntington (of railroad and library fame), who in turn merged it with some other companies he owned to form Southern California Edison.

In 1905, the trio sold most of their holdings in the electric-power companies and began looking into the natural-gas industry. At that time there was only one company supplying natural gas in Los Angeles. The gas was manufactured from coal through an expensive process that yielded a poorquality product. But Kerckhoff had an idea-to capture the natural gas that was allowed to escape from oil wells before the oil was pumped out. The vast, newly developed oil fields of Kern County provided more than enough supply, and they were located close enough to Los Angeles to be economical. Kerckhoff and his associates activated his plan, and their business, the Domestic Gas Company, flourished. Several years later, the firm was opened to new investors, and the company's name was changed-to the Southern California Gas Company. In 1927, Kerckhoff, Balch, and O'Melveny retired from the gas company—rich men—and turned their attention, full time, to philanthropy. Then as now, rich, influential businessmen would cross paths with others in their social circle, and it was inevi-

**Henry O'Melveny** 

As The Campaign for Caltech enters its final year, Caltech News takes a look back at three men who were members of the Institute's Board of Trustees in the 1920s, and who were friends and business associates for many years. Their entrepreneurship had a profound effect on southern California, and their philanthropy helped transform Caltech from a manual-arts training college into an international center for scientific and engineering research.

William Kerckhoff was a savvy businessman with an entrepreneurial spirit, William Kerckhoff

unafraid of risks and ready for opportunity. He started his first business in 1879, at the age of 23, when, fresh off the train from Indiana, he walked into the offices of a Los Angeles lumberyard and offered to buy 25 percent of the company. A deal was soon made, and Kerckhoff parlayed the single facility into 11 lumberyards, timberlands in Oregon, and a fleet of cargo ships.

Henry O'Melveny moved to Los Angeles in 1869 when he was ten years old. The son of a successful lawyer and judge, he grew up in upper-class Los tornia in 1896.

Archive

of Caltech

The entrepreneur, the lawyer, and the engineer met during Kerckhoff's effort to form a company to sell hydroelectric power produced from the waters of the San Gabriel River, which at that time flowed freely from Azusa to the ocean. O'Melveny was in charge of the negotiations to obtain water rights to the river, Balch oversaw the engineering aspects, and Kerckhoff, being president of the company, handled everything else.

On June 29, 1898, nine years after Kerckhoff decided to gamble on a venture never tried before on such a large scale on the West Coast, the first unit of the San Gabriel Power Company came on line and produced power—for Los Angeles's red streetcars.

This successful company was the first of many for Kerckhoff, Balch, and O'Melveny. In all, they started or purchased 11 electric-utility corporations table, according to Caltech Archivist Judith Goodstein, that the trio would be friends, business associates, or acquaintances of men who were serving on Caltech's Board of Trustees. Balch and O'Melveny had become members in 1925. In 1927 they were helping the Institute search for donors to build the new biology laboratories that had been promised to renowned geneticist Thomas Hunt Morgan when he came to Caltech to start the biology division.



Allan and Janet Balch

Balch pledged \$1 million toward the lab, and, when other sources of funds fell through, he asked his old friend Kerckhoff for the final \$1 million needed to fund the project.

Kerckhoff was a willing coinvestor. In addition to his longtime friendship with Balch, Kerckhoff had another association with the Institute-he had been a neighbor of Caltech trustee Norman Bridge for many years. Kerckhoff said, "I have been watching how, through the research output of the Norman Bridge Laboratory, Dr. Bridge's name and fame are now spreading through the world, and I want to do the same thing for biology that he has done for physics." Kerckhoff was willing to donate the \$1 million—as long as the building was named for him. Balch and the other donor, the Rockefeller Foundation, had no objection, and so the first unit of the William G. Kerckhoff Laboratories of the Biological Sciences was dedicated in 1928. Kerckhoff died the following year and saw very little of the ground-breaking science that was done in the Kerckhoff Laboratory under the direction of Thomas Hunt Morgan. Morgan continued the pioneering research with fruit flies that he had started at Columbia University, where he had discovered the chromosomal mechanism by which character traits

are passed on from parent to offspring through the interaction of genes. For his work, Morgan was awarded the 1933 Nobel Prize in Medicine.

Also in 1933, Balch started his tenyear tenure as president of Caltech's Board of Trustees. He had already served as first vice president, chairman of the finance committee, and member of the executive council, and was serving as a member of the Observatory Council which was overseeing the construction of the 200-inch telescope for Palomar Observatory.

Balch and his wife, Janet, who were proud to say that they did everything together, were founding members of The Associates. They donated the funds to start a graduate program in geology—the Balch Graduate School of Geological Sciences at Caltech. But perhaps their best-known donation was the one that built the Athenaeum.

According to Goodstein, the tale surrounding the gift has entered into the realm of Caltech legends. "The Balches gave the funds to the Institute in 1929 in the form of stocks and bonds. Caltech's elders, in their wisdom, immediately converted these assets to cash. Several months later, the stock market crashed, and the school found itself in the enviable position of having close to half-amillion dollars, in hand, earmarked exclusively for one building."

In 1941, the Athenaeum was the site of Mr. and Mrs. Balch's golden wedding anniversary celebration. More than 3,000 people showed up to wish them well. The Balches died in 1943, within four months of each other, and, having no children, willed almost half of their estate—one million dollars—to Caltech.

O'Melveny gave large amounts of his time and legal expertise to the Institute. He served on the Board of Trustees from 1925 until his death in 1940. He participated in the discussions for the acquisition of Tournament Park and the land for Palomar Observatory. O'Melveny also drafted the rules incorporating The Associates. His law firm handled all of the Institute's legal work relating to the war effort during World War II. And, last but not least, O'Melveny was, according to Robert Millikan, one of four influential local men who persuaded him to come to Caltech full time and accept the responsibilities of president of the Institute. (Millikan never accepted the title of president. He preferred being called chairman of the executive council.) This trio of men, whose fortunes were made as a fledgling community grew to the stature of a city, helped Caltech at a time when it too was expanding its horizons. Kerckhoff, Balch, and O'Melveny helped bring world-class biology to campus, enlist the services of a visionary president, and build a faculty club that hosts scientific luminaries from around the world.

### Observer

#### Continued from page 1

timescales exceed the lifetime so far of the space age. But this theory, like a host of other speculations about Mars, awaits proof. "What we may really find at Mars," says Albee, "is that our theory of internal dynamos needs to be revised."

In addition to Albee, three other Caltech researchers are involved in the Observer's scientific investigations: Member of the Professional Staff Edward Danielson and Professors of Planetary Science Duane Muhleman and Andrew Ingersoll. They are part of a group of more than 100 scientists from the United States, France, Russia, Germany, Austria, and England who have come together in an international collaboration that-if all works out at Mars this time-should set the course for Martian exploration throughout the 1990s. Observer is currently set to play an important role in a Russian mission, scheduled for 1994, that will land two surveillance stations on the planet. The information they collect about the Martian surface will be relayed to a French-designed radio system aboard Observer, and will then be transmitted back to Earth by the spacecraft. A similar NASA mission is in the works to put a permanent monitoring network of at least a dozen small landers on Mars before the end of the century. Known as the Mars Environmental Survey Mission, the project now awaits final approval and funding.

Observer's studies will provide a series of "road maps" to guide these future missions, says Albee, adding, "the observations that we will carry out will create a database of information about Mars that will be made freely available to the global community of planetary scientists."

Albee first became interested in Martian research back in 1975 when as JPL's chief scientist-and heavily involved at the time in lunar studies-he helped to coordinate the closing stages of the Viking program. In the afterglow of that immensely successful effort, Albee served on several NASA committees that put together an ambitious agenda of future missions to the terrestrial planets and looked forward to returning, early and often, to Earth's nearest neighbor. The budget reductions and program retrenchment that wracked NASA in the 1980s cut those plans short. Instead, says Albee with feeling, "We spent the next seventeen years just trying to get back to Mars." The new cost-conscious atmosphere at NASA has meant that Albee, as Observer's project scientist, has had to devote considerable attention to balancing the often-competing priorities of doing good science and saving money. The approach adopted by the Observer team has been to equip the

spacecraft with a complement of mutually reinforcing instruments, "chosen," says Albee, "to be synergistic, to fit with one another. It's not that one instrument will tell us everything, but that several, working together, should greatly enhance the state of our knowledge."

The mystery of Mars's missing water will, for example, be probed from several directions. In the nearly two decades they've spent studying the dried river channels, empty stream beds, and apparent flood plains that turned up in the Viking photos, Mars scientists have had plenty of time to develop an intricate picture of how these features might have arisen on Mars and to devise appropriate methods of testing their theories. One widely held scenario is that Mars's atmosphere at one time contained enough carbon dioxide to produce a greenhouse effect, warming the planet and freeing water to flow across its surface. If, as it's suspected, that era ended when the bulk of the CO, leaked out of the atmosphere and became tied up in Mars's rocks, mementos from that period might exist in the form of abundant carbonate minerals. Two of Observer's spectrometers-one working at gamma-ray, the other at infrared, wavelengths-will search for evidence of these compounds, as well as for other water-related minerals, such as nitrates and sulfates, that might have been left behind as Martian lakes and rivers evaporated.

As for the ancient Martian water itself, it's generally believed that at least some of it is frozen under the planet's surface in permafrost, a type of icebound soil found in Siberia and Alaska. On Earth, permafrost is associated with specific surface characteristics, and Observer's camera, which is capable of resolving features down to a size of about 10 meters, is expected to reveal a similar signature on Mars, if permafrost is indeed present. The spacecraft's neutron spectrometer will also scour the planet for evidence of hydrogen, which on terrestrial planets is largely tied up with oxygen, and thus serves as a highly reliable tracer of H<sub>2</sub>O abundances. "These results," notes Albee, "will only be useful if the permafrost is relatively near the surface, since the spectrometer cannot probe too deeply underground." This search for water carries implications beyond those relating to Mars's climatic history. Life-of the human variety-may be in Mars's future, but many scientists have not ruled out the possibility that the planet embarked on a biology experiment of its own in its distant aqueous past. "If life did ever start on Mars," says Albee, "the planet's ancient lake beds would be one likely place to search for evidence." Although Observer won't be in a position to scrutinize these sites, they should come in for close investigation later this decade when Russian, and possibly American, landers explore selected portions of the Martian surface.

# FRIENDS



About 60 students interested in "Entrepreneurship" heard about the topic firsthand this fall from Paul Orfalea, founder and president of the international Kinko's Copy Center chain. Orfalea, who started Kinko's as a small school-supply business that offered copying services to UC Santa Barbara students out of a taco stand, continued to talk shop with the Caltech undergrads long after finishing his formal presentation in the Athenaeum. His appearance was jointly sponsored by Caltech's Office of Annual Giving and the Caltech Y.

# Kingsley Astrophysics and Space Science Fund established

Caltech has received a \$100,000 gift from the Lewis A. Kingsley Foundation of Garden Grove, California, to establish the Merle Kingsley Endowed Fund for Astrophysics and Space Science. The fund will provide discretionary support to Caltech faculty and students involved in the teaching, research, and study of issues at the forefront of astrophysics and space science. The fund is named for Merle Kingsley Elkus, who with her late husband, Lewis Kingsley, established the Lewis A. Kingsley Foundation in 1963. Through the foundation, as well as through personal awards, she has provided major support for graduate fellowships and undergraduate scholarships to encourage Caltech students in the study of space science and astronomy, fields in which she has a longstanding interest. She is also a member of the ARCS Foundation (Achievement Rewards for College Scientists), another generous supporter of Caltech students, as well as a longtime member of the Caltech Associates. The primary funding area of the Lewis A. Kingsley Foundation is higher and secondary education in the form of scholarship funds to pre-selected organizations in the Los Angeles area. Kingsley, who died in 1979, was the founder and president of the Kingsley Machine Company.

# Durfee Foundation launches China III

Six Caltechers have received grants to pursue travel and study in China from the Durfee Foundation, under Phase III of the foundation's American/ Chinese Adventure Capital Program. The six, all of whom have previously visited China with foundation support, are former Caltech Research Fellow William Bleisch; Robert "Stu" Jamieson, who recently retired from Caltech's Office of Patents and Technology Utilization; Tom Lehman, associate manager of technical operations in Caltech's Office of Public Events; and alumni Pamela Logan '81, MS '82; Mark Ragins '79; and Theron Stanford '87.

Bleisch, who was previously an Institute postdoc in biology, received a grant to travel up the Yangtze River and compile a filmed record of the natural environment and historic sites that will be destroyed when the construction of a giant dam exposes the region to severe flooding. Jamieson, who first went to China under a Durfee grant in 1986 to retrace the steps of his missionary grandfather, received support to return to rural Gansu province for a "family reunion." (An article about his first Durfee-sponsored expedition appeared in the February 1988 Caltech News.) Lehman was awarded funding to visit the large "extended family" he now has in China, as the result of three previous visits, one under foundation sponsorship, to study the Chinese performing arts, particularly circuses and acrobatic companies.

Logan, who is currently writing a book on her travels that will incorporate her first Durfee-supported adventure in China, will be learning about social workers in Chinese rural areas. Ragins, now a psychiatrist in Long Beach, California, received support to continue his investigations of Chinese, and in particular Tibetan, approaches to mental illness. Stanford, who is a graduate student at UC Berkeley, will travel to the National Lantern Riddle Information Exchange Center in Liaoning Province, where he will learn about traditional Chinese games and puzzles.

The Durfee Foundation was established by the family of Caltech Life Trustee and Chairman of the Board Emeritus R. Stanton Avery, who served on Caltech's Board of Trustees from 1971 to 1985. The foundation initiated the American/Chinese Adventure Capital Program in 1985 to encourage creative interaction between individual Americans and people in mainland China and to offer the opportunity for participants to pursue a personal interest in China. The goals are Avery'sthe result of his own experience in China in 1929, when he took a year's leave from college to explore China and a host of interests that it inspired.

## Veysey Student Life Fund established

Victor and Janet Veysey have founded the Veysey Student Life Discretionary Fund at Caltech with a \$28,000 gift aimed at enhancing undergraduate life through interactions between students and faculty, alumni, and leaders in business, politics, and science. The grant will be matched by funds from the Caltech Centennial Challenge, sponsored by the late Hugh Colvin BS '36.

"It's a wonderful opportunity to help students get acquainted with faculty as people, not just as instructors or researchers," said David Wales, professor of mathematics and master of student houses. Wales and Gary Lorden, vice president for student affairs, will oversee the fund with the help of a small committee composed mainly of students. The fund, which should operate for five to ten years, will support small group discussions between students and faculty, visiting alumni, scientists, and community leaders, possibly combined with special house dinners, concerts, or plays.

Vic Veysey earned his BS in civil engineering in 1936 from Caltech, where he belonged to Fleming House, served as senior class president, and worked as editor of *The California Tech*. In 1938 he received an MBA from Harvard and returned to Caltech as an instructor in economics and accounting. After teaching at Stanford for a year, he again returned to Caltech as an assistant professor of economics and industrial relations from 1941 to 1948. He married Janet Donaldson in 1941; they have four children.

Following terms as a California Assemblyman and U.S. Representative, Veysey served as assistant secretary of the army for civil works, where he was responsible for the Army Corps of Engineers and the Panama Canal. In 1977 he returned to Caltech once again as director of the Industrial Relations Center, where he remained until his retirement in 1983. Veysey remains active in the Caltech community, serving last year on the Alumni Association Board of Directors, and currently on the boards of SURF and the Caltech Y.

Gifts by will

Trusts and bequests provide welcome support to Caltech's Operating and Endowed Funds. Recent gifts received by the Institute include:

Douglas Norman Schneider—The sum of \$218,594 has been distributed to Caltech for unrestricted purposes from Mr. Schneider's estate. He was a friend of the Institute.



Joining President Everhart for a group portrait at the November ARCS (Achievement Rewards for College Scientists) Luncheon were 13 undergraduate and graduate students who attend Caltech with support from ARCS scholarships and fellowships. From left, front row: Brett Warneke, Aaron Hawkins, Dawn Cornelison, President Everhart, Dori Levanoni, Marvin Halling. Second row: Todd Rope, George Fox, Erik Bierwagen. Third row: Emil Kursinski, John Thompson, Eugene Lipovetsky. Back row: Roger Anderson, James Mason. Not pictured: Susan Sheu. John Navas—\$1,058,743 has been received by the Institute from Mr. Navas's estate. The funds are unrestricted. He was a longtime friend of the Institute.

Ygnacio Bonillas—\$1,297,377 for unrestricted purposes has been received from Mr. Bonillas's estate. He received BS and MS degrees in geological and planetary sciences in 1933 and 1935 from Caltech. He was a life member of the Caltech Associates and a member of the Provost's Circle.

For information about wording for bequests to the Institute, call the Office of Gift and Estate Planning, (818) 356-2927.



Dinner speaker C. Michael Armstrong, Anne Armstrong, Doris Pankow, Doris Everhart, Caltech President Tom Everhart, and George Smith.

# Hughes CEO speaks to Associates

At the Associates' annual Black Tie Dinner held October 16 in the Athenaeum, 268 guests heard C. Michael Armstrong, chairman of the board and chief executive officer of Hughes Aircraft Company, address the challenges of the changing work environment in California. Armstrong, who as Hughes CEO heads the single largest industrial employer in the state, discussed the current exodus of industry and jobs from California and presented a thoughtful, vigorous appraisal of how best to stem and reverse this trend.



Professor of Chemical Engineering Emeritus Nick Tschoegi; his wife, Sophie; and their son Chris.



Bob Henigson, Ingelore Bonner, Professor of Biology Emeritus James Bonner, Phyllis Henigson, and Joanna Muir.



Elizabeth Barnes, Susan Davis, Harkness Professor of Social Science Lance Davis, Anne Armstrong, and C. Michael Armstrong.



Archivist and Registrar Judith Goodstein, Berneice Anglea, and Vice Provost and physics professor David Goodstein.







David Goodstein, Lew Allen, and Terry Cole.



#### Charmian Robinson, Judge Cynthia Hall, C. Michael Armstrong, and Anne Armstrong.

Anne Armstrong and C. Michael Armstrong with General Counsel Harry Yohalem and Martha Yohalem.



Russ Faucett, Doris Everhart, and Carol Ann Faucett.



Mary Johnson and C. Michael Armstrong.

Richard Elkus, Merle Kingsley Elkus, and George Page.



Chemistry professor Barbara Imperiali, and Senior Research Fellow in Chemistry Lawrence Sita.



# Ted Combs '27 has lived

**By Winifred Veronda** 



His current efforts focus on developing new scholarships for Caltech students.

recalled, and, fortified with his report card from Chaffey, he climbed aboard and the two headed west for Pasadena. On campus they met Professor Harry C. Van Buskirk, registrar and mathematics professor, who glanced over Combs's report card and remarked, "You'll do. Get a catalog, and I'll see you in September." That, at least, is how Combs recalls the beginning of "one of the great experiences of my life." Initially he lived in a 7 by 12foot "apartment" in the garage of Clyde Wolfe, assistant professor of mathematics. Rent was free, if he did some gardening. The engineering student's interests quickly expanded beyond classrooms and laboratories. Combs became a yell leader, won a letter in track, earned a part in a Pasadena Playhouse production, developed his skill as a debator, became Gnome Club president, and was elected editor of the Big T. He also served on the Board of Control, which supervises the Caltech Honor System.

neers when he graduated, but Combs wasn't alarmed. He simply put his ingenuity to work, and went on to become a publisher of college yearbooks, chief usher at the Los Angeles Coliseum, high-school algebra teacher, building inspector and assistant city engineer for the city of Upland, creator of research and education programs on earthquake-resistant structures, pioneer in timber-fabrication processes, and motion picture consultant for MGM studios—all by the time he was 32.

By this time, he had also become a member of the Alumni Association Board of Directors, and editor of the *Alumni Review*, forerunner of *Engineering* & Science magazine.

At 32, Combs, now married and the father of two little girls, had become well established in the lumber industry. In 1940, as the defense effort was shifting into high gear, the government noted his expertise in the field and tapped him for service. Combs, who had accepted a commission as second lieutenant in the reserves after completing his Caltech ROTC, was given the task of setting priorities to bring order out of chaos in the lumber industry.

He accepted active duty as a reserv officer in the U.S. Army, and within a few months he had been assigned to the undersecretary of war, in Washington. "Combs," he recalls being told, "the construction equipment situation in this country is in a state of disaster. You've got 90 days to straighten it out." By his account, Combs succeeded, and went on to equally complex assignments involving streamlining procedures for wartime construction contracts, and for training engineers for wartime assignment. The war years were busy ones for Combs, who was heavily involved in construction efforts to meet a challenge: boosting productivity to exceed that of any other nation in history. He traveled widely on varied assignments, was promoted to colonel, and got his own unit for duty in Europe. Accompanying him on the crossing was an old friend, his violin. An avid violinist, Combs entertained himself regularly by seeking out the ship's un-

Entering a writing contest in the Women's Home Companion as a second grader seems a bit audacious, but Theodore C. Combs (BS '27) has never been put off by a novel challenge. He won a gunmetal pocket watch for his efforts, although he doesn't recall the subject of his entry.

That confidence and readiness to tackle the obvious and the unlikely have characterized Combs's whole career. And, because of his close, li long commitment to Caltech, the Institute has been a major beneficiary of his abilities. The alumnus, who worked with many Caltech leaders during this long association, was its first director of corporate relations and its first director of alumni giving. He conceived a study group whose efforts led to the hiring of the first full-time Alumni Association director and to the creation of Caltech News as a publication for all alumni. Combs went on to serve for almost six years as secretary to the Board of Trustees, secretary to the Caltech Corporation, and executive director of The Associates of Caltech. In this capacity, he negotiated the Associates' move to Caltech's Office of Development as an entity with its own executive director. After retiring, he volunteered for several years as representative on the boards of directors of small corporations in which Caltech-through bequests-held the controlling interest.

Caltech, in class and on the varsity track squad, gave Ted Combs, now 86, his first taste of going the distance. The track team won the regional conference championship during Combs's junior year, 1926.

Four years of

But all of this is getting ahead of how Combs, whose association with the Institute spans nearly 70 years, happened to arrive on campus in the first place. He reminisced about this as he sat in the lanai of the Georgian home in San Marino, where he has lived for 43 years. Outside a window stretched a garden, where Combs loves to work.

Tall and lean, his face at 86 almost unlined, Combs described a 1922 journey with his family from Denver to Ontario, California—travel that would eventually lead to Caltech. In Ontario, his father worked in real estate, and Combs graduated from Chaffey Union High School at age 16.

He accepted admission to Pomona College, but fate changed his direction when a friend on a motorcycle announced he was on his way to Caltech, and wouldn't Combs like to ride along? "What's Caltech?" Combs inquired, and was told that it was a technical school. "It sounded like my dish," he

There were few jobs open for engi-

# long and prospered

used solitary-confinement quarters and playing concerts for his own enjoyment.

In Europe, he chose to join the Sixth Army Group, which gave engineering support to Patton's Third Army and two additional U.S. and French armies. After V-E Day, Combs was on the first troop ship to redeploy to the Pacific.

After several months in the Philippines, and after VJ Day, Combs arrived in Kyoto. Along the way, he had seen the beach chosen for the landing of U.S. invasion forces. "The landing would have been much rougher than we anticipated in planning," Combs said. "If we had invaded, I'm confident I wouldn't be here today."

Combs supervised the opening of airports, ports, water supplies, and other critical facilities in a country that had been devastated by bombing. By late November, he was free of duties and ready to return home. At this point he received an offer that he still Japanese merchandise today.

Combs's first marriage had become a casualty of long wartime separations and—as he found on his return to the U.S.—so had less important aspects of his life. "The civilian world was baffling," he said. "I bought clothes where I had shopped for years, and found I had no credit. I looked for old friends and couldn't find them. My contacts in the lumber industry were no longer there, and my old job no longer existed. And worst of all, I had no family."

Characteristically, Combs didn't hesitate long before setting out in a new direction. He decided to try sales, and began as the lowliest salesman in the San Francisco-based Timber Structures, Inc. Ted Coleman (BS '26), an old Gnome friend, was living in the San Francisco area, and the Colemans invited Combs to meet a house guest from Pasadena. The guest was Carmen





ROTC Cadet Combs later saw five years of active duty in World War II.

once again decided to "start over. I've never been afraid to take this kind of chance," he said. "I've always been alert to the sound of opportunity knocking."

Back in southern California, the couple remodeled Carmen's home in San Marino and settled there, while Combs went on to become president of the Arch Rib Truss Company. Then he joined Zero Manufacturing Company, a firm specializing in deep-drawn aluminum containers, as vice president of engineering.

Combs left Zero in 1963, having achieved an important goal—a base of financial security that would afford him the luxury of pursuing options he would most enjoy. Caltech would become a major benefactor of his new situation.

After leaving Zero, Combs initially plunged into property development, but friends at Caltech asked for his help. A new position—director of corporate relations—was being established, and Combs offered half of his time to it.

Meanwhile, Caltech was gearing up for its Science for Mankind fund-raising campaign, and Combs was named director of alumni giving. Assessing the Alumni Association, at that time an organization of volunteers, he decided it was time to go professional. He conceived a study group, whose efforts led to the hiring of the Institute's first full-time Alumni Association director. Subsequently the study group decided that the Institute needed a publication that would go to all alumni, and Caltech News was born. President Lee A. DuBridge, a good friend, had even more in mind for Combs, and asked him to become secretary to the Board of Trustees, a responsibility that also involved being secretary to the Caltech Corporation and executive director of The Associates of Caltech. Harold Brown arrived as president in 1969. "He was very, very quick on the uptake," Combs said, "and didn't really need breaking in. He was a genius at money management. But he was shy socially, and a reluctant fundraiser." Combs remembers arranging a receiving line for Brown at a Caltech reception, a line Brown wouldn't stand in. Instead, he chose a quiet spot in a corner. "There he is," Combs would tell guests, pointing out the new president. "Go shake his hand."

At Brown's request, Combs stayed on at Caltech until two years past mandatory retirement. Afterward, he scarcely noticed an increase in free time. He was often asked to work as a volunteer on boards of corporations in which Caltech—through bequests held controlling interest.

But Caltech had been only one aspect of life for the Combses back in southern California. They traveled frequently and widely with friends of many years, visiting every continent. Antarctica was their favorite.

The Combses and their friends had developed a love for exploring in fourwheel-drive vehicles, always traveling with two cars for safety in the remote locations they visited. They camped in out-of-the-way spots throughout the southern United States and in Baja. Rugged areas in Death Valley put camping skills to special tests.

Combs has not slowed his traveling pace. In the spring, he spent a month in the Orient with friends, followed by a camping trip into northern Baja. Upcoming plans include a sail with 14 friends down the Turkish coast.

The interest in writing that led Combs to enter a contest at age seven has remained constant. In recent years, he has written a history of the Gnome Club and of the Caltech Y; the story of the Nelder Grove, Caltech's grove of giant redwoods; a book on Tournament Park; and a new book, *Columbus, Spain,* and the Incas.

Combs has served as a member of the Alumni Association board and the Caltech Y board; and he's currently on the board of the Friends of Caltech Libraries and the Steering Committee of the Executive Forum of the Industrial Relations Center. He also serves as co-chair of the Alumni Association's Long-Range Planning Committee, and is compiling a history of the Associa tion. Combs is also active in the Caltech Associates, where he is a member of the President's Circle. Friends have always been a priority in Combs's life, and continue to be. So has family. Today, Combs remains close to both his children and those of Carmen (who died in 1991), and to their nine grandchildren and five great grandchildren. Combs will soon be moving to a condominium adjoining the campus. From this vantage point he wants to stay involved, particularly to continue developing scholarships for Caltech students. "I've been very fortunate," Combs said. "I believe the span of history that I've experienced is the most interesting in the history of the world, and being part of Caltech has certainly added to that. I hope some of my contributions to the Institute will be enduring. I know that for me, the relationship has really been a love affair."

In '26 Combs (in front) and Caltech roomate Henry Gunning made the trip to Camp Lewis, Washington, for ROTC training in style, in a Studebaker purchased for \$50.

sometimes muses upon.

A nationally prominent Japanese manufacturer wanted to market highquality products in the U.S., and asked Combs to become his consultant. He invited Combs to name his own salary, and promised a western-style house in Kyoto. Familiar with what he terms "shoddy Japanese merchandise," Combs declined. He occasionally remembers the offer as he observes impeccable Williams Boyle, and that evening a romance began.

A promotion to vice president of sales with Timber Structures took Combs to Portland, but both he and Carmen knew that their hearts were in southern California—because of friends, environment, and, in Combs's case, Caltech. He resigned his position and headed south, where he and Carmen were married, and where Combs had

### **CHAPTER** ACTIVITIES

Bostonians reap benefits of geology field trip

There's far more to New England's geology than Plymouth Rock, as members of the Boston Chapter discovered in October during a guided tour of the region's countryside led by Northeastern University geologist Richard Naylor PhD '67. Alumni hiked through the brilliant fall foliage, broke for a box lunch, and explored the complex, varied terrain all around them, which numerous geologists, Naylor included, have sought to explain.

#### Tri-State Chapter has double-bill

In a tri-state event last October, Caltech and MIT alumni from the region joined together to tour a fusion research lab-Columbia University's Tokamak Facility. Conducting the tour were Gerald Navratil BS '73, chairman of applied physics at Columbia, and Michael Mauel, an MIT alumnus and a colleague of Navratil's. The Beavers from both coasts learned about new developments in fusion physics and about the potential of the tokamak experiment to harness nuclear energy.

A second tri-state event took place this past November in Greenwich, Connecticut. Chang C. Tsuei (MS '63, PhD '66) received a warm reception when he spoke on "Room-Temperature Superconductivity: A Pipe Dream or a Realistic Possibility?" Tsuei, manager at IBM's Thomas J. Watson Research Center, is the inventor of a superconducting material called the "Tsuei wire." He gave audience members a chance to experiment with a spinning magnet hovering above a real hightemperature superconductor.

last October and learned about advances in recyclable packaging from the company's material conservation manager, Joe Ragno. Ragno, who discussed "Environmental Influences on Packaging Design," lends his expertise in recycling, re-use, source reduction, and package elimination to a regional coalition that is developing packaging guidelines for industry.

#### Two Arizona groups discuss Baja-Mexico bifurcation

Twin gatherings in Tucson and Scottsdale last October focused on rift geology and on the slow movement of the Baja, California, peninsula away from mainland Mexico along a rift system. The speaker in both cities on consecutive days was Joann Stock, associate professor of geology and geophysics at Caltech. Stock presented evidence of the rift's origin and evolution, based on field studies of volcanoes, faults, and mountain ranges that have been exposed in the area.

#### S.F. Chapter returns to Lick

Astronomy has lost none of its appeal for Bay Area alumni, judging by the large number of San Francisco Chapter participants who turned out for the third trip in a row to the University of California's Lick Observatory, near San Jose (the earlier excursions were held in May and June). The visit, billed as "an evening at the Lick Observatory," included a private tour of the facility and a talk on new frontiers in astronomy and astrophysics.

One of the finer points of the San Gabriels' complex and intriguing history is explained by kneeling geologist Bruce Carter '65, who led a field trip into the mountain range above Pasadena this past Novembe

Association offers new job-listing service, and more





In an effort to expand the range of services available to Caltech alumni, the Association will be making a new career-oriented program, known as Caltech ProNet, available to alumni in 1993. Caltech ProNet will link interested alumni with potential career opportunities. A voluntary program, ProNet provides three services: It cross-matches alumni profiles against requests from participating corporations; circulates background information of alumni actively seeking employment changes to subscribing companies; and publishes a job-listing newsletter. Registration packets will be sent to alumni in January. Please look for the special announcement in this issue for additional information.

In another move to enhance the Association's range of services, the **Electronic Communications Committee** was created this fall to oversee the alumni electronic mail network, on which more than 1150 alumni currently hold accounts. In addition to the campuswide news groups on the system, specific alumni news groups are in operation, dealing with such issues as job offers and resumés, alumni information, and general discussion. Access to the Alumni Association electronic mail network is available through Association membership. If you are interested in participating, please contact the Alumni Office at 818/356-8365. The Alumni Association exists for the benefit of all alumni whether they attended Caltech as undergraduate or graduate students. We are interested in your comments about the Association and its activities. Please send your thoughts to: Le Val Lund, President,

Caltech Alumni, Mail Code 1-97, Pasa-

dena, CA 91125, or by electronic mail

to Association President c/o

judyamis@pcmail.caltech.edu.

### A big thank-you

Over the years, many Caltech faculty and alumni have provided outstanding leadership for travel/study programs and stimulating addresses both at chapter meetings nationwide and at Seminar Day on campus. The Alumni Association takes this opportunity to publicly recognize those who have participated in programs and meetings during the past year.

#### FACULTY:

Trips: Jenijoy La Belle, Bill Schaefer, Bob Sharp '34, Lee Silver '55.



**Geologist Lee Silver leading the way** on a travel/study tour of Yellowstone.

Chapters: Glen Cass '78, Judith Cohen '69, Judith Goodstein, Jenijoy La Belle, Jerry Pine, Charles Plott, Ellen Rothenberg, Bob Sharp '34, Joann Stock, Yu-Chong Tai, Stephen Taylor, Amnon Yariv. Seminar Day: Frances Arnold, Jack Beauchamp '64, Charles Beichman (IPAC), David Goodwin, David Halpern (JPL), Philip Hoffman, Andrew Ingersoll, Jeff Kimble, Joseph Kirschvink '75, Christof Koch, Gilles Laurent, Jeremy Mould, Peter

**Results of Caltech-Rice computing** collaborations discussed in Houston

It was fitting that Caltech alumni living in Houston gathered at Rice University last month to hear about projects that resulted from collaborations between the two schools. Paul Messina, director of the Caltech Concurrent Supercomputing Facilities, discussed the cooperative projects, which include the Center for Research on Parallel Computation, at Rice, and the Concurrent Supercomputing Consortium, headed by Messina. The projects include research on new programming languages, better compilers for existing languages, algorithms, applications, and other aspects of computation.

Colorado Chapter brews up event of food, facts, and a facility tour

Colorado Chapter members toured the Coors Brewing Company in Golden Participants, from left, included: John Opfell '47, How Bailey '41, Dana Far-rington (wife of Paul Farrington '41), Don Hicks '46, William Buchman '56.



Ordeshook, Stephen Taylor, Peter Weichman, James Westphal.

#### **ADMINISTRATORS**

Chapters: Tom Anderson, Dan Bridges, Tom Everhart, Paul Messina, Robert O'Rourke.

#### ALUMNI

Trips: Bruce Carter '65, Dan Dzurisin '75, Sue Kieffer PhD '71, Le Val Lund '47, Brian Von Herzen '89, Haimin Wang '88.

Chapters: Glen Cass '78, Judith Cohen '69, Terry Cole '58, Gerald Navratil '73, Richard Naylor '67, Bob Sharp '34, Chang Tsuei '63.

#### STUDENTS

Chapters: Karen Jonscher (graduate student), Alfredo Morales (SURF), Lan Smith (SURF). Seminar Day: Keow Lin (Lindee) Goh (SURF), Antonio Rangel (SURF), Erik Taylor (SURF).



Caltech visitors viewing the Pu'u O'o lava flow during last fall's travel/study program in Hawali included (clockwise from lower left:) Mimi Shapiro (wife of Hank Shapiro'50), Martin Poggi '37, John Peyton '54, Julia Peyton, Harris Adams '49, Peter Mason '51.

### ALUMNI ACTIVITIES

January 1, 1993, Rose Parade event. Breakfast and lunch at the Athenaeum. Reserved seating at Hill and Colorado for the 104th Tournament of Roses Parade.

January 6, San Francisco Chapter Meeting, with Hugh Lusted, president of BioControl Systems, "BioControl Systems: Use Your Nervous System to Control Machines."

January 12, New Mexico Chapter Meeting, with Murray Gell-Mann, Robert Andrews Millikan Professor of Theoretical Physics.

January 14, Santa Cruz Area Monthly Luncheon, Peachwood's at

February 25-26, Phoenix/Tucson Chapter Meeting, with David Halpern, senior research scientist, JPL, "El Niño and Climate."

May 13, Class of 1943, 50th Reunion Dinner, the Athenaeum.

May 14, Half Century Club Reception and Luncheon, the Athenaeum.

May 14, Class of 1948, 45th Reunion Dinner, the Athenaeum.

May 14, Class of 1953, 40th Reunion Dinner, the Athenaeum.

May 14, Class of 1968, 25th Reunion

Dinner, the Athenaeum.

### THE CALTECH ALUMNI ASSOCIATION ANNOUNCES



a career service for people not looking for a job... and those who are.

C l'Clin Languer

<b>Non't miss the opportunity of a lifetime because a</b>	Venture Capital
Company doesn't know you are there. From venture capital firms seeking senior management for start-ups to Fortune 500 companies searching for experienced professionals, companies of all types and sizes are always	High-tech
looking for top talent. Content as you may be with your current position, there are opportunities out there that might entice you to make	Fortune 500
a change. And, if you're actively looking for a new position, ProNet can help you, too. Registering with ProNet assures that a profile of your	Start-ups
experience and abilities is available to employers seeking to fill challenging positions you wouldn't hear about otherwise.	Bio-tech
HOW DOES CALTECH PRONET WORK?	
A company calls ProNet and requests a search for the indi- vidual they need. This request is cross-matched against the profiles of participating alumni. If you're the one they're	Management
looking for, you'll be notified. <i>Complete confidentiality</i> is maintained throughout this process and you can restrict the release of your profile.	Pharmaceuticals
WATCH YOUR MAIL FOR DETAILS	
ProNet information packages are being mailed in mid-January. If you do not receive one, please write to Caltech ProNet	Chemicals
Registration Department, Caltech Alumni Association, Mail Code 1-97, Pasadena, CA 91125; or call (818) 356-0654.	Manufacturing

Vonture Canital

Alumnus Richard Alexander '48 brought his grandson Colin Alexander Bennett along on last October's Orange County geology field trip with Bob Sharp. In the background, checking out a formation along the Cristianitos Fault at San Onofre is Brent Folsom, son of Blair Folsom '68.



Pasatiempo Inn, noon. For reservations, call Bob Shacklett at 408/ 722-6021. Luncheons are held the second Thursday of each month.

January 21, San Francisco Peninsula Luncheon, Ming's Restaurant in Palo Alto, noon. For reservations, call Hugh Dubb at 415/362-3800 or 408/773-9100. Luncheons are held the third Thursday of each month.

January/February, Washington, D. C., Chapter Meeting, with Charles Elachi, assistant lab director, Space Science and Instruments, JPL.

February 16, San Francisco Chapter Meeting, with Joel Birnbaum, VP of R&D, and director of Hewlett Packard Labs, "Information Technology: Impact on Future Society."

May 15, 56th Annual Seminar Day and Dinner, on the Caltech campus.

May 15, Class of 1958, 35th Reunion Dinner, the Athenaeum.

May 15, Class of 1963, 30th Reunion Dinner, the Athenaeum.

May 15, Class of 1983, 10th Reunion Dinner, the Athenaeum.

July 12-21, Iceland Travel/Study Program, with Robert Sharp '34, the Robert P. Sharp Professor of Geology, Emeritus, and Sue Kieffer PhD '71.

For information on the above, please contact Arlana Bostrom for chapter events (818/356-8363), Patsy Gougeon for Seminar Day/Reunions (818/356-8366), and Helen Shafran for travel/study and local programs (818/356-8364).

# Calling all alumni bistory buffs. . . .

A subcommittee of the Publications Committee, headed by Ted Combs '27, is currently working on a history of the Alumni Association and is considering publishing the results. The estimated price of the book, which should be approximately 130 pages in length, is \$25. Before going to press, the Association would like to assess what the level of membership interest might be in purchasing such a history. Please fill in and return the adjacent coupon to: Caltech Alumni Association, Mail Code 1-97, Pasadena, CA 91125, or E-mail your response to Marti Jackson at marti@pcmail. caltech.edu.



Yes, I am interested in purchasing \_ copies of a history of the Caltech Alumni Association at \$25 per copy.

Name:

Home Phone:

**Business Phone:** 

# Fjording ahead toward Iceland '93

"Whenever Mother Nature chooses to mix hot rocks with cold ice, the outcome is, conservatively speaking, unusual. In Iceland this mixture has resulted in curious landforms, spectacular scenery, lots of water, and a variety of ecological environments. Owing to its location on top of a spur off the mid-Atlantic spreading ridge, it is the center of abnormally high geothermal and tectonic activity."

Thus begins Bob Sharp's description of Iceland, the subject of a second in a series of travel/study programs that Bob will co-lead with Susan Kieffer PhD '71, Regents' Professor of Geology at Arizona State University. The total cost of the trip, scheduled for July

12-21, 1993, will be \$2,300 per person, double occupancy, and \$2,650 per person, single occupancy. This price includes all group-related accommodations, transportation, and meals. The cost of airfare to and from Iceland is not included. Currently, roundtrip airfare to Iceland is estimated at \$1,100 from Los Angeles, and \$736 from New York; of course, these fares are subject to change. Spaces are limited, so if you would like to be a part of this exciting travel/study program, please fill out the form below and return it, with your deposit, to the Alumni Association. If you have any questions, please call Helen Shafran, assistant director for programs, at 818/356-8364.

# Help us find these lost alumni

1922

Blake Beatt

1941

Caltech has no record of the addresses of these alumni. If you know the current locations of any of them, please relay the information to Kathleen Pearson, Information Services, Mail Code 105-40, Pasadena, CA 91125, or call 818/356-4863.

Blake Beatty	BS	Norman Z. Alcock
Arthur J. Garfield	BS	Morris R. Clark
1923		Samuel J. Easley
Robert I Hammond	BS	John M. Feeley
1974		Glyn Frank-lones
Deben C. Maria	DC	Denald I Hamme
Kobert C. Hastings	Do	Lionald L. Harvey
Mitchell C. Lukens	BS	Lloyd A. Lewis
Willard H. Tracy	BS	Blaine R. Nelson
1925		John G. Partlow
Wilfred G. Thompson	BS	George I. Reimens
Conrad J. Waller	BS	Frederick G. Robinson
1926		C. B. Stadum
Hung Y. Chang	BS	Clyde T. Standridge
Riley L. Gilbert	EX	Floyd G. Steele
Fray Handwick	BS	Robert L. Weaver
John R. Honmill	ne	Colman Zola
John K. Howen	Do	10/2
1927	-	1942
Frank F. Peterson	BS	Mehmet F. Bebe
Thomas S. Southwick	BS	Othan M. Emre
1928		Frank I. Given
Francis C. Martin	MS	Chong-Hu Go
1929		Richard Latter
John D. Elder	PhD	Victor H. Martinez
Reymond J. Kircher	BS	Charles B. Metz
Kam H. Lau	BS	Enver M. Muradoglu
Inline Nelson	BS	Russell Rhype
Tau W/ Robinson	DC	Walson C. Southan
True w. Robinson	DO	walter S. Spunier
willem Oyterboeven	PhD	Robert 5. Worthington
1930	121.24	1943
Donald K. Allison	BS	James M. Brown
Bertram R. Coupland	BS	Wayne H. Brown
William Kelley	BS	Ted L. Crosthwait
Frank N. Moyers	BS	Benjamin A. Daleon
Jack D. Pritchett	BS	Richard M. Holcombe
1931		Edward G. King
Jack H. Amann	BS	Robert H. Koch
Ababam I Grafman	nc	Robert II. Roch
Mondal W Link	Do	Kobert W. Kong
Marvin W. Fiall	05	William L. Leeds
Thomas V. Tarbet	BS	Roland E. Lundquist
James B. Taylor	EX	Klaus Mampell
William T. West	BS	Robert W. Mitchell
T. R. White	BS	Norman Newsome
Carl K. Yoshioka	BS	Lawrence K. O'bert
1932		Richard E. Pentonev
Taginasi Galiyar III.		
F. B. Phleger	MS	Alexander C. Ridland
F. B. Phleger Henry W. Schultz	MS	Alexander C. Ridland
F. B. Phleger Henry W. Schultz Bichard A. Szerle	EX BS	Alexander C. Ridland Fred D. Roberts Dan R. Scholz
F. B. Phleger Henry W. Schultz Richard A. Searle	MS EX BS	Alexander C. Ridland Fred D. Roberts Dan R. Scholz
F. B. Phleger Henry W. Schultz Richard A. Searle 1933	MS EX BS	Alexander C. Ridland Fred D. Roberts Dan R. Scholz Leslie A. Shannon
F. B. Phleger Henry W. Schultz Richard A. Searle 1933 Thomas C. Burk	MS EX BS EX	Alexander C. Ridland Fred D. Roberts Dan R. Scholz Leslie A. Shannon Peter A. Tileston
F. B. Phleger Henry W. Schultz Richard A. Searle 1933 Thomas C. Burk Luis E. Kemnitzer	MS EX BS EX MS	Alexander C. Ridland Fred D. Roberts Dan R. Scholz Leslie A. Shannon Peter A. Tileston Ernesto Vicente
F. B. Phleger Henry W. Schultz Richard A. Searle 1933 Thomas C. Burk Luis E. Kemitzer William A. Larsen	MS EX BS EX MS MS	Alexander C. Ridland Fred D. Roberts Dan R. Scholz Leslie A. Shannon Peter A. Tileston Ernesto Vicente Courtland L. Washburn
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F. B. Phleger Henry W. Schultz Richard A. Searle 1933 Thormas C. Burk Luis E. Kernnitzer William A. Larsen Edwin B. Michal Winaton H. Rice Maple D. Shappell Warten H. Smith William R. Whittaker Alexander Wolf 1934 Jack M. Desmond Duncan L. Hooper Robert A. Howard Jack F. Judson Edward E. Simmona Francis G. Tracy Rudolf Von Huene 1935 Leon S. Becker Edward A. Bertram Charles J. Gibbs Fun-Chang Huang Harry M. Koona Rusel L. Maycock Dagoberto Rivas 1936 W. B. Beckley Calvin M. Bolter Paul H. Hammond 1937 Robert A. Becker	MBS EX BS EX MS BS BS FhD BS BS EX PhD BS BS EX PhD BS BS BS BS BS BS BS BS BS BS BS BS BS	Alexander C. Ridland Fred D. Roberts Dan R. Scholz Leslie A. Shannon Peter A. Tileston Ernesto Vicente Courcland L. Washburn 1944 William O. Ballard Francisco Barriga William E. Bell Donald G. Benjamin Mehmet N. Berkant Errugrul Birlik Joseph E. Burch William G. Burke Ahmed Cebeci Carlos A. De Medeiros Weldon R. Donbach E. J. Goehring Charles P. Harrison Paul J. Labanauskas Carl O. Mattinson Keanneth L. McDreen John G. McDonald A. J. Morgan Carl W. Olson Merrill E. Onatad Ethem Ozkaragoz Longueville H. Price Joim M. Ridlehuber David F. Rutland Mayo G. Shults Philip H. Smith Roberto L. Stein P. S. Taevilla:
F. B. Phleger Henry W. Schultz Richard A. Searle 1933 Thomas C. Burk Luis E. Kernnitzer William A. Larsen Edwin B. Michal Winaton H. Rice Maple D. Shappell Warten H. Smith William E. Stone William R. Whittaker Alexander Wolf 1934 Jack M. Dearnond Duncan L. Hooper Robert A. Howard Jack F. Judson Edward E. Simmons Francis G. Tracy Rudolf Von Huene 1935 Leon S. Becker Sussel L. Maycock Dagoberto Rivas Rusel L. Maycock Dagoberto Rivas 1936 W. B. Beckley Calvin M. Bolster Paul H. Hammond 1937 Robert A. Becker	MB EX BS EX MS MS BS PhD BS BS EX PhD BS EX PhD BS BS BS BS BS BS BS BS BS BS BS BS BS	Alexander C. Ridland Fred D. Roberts Dan R. Scholz Leslie A. Shannon Peter A. Tileston Ernesto Vicente Courtland L. Washburn 1944 William O. Ballard Francisco Bartiga William E. Bell Donald G. Benjarnin Mehmet N. Berkant Ertugral Birlik Joreph E. Burch William G. Burke Ahmed Cebeci Catlos A. De Medeiros Weldon R. Donsbach E. J. Goehring Charles P. Harrison Paul J. Labanauskas Carl O. Mattinson Kenneth L. McBreen John G. McDonakl A. J. Morgan Carl W. Olson Merrill E. Onstad Ethem Ozkaragoz Longueville H. Price Jim M. Ridlehuber David P. Rutland Mayo G. Shults Philip H. Smith Roberto L. Stein R. S. Tanyildiz Couley 62 Window
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F. B. Phileger F. B. Phileger Henry W. Schultz Richard A. Searle 1933 Thormas C. Burk Luis E. Kernnitzer William A. Larsen Edwin B. Michal Winaton H. Rice Maple D. Shappell William R. Stone William R. Whittaker Alexander Wolf 1934 Jack M. Desmond Duncan L. Hooper Robert A. Howard Jack F. Judson Edward E. Simmons Edward J. Boeper Rudolf Von Huene 1935 Leon S. Becker Edward A. Bertram Charles J. Gibbs Fun-Chang Huang Harry M. Koons Russel L. Maycock Dagoberto Rivas 1936 W. B. Beckley Calvin M. Bolter Paul H. Hammond 1937 Robert A. Beckst Thomas R. Burnight Ja-Yung Cheng Anthony Euson James A. Hurst	MBS EX BS EX MS BS BS BS BS BS BS BS BS BS BS BS BS BS	Alexander C. Ridland Fred D. Roberts Dan R. Scholz Leslie A. Shannon Peter A. Tileston Ernesto Vicente Courteland L. Washburn 1944 William O. Ballard Francisco Barriga William E. Bell Donald G. Benjamin Mehmet N. Berkant Erugrul Birlik Joseph E. Burch William G. Burke Ahmed Cebeci Catlos A. De Medeiros Weldon R. Donsbach E. J. Goehring Charles P. Harrison Paul J. Labansuskas Catl O. Mattinson Kenneth L. McEreen John G. McDonald A. J. Morgan Carl W. Olson Metrill E. Onstad Ethem Ozkaragoz Longueville H. Price Jim M. Ridlehuber David F. Rutland Mayo G. Shults Philip H. Smith Roberto L. Stein R. S. Tanyildiz Garland S. Taylor William M. Trimble 1945 Victor A. Ari
F. B. Phleger F. B. Phleger Henry W. Schultz Richard A. Searle 1933 Thomas C. Burk Luis E. Kernnitzer William A. Larsen Edwin B. Michal Winston H. Rice Maple D. Shappell Warren H. Smith William R. Whittaker Alexander Wolf 1934 Jack M. Desmond Duncan L. Hooper Robert A. Howard Jack F. Judson Edward E. Simmons Francis G. Tney Rudolf Von Huene 1935 Leon S. Becker Edward A. Bertram Charles J. Gibbs Fun-Chang Huang Harty M. Koons Rusel L. Maycock Dagoberto Rivas 1936 W. B. Beckley Calvin M. Bolster Paul H. Harmond 1937 Robert A. Becker Thomas R. Burtight Ju-Yung Cheng Anthony Baston James A. Hurat	MB EX BS EX MS MS BS PhD BS BS FhD BS EX PhD BS EX PhD BS EX BS BS BS BS BS BS BS BS BS BS BS BS BS	Alexander C. Ridland Fred D. Roberts Dan R. Scholz Leslie A. Shannon Peter A. Tileston Ernesto Vicente Courtland L. Washburn 1944 William O. Ballard Francisco Barriga William E. Bell Donald G. Benjarnin Mehmet N. Berkant Ertugral Birlik Joseph E. Burch William G. Burke Ahmed Cebeci Catlos A. De Medeiros Weldon R. Donsbach E. J. Goehring Charles P. Harrison Kenneth L. McBreen John G. McDonald A. J. Morgan Carl W. Olson Metrill E. Onstad Ethem Ozkaragoz Longuvillet H. Price Jim M. Ridlehuber David F. Rutland Mayo G. Shults Philip H. Smith Roberto L. Stein R. S. Tanyildiz Garland S. Taylor William M. Trimble 1945 Victor A. Aris
F. B. Phileger Henry W. Schultz Richard A. Searle 1933 Thomas C. Burk Luis E. Kermitzer William A. Larsen Edwin B. Michal Winaton H. Rice Maple D. Shappell Warren H. Smith William E. Stone William E. Stone William R. Whittaker Alexander Wolf 1934 Jack M. Dearnond Duncan L. Hooper Robert A. Howard Jack F. Judson Edward E. Simmons Francis G. Tracy Rudolf Von Huene 1935 Leon S. Becker Edward A. Bertram Charles J. Gibbs Foun-Chang Huang Harry M. Koons Russel L. Maycock Dagoberto Rivas 1936 W. B. Beckley Calvin M. Bolter Paul H. Hammond 1937 Robert A. Becker Thomas R. Burnight Ju-Yung Cheng Anthony Easton James A. Hurat Paul F. Jones	MBS EX BS EX MS BS BS BS BS BS BS BS BS BS BS BS BS BS	Alexander C. Ridland Fred D. Roberts. Dan R. Scholz Leslie A. Shannon Peter A. Tileston Ernesto Vicente Courtland L. Washburn 1944 William O. Ballard Francisco Bartiga William G. Bell Donald G. Benjamin Mehmer N. Berlann Errugrul Birlik Joseph E. Burch William G. Burke Ahmed Cebeci Carlos A. De Medeiros Weldon R. Donsbach E. J. Goehring Charles P. Harrison Paul J. Labanauskas Carl O. Mattinson Kenneth L. McBreen John G. McDonakl A. J. Morgan Carl W. Olson Merrill E. Onstad Ethem Ozkaragoz Longueville H. Price Jim M. Ridlehuber David F. Rutland Mayo G. Shults Philip H. Smith Roberto L. Stein R. S. Taylor William M. Trimble 1945 Victor A. Ari Scanley D. Clark Scanley D. Clark Scanley D. Clark
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F. B. Phileger Henry W. Schultz Richard A. Searle 1933 Thormas C. Burk Luis E. Kermitzer William A. Larsen Edwin B. Michal Winaton H. Rice Maple D. Shappell William E. Stone William E. Stone William R. Whittaker Alexander Wolf 1934 Jack M. Desmond Duncan L. Hooper Robert A. Howard Jack F. Judson Edward E. Simmons Francis G. Tracy Rudolf Von Huene 1935 Leon S. Becker Edward A. Bertram Charles J. Gibbs Fun-Chang Huang Harry M. Koons Russel L. Maycock Dagoberto Rivas 1936 W. B. Beckley Calvin M. Bolter Paul H. Harnmond Jarke J. Johos Thormas R. Burnight Ju-Yung Cheng Anthony Baston James A. Hurat Paul F. Jones Thormas N. Shaw Ellis W. Shuler	MBS EX BS EX MS BS BS BS BS BS BS BS BS BS BS BS BS BS	Alexander C. Ridland Fred D. Roberts. Dan R. Scholz Leslie A. Shannon Peter A. Tileston Ernesto Vicente Courtland L. Washburn 1944 William O. Ballard Francisco Barriga William E. Bell Donald G. Benjamin Mehmet N. Berkant Enrugrul Birlik Joseph E. Burch William G. Burke Ahmed Cebeci Catlos A. De Medeiros Weldon R. Donbach E. J. Goehring Charles P. Harrison Paul J. Labanaukas Carl O. Mattinson Kenneth L. McBreen John G. McDonald A. J. Motgan Carl W. Olson Metrill E. Onstad Ethem Ozkaragoz Longueville H. Price Jim M. Ridlehuber David P. Ruchand Mayo G. Shults Philip H. Smith Roberto L. Stein R. S. Tanylot William M. Trimble 1945 Victor A. Ati Scanley D. Clark Scanley D. Clark Scanley D. Clark Scanley J. Beiren

1947 1952 Rolland S. Asher Paul E. Arbo Adolfo J. Atencio William D. Bezde Elias G. Arcoulis BS MS MS EX MS Oswin N. Brown Ta-San Chung Fredric B. Clarke BS BS Smith V. Bucy Wesley Caspers Frank C. Lang Bernard J. O'Neill Eng Raymond M. Clock Hugh H. Collins BS MS BS Eng MS Basil R. Parnes William C. Robis Brian D. Dagnall BS BS BS Subodh C. Das MS Fernand P. De Percis MS Yung-Chung Shen Donald E. Sutton Orin J. Demuth BS Richard W. Week Leo Fiorello MS BS MS MS MS MS Eric Gillam Howard E. Wilson Elmer E. Hall MS 1953 Walter Harrin Guerin E. Carlson Stanton L. Eilenberg MS John W. Hai BS BS Merwyn E. Hodge Theodore Einwohn Ea-Qua Huang Paul T. Hutchia Eng Eng BS MS BS MS MS Donald O. Emersor Stuart G. Lennox Felix A. Kalinski MS Dougal H. McRae James S. Lesko Rodin Lesovsky MS George H. Moore Wilbur F. Offerma Vicente H. Lim Sherman H. Ripley Jesus Ruiz-Elizondo MS PhD John Manoukian Michael K. Molloy MS Norman M. Schroede Eng BS Thomas R. Slodowski Fred P. Storrer David S. Twining Basil E. Moorehea BS Raymond L. Olson John L. Orr MS MS BS MS Loys M. Satterfield 1954 EX BS MS Alexander Smith Francis D. Sullivar Otto Cardinale PhD BS BS John T. Coughlin Jassim M. El-Hussaini Wesley R. Guebert James E. Guinane Raymond B. Tasker Russell A. Thompson George R. Vanden He Arthur F. Vieweg MS EX MS MS MS Eng Paul K. Henney Irvin G. Henry BS Pao K. Wan Clifford M. Wimberly MS MS Richard R. Hodge MS MS PhD Herberto Jimenez Eugene A. Kaiser Robert G. Morris 1948 Fred P. Adler MS Yin-Ching Au James A. Bunce Tao-Hung Chu BS MS EX MS EX EX Berdine H. Roger Francis F. Scott MS Albert R. Clark Burgess F. Colline James R. Dale MS Bruce J. Watkins Paul F. Weyen BS BS MS MS Herbert H. Winter Charles D. Edward Patrick N. Glover MS 195 MS MS EX Alain Brethes BS John D. Britton Chien Hsiao MS Omet I. Inonu Douglas D. Campbell Lewis F. Ellmore Jean Garcin MS MS Peter C. Lambert Robert J. MacNeill BS MS Daniel J. Griffin William E. Huber Herman A. Mason Walter P. Murphy BS Eng MS Oreste W. Lombard Carl R. Oberman BS MS MS Geoffrey V. Parkins John S. Swain Robert K. Swank MS James Meacham William T. Moore BS MS William R. Moreland Roy W. Paul MS BS MS William H. Voelker MS Roy M. Sacha James E. Whitney David B. Wilford MS MS MS MS 1956 BS Kermit M. Bandt Robert S. Winner Albert K. Wong 1949 Robert S. Winniford MS BS Wilmot G. Brownle James L. Cowan Robert W. Edwards BS EX Thomas E. Aller En Jacques Feige James R. Foster E. M. Gold Thomas J. Andrews MS MS MS BS BS BS MS MS BS MS Laurence I. Baumann BS Arthur R. Bento BS Joseph F. Burkholder David W. Hill BS MS James L. Kelly Duncan E. MacDuffie Harold D. Cooper Harold W. Davidso MS Francis C. Foster Daniel J. Milton Eng Rolland G. Moody George M. Hrebec Frank G. Hylton BS William N. Spence BS Prabandam Srinava Fred E. Krasin Tran N. Truong Robert M. Young 1957 Max Krauss PhD Pierre J. Leroux A. R. Marks BS MS BS MS MS James L. Appleton Eng MS MS Michael F. Man Dan M. Parker Charles C. Petty Anthony A. Dupont John F. Edsforth BS BS BS Douglas B. Holdridg Richard J. Kerr Marion C. Rinehan BS Dale D. Ryder Robert Schwarz BS Stephen M. Mak Donald T. Meyer Eng MS Salim Solomon MS Donald C. Stins Dale Vrabec BS BS MS Robert T. Moon MS Girair M. Nazariat BS EX John W. Wilkening James M. Short Jean F. Wiren William G. Wo BS BS Franklin C. Silvey Joseph E. Stuteville Genard J. Thevenor MS



MS MS BS MS PhD MS BS MS EX BS MS MS MS MS

BS MS BS BS MS BS BS BS BS BS BS MS



#### CALTECH ALUMNI ASSOCIATION Iceland II Travel/Study Program, July 12-21, 1993

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I/we wish to participate in the Alumni Association's geology travel/study program in Iceland. Enclosed is my deposit check for \$ representing \_\_\_\_\_ persons at \$200 per person.

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Anhur G. Gross	BS	Louis B. Zambon	MS	James C. Conly	PhD	1958
Arnulfo G. Gutierrez	MS	1946	242.5	Thomas E. Dowd	MS	David A. Ackley
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1939		Daniel Corres-Guzman	MS	M. D. Quigley	Eng	George Gerson
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Michael E. Hiehle	BS	Hassan F. Fareh	MS	Martin N. Ross	BS	David B. Leeson
Winthrop G. Jones	MS	Robert W. Foote	BS	Philip Rosten	MS	Rene E. Maurice
Spencer W. Oakley	BS	Geotge S. Gill	BS	Charles A. Savant	BS	Hugh D. Palmiter
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Lester G. Zukerman	BS	H. T. Huang	BS	Robert S. Welte	BS	Charles L. Statham
1940		Frederick I. Lewis	MS	Norris D. Whitehill	BS	Gunnar E. Scenberg
George A. Brettell	MS	Norman I. MacDonald	BS	John D. Wilkes	PhD	1959
Arthur M. Compton	BS	Stanley R. Nixon	BS	Amos L. Wright	MS	Kenneth H. Adams
William E. Gentner	MS	Carl K. Salbach	MS	Stanley A. Zwick	BS	Victor Baekelandt
Arville C. Gibson	MS	Harvey F. Smith	MS	1951		Louis N. Bathish
William J. Green	MS	Claudio F. Stegmann	MS	Raymond L. Angelo	Eng	Chai B. Byun
George A. Hatton	MS	Basil G. Stergis	MS	Ricardo M. Arosemena	MS	Clark E. Carroll
Clark L. Hosmer	MS	Yu-Sin Tung	MS	Kenneth R. Berg	BS	Ronald A. Christensen
Orson B. Lolmaugh	BS	Thomas F. Weldon	MS	Richard B. Campbell	MS	Andre J. Fossard
Adolph Lovoff	MS			Edward B. Crichton	BS	Michel P. Guillemet
Luigi Menis	BS			John R. Doe	BS	Ronald B. Leonard
Norman L. Peterson	MS			Oliver H. Gardner	BS	Robert Maltz
Robert A. Phillips	BS			Howard C. Goodell	MS	Didier Momne
Sabin A. Ustel	MS			Carl-Nils Hildabrand	BS	Kenneth A. Mumoka
Edward R. Van Driest	PhD			Jacob P. Lafdjian	MS	Stanley Roth
Tsung-Su Wang	MS			Gerald M. Montoe	PhD	Walter V. Weber
James M. Watkins	BS			Wilfred C. Mosier	MS	
				Joseph E. Padgett	MS	

John M. Palmer

Allan J. Su

Richard K. Smyth

Arthur E. Wennst

MS BS MS

BS BS

1960 Neville A. Black Paul R. Calaway Joseph M. Caule Jacques J. De Barbeyra James J. Geiger Edward G. Gibeo Meredith C. Gou Ernest A. Isaacs Pierre E. Joffre ouis Kingslar Thomas R. Koehler Donald Krotser Jimmy C. Larsen Laurence V. Niven Richard A. Newcome Walter E. Pelton Jan Rampacek William A. Sinoff Stephen V. Stephen David L. Tucker Paul R. Wides 1961 Charles A. Allen George S. Argyropoulos Edward G. Hauptmann John M. Kallfelz Vassilios Kerdemelidi **Roland Kitten** Stephen J. Luner Etienne Macke Ann R. Massar Maung S. Maun ce W. McCombs Nick S. Mousouris Demetrius Philippou Jean-Pierre Que Dwain J. Reed Rolf Richter Warren L. Simn Lewis L. Smith Jeanne M. Weiler 1962 Nazeer Ahmed MS Clement C. Auder John W. Berry James T. Chang Michel M. Cousir Michel D'Arbau Jean C. Dubois Larry D. Fitzgerald Donald C. G rwood Scott E. Gilles John M. Grover Peter W. Hamm Merlin E. Howden Marlyn T. Jakub Miguel E. L Chung-Yen Liu Alexander N. Lyon John F. Murphy Jean M. Noel Barry N. Pines Dennis R. Wik 1963 Michael F. Behrens Pierre J. Facon William F. Francis Leo Horowitz Stephen H. Mastin Raymond F. Poggi Lee W. Samuelson David S. Siegel Will G. Spiegelman Randle W. Ware John Y. Wu 1964 Bruce J. Aborn **Eudoxia** Aliferia Tzeu-Ching Chang Der-Shyr Chen William S. Cheng Duygu M. Demirlioglu Jean-Marie F. Grange Wallace I. Honeywell Takehiko Ikeda Karl H. Kanus Chung-Mo Kwok George E. Mager Richard D. Maxs Harris A. Notarys Edwin S Oko Jacques A. Parison Andreas Publ George E. Radke Michel E. Sivirine Nelson M. Skalbania Harold P. Waits David E. Wood 1965

Philip R. Austi Raymond P. Cej Philippe R. Chalier Inder Cheem

	1967	
IS	Surendra N. Adodra James R. Boyd	MS
s	Martin D. Cooper	BS
AS	John B. Davies	MS
45 45	Larry E. Dillehay	BS
hD	Payton D. Fuller	MS
as As	Basil E. Gala William C. Galley	MS PhI
45	Robert E. Goldwasser	MS
hD	Eitan Gonen	MS
15	Jun Ikeuchi	MS
x	Louis Kircos	MS
S	Chien-Shih Lu Papor Z. Marmarelia	PhI
S	Duan2e P. McClure	BS
IS	Jean M. Moysan	MS
IS IS	Robert C. Neveln	BS
S	Karuppagounder	
10	Palaniswamy	MS
AS	Michael Plouf	EX
45	Michel A. Scavennec	MS
AS	Nagendra Singh Vivian I. Steadman	MS
AS	Duke A. Sun	BS
S	Paul F. Williams	BS
hD	David C. Wilson 1968	MS
4S	Mohan P. Ananda	MS
s	Alain A. Artaud	MS
15	Randall B. Cook	BS
AS	Gerald M. Cotreau	MS
IS IS	William M. Denny William I. Driskell	MS
AS	Jacques P. Fleuret	MS
1S	Jay R. Freeman	BS
nD	Kermit R. Kubitz	BS
	John M. Lehman	BS
4S S	Leroy C. Lin Dele I. Miller	Phi
hD	Jean-Pierre G. Morel	MS
AS	Brian M. Schaefer	MS
AS	John F. Walters	BS
AS	William A. Wright	BS
'hD	1969	nc
s	Jean-Henry Barth	MS
BS PhD	James N. Brantner	MS
AS	George K. Chan	MS
S	Shuan-Ping Chao	MS
hD	Ted W. Dillingham	BS
AS	Charles H. Fisher	BS
AS	Michel H. Flandrin	MS
15	Michael S. Garet Mark P. Goldstein	MS
10	Luis N. Ikwueke	MS
MS	Barry R. Keller Thomas O. Mahon	BS
s	Michael Meo	BS
AS	Yavuz Rona	MS
AS	Murny D. Smigel	BS
x	Constantine Spyropoulos	MS
as	Ramachandra Srinivasan Richard L. Sweet	Phi
s	Luis A. Vega	MS
s	George A. Wiltsee	BS
4S	1970	MO
4S	Luiz T. Auler	MS
AS AS	Claude A. Beagle David Boss	BS
s	Kevin G. Donohoe	MS
S	Richard F. Doyle	BS
hD	Abdol R. Faiz	MS
AS	Atef I. Girguis	MS
AS	Edwin J. Hamilton Robin D. Hinchfeld	PhI
S	Allen G. Hirsh	BS
S	William C. Hocker	BS
hD	Nicole H. Imbert	MS
AS	Juan E. Leon	MS
AS	Fierce A. Lynne Isaac A. Majerovicz	MS
4S	Jovka Michova	MS
(S	Vivek C. Monteiro	MS
hD	Robert E. Powell	MS
	Richard A. Sramek	Phl
(S	George Z. Voviadiia	MS
(S	Peter M. Wilzbach	BS
ſS	Sheldon H. Zemell	MS

Carl R. Anderson David S. Anderson Richard B. Baxter Richard J. Blint Eric R. Bo issaye Emmy T. Chan Robert L. Derham Samuel R. Gardines Joseph L. Hammack D Frank Kendall Sai-Kit A. La Andrew H. Lo Raphael Loewy Robert N. Miller D Don N. Page John N. Power Gerson S. Shostak James P. Simmons Dan A. Sinema Lawrence K. Tu Keikichi Yagii 1973 Lary D. Andrews Dikran Antreasyan Frederick H. Auld Bruce W. Bennett Raymond E. Cathar Deborah D. Chung Bruce S. Eisenhan Daniel P. Haake James W. Hugg Xaviet F. Lagard Vincent M. Miskowski Michael A. Piliavin Louis Sandler William W. Schlitzkus Brooks N. Schmidt Richard A. Shaw Clifford E. Smith Clement L. Tai Kee-Hau Tsang Wayne K. Warzecha Rodney K. Womer Hung L. Wong hD Bruce Woodford 1974 Neil S. Berkey Dennis B. Creamer Walter K. De Logi Jay D. Doty Robert B. Fisher Charles A. Foley Edward M. Hedgecock Gregory A. Jirak Joseph F. Karnicky Harold J. Katz Peter J. Knox Betty P. Kwan Daniel F. Lam David Y. Leung George B. Levir Thanh Luu Alain A. Martin Albert T. Ng David Pollard D. W. Riven Sedigheh Salim Charles F. Schmid Satish C. Sharda John C. Smith Hon H. So Arlan D. Steinolfson hD Donald J. Sullivan W.S. The W. S. Thompson Frederick D. Williams Thomas W. Yee 1975 Eric M. Benjamin Erik J. Brune Charles W. Conne James C. Conwell Christopher L. Coope Peter J. Drivas Alexander C. Egwuatu Klaus H. Engelhardt Manuel R. Florez D Ralph R. Hayward ylvan A. Jacques Ravi Jain Jonathan D. Katz Diane J. Kent Vincent K. Leung Robert W. Lim Brian T. Luke William C. Moss Michael L. Norman John P. Pelegano Michael D. Rourke Omer Savar hD arry Schneidman Fredrick H. Seguin Jeffrey B. Smith Eric N. Vella

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Mustafa A. Abushagur EX Adi R. Adiwoso James C. Althoff MS PhD Kwok-Shing K. Au-Yeu MS Anthony F. Barton MS Andrew Bewsher MS Mark S. Bickford MS Duane K. Boman PhD John L. Chambers MS BS BS Philemon C. Chan Pei-Chuang Chen Pierre Choubert PhD MS Randal K Goodall Bruce G. Herring MS Bart Jackson Frederick G. Johnson Kevin E. Jones MS PhD James J. Kelly Thomas G. Kennedy MS Thomas D. Little PhD Kai-Yan M. Ma Juan M. Mantiquez Obiefuna T. Nwasike Madeline Paciorek James F. Pankow Vega D. Sankur MS BS PhD Michael J. Savage Frank Stackho Michael A. Surkes Paul M. Whitmore BS MS Glenn D. Wood Gong P. Yeh PhD Ronald W. Zimmerman PhD MS 1978 Nain H. Al-Adhadh BS MS BS Ray H. Bartlett Farhad Barzegar William E. Bratton Chris A. Broka MS MS BS Arthur J. Buto Daniel G. Canin MS Reazuddin A. Chaudhur Wilbert Chew MS MS EX David A. Chin Robert M. Claudson W. R. Clingan Jack D. Dodd Mark B. Dolson Fred M. Dycus MS BS BS MS BS Christopher L. Frenzen Alan A. Hahn Burl M. Hall Wiley D. Holcomb Syed J. Husain PhD MS Behnam Hushmand Edward N. Keller MS Bing H. Ko Kristen M. Lanson BS MS Jesus Leyva Ramos MS Thomas A. Loder PhD Moses L. Ma BS MS Amelia M. Maxted Luis M. Medina-Vaillard BS MS Arthur I. Metz Donald E. Miser Lawrence I. Mortin James H. Mullany John C. Neu MS PhD PhD Tor E. Ostbo Siranush Papazian Charunya Phichitkul BS MS Stephen P. Pope MS BS BS Jim D. Povlis Jack Powell Michael A. Schwartz Kenji Shintani Tom P. Sterk Chen Sun Wayne J. Thompson George Triantafyllou MS Yau K. Tsui Nikolaos P. Vasilak PhD David S. Wong Ella H. Wong King-Wah W. Yeung MS Jeffrey C. Yuen Barton Zwiebach MS MS 1979 Mark C. Anderson Elizabeth P. Blankenhor MS Genevieve M. Bliek MS MS Douglas A. Breisky Boyd J. Carter Ping Y. Chiu Ping Y. Ch Bo H. Cho Steven W. Cordray Mark B. Cronshav MS MS Brian G. Easton MS Steven T. Eckman MS ent L. Ellerbroek PhD Kenneth P. Fecteau Carl R. Gilray Frederick S. Grennan PhD Alvin J. Hill

1980 Richard P. Anstee Jean-Luc R. Ascharc Pamela R. Auburn N. W. Barcus Meir Bartur Michael S. Becker Robert J. Benson Donna H. Berry Roland L. Bouchard Iohanan L. Codona David M. Cole Brian R. Davis Alain Delsupexhe Kenneth Eagle Peter A. Edwards Reda Abdu E. El-Damak James R. Ellison Thomas H. Fly Jon Fong Courtenay P. Footman Jeffrey L. Fordon Karen E. Gaston Robert A. Gelfand Patrick W. Goalwin Charles E. Goodhard Peter M. Goodwin John A. Goree Mark E. Gurn Mohammed F. Helwa Kwok K. Ho Sudhir K. Jain Jeffrey B. Johnson David M. Joseph Scott M. Konishi Norman T. Lee Bosco H. Leung Herman S. Li Mark A. Ludwig Christian Mailhio Max Marshall Kevin S. McLoughlin James C. Meado Gary H. Memovich Alexandros Papachristidis ames S. Patt Carolen I. Paularens Marc J. Peran David J. Perozzi Michael K. Reach Wayne H. Richardson Alexander F. Rivers Colleen R. Ruby William B. Schmidke Robert Schulz Napapon S. Scott Patricia F. Scott David C. Shafe Kwoktai Shum Charles S. Slater Joseph S. Stephen Eric J. Swanson James K. Wang Robert W. Weav 1981 Rajapillai V. Ahilar Erdal Arikan G. Aston-Jones Philippe G. Boita Bret S. Burns Thomas D. Burton Carla J. Casewit Constantine Chazapin Adelaide D'Ambro Vanevic C. Daniel Antonio De Candia Kathryn L. DeWitt Horace R. Drew Singaravelu Elangovi John F. Fill Steven L. Gay Natalie S. Gluck Marci L. Gray Shahram Hamidi Richard R. Hardy Brian Herndier Daniel J. Jacob Michael P. Karyeaclis Richard P. Keller Hin-Wing Kui Luen-Hin Kwok Louis Lamarche Christopher Lan Tuan A. Le Derek S. Lillie Aneesh V. Man James P. McDermott Kay W. Merritt Evelyn B. Newma James E. Quick David B. Reiss Leonid I. Rudin Raghvendra Sahai

1982 Cathryn C. Allen PhD MS Mung-Ling Ang Stewart W. Baillie MS MS John R. Bennett MS Marc J. Berman MS Scott A. Biller MS Robert E. Blair MS Bennett H. Bonham MS Jonathan F. Buss BS oudon L. Campbell PhD Kwokming J. Cheng Steven A. Cohen PhD MS Pascal O. Correc MS Abraham A. Dauhajre Kathryn L. Doughty BS MS Ilknur Erbas Graeme F. Fowler MS BS Clifford E. Frieler BS BS Joseph A. Garcia Steven H. Green Gothard C. Grey MS PhD Rajan Gupta Karl W. Heuer PhD Ralph E. Howard Nak-Hui Hwang MS BS BS Elizabeth A. Kendall Randal D. Koster BS MS Leonardo A. Laroco MS Catherine H. Leblanche Marie-Bernard P. Levine Douglas Y. Mackenzie MS MS Philippe Marie Olivier Martin MS BS BS Linda B. McAllister BS Wen J. Meng David P. Millar MS MS Fai H. Mok MS David A. Myers MS Jan S. Najdzie PhD Byron L. O'Steen Hisup Park Michael L. Per BS BS BS Richard D. Pfaff Pamela J. Phillips Forrest C. Quinn MS MS MS Mohit Randeria MS Russell O. Redm Ann J. Rosenthal Philip A. Sackinger PhD BS MS Edward Schepps Margaret B. Sho BS BS BS Kenneth R. Sieck Terrance P. Smith MS PhD Gordon S. Stewart Michael E Sribile MS BS Brett C. Stutz BS Glen H. Swindle Saleh A. Tanveer Paul D. Thomas MS MS MS Anuchit Timnuchit BS Liem T. Tmn BS Russell E. Walker Xian-Li Yeh MS 1983 BS Khaled A. Abdel-Ghaffa PhD Lorna L. Anderson Nancy N. Becker MS BS Robert E. Betzig Alejandro A. Bo David P. Brady Clark D. Brooks PhD MS MS William M. Brune MS Kathleen M. Carey MS Ri-Chee Chou MS PhD Karl R. Clausing Jeremiah F. Cor MS Walter A. Coole BS Yongburn P. Cuevas James M. Cummings Barry D. Davidson MS BS Curt G. De Groff BS Marc M. De Villepin PhD Andrew M. Duncan PhD James E. Flowers Chi H. Fong MS MS Joseph F. Garvey Ghavam Ghavamishahidi Thomas M. Hagstrom BS Wahid S. Hamid MS MS Deborah R. Harr MS Michael S. Hisey MS Hamid Johari BS BS John Kao Young S. Kim Anthony Magaldi BS Michael I. Mettille PhD Frank A. Meyer Jean-Michel Missirian EX PhD Roman Movshovich David J. Muraki PhD MS Olin P. Norton Wendy A. Olson MS

1984 Stephen C. Ance MS Norbert K. Arndt MS Clinton L. Ballard BS BS Gregorio Beitman Paul S. Bloch PhD Anne-Marie Brest Carol J. Bryan PhD Hong-Man Chan Pang-Chieh Chen Mark S. Chitjian BS MS Haris Christodoulou PhD Yam K. Chu Edward J. Corbett MS MS Jose E. Disini Michael M. Doty MS Benjamin Frisch David A. Goldberg PhD BS BS Stuart Gondrici Herman J. Gordon PhD Koichi Gotoh MS Peter J. Grieve Roch Guerin Orkum Hasekioglu PhD BS PhD Jeffrey M. Hicks BS MS Elliot B. Hohri Chih-Chieh Hu Karim F. Karagulla Claude Lauzon MS Francoise J. Lemouel John M. Mahony Alan Y. Mak MS BS MS Moses Mares MS Craig N. Minor Bruno C. Nadd Tarik Naheiri Phu T. Nguyen Shouleh Nikzad PhD MS Mats G. Nordahl MS Mats G. Mats Nyer PhD Jeffrey P. Rhinesmith PhD Helio T. Rodrigues BS BS Michael P. Scharz Steven G. Schlipf MS BS BS Kurt E. Seel Peter Siracusa Steven M. Stahl MS PhD Howard D. Stone Barry A. Swartz Daniel A. Tazartes MS BS Brian S. Tipton James M. Trosino MS Wilman Tsai PhD Nadeem Tufail Peter D. Washabaugh Ned S. Wingreen Kriengkrai Wisanrakkit PhD MS BS BS 1985 Manuel Acevedo-Ruiz MS Denice Ball BS BS Roberto A. Cam Ariel Caticha Keming Chen Gary T. Chow MS Siew K. Chua Young H. Chung Mark Crawshaw Edward L. Cuellar MS BS PhD Margaret M. Farrell BS MS Sheldon I. Green Betty J. Hannous Robert M. Henderson MS Kenneth G. Jordan Ting-Lin Kao BS MS MS BS BS Ivo Klemes Byung S. Kwak Kikis M. Kyriac David E. Levy Blake H. Lewis William M. Pegram PhD BS MS BS MS Jeannine-Marie St. Jacqu Cynthia C. Walker John B. Wall MS MS BS Michael J. Walsh Johann C. Weber Andrew J. Weir MS Jesse Wen Christopher Yo Christine H. Yu MS PhD Thomas C. Zietlow 1986 Douglas D. Axe PhD BS BS Mihir Bellare Douglas J. Bennets MS Mark K. Bennett Lynda C. Brinson Wei Chen Piranart Chokwatana Eng David H. Chow Sung H. Chun MS Uma D. Dasika Denise L. Draper Stephen L. Gipson PhD MS Thomas G. Green Brian F Harfield

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John G. Hartnett	MS	Jose A. Amarante	MS	Bruce D. Westermo	MS	Sai Yuen B. Ho	MS	Paul N. Spathis	BS	Richard L. Paquette	BS	Marc E. Herant	BS	Raymond G. Mayer	MS
Ronald E. Hutton	BS	Luis Y. Aranguren	BS	Eric D. Williams	BS	Artie Hodges	BS	Maritza I. Stapanian	PhD	Jonathan E. Parker	BS	Chi F. Ho	PhD	Colleen McDermott	
Michel A. Lagorce	MS	Theodor S. Colbert	MS	Stephen N. Young	MS	Stephen C. Jackson	BS	Alphonse C. Sterling	BS	Vipul Periwal	BS	Watche S. Hoknayan	MS	Pete Morcos	
William P. O'Neill	BS	J. L. Compton	MS	1976		Kurt E. Jechel	BS	Frederick R. Vachas	BS	Alexios P. Polychronakos	MS	Mark A. Johnson	PhD	John Murphy	MS
Roger L. Peterson	PhD	Brian T. Cox	BS	Iraj Aalam	MS	Deanna K. Johnson	MS	Michael R. Walsh	BS	Zinovy B. Reichstein	BS	Julie A. Kern	MS	Sung K. Or	MS
George A. Repasy	BS	Stephen H. Elliott	BS	Ahmet V. Arslan	MS	David L. Keller	MS	Daniel Wenkert	MS	Ilene M. Reinitz	BS	Kerry I. Litvin	MS	John T. Orchard	MS
Robert R. Roberts	BS	Ronald A. Friedland	EX	Richard M. Atwater	BS	Ahmad F. Khorrami	MS	Laura H. Wesson	BS	David C. Sams	MS	Mary Ann C. Maher	MS	Adam J. Perse	BS
Roger S. Schlueter	MS	John D. Gallivan	PhD	Denis W. Aull	MS	Robert R. Krchnavek	MS	Arthur R. Williams	PhD	Balachandran Sathiapalan	PhD	Michael J. McDowell	BS	Hector P. Rotstein	MS
Robert B. Scott	BS	Ralph B. Graham	BS	Russell A. Bell	BS	Aleksander Kupiszewski	BS	George W. Williams	BS	Paul D. Siders	PhD	Milagros Montalvo	BS	Majid Saghafi	MS
Bernard C. Solelhac	MS	Thomas C. Gunderson	MS	Craig R. Broskow	BS	Albert Y. Lam	BS		1.00000	Stinivas Stidhar	PhD	James J. More	MS	Martin J. Savage	PhD
Benjamin Stackler	BS	Gregory E. Kandel	BS	Charles R. Byler	BS	Thomas K. Lee	PhD			Aditva Stiniyasan	BS	Thomas J. Nadeau	MS	Karen M. Siegrist	BS
Melvin M. Stephens	BS	Ian A. Kling	BS	Martin F. Cohen	MS	Brian T. Lew	BS			Kenneth I. Stern	MS	Tak-Kwong Ng	MS	Phalkun Tan	PhD
David O Swint	MS	Alan S. Lederman	BS	Michael C. Coln	BS	Paul Linares	MS			Charlie E. Strauss	BS	Yannis Nikoleris	BS	Thomas J. Tromey	BS
Marias I. Turrelraub	MS	Chi C. Le	MS	Michael L. Cooper	MS	Mark G. McHarg	BS			Steven Y. Tam	MS	Kevin C. Power	MS	Xi Wang	MS
Philippe Vidal	MS	Philip I. Lowry	EX	James E. Curry	MS	Mark T. Nussmeier	BS			Mark M. Todotovich	BS	Todd C. Pulvino	MS	Christopher Webb	PhD
Bohen O Winkler	MS	Gary A Marack	MS	Cedric S. Daksla	MS	Carol A. Oken	MS			Gregory P. Tollisen	MS	Michael A. Rider	MS	Mark Weitzman	MS
Falix S Wone	MS	Kirk A Marberry	BS	James W. Deutsch	PhD	Patty P. Pang	BS			Currie A Trimble	BS	Steve S. Roy	BS	Hustens Wen	MS
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Robert T. Barron	ME	David C. Muchmore	PhD	Robert H. Higley	BS	Christian S. Parry	BS			Camilla A Van Voorbees	BS	Donald Schwendeman	PhD	Langche Zeng	MS
Robert M. Bonrman	PLD	Wester F Marcall	DC	James T. Hong	BS	Michael B. Porter	BS			Jakob I mn Zul	MS	Steve S. Shin	BS	1991	
los Ching	MS	About Ordeal	BS	Andrew J. Jankevics	BS	John M. Punsch	BS			Thiri Vainas	BS	Stewart A. Silling	PhD	Charles L. Blake	BS
Harold T. Couch	PLD	Jan Maria Onizia	MC	Barbara F. Keenan	MS	Christopher B. Rogers	BS			David W Voother	MS	Dale R. Watten	PhD	Dong-au Kim	BS
Richard C. Counders	PhD	Pickard I Schooll	DC	Craig S. Lage	BS	Michael Rubinstein	BS			Kampia Washamain dhu	MO	Chang D. Yoo	BS	Linha Kim	BS
Charles M. Press	PhD	Charle Garil	5	Thomas I. Lawler	BS	Augusto Sagnotti	MS			Timeshar I W/III.	DC	1987		Allen I. Knurson	BS
Somukat M. Peroz	MS	Claude Sotil	MS	Keith D. Neetman	BS	Mavis Shure	PhD			Paine D William	Do	Asif Ahmed	MS	Kyung woo Lee	BS
James A. Hau	00	Gregory R. Stewart	BS	Chiu-Yuen I. Na	BS	Eric J. Siskind	PhD			Brian D. Wilson	M.S.	Javmant H. Arakeri	PhD	Zhenhuan Liu	MS
Lans P. Miller	DO	Jack K. Iam	BS	Douglas G. Petrie	BS	Cheri E. Smith	MS			Sung J. 100	BS	Bryan R Borach	MS	Jopathan Miller	PhD
Larry R. Miller	BS	Paul I. Wegener	BS	Lewis S. Proudfoot	BS	Dean G. Sturreyant	MS			Jettrey W. Tu	BS	Yie Hwa Chang	PhD	Ambus Risel	De
Lawrence R. Newkirk	BS	William M. Weigel	BS	Robert H. Reiner	MS	Jebril A Swedan	MS					Vladimit K Dagan	BS	Cod P. Sabukhaian	PLD
Thomas E. Oberjat	BS	William W. Yue	MS	Stephen Robsky	EX	James L. Taylor	PhD					Frik S Eber	BS	Michael P. Schutherage	PhD
Heiko H. Ohlenbusch	PhD			Stephen R. Roe	BS	Steven G. Trabert	BS					David S. Fashana	MS	Mash E Terminh	M
Robert E. Senatin	BS			Mark G. Rowan	BS	James C. Walseth	BS					Andrew D. Gaupor	MS	Mark E. Tomusiak	MO
Richard D. Sherman	MS			Alan B. Saul	BS	Tak-Yin Wong	MS					Parton & Gibner	MS	LOOD	MS
Alan M. Title	PhD			Subbash Sharma	BS	Tak-Tiu wong	1915					D M Goodeske	EV	1992	DO
John C. Urey	PhD			Hubert H Shen	BS							Asia W/ Grouper	MC	Joseph P. Caroselli	BS
Donald H. Valentine	PhD			Alan I Shuarannan	BS							King W. Lines	MO	Ricky I. Chen	MS
John K. Yoh	MS			Don I. Slankard	BS							Run w. Haas	MO	Olga Divovitch	MS
				Karl D. Stanban	BS							Charles C. Les	EV	Andrew K. Fung	BS
				Second M. Sauce	nc							Charles C. Lee	LA	Mohammad R. Gharib	BS
				Steven M. Sweeney	DO							Lap T. Lee	MS	Jerry L. Haney	MS
				Gamld A Wadaki-J	ne							Inter I Marine	PLD	Hampden D. Kuhns	BS
				Sentia A. weachind	00							John J. Ngai	PhD		
												Knahh B. Nguyen	BS		
												Ching-Long Ni	PhD		

# PERSONALS

#### 1943

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GEORGE D. AVANT, MS, of Tallahassee, Florida, has recently completed 25 years with A. G. Edwards & Sons Inc. as a stockbroker and has been awarded a set of Royal Doulton china. He is also active in real estate and timber growing (pine trees).

#### 1945

WALTER B. DANDLIKER, PhD, of San Diego, California, has been honored for a lifetime of achievement by the American Association for Clinical Chemistry. Chief scientist at the Diatron Corp., he has also worked at UC Berkeley, Harvard, and Scripps Clinic; his contributions to clinical chemistry span more than 40 years. His recent work includes the development of technologies that permit faster diagnostic tests on patients.

#### 1946

EBERHARDT RECHTIN, PhD '50, has received a Japan Computer and Communications Prize of 5 million yen (\$40,000). The prize was awarded for his fundamental contributions to the architecture and design of the deepspace digital-communication systems that have permitted the spectacular return of images to Earth by spacecraft exploring the solar system. Indeed, he was the architect of the Jet Propulsion Laboratory's Deep Space Network, which he managed 1961–1967 as an assistant laboratory director. He is now a professor of electrical engineering and engineering systems at the University of Southern California.

#### 1951

CORNELIUS J. PINGS, MS '52, PhD '55, provost and senior vice president for academic affairs at the University of Southern California, has been appointed the next president of the Association of American Universities. He will assume the post February 15, 1993, for a term of five years. He has served in his current position at USC since 1981, and he was previously professor of chemical engineering and chemical physics, as well as vice provost and dean of graduate studies, at Caltech.



At a ceremony at the Athenaeum last month, alumnus Chuck Thomas '35 applauded the unveiling of the artwork for the U.S. postal stamp honoring Theodore von Kármán, whose research on the principles of airplane design and flight helped to set the stage for modern aviation. The man doing the honors was alumnus W. Balley Oswald (seated), assisted by his grandson. Oswald, who received his PhD in 1932, is the oldest living graduate student of von Kármán.

tional competition, where three awards were made representing the humanities, the sciences, and business-technology-human development, respectively. Hefferlin has taught physics at Southern College for 37 years. In regard to the award, he said, "Much of the credit belongs to my wife, Inelda Phillips Hefferlin, who has lived with my long hours at the college and my many science trips."

#### 1960

EDWARD R. H. MCDOWELL, MS, PhD '64, of Pacific Palisades, California, has been named recipient of the F. J. & Dorothy Van Antwerpen Award for Service to the Institute; he was given the award by the American Institute of Chemical Engineers (AIChE). The award honors his contributions to the Institute as past president, former director on the governing council, and general campaign chair of AIChE's Foundation Board. An AIChE Fellow, McDowell has served on many national AIChE committees. Before retiring in 1986, he served as manager of reservoir engineering at Chevron's Oil Field Research Company in La Habra, California. While at Chevron, McDowell's on-the-job accomplishments included worldwide consulting on computer simulation of oil fields, including enhanced recovery processes. In addition, as an avid offshore sailboat racer, he has served as commodore of the King Harbor and Santa Monica Yacht Clubs, and he received King Harbor's 1991 Yachtsman of the Year Award. He is also a magician.

#### 1961

PETER C. MAYER, of Guam, writes, "I have recently learned that I shall be listed in the Eleventh Edition of *Who's Who of the World*. This is in addition to previous inclusion in *Who's Who in Finance and Industry*. Many events were necessary for these honors to be possible. None is as important as my education at the California Institute of Technology and at the University of California at Berkeley. This note is submitted as thanks. I have held faculty positions at Shanghai University of Finance and Economics, China; Kobe University, Japan; and the University of Guam. In addition, I have served as Senior and Chief Economist for Guam's Department of Commerce." He adds that he received his master's and doctoral degrees in economics from UC Berkeley.

#### 1963

FEDERICO R. NORWOOD, MS, PhD '67, of Albuquerque, New Mexico, has been named a Fellow of the American Society of Mechanical Engineers. He is a senior engineer at Sandia National Laboratories.

#### 1964

CHARLES VINSONHALER has been named the 1992 Connecticut Professor of the Year by the Council for Advancement and Support of Education (CASE). The honor recognizes his "extraordinary commitment to teaching undergraduates" and is given as part of the CASE Professor of the Year program, which salutes the most outstanding undergraduate instructors in the country at both the state and national levels. Vinsonhaler teaches at the University of Connecticut.

#### 1967

JAMES F. BEALL, of Houston, Texas, writes that May was a big month for the Beall family: Anne, his wife, graduated from Southern Methodist University's Perkins School of Theology, their daughter Catherine graduated from high school, and their daughter Kristin graduated from Austin College.

SUSAN W. KIEFFER, MS, PhD '71, was awarded the Arthur A. Day Medal by the Geological Society of America at its annual meeting in Cincinnati, on October 26. "Kieffer was recognized for her accomplishments as a superb experimentalist, field observer, theoretician, and teacher. She was cited as having 'an uncanny knack for solving the physics of interesting problems in geology and then developing applications of considerable generality.'"

#### 1969

LAWRENCE SHIRLEY, of Towson, Maryland, has been elected a Fellow of the Mathematical Association of Nigeria, the organization's highest honor, which has never before been awarded to a non-Nigerian. The ceremonies involved a visit to the Emir of Kano and formal conferment by the Governor of Kano State and the President of the Mathematical Association at the Association's Annual Conference in Kano, Nigeria, on September 1. The award was in recognition of Shirley's fifteen years of work in mathematics teacher education and curriculum development in Nigeria. He currently teaches mathematics education at Towson State University in Baltimore and serves on the Executive Board of the International Study Group on Ethnomathematics.

ALLEN FUHS, MS, PhD '58, a Distinguished Professor Emeritus at the Naval Postgraduate School (NPS), was inducted into the International Space Hall of Fame in Alamogordo, New Mexico, in October. An internationally renowned educator and space scientist currently serving on the U.S. Space Policy Review Board, Fuhs was honored for his many contributions to the exploration of space. These contributions include, among numerous others, laying the groundwork for the development of NPS's space-systems group and serving as its chairman until 1987; serving, at separate times, as chairman of the mechanical engineering and aeronautical engineering departments at NPS; and serving as president of the American Institute of Aeronautics and Astronautics.

RAY HEFFERLIN, PhD, physics chairman at Southern College of Seventh-day Adventists, has been selected to receive the 1992 National Zapara Award for Excellence in Teaching, in the science category. The award includes a \$3,000 cash prize. He was selected last spring on the recommendation of students and peers as one of three recipients of the award on the local campus level. This qualified him to enter the na-

#### **KEEP US INFORMED!**

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Name	
Degree(s) and Year(s) Granted	
Address	
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News	

#### 1974

RALPH W. ALEWINE III, PhD, Director of the Nuclear Monitoring Research Office, Defense Advanced Research Projects Agency. has received a Department of Defense Distinguished Civilian Service Award, which is the department's highest civilian award and recognizes exceptional contributions to national security. Among his many responsibilities, Alewine directs the department's research program for improving verification capabilities regarding nuclear-testing agreements, serves as head of the U.S. delegation to the United Nations Conference on Disarmament, Group of Scientific Experts, to consider international cooperative measures to monitor a nuclear test ban, and is chairman of the NATO Joint Working Group on Atomic Information.

#### 1980

JOHN M. CIMBALA, MS, PhD '84, now an associate professor at Pennsylvania State University, writes that he has received an outstanding teaching award from the university's college of engineering.

#### 1983

LYNMARIE THOMPSON, an assistant professor of chemistry at the University of Massachusetts, has been selected as a National Science Foundation Young Investigator. She will receive up to \$100,000 per year, for five years, through a combination of federal and private funds. A biophysical chemist, she will be using sophisticated techniques involving solid-state nuclear magnetic resonance, to better understand basic biochemical mechanisms at the molecular level; she will be specifically looking at how membrane receptors transmit information across cell membranes. After graduating from Caltech, Thompson received her MS and PhD in chemistry from Yale University, in 1985 and 1989, respectively.

#### 1984

DANIEL C. DAVIS, a medical doctor and a lieutenant in the U.S. Navy, married Amy Cindrity, of Fallbrook, California, on October 24. She is currently attending San Diego State University. Davis is in his final year of diagnostic-radiology residency at Balboa Naval Hospital, in San Diego.

#### 1985

MICHAEL CHWE writes, "I'm in Korea now until December with my wife, Namhee Lee (we got married in March), who is doing research for her dissertation in modern Korean history. I finally got my PhD in June in economics at Northwestern University. Last year I was a postdoctoral fellow in the economics department at the University of Chicago, and this year I am starting there as an assistant professor. Right now the leaves are changing colors and we are enjoying sweet potatoes."

TED WOODWARD, MS, PhD '88, and SHERYL (SMITH) WOODWARD, MS '85, PhD '88, are pleased to announce the birth of their first child, a daughter, Helen Jessie, on October 12. Both have been employed since graduation as members of the technical staff at AT&T Bell Laboratories, in Holmdel, New Jersey. He is in the Advanced Photonics Research Department, and she is in the Lightwave Communications Research Department. They live in Lincroft, New Jersey.

# OBITUARIES

#### 1923

JOHN R. NORTH, of Mountain View, California, on September 28; he was 92. He was the former president of Gilbert/Commonwealth (Commonwealth Associates), a consulting and design-engineering firm in Jackson, Michigan. He had been associated with Commonwealth since 1924, and was president from 1958 to 1963, when he retired. He was presidential advisor for North Central Airlines, and active with the Civil Air Patrol in World War II. His professional societies included, among many others, the National Society of Professional Engineers, the Society of Automotive Engineering, and the American Institute of Electrical Engineers (now the Institute of Electrical and Electronics Engineers), in which he attained the rank of fellow (1941) and served as director (1945-1949) and vice-president (1949-1952). He was listed in Who's Who in Engineering. He is survived by two sons, Robert and Donald; a daughter, Lucille Loomis; and 23 grandchildren and 36 great-grandchildren. His wife, Martha, died last year. He was particularly proud that his grandson, Donald, Jr., is an undergraduate at Caltech.

#### 1931

ROBERT M. LEHMAN, of Pasadena, California, on November 9. He was a member of the Descanso Gardens Guild, The Associates of Caltech, and the Valley Hunt Club. He is survived by his wife of 66 years, Evelyn; two sons, Robert and Charles; two daughters, Mary Harvey and Sally Boynton; 12 grandchildren and 15 great-grandchildren; and a sister, Susan Young.

#### 1933

ROBERT L. SUGGS, MS, of Metairie, Louisiana, on September 4, 1989. He was founder and chairman of the board of Petroleum Helicopters Inc., operator of the largest commercial helicopter fleet in the world. He is survived by his wife, Carroll.

#### 1946

ROBERT G. PARKE, MS, of San Antonio, Texas, on March 2. He is survived by his wife, Lee.

#### **ALUMNI ASSOCIATION FINANCIAL STATEMENT**

ALUMNI ASSOCIATION CALIFORNIA INSTITUTE OF TECHNOLOGY Pasadena, California

#### BALANCE SHEET June 30, 1992

#### ASSETS

Cash on Hand and in Bank\$ 1	25,540
Investments:	
C.I.T. Consolidated Portfolio	26,155
Money Market Funds	76,792
Receivables	15,951
Inventory	19,154
Deferred Program Expense	55,530
Postage Deposit and Other Assets	2,000
Computer and Other Equipment	22,315
Accumulated Depreciation	0,880)
TOTAL ASSETS\$1,8	32,557

LIABILITIES, RESERVES AND SURPLUS	
Accounts Payable\$	71,149
Deferred Income:	·
Investment Income from C.I.T. Consolidated Portfolio	.56,000
Program Income	129,765
Life Membership Reserve	426,435
Reserve for Directory	.54,932
Reserve for Publications	8,231
Reserve for Electronic Database	715
Investment in Equipment	.11,435
Surplus	.73,895
TOTAL LIABILITIES, RESERVES AND SURPLUS	.832.557

#### STATEMENT OF INCOME, EXPENSES AND SURPLUS For the Year Ended June 30, 1992

# INCOME Dues of Annual Members \$ 71,410 Investment Income: \$ 80,081 C.I.T. Consolidated Portfolio \$ 80,081 Money Market Funds 7,562 Net Income of Alumni Programs \$ 4,738 Sale of Legends 2,890 Other \$ 5,352 TOTAL INCOME \$ 172,033

EXPENSES	
Publications	\$ 24,709
Net Expenses of Seminar Day	
Net Expenses of Class Reunions	
Net Expenses of Chapter Programs	
Student/Faculty/Alumni Relations	
Undergraduate Admissions Support	
Administration	
Membership	
Directory	
TOTAL EXPENSES	\$ 190,748
INCOME OVER (UNDER) EXPENSES	\$ (18,715)
Surplus, June 30, 1991	
Surplus, June 30, 1992	\$ 73,895

INDEPENDENT AUDITOR'S REPORT

Board of Directors Alumni Association California Institute of Techn

I have audited the accompanying balance sheet of the Alumni Association, California Institute of Technology, as of June 30, 1992, and the related statement of income, expenses and surplus for the year then ended. These financial statements are the responsibility of the Association's Board of Directors. My responsibility is to express an opinion on these statements, based on my audit.

I conducted my audit in accordance with generally accepted auditing standards. Those standards require that I plan and perform the audit to obtain

#### 1986

ROD VAN METER, of Los Angeles, writes that he married Kathy Fleischer on March 18, 1989, in Yosemite National Park. He received his MS in computer engineering from USC in December 1991. In February 1992, after more than five and a half years as a programmer at USC's Information Sciences Institute, he accepted a position as chief software engineer at ASACA, a video and test-equipment manufacturer located in western Tokyo, where he expects to be at least until the end of 1993. He hopes to bring more awareness of the U.S. market to the company as it moves into the computer mass-storage field. He is interested in meeting alumni living in Japan. He can still be reached by e-mail at rdv@isi.edu, or through the Alumni Association.

DAVID B. SHELDON, of Bishop, California, on August 12. He died when his sailplane crashed in the White Mountains, in Inyo County, California. An Air Force pilot during World War II, he loved to fly and had flown a variety of aircraft for over 50 years. He was also a ham radio operator and a photographer. He graduated with Alpha Omega Alpha honors from Harvard Medical School in 1950, and from 1955 to 1966 he was a general surgeon on the staffs of St. John's Hospital in Santa Monica, Santa Monica Hospital, and the UCLA Medical Center. He moved to Bishop in 1966, where he had a private practice and was a general surgeon at Northern Inyo Hospital; he had gone into semiretirement on July 31. He is survived by his wife, Carol Partridge Sheldon; a former wife, Dorothy Sheldon; his son, Spencer; his daughters, Anne Sheldon, Sarah Sheldon Cashbaugh, Emily Sheldon, and Grace Sheldon; his stepdaughter, Phyllis Partridge Bateman; his stepson, Alan Partridge; eight grandchildren; and his sister, Barbara Rush.

reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. I believe that my audit provides a reasonable basis for my opinion.

In my opinion, the financial statements referred to above present fairly, in all material respects, the financial position of the Alurmi Association as of June 30, 1992, and the results of its operations for the year then ended, in conformity with generally accepted accounting principles.

Calvin A. Ames Certified Public Accounta

September 19, 1992

#### 1947

LOREN F. STRINGER, MS, of Clarence, New York, on September 19; he was 67. A leading authority on power electronics systems and industrial controls, he was president of Stringer Power Electronics Corp., which he formed after retiring from Westinghouse Electric Corp. in 1985. He held 24 U.S. patents, and received many awards, including the Westinghouse Special Patent Award, the Westinghouse Order of Merit, and both the William E. Newell Award and the Lamme Medal of the Institute of Electrical and Electronics Engineers, to which he was elected a fellow. He was also a member of the Association of Iron and Steel Engineers and a technical adviser for several committees of the International Electrotechnical Commission. He was an

all-around athlete, bridge player, and musician. Survivors include his wife, Gretchen; two daughters, Pamela Stringer and Lizbeth Coffman; two sons, William and Frederick; his mother, Helen; and a granddaughter. A memorial fund has been established at Caltech. Those wishing to contribute should write to the Loren F. Stringer Memorial Fund, Caltech, 1201 East California Boulevard, 105-40, Pasadena CA 91125.

#### 1989

HEATH A. MAXFIELD, on August 19. After graduating from Caltech, he spent two years in the Peace Corps, then moved to Portland, Oregon, where he was living with his girlfriend, Elizabeth Essex. He is survived by his parents.

Caltech News

California Institute of Technology Pasadena, California 91125

ADDRESS CORRECTION REQUESTED

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California Institute of Technology

Volume 26, No. 6 December 1992



In this issue

As Mars Observer heads toward the Red Planet, Caltech geologist Arden Albee looks forward to returning to a place he's never been.

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# Caltech News



Nurtured by Caltech faculty, Project SEED is growing into a great utility far larger effort to improve the quality of the nation's precollege science education.

Three power company executives who were of to Caltech.

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From '23 to '93. Ted Combs '27 bas an unbroken record of involvement with the Institute.

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