

CALTECH NEWS

In the future: a nationwide radio telescope array?

Astronomers at Caltech and JPL have completed a feasibility study of an economical nationwide array of large radio dishes that would have the effect of transforming the entire country into an immense radio telescope. This array, they have concluded, would be a powerful scientific tool, with thousands of times more resolving power than the largest optical telescopes.

The transcontinental radio telescope would produce the first high-quality fine radio maps of the structure of such exotic objects as quasars, forming and dying stars, and other celestial objects in our galaxy and beyond. The system could be used to make more precise measurements than now are possible at astronomical distances. The earth's rotation and tectonic plate movement could also be studied.

The researchers who conducted the study were led by Caltech Professor of Radio Astronomy Marshall H. Cohen. According to Cohen, an array of ten matched radio dishes, each about 25 meters in diameter, could be constructed throughout the continental U.S. and in Alaska and Hawaii for about \$38.8 million. Operation costs would run \$4.8 million per year, and the array would be controlled by a single computer at a central operations center.

In addition to Cohen, the members of the study group included Caltech Senior Research Engineer Martin S. Ewing and Research Associate Anthony C. S. Readhead; Gerald S. Levy, Richard K. Mallis, and John R. Smith of JPL; and

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Paul Jennings adjusts an antique seismoscope from Carson City, Nevada, used to help calculate the local magnitude of the 1906 San Francisco earthquake.

New insight into the 1906 San Francisco quake

Caltech researchers, using new mathematical techniques and resurrected antique seismic instruments, have gained new insight into the 1906 San Francisco earthquake.

Paul C. Jennings, professor of civil engineering and applied mechanics, and Hiroo Kanamori, professor of geophysics, have derived for the first time a local

magnitude (M_L) of 6.9 for the quake. This contrasts with 8.25, the surface wave magnitude (M_S) that the temblor is traditionally assigned.

The surface wave magnitude measures the overall size of the quake, including the length of faulting, but doesn't necessarily indicate the strength of ground shaking near the fault. On the other hand, the local magnitude measures the size of an earthquake in a range of vibration highly damaging to

structures, and thus is of particular importance to earthquake engineers.

The local magnitude hadn't previously been determined for the 1906 quake because of a lack of appropriate seismic records, and thus seismologists didn't know how the temblor compared with more recent quakes in strength of ground shaking. The newly obtained value, 6.9, is approximately comparable to that of many recent large earthquakes in California (for example: the San Fernando earthquake, 6.3 to 6.4; the 1968 Borrego Mountain earthquake, 6.4 to 6.9; the 1953 Kern County earthquake, 7.2).

These figures indicate that the 1906 San Francisco quake is comparable to these temblors in strength of ground shaking near the fault, although the area affected was much larger because of its extensive fault length.

The Richter, or local magnitude, scale that usually is used in reporting magnitudes of California temblors was devised in 1935 for southern California by Charles F. Richter, now Caltech professor of seismology, emeritus. Dr. Richter and Caltech seismologist Beno Gutenberg later extended the scale to worldwide earthquakes. The scale has since gained wide acceptance and is currently the most commonly used measure of earthquake size.

However, Richter's original concept was elaborated upon, so that several types of magnitude scales, such as the surface-wave magnitude scale, are now in existence. These scales provide earthquake specialists with a more complex variety of information about the different types of ground motions produced by a specific quake than is available from the original Richter local magnitude scale.

Please turn the page

To reach their estimate, Jennings and Kanamori developed a new mathematical formula for interpreting old seismoscope records of the quake. The formula enables experts to derive the local magnitude of temblors from the records of seismoscopes—instruments designed to yield a different type of information about ground wave motions than that given by today's seismograph readings.

Their method of calculation should prove particularly important in determining the local magnitude of large earthquakes, because the more sensitive seismographs near an earthquake epicenter are generally thrown off-scale by very large temblors.

Jennings and Kanamori were particularly interested in determining the local magnitude of the San Francisco quake because this temblor serves as a prototype for the disaster-causing potential of such an event.

The 1906 event was the first major earthquake in the United States to be recorded on scientific instruments, and produced the first recognized evidence for the association of faulting with earthquakes, as well as providing the first impetus for earthquake-resistant designs in this country. The possibility of a quake of similar magnitude occurring on the San Andreas Fault or elsewhere is often the controlling factor in the design of major engineering projects in California.

In their calculation of the San Francisco quake's local magnitude, Jennings and Kanamori evaluated data from two instruments that recorded the event—a "simple pendulum" device located during the temblor at Yountville, California, 65 kilometers from the epicenter near the Golden Gate Bridge, and a Ewing Duplex Pendulum seismoscope that recorded the quake from Carson City, Nevada, 291 kilometers from the epicenter. The seismoscope had been retired

from service in 1916; it eventually was located in storage at the Reno campus of the University of Nevada.

Both instruments are similar to today's more sophisticated seismoscopes—devices that record earth motions via a conical pendulum suspended by a fine wire from a horizontal beam. The record is scribed by the pendulum on an inverted smoked watch glass, and the strength of the temblor is calculated through mathematical analyses of the extent of the scratch marks. Engineers use seismoscope records to calculate the effects of earth motions on buildings and other structures.

Before evaluating the record of the Carson City instrument, the scientists needed to know its inherent responses to seismic waves—its period, damping, and gain. When it was recovered, it was damaged and some of its original parts were missing. At Caltech, it was repaired by Ivar Sedleniek of the Institute's Seismological Laboratory and Raul Relles of the Earthquake Engineering Laboratory.

To check the accuracy of their reconstruction, and to help evaluate the seismoscope's functioning, Kanamori and Jennings compared test results from their instrument with those from identical tests done on a similar instrument in London. The London instrument, which rested in the London Science Museum, was tested by their colleague N. N. Ambraseys.

After these tests, they calculated the magnitude of the quake from the records of both the Carson City and the Yountville seismoscopes, and arrived at an approximate local magnitude of 6.9. In arriving at this figure they also examined records from Ewing Duplex Pendulum seismographs from Mt. Hamilton, Alameda, San Jose, Oakland, and Berkeley, California—all located from 20 to 36 kilometers from the earthquake fault.

Records from those sites were seriously distorted by the strong motion, which drove the instruments off-scale. However, the scientists estimated that, even if the instruments had gone off-scale by a factor of 20, which was unlikely, the local magnitude of the San Francisco quake would not have been more than 6.9.

Fullerton named Institute relations vice president

Dwain N. Fullerton, former associate vice president for medical development at Stanford University Medical Center, has been named vice president for Institute relations at Caltech, President Marvin L. Goldberger has announced. Fullerton, 48, responsible for development and public relations at the Institute, replaces Eugene R.



Dwain N. Fullerton

Wilson, who has become executive director of the Atlantic Richfield Foundation.

"We are delighted that Dwain Fullerton, a highly regarded professional in higher education, has agreed to join us at the Institute and we extend to him a warm welcome," said Goldberger. "The position of vice president for Institute relations is one of the most important at Caltech—one that is vital in maintaining the Institute's relationships with alumni and friends of the Institute, business, industry, private foundations, and the public."

A native of Hanford, California, Fullerton served in the U.S. Coast Guard, and earned his BS and MA in philosophy from Stanford and was a Fulbright Scholar at Universidad Nacional de Chile. He joined Stanford in 1960 as director of mail appeal for the Stanford Annual Fund, and in 1967 was named associate director of Stanford's International Center for the Advancement of Management Education (ICAME). His duties at ICAME carried him to Lima, Peru, where he was responsible for the center's educational programs in the provinces and operated the Latin American portion of ICAME operations.

He was named director of corporate relations at Stanford in

1969, and in that post was responsible for all university corporate gift programs. In 1979, he was named associate vice president for medical development at Stanford, and designed and executed the development programs for the Stanford University Medical Center, the Hospital, and the University Clinics.

Fullerton assumed his duties at the Institute in November. He and his wife, Patricia, and their two children, Sarah, 16, and James, 11, will make their home in Pasadena.

Corcoran honored by Mexican academy

William H. Corcoran, the Institute Professor of Chemical Engineering, has been elected a corresponding member of the National Academy of Engineering of Mexico.

In October, Corcoran began a two-year term as vice president of the Accreditation Board for Engineering and Technology (ABET), formerly called the Engineers' Council for Professional Development (ECPD). ABET has responsibility in the United States for accreditation of educational programs for engineers, engineering technologists, and engineering technicians.

Vanoni distinction

Vito A. Vanoni, professor of hydraulics, emeritus, has been named an honorary member in the American Society of Civil Engineers, the highest distinction given by the ASCE. There are fewer than 100 honorary members in this society of more than 60,000 members. Vanoni has been distinguished in his field for pioneering research over 40 years in the area of transport of sediments by flowing water.

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EDITORIAL STAFF

Executive editor: Winifred Veronda.

Staff associates: Phyllis Brewster, Diane Davis, and Kay Walker.

Photographer: Chris Tschoegl

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Alumni Association President Jim Workman and National Alumni Fund Chairman Andy Campbell at the formal dedication of the Alumni House.

Caltech alumni: proud possessors of a handsome home

Celebrating the fulfillment of a long-cherished dream makes any social event especially festive. So it was with joy and delight that members of the Board of Directors of the Alumni Association and of the Caltech faculty met on October 23 to formally dedicate the Alumni House and to honor friends and donors who had made it a reality.

The early 1920s white-frame residence, its traditional furnishings in keeping with its heritage, looked particularly handsome as guests toured the downstairs living and dining rooms, lanai and gardens, and the offices upstairs that house the Alumni Association and Alumni Fund. Guests unanimously agreed that the Association can take tremendous pride in the home it has acquired.

Hors d'ouvres were passed and in the dining room, the Duncan Phyfe table was spread with an array of fruit and cheeses for the visitors to sample. The table and Chippendale chairs, upholstered in Italian kid leather, are a gift from the Caltech President's house. An antique sideboard sits nearby.

Decorations in the living room reflect Caltech's own history; an architect's rendering, showing a 1924 conception of the Caltech campus of the future, hangs over a Chippendale sofa, while a bust of

Amos G. Throop, founder of Throop Polytechnic Institute, looks out from over the fireplace.

Recognized with special thanks at the cocktail reception were the founders of the Alumni House—individuals who have made major contributions to the project: Robert E. "Ed" Foss, BS '32; James W. Glanville, MS '45, Eng '48; Richard L. Hayman, Ex '36; J. Stanley Johnson, BS '33, MS '34; John R. McMillan, BS '31; Carel Otte, Jr., MS '50, PhD '54; Stanley R. Rawn, Jr., BS '52, MS '53; the Gnome Club and the Sigma Club. On hand to express their thanks were Caltech President Marvin L. Goldberger, Alumni Association President James W. Workman, and Alumni Fund Chairman Andrew B. Campbell.

Goldberger, Workman, and Campbell said "thank you" to all the alumni and friends who supported the project and its realization—founders, founding donors, and contributors. "Because of your generosity," said Workman, "14,000 Caltech alumni can now enjoy their own home."

The Alumni House is the culmination of an idea initially conceived in 1966 when the Alumni Association first proposed acquiring an alumni center. Last winter—13 years later—the Association Board of Directors, under the leadership of Carel Otte, decided that such a center had become imperative because of tremendous growth in programs and services.

When Caltech granted the Association the use of an Institute-owned house at 345 South Hill

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Carel Otte, the 1979-80 Alumni Association President, with Caltech Trustee James W. Glanville and Caltech President Marvin L. Goldberger. Glanville and Otte were among the Alumni House founders honored at the formal dedication.



Caltech President Marvin L. Goldberger with Mr. and Mrs. J. Stanley Johnson. Johnson was honored as an Alumni House founder.



Victor V. Veysey and Mrs. Veysey with Fred A. Wheeler, as the Veyseys examine the founder's plaque that Wheeler received as the representative of the Gnome Club.

Many Caltech students "suffer too much" during their undergraduate years because they fail to mix their academic work with sports and activities, says 1980-81 Alumni Association President James Workman, BS '57, MS '58. From his own years as a Tech undergraduate, Workman knows the benefits that come from combining academic work and extracurricular play via on-campus activities, and he would like to encourage present-day students to take advantage of these opportunities. He hopes the new Alumni House will foster the kinds of contacts with undergraduates that will provide opportunities to convey this viewpoint.

A tall, sandy-haired man with a wry sense of humor, Workman is variously described by his friends as "terribly witty, sardonic, and quick on the draw," "disciplined and organized," "warm and outgoing," "analytical and discerning," "appearing laid-back without actually being that way," and "one of those exasperating people who could command a 4.0 average without seeming to try." (Workman says this last remark is an overstatement of the facts.)

The Association president grew up on an orange ranch in Villa Park, California, and he inherited an enthusiasm for sports from his father, who was a Gold Medal winner in rowing at the Olympics in Amsterdam in 1928. Recalling his Caltech student years, he summons up an image of wholesomeness, noting, "Our class was more into ice cream parties than beer busts." To help with expenses, he worked as a student house waiter with a few appearances in waiter's attire at the Athenaeum, and he was a research assistant to a graduate student in engineering.

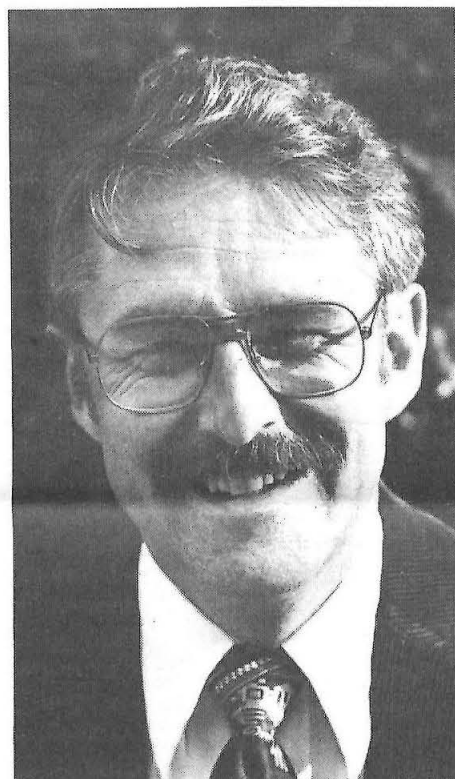
As a student, Workman dipped deeply into the well of undergraduate activities, running track and cross country and playing basketball, and going out for football on urging from Coach Bert LaBrucherie. Although he had never played football before, he lettered in the sport for three years and "was one of the best players to come through the system," according to his former Ricketts House roommate, Craig Elliott, BS '58. (Work-

Students' role model: meet President Jim Workman

by Winifred Veronda

man terms this remark another exaggeration, and says some of his former classmates have cloudy memories.)

The Workman-Elliott friendship was put to a unique test when the two roommates opposed one another in a close race for the ASCIT presidency in 1956. (It was a personality contest, rather than a battle over issues, Workman recalls.) El-



Jim Workman

liott won the race but the friendship endured; Workman was an usher at Elliott's wedding two years later.

An outstanding student, Workman sustained an excellent grade point average despite his heavy involvement in sports and student government, and never seemed to feel the weight of academic pressure, according to former housemate Dick Van Kirk, BS '58. Van Kirk was one of several contemporaries of Workman's who also knew him as an instructor. During 1957-58 Workman taught applied mechanics/dynamics for Professors Donald E. Hudson and George W. Housner, and he earned a reputation as an outstanding lecturer.

After completing his master's degree at Caltech in 1958, Workman went on to Columbia University where he spent four and a half years and earned an Eng ScD degree. It was there on a blind date that he met Marian Wilson, the

future Mrs. Workman, who was a nurse at Columbia Presbyterian Hospital in New York City.

From New York the couple returned to the West Coast where Workman joined the staff of the Rand Corporation in Santa Monica. He left Rand for employment with a consulting engineering firm owned by Caltech alumnus Mihran S. Agabian, MS '48, and after ten years he joined Applied Theory, a Westwood, California, firm that conducts studies for the Department of Defense concerning ground motions caused by nuclear explosions.

The father of four teenagers—Paul, 13; Bill, 15; Tom, 16; and Nancy, 18—Workman has been active in youth programs, particularly YMCA club programs and scouting, and has navigated the lower Colorado River twice with scouts on canoe trips. Mrs. Workman works as a nurse at the Little Company of Mary Hospital in Torrance, and the couple share responsibilities at their home near the beach in Westchester.

Workman became involved in the Alumni Association when he was asked to serve on the Alumni Seminar Day Committee. Workman was intrigued with this opportunity to stay in closer touch with developments on the campus, and in 1975 he became a member of the Alumni Association Board of Directors.

As he discusses Alumni Association activities this year, Workman emphasizes the Alumni House and its potentials for strengthening the Association's visibility.

"When we decided to go ahead with the Alumni House, we took a look at our image on campus," he says. "We're a source of support for several student projects, but, too often from the students' perspective, the Alumni Association has been just another door. The house will give us much stronger identification, and in the long run, this will provide Caltech with a stronger alumni body."

The Association has made a commitment to invest more than \$100,000 in the house, Workman notes, and he adds that "this investment will substantially increase our ability to serve alumni and the campus." Establishing the house as an integral part of the Caltech community and ensuring its maximum use by faculty, students, and alumni is a major goal of the Alumni Association this year, he stresses.

And along the way, there will be

plenty of opportunities to remind undergraduates that they can ease their academic sufferings via non-academic breaks.

Radio telescope array proposed

Continued from page 1

Donald C. Backer of UC Berkeley. These scientists were aided by several dozen other radio astronomers around the country.

The scientists say the Caltech-funded study evaluated the idea of a transcontinental radio telescope array, first proposed in 1977, in the light of recent substantial advances in the art of Very Long Baseline Interferometry (VLBI). VLBI involves operating two or more widely separated radio telescopes simultaneously and combining their data to give the effect of one extremely large telescope. During the array's operation, the earth's rotation produces a scanning effect that allows the VLBI array to "build up" a radio map of a celestial object.

Since the 1960s, VLBI has given astronomers an unprecedented look at the structure of astronomical objects. By synchronizing observations using high precision atomic clocks, astronomers have been able to correlate distant telescopes and to produce the first crude radio maps of distant galaxies with violent active centers. The maps have revealed such phenomena as massive jets of matter and energy spewing from galactic cores.

With VLBI, scientists making precise studies of the earth use distant quasars as fixed beacons to determine the relative movement of the radio telescopes. They also have made precise measurements of the earth's rotation and of the movement of such crustal features as the San Andreas fault.

Because the individual radio dishes of the proposed array would be so widely separated, it would be possible to make astronomical measurements trigonometrically, according to the report. This would greatly reduce uncertainty about such fundamentally important measurements as the distances to stars, galaxies, and other objects.

The report notes that, for geophysics, VLBI provides accurate astrometric and geodetic measurements of the rotation of the earth and the motion of its crust. These measurements can give information on the earth's liquid interior, the mass and movement of its atmosphere, the process of continental

drift, and earthquake generation. In addition, the VLBI array could test the theory of relativity by comparing theoretically predicted and actual measurements of the gravitational deflection of radio waves from stars by the sun.

Radio telescopes throughout the world have already been joined in VLBI studies, and in this country a group of seven existing dishes (in Massachusetts, West Virginia, Iowa, Texas, and California) have been involved in VLBI studies since 1975. Although these arrangements have provided a powerful tool for mapping objects in outer space, the Caltech-JPL researchers say the network has several major drawbacks. Among these are its poor geographic coverage, poor short wavelength performance of the antennas, and the lack of standard equipment and central coordination.

Alumni House

Continued from page 3

Avenue, the alumni board voted to raise the money to remodel and refurbish the 3,900 square feet of interior space and to relandscape the grounds. Since last winter more than \$95,000 has been raised in a low-key fund-raising effort among a few staunch supporters of the organization. In less than a year, the Alumni House has become a reality.

None of the funds have been drawn from those of the Association itself, nor has the fund raising conflicted with any Association or Alumni Fund activities. Pleased with generous gifts from the small group contacted, Workman says that additional funds are needed to finish furnishing the house and to landscape the yard. Another \$15,000 is required to complete the work.

Caltech orients its class of 1984; Big Brother doesn't show

New Caltech students partook of a rock-and-roll trip to Freshman Camp on September 25 as the Institute returned—after a one-year diversion to the San Bernardino Mountains—to Catalina Island for its freshman orientation.

Introductions to practically everything at Caltech filled the two-day program as upperclass men and women, RAs, staff, faculty, and alumni kept up a flow of vital information. In assemblies and gatherings, the new students were wel-

comed (by everyone official), advised (on everything official and unofficial), instructed (about the honor system), encouraged (to join extracurricular activities), directed (on how to survive rotation), and admonished (to seek advice).

In the evening they were entertained by the Beatles (on film), and on stage by a widely varying range of talent. And they were informed about research in lectures by faculty members.

Professor of Chemical Engineering Fredrick H. Shair reported on his research involving the tracing of prevailing air-pollutant travel patterns through the Los Angeles basin and beyond. Assistant Professor of Political Science Bruce E. Cain drew upon statistics to examine the reported strength of the political shift to the right.

Professor of Geophysics Thomas J. Ahrens, discoursing from the beach, described the reasons for the unique eastern direction of magnetization of the rocks of Catalina. And Professor of Environmental Science Wheeler J. North, standing on the edge of a partially submerged dock, handed around freshly gathered samples of local underwater organisms for examination, along with information about each of them—giant kelp, soft coral, a sea star, sea cucumber, rock scallop, spiny lobster, sea urchin, and sandshark.

In other more impromptu addresses, the new students heard words like these:

"Part of maturing is learning to overcome frustration. Doubts are natural, but don't try to handle them without help."

"In high school you were academic studs. Here you'll sweat blood."

On the honor system: "Accept

now; the believing will come later."

"Here you can talk to people without having to talk down."

"Eight out of ten undergraduates are here with financial assistance from outside their families."

"It took me a year here to figure out that double-E (EE) was an option instead of a shoe size."

"Bitching is a way of life here. Try to break the cycle."

Humorous references to Big Brother and 1984 reoccurred frequently in the talks and presentations, and it was with both humor and sincerity that James J. Morgan, vice president for student affairs, ended his greeting to the class with:

"I expect to see you all at commencement—in June 1984."

Research goes on as usual for this new millionaire

Caltech Research Fellow Richard Scheller, 26, says that becoming an overnight millionaire won't really change his life very much. His most important objective will be to continue his research involving the molecular biology of the early development of sea urchin embryos—that is, once the media have moved on to other news phenomena and left him in peace.

Scheller, who earns about \$13,000 a year as a research fellow working with Professor of Biology Eric H. Davidson, made his fortune by owning—at the right time—15,000 shares of Genetech Inc. In mid-October, Genetech became the first genetic engineering firm to sell its stock to the public, sending shock waves through Wall Street. During

its first day on the market, the stock opened at \$35 a share, shot up to \$80 at one point, and finally closed at \$71.25. By then, Scheller's stock was worth \$1.1 million.

Scheller came into possession of these assets as a graduate student working for a few months on research for Genetech—then an unknown company—on the chemical synthesis of a hormone. For his efforts he received a stipend of \$5,000—and a lot of inexpensive stock. Disturbed that he was neglecting basic research, he left the firm early and gave half of the shares back, holding onto a portion that had cost \$300.

Scheller, who lives in a small apartment near Caltech, says that his good fortune will make few changes in his life. However, he probably will reinvest 10 percent of his assets to generate some income for himself. After all, for the immediate future, his earnings will continue to hover around the \$13,000 a year figure. In April he will go to Columbia University Medical School to continue his research, and after that his goal is an academic position "at a good university."

Meanwhile, he doesn't have to worry about fortune hunting females. His good friend of two years is Linda McAllister, 20, a Caltech undergraduate majoring in science and mathematics, and she proved her loyalty while he was poor.

Scheller's office cubicle in Alles was a busy place the day after Genetech went public, as reporters and camera crews trooped through. One of them noticed an empty champagne bottle on a file cabinet and asked whether it was from a celebration of the stock's success.

No, Scheller responded. It was from getting his doctorate. And that's something you can't buy.

Open house for The Associates



At an open house for members of The Caltech Associates in the Institute engineering labs, Rolf Sabersky (professor of mechanical engineering) describes his research for Mr. and Mrs. Victor Lozoya and their guests, Mr. and Mrs. Robert Christy, center.

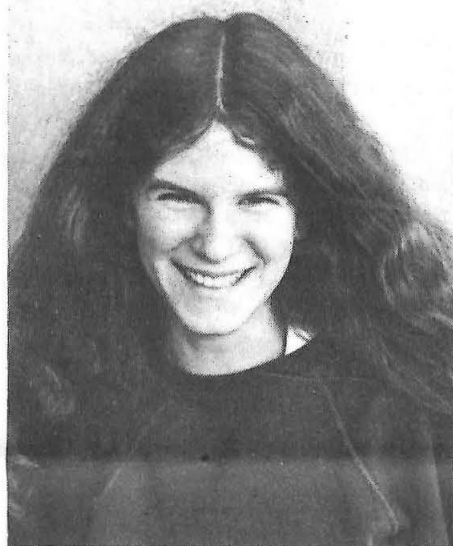
On the cover

In the cover photograph, Caltech laboratory technician Dana M. Hanke works in the synchrotron laboratory on campus to assemble a radio telescope dish destined for the Owens Valley Radio Observatory. The telescope dish is based on a design by Caltech Professor of Physics Robert B. Leighton and is one of three to be used at Owens Valley for coordinated observations. Called an interferometric array, this kind of assembly makes it possible to get information comparable to that from a much larger instrument. The creation of a nationwide array of such radio dishes has been recommended by astronomers at Caltech and JPL. (See story on page 1.)

Freshman Sutton wanted a "hard school" and picked her grandfather's

Caltech freshman Eliza Sutton first heard about the Institute from her grandfather, Richard M. Sutton, but she doesn't remember the conversation. She was only three years old when she was taken for a last visit to her grandfather's home in Altadena just before his death in 1966.

The late Richard M. Sutton might be surprised to learn that his grand-



Eliza Sutton

daughter is studying as a freshman at the same Institute where, in 1920, he earned a PhD in physics along with an all-male contingent of doctoral candidates, and where he taught physics only to men for the last eight years of his life.

Eliza *does* remember hearing about Caltech and her grandfather and physics from her father, David C. Sutton, who earned his PhD in physics from Princeton and teaches at the University of Illinois.

At Caltech, Eliza Sutton may be following one family tradition but definitely not another. Her first academic love, and her intended major, is biochemistry.

"Definitely not physics," says this slight-of-build, 17-year-old graduate of Palo Alto High School's class of

Continued in column 2

The Alumni Association balance sheet

The accompanying Alumni Association financial statement has been carefully reviewed by the Board of Directors. The large deficit shown results from three major causes. First, the dues increase just instituted was delayed a year longer than it should have been. Inflation, continuing at a rate higher than anticipated, magnified the effect of that delay. Small deficits occurred in all areas of Association activity.

Second, because of several special opportunities, more chapter meetings were conducted than are normally scheduled. In keeping with our long-standing policy to support alumni outside the southern California area, the Association underwrote a significant portion of the costs for those programs. Third, after careful consideration the Board of Directors authorized the preparation of new materials for membership development. These materials

Eliza Sutton

Continued from column 1

1980, "because it's theoretical. I'm thinking more in terms of applied science. I'm more geared toward medical school."

Another field at Caltech that Eliza Sutton could easily enter if she chose to is computer science. In the second grade at Washington Elementary School in Seattle, Eliza worked on computer terminals, playing math games in the computer cartoon language, TUTOR. She spent the past summer designing a computer program in TUTOR for third graders in the state of Illinois, under a special education grant to the University of Illinois.

But by the third grade, Eliza was dissecting a cow's eye and a horse's heart, and she liked that better than computer programming. So her studies veered toward biology and eventually into biochemistry.

Why did Eliza Sutton come to Caltech? Because of her grandfather? Definitely not! "I wanted a school that was really hard—where I'd really have to work," she says.

It looks as though Eliza Sutton has come to the right place.

**The October Caltech News story, "The freshman class: a quick preview," stated incorrectly that Eliza Sutton is the granddaughter of Caltech alumnus Richard A. Sutton (BS '43, MS '47). We regret the error.*

represent an investment in the continued strength of the Association—participation by a large number of alumni.

Because of the deficit and our concern for the continued well being of the Association, significant changes have been made in the 1980-81 budget and in the procedures used to keep the Treasurer,

Executive Committee, and Board of Directors informed of our situation relative to that budget. Despite the need to economize and to reduce support in some areas of activity, we believe the Alumni Association program for 1980-81 will serve the alumni, the Institute, and its students in keeping with our tradition of excellence.

ALUMNI ASSOCIATION CALIFORNIA INSTITUTE OF TECHNOLOGY Pasadena, California

BALANCE SHEET

JUNE 30, 1980

ASSETS

Cash on Hand and in Bank	\$ 51,450.85
Investments:	
C.I.T. Consolidated Portfolio	472,156.49
Money Market Fund	25,000.00
Deposits in Savings Accounts	20,360.49
Investment Income Receivable	22,800.00
Other Receivables	2,536.47
Postage Deposit and Deferred Expenses	2,675.37
Total Assets	\$596,979.67

LIABILITIES, RESERVES, AND SURPLUS

Accounts Payable	\$ 16,275.38
Deferred Income:	
Annual Membership Dues paid in advance	33,897.30
Investment Income from	
C.I.T. Consolidated Portfolio	22,800.00
Life Membership Reserve	529,799.19
Reserve for Directory	5,731.19
Surplus (Deficit)	(11,523.39)
Total Liabilities, Reserves and Surplus	\$596,979.67

STATEMENT OF INCOME, EXPENSES, AND SURPLUS FOR THE YEAR ENDED JUNE 30, 1980

INCOME

Dues of Annual Members	\$ 57,686.60
Investment Income:	
C.I.T. Consolidated Portfolio	25,436.42
Deposits in Savings Accounts	2,487.68
Annual Seminar	15,080.35
Program and Social Functions	30,195.93
Class Reunions	10,439.81
Area and Chapter Meetings	7,860.75
Total Income	\$149,187.54

EXPENSES

Publications	\$ 12,000.00
Annual Seminar	19,849.88
Program and Social Functions	29,585.85
Class Reunions	14,496.96
Area and Chapter Meetings	20,663.04
Student Programs	12,988.47
Institute Secondary School Relations	3,194.66
Administration	33,179.11
Membership	8,607.22
Scholarship	326.50
Directory	5,000.00
Total Expenses	\$159,891.69
Excess of Income (Expenses)	\$ (10,704.15)
Surplus (Deficit), June 30, 1979	(819.24)
Surplus (Deficit), June 30, 1980	\$(11,523.39)

AUDITOR'S REPORT

Board of Directors, Alumni Association, California Institute of Technology:

I have examined the balance sheet of the Alumni Association, California Institute of Technology as of June 30, 1980, and the related statement of income, expenses and surplus for the year then ended. My examination was made in accordance with generally accepted auditing standards, and accordingly included such tests of the accounting records and such other auditing procedures as I considered necessary in the circumstances.

In my opinion, the accompanying balance sheet and statement of income, expenses, and surplus present fairly the financial position of the Alumni Association, California Institute of Technology at June 30, 1980, and the results of its operations for the year then ended, in conformity with generally accepted accounting principles applied on a basis consistent with that of the preceding year.

Calvin A. Ames
Certified Public Accountant

September 23, 1980

Obituaries

1925

FRANCIS W. MAXSTADT, MS, PhD '31, on September 6 in Long Beach. Maxstadt had been a member of the Institute staff from 1919 to 1960. He served as an associate professor of electrical engineering, and, in 1953, he was appointed registrar. He is survived by a son and a daughter, 12 grandchildren, and 5 great-grandchildren.

1926

ROBERT W. "R. W." MOODIE on September 3 of a heart attack.

GEORGE W. RUSSELL on June 20 in Ojai, California. At the time of his retirement in 1969 he was general superintendent of American Bridge Division, U.S. Steel Corporation, in Fresno, California. He is survived by his wife, Janice, two daughters, and three grandchildren. In a *Caltech News* article about the Half-Century Club (July 1976), Russell "infused his remarks with optimism as he urged the members to keep up their momentum. He told them that, after 50 years of playing golf, he had just made his first hole in one."

1933

EDWARD D. ALCOCK, MS, PhD '35, in July.

1946

KENNETH BARDEN, MS, Eng '47, on May 10 in Baton Rouge, Louisiana, of a heart attack. He had been retired for several years from the U.S. Navy, with whom he spent a career as an Engineering Duty Only officer.

1961

RODNEY D. DOKKEN, MS '62, on August 18. Dokken drowned while working on his boat. Dokken had been a member of the technical staff at Hughes Aircraft in Torrance, California. Memorial contributions may be sent to Tom Garrow, Office of Memorial Funds, Caltech, 91125.

1984

DAVID J. BAGNALL, on Sunday, October 5, of a blood clot in the lungs. He had planned on studying engineering at Caltech. His parents live in Gainesville, Florida.

Personals

1924

HAROLD R. BECK, who was president of the Alumni Association in 1927-28, is retired and staying at Highley's Guest Home, 6835 Hazeltine, Van Nuys, California, 91405. He desires visitors—any time—and he can be reached by phone, (213) 780-9485.

1933

MERRILL BERKLEY, owner of Rex Engineering Company, Los Angeles, says, "I continue to make two different designs of automatic compressed air drain traps which are marketed by two companies which I keep busy competing with each other. My coffee breaks are two trips abroad each year."

JOHN D. MENDENHALL writes that he retired at the end of 1977 as a principal project engineer after 30 challenging, enjoyable years with Parsons Corporation. Living in "our Seattle home with terraces down to our perpetual brook," Mendenhall is fully occupied with mountaineering (rock and ice), skiing, investments, the Municipal League, and plans and spex for remodeling.

1935

FRANK J. MALINA, MS, MS '36, PhD '40, has edited *Visual Art, Mathematics and Computers: Selections from the Journal LEONARDO*, published by the Pergamon Press. The book, which shows how modern art forms have adapted to present day progress in science and technology, suggests ways of further exploring mathematical visual art.

1942

WENDELL HARTER, MS '47, received the highest award that can be presented to a volunteer leader by the Metropolitan Los Angeles YMCA. The Golden Book of Distinguished Service Award was presented to him for more than 23 years of service to youth. Employed at Northrop Corporation, Aircraft Group, since 1948, Harter is manager, systems effectiveness and safety.

1943

IVER A. LUND, MS, retired on January 11 from his position as chief of the climatology branch, Air Force Geophysics Laboratory, Hanscom AFB, Maine. He is now residing in Merrimack, New Hampshire.

EVERETT J. MACARTNEY has recently been transferred to London where he has been appointed vice president of Brown & Root (U.K.) Limited to oversee their onshore projects in Europe, Africa, and the Middle East.

JAMES H. COLVIN, MS, formerly vice president for business affairs, University of Texas at Austin, became senior vice president on September 1.

A. J. R. SCHNEIDER, BS, MS '43, PhD '49, reports that in 1978 he was fourth in the 20 km race and fifth in the marathon at the National AAU competition, age 55-59 class.

1944

WILLIS A. BUSSARD has become director, government programs division, of SGS Control Services. He says it is "an interesting assignment in a unique aspect of international trade."

1946

LAURENCE O. HAUPT, JR., MS '47, writes, "At the end of 1976 I retired from Procter & Gamble as Manager of the Cincinnati Toilet Goods Plant and with wife Dorothy moved aboard our Whitby 42 ketch in Tarpon Springs, Florida. We had taken it down the Ohio and Mississippi rivers in October 1976 from Cincinnati. With another couple aboard we left Miami on April 30, 1977, for Bermu-

da, the Azores Islands, Portugal, Spain, Italy, Greece, and Turkey. Turnaround point was Antalya, Turkey, and thence to Rhodes, Crete, Yugoslavia, Italy, Corsica, Sardinia, Spain, and now Gibraltar. We will now go to Tangier, the Canary Islands, Barbados, the Carib, Bahamas, and back to Florida by summer 1981. On this long passage we will have another couple aboard, but most of the time in the Med there were just the two of us. We spent the six winter months successfully in Arenys de Mar near Barcelona; Kusadasi, Turkey, about 60 miles south of Izmir; and Cala Galera about 100 miles northwest of Rome. It's been fun but we look forward to seeing our three children and the States again."

1953

ARTHUR E. BRITT sends some news: "I retired in August 1978 after 25 years with Hughes Aircraft Company. I'm living with my wife, Anne, and family in Tucson, Arizona, where I'm enjoying home improvement projects, a few college courses, and real estate investments."

BRIJ SEONI, MS, joined Acres International Ltd. in July 1979 as a senior irrigation engineer. He has recently completed an assignment in Sri Lanka and is now scheduled for one in Thailand.

1957

TERRANCE H. TENNANT, MS, has been appointed program director of the RAM guided missile weapon system at General Dynamics, Pomona Division. RAM is a ship defense Missile System being co-developed under sponsorship of the U.S. Navy and the governments of Germany and Denmark.

1965

MAJOR VERNON L. BLISS, writing from "the place where America's day begins," says, "Last February I finally completed my PhD in atmospheric science at the University of Washington. Since my dissertation concerned the numerical simulation of typhoon formation, I volunteered for an assignment in the tropics; and my family (Janet; Eric, 9; Suzanne, 6) and I wound up here at Andersen AFB, Guam. On 1 June I took over command of the base weather station (Detachment 2, 1st Weather Wing). The job is perfect for a tropical meteorologist because we support flying activities throughout the equatorial areas from Hawaii to the east coast of Africa—and, of course, an occasional tropical storm or typhoon adds a bit of spice to the job."

JOHN F. GUNN, MS, has been named director of the Small Business Systems and Terminal Planning Center, Bell Laboratories, Holmdel, New Jersey. He lives in Rumson, New Jersey, with his wife, Roberta, and their six children, Robin, Susan, Ellen, John, Sarah, and Elizabeth.

1969

RICHARD RUBINSTEIN, now with Digital Equipment Corporation in Massachusetts, asks, "Where is the class of '69?" He answers, "Missing, if the number of personal notices means anything." He provides one personal notice: "Barbara and I are happy and well, successfully transplanted to the east coast." Anyone else out there from '69?

1970

ARMANDO F. SILVA-MOREIRA writes to correct his listing in the Alumni Directory; he is assistant professor of physics at the Instituto de Fisica-Unicamp in Brasil, not professor.

1971

RON JOINER announces a new daughter, Wendi Beth, born January 7, 1980. He and his family live in Pasadena.

1973

BRUCE WILLIAM BENNETT received a doctoral degree in policy analysis from the Rand Graduate Institute at the Rand Corporation on September 4. His dissertation, "Uncertainty in ICBM Survivability," explores the vulnerability of U.S. ICBMs to Soviet attack.

DENNIS Y. LOH writes that "after a three-year period in internal medicine at the Peter Bent Brigham Hospital, I'm back doing molecular biology of immunoglobulin genes at MIT. The former Heidi Petersen and I got married about a year ago."

1974

KEITH R. KARASEK received his PhD in applied physics from Harvard in October 1979. After some months as a postdoc at Harvard, he became a member of the research staff of International Harvester Corporation in Hinsdale, Illinois, in September 1980.

1975

WILLIAM M. COUGHRAN, BS, MS '75, received his PhD in computer science from Stanford University in June 1980 and is now employed by Bell Labs in Murray Hill, New Jersey.

ELIAS S. SHIU, PhD, has been promoted to associate professor of actuarial mathematics at the University of Manitoba, Winnipeg, Manitoba, Canada.

1976

KARL RUDNICK, PhD, has departed from Texas A&M, where he was an assistant professor of mathematics, for a new home in Redondo Beach, California. He is now working for the Aerospace Corporation.

1978

ALVIN J. DREHMAN married Elizabeth Gutai in August 1979. He is now a graduate student at Harvard University, studying materials science.

WAYNE J. THOMPSON, PhD, has been appointed assistant professor of chemistry at UCLA.

1979

WILLIAM D. JONES, PhD, assistant professor of chemistry at the University of Rochester, New York, has been awarded a 1980 Camille and Henry Dreyfus Grant for Newly Appointed Young Faculty in Chemistry. The grant carries a \$25,000 stipend, to be used as seed money for new ideas and projects. Jones's research will involve studies of organometallic compounds.

1980

STEVEN W. JOHNSON, MS, has joined Ethyl Corporation as a development engineer in the process development section of the R & D department in Baton Rouge, Louisiana.

Gates Laboratory renovation

Gates Laboratory—the second oldest building constructed on the Caltech campus—will begin renovation to become the Institute's main administration building. The project is being initiated via a \$1 million grant from the Ralph M. Parsons Foundation of Los Angeles, and the renovated building will bear the name of Ralph M. Parsons.

"We're deeply grateful to the Parsons Foundation for helping us realize our hope of preserving this building," said Caltech President Marvin L. Goldberger. "The Parsons grant will enable us to begin to rejuvenate a building that has housed many generations of fine scientists, and it will also relieve a pressing space problem on campus."

Gates Laboratory, built in 1917, housed two undergraduate chemistry laboratories and two research groups when it was damaged by the 1971 earthquake. Initially it was marked for demolition because of major structural damage (a fate that befell Caltech's oldest building, Throop Hall), but later a decision was made to strengthen and maintain its outer shell in the hope of eventual renovation.

Built before earthquake safety

building codes were established in California, Gates provided 16,340 square feet of laboratory, office, and storage space. It had been a gift of C. W. Gates and P. G. Gates of Pasadena. For many years, all Caltech freshmen became familiar with the building as they took their required freshman chemistry laboratory course inside its walls.

The renovated building will house the offices of the Caltech president, provost, vice presidents, and other administrative and support personnel who are now located in Millikan Library and other buildings on campus. Additional private gifts are being sought to complete the renovation of the entire building as administrative office space.

The person whose name the building will bear, the late Ralph M. Parsons, founded in 1944 the Pasadena-based worldwide engineering and construction firm that is named for him. The company, now working in more than 40 countries around the world, provides design, engineering, and construction services to private and governmental clients for a variety of complex petroleum-chemical, mining and metallurgical, public and civil, transportation and power, and nuclear projects. The Parsons Foundation was established in 1961.

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This dish will become part of a radio telescope array that looks deep into the cosmos. See page 5.