CALTECH NEWS

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Light pollution threatens Palomar's research capacity

By Winifred Veronda

Light pollution — created by urban sprawl in surrounding valleys — is posing a serious threat to Palomar Observatory and its capacity for astronomical study and discovery.

An instrument that measures light, the 200-inch Hale Telescope can detect light from objects 100 million times fainter than the naked eye. But the telescope gathers man-made light just as it takes in that from space — and herein lies the problem.

When it was completed in 1948, the 200-inch Hale was the largest optical telescope on earth. It remains the biggest in this country, and because of its size and its achievements, it has played a leading role in astronomy during much of its existence.

Said Carl Sagan in a recent article, "Despite completion of a defect-plagued Soviet telescope with a 236-inch mirror, the Palomar instrument has remained the largest and most productive optical telescope on earth."

Palomar Mountain was first scouted for an observatory site in 1890 — and was deemed too far away from civilization.

Thirty-five years ago, when the 200-inch lens was installed, the mountain was still remote from towns or cities. San Diego, 50 miles away, was barely detectable.

But today, San Diego and its suburbs have spread on one side of the mountain, and the desert communities have appeared on the other side.

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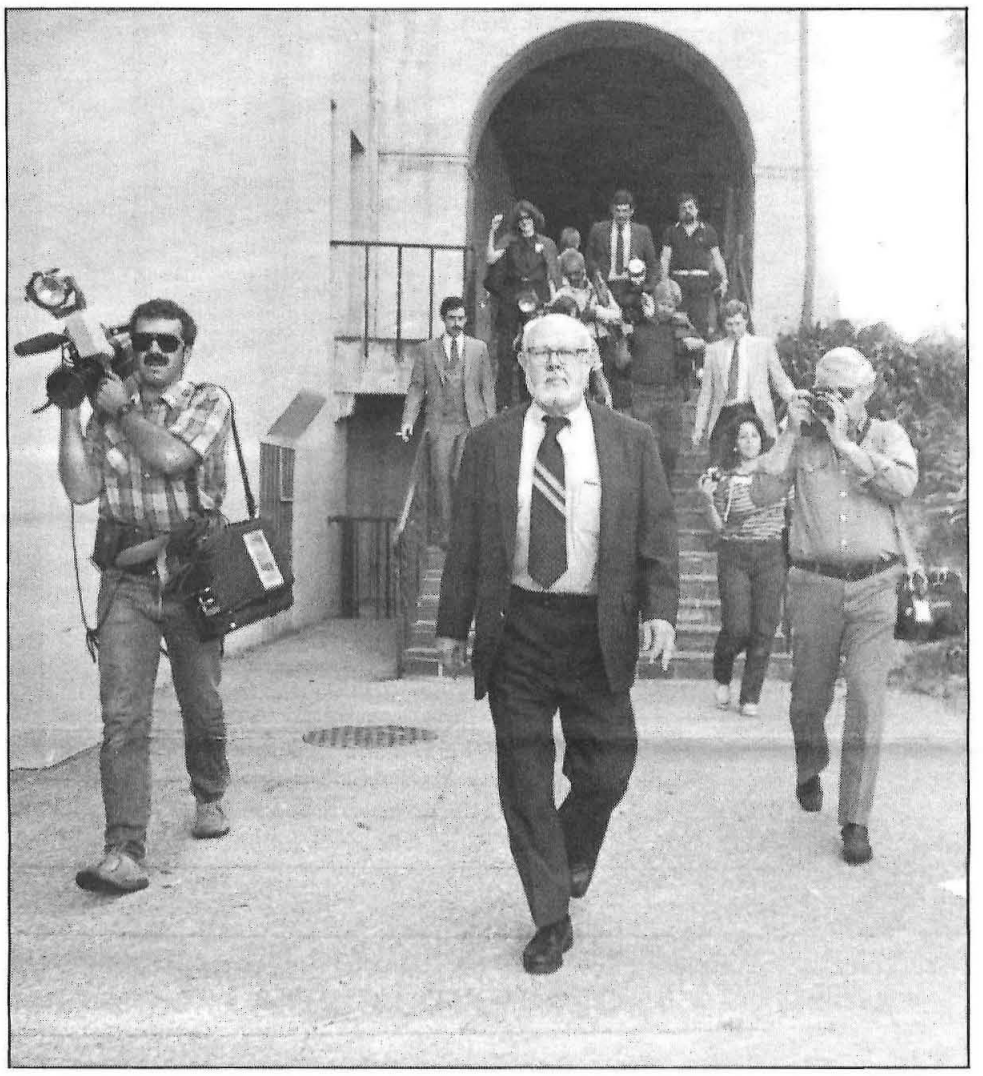


Where does sunlight come from? For Willy Fowler, a Nobel quest

"What we're doing is mainly a cultural and intellectual contribution to the sum total of human knowledge and that's why we do it. If there turn out to be practical applications, that's fine and dandy, but we think it's important for the human race to know where sunlight comes from."

With these words, William A. Fowler discussed his work on the life cycles of stars and the dynamics of chemical reactions for which he was awarded the 1983 Nobel Prize in Physics.

Fowler, who shared the prize with Subrahamanyan Chandrasekhar of the University of Chicago, was attending a conference at the Yerkes Observatory in Wisconsin when the phone call came telling him he was the recipient. The prize is worth about $190,000; he and Chandrasekhar will divide it.

"I was in the shower and suddenly I was aware that the phone was ringing," said Fowler as he talked by telephone to persons at a press conference in the Athenaeum. Fowler said he considered ignoring the phone but decided not to: "When I finally toweled myself off and answered, it was NBC or someone."

"Contrary to my usual way, I'm rather humbled," he said, "because I'm puzzled that I've been singled out among the many, many people who have made major contributions to astrophysics. My career is in stark contrast to that of Barbara McClintock, who just won the Nobel Prize in medicine. She did that on her own, whereas my work has been in collaboration with students, postdoctoral fellows, Kellogg faculty, other faculty at Caltech, and with people all over the world."

Terming the prize "a great thing for Kellogg," Fowler said it is in recognition of "how much the lab has contributed to a very fundamental field of human knowledge. Whether or not it will have any practical application I don't know, but I don't know that we care. To know how energy is generated in the stars is a very fundamental problem, and we just get a kick out of doing that."

Within physics, Fowler's research has ranged widely, including studies of the atomic nucleus, of how the thermonuclear furnaces of the sun and other stars burn and create elements, of the constitution of meteorites, and of the nature of quasars, pulsars, and black holes. He has made major contributions to our understanding of nucleosynthesis—the formation of elements from simpler basic units—and has been termed the "guru" of this field.

Most recently he has been focusing on what he terms "the supernovae problem." "Some stars wind up their final stage of stellar evolution as a gigantic explosion, which astronomers have labeled supernovae, and we're trying to understand the physics of that," Fowler noted. "I'm working on the physics of what goes on to cause a star to explode. We believe part of that is the gravitational collapse of the interior."

Asked repeatedly about practical applications for his work, Fowler said that the most obvious indirect application is toward the terrestrial development of fusion as an energy source. "The connections to our work are not all that direct," he said,

Please turn the page

"because, to make terrestrial fusion work, we have to use deuterium and tritium—heavy isotopes of hydrogen—as the fuel, whereas ordinary hydrogen works in the sun. But we've studied many reaction processes that take place in stars that we believe will be of secondary interest to the people who are trying to make terrestrial fusion work."

Fowler said there are also practical applications for medicine—again indirect—through the study of radioactive substances that are produced in element building in stars.

Fowler has been at Caltech since 1933 when he entered as a graduate student after receiving his BS degree in physics from Ohio State University. He received his PhD in physics from Caltech in 1936 and became a research fellow in nuclear physics. He became assistant professor in 1939 and professor in 1946.

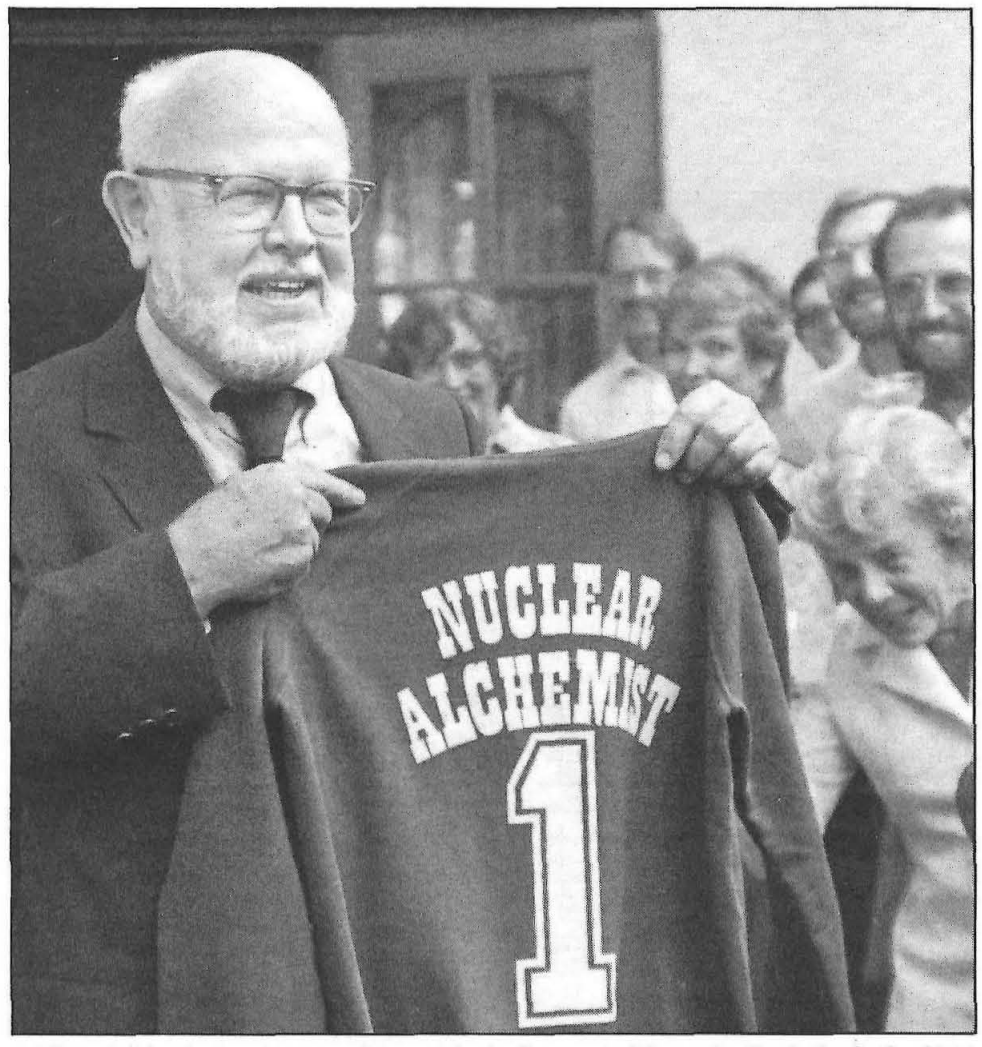
In 1970 he was named the first Institute Professor of Physics at Caltech, an honor given to outstanding faculty members. He became Institute Professor of Physics, Emeritus, in July 1982.

His awards include the National Medal of Science (1974), the President's Medal for Merit (1948), NASA's Apollo Achievement Award (1969), the Eddington Medal of the Royal Astronomical Society, London (1978), and the Bruce Gold Medal from the Astronomical Society of the Pacific (1979). He has been a member of the National Academy of Sciences since 1956.

Fowler is a steam engine buff, and among the personal honors he particularly treasures are his memberships in the Los Angeles Live Steamers and the National Association of Railroad Passengers.

Asked what he plans to do with the prize money, Fowler said, "As you know, I'm retired, so the prize money is going to come in handy."

Fowler is the 20th Caltech faculty member and/or alumnus to receive a Nobel Prize. The total number received is 21, because Linus Pauling was awarded both the Chemistry Prize in 1951 and the Peace Prize in 1962.



William Fowler displays his sweat shirt, a gift of colleagues in Wisconsin. On the back, the shirt is inscribed, "Nobelist 1983." Believing that science can be done with a light touch, Fowler has written papers with such titles as "How Now, No Cosmological Helium," and "What SNU? The Case of the Missing Solar Neutrinos."

Star-struck Kellogg Lab rolls out the red carpet

William J. Fowler (PhD '36) was back on campus and involved in his second press conference in the two days since he had won the 1983 Nobel Prize for Physics. The first conference had been by telephone patch from Yerkes Observatory in Wisconsin to the Athenaeum; this one, in Millikan Board Room, gave photographers the chance to record the Nobel features for posterity.

Caltech sprang its welcome as Fowler emerged from the library. "The Ride of the Valkyries" blared from stereos on campus buildings, and a sign draped from the top of Millikan Library proclaimed, "Whoopee, Willy!" The sign was engineered by husband-and-wife Robert Christy and Juliana Sackmann, faculty members in physics, and anchored in place by Caltech students.

(Neither Sackmann nor Christy could persuade the security forces to open the top door of the library, but this was no problem for the students, who jimmied the door open.)

Hugs and warm wishes surrounded Fowler as he greeted colleagues grouped around the red carpet (provided by Juliana Sackmann) that led the way to the door of Kellogg Lab (festooned with roses) — and to a sign reading, "We're star struck, Willy." Another rose garland surrounded the door to Fowler's office.

Meanwhile, in Dabney Lounge and gardens, where a reception was getting under way, graduate students, post docs, and faculty were warming up on some lyrics prepared for the occasion by Senior Research Associate Peter Haff in collaboration with Professor of Physics Charles O. Barnes.

Commemorating Fowler's enthusiasm for railroading, and to the tune of Casey Jones, one stanza was rendered:

Willy Fowler is a grand old chap
With white hair, whiskers and his Pirate's cap.
He cracks to the students in the tandem lab,
"Boys, there's just one thing that I wish I had."
"Your Medal of Science;" the Kellogg team cries,
"Or maybe your thinkin' 'bout a Nobel Prize?"
"The Nobel Prize? Nope, I'll explain,
All I really want is my little choo-choo train."

The little train was close at hand—circling a track atop a cake inscribed, "What are you going to do for an encore, Willy?"

Fowler displayed another gift that he brought back with him from the staff at Yerkes Observatory—a maroon sweatshirt bearing the inscription, "Nuclear Alchemist #1." The shirt was in the colors of his alma mater, Ohio State.

Pressed to make a few remarks, Fowler noted that he had been asked whether becoming a Nobel laureate would change his life. Not likely. "Being a fellow who's been called Willy for as many years as I have," said Fowler, "this isn't going to change me."

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City lights: growing hazard to Palomar's effectiveness

Continued from page 1

The sky looking toward the cities of San Diego and Los Angeles is now twice as bright as the sky looking away from the cities — and estimates are that, by the year 2,000, population in the area will have increased by more than 50 percent. The effect of this is that, for a significant fraction of the sky, the efficiency of the 200-inch telescope is reduced for many fundamental astronomical problems to the equivalent of a 140-inch telescope. Concern grows that Palomar may experience the fate of Mount Wilson, which has been severely crippled by the lights of Los Angeles.

During the past 18 months, Caltech and Palomar Observatory leaders have mounted a campaign to alert the public to the problem. In approaching communities, they have asked for cooperation on these points:

One point calls for keeping to a minimum lights in the area of the observatory. Coupled with this is a request that much advertising and other non-essential outdoor lighting be turned off by midnight. Another is to have all outdoor lights shielded.

The third step — and the most vital — is to encourage the use of low-pressure sodium (LPS), rather than high-pressure sodium (HPS) street lighting. Street lighting contributes up to an estimated 35 percent to Palomar's light pollution problem.

High-pressure sodium lamps spread their light over a broad band of the colors of the spectrum, overwhelming the faint light from distant galaxies and quasars. Because their emissions are so broad, HPS lights cannot be either filtered out or ignored by astronomers. LPS lamps, on the other hand, emit light in a very narrow band within the yellow portion of the spectrum. Because this "emission line" is so narrow, astronomers can either filter the light out or ignore it.

Says Robert Brucato, assistant director of the observatory, "Low-pressure sodium is monochromatic. It is like a picket fence with just one picket. We can work around it.

"Mercury-vapor (once the standard of lighting for cities but now generally deemed too expensive) is like a picket fence with six or eight pickets. We can also work between its lines. High-pressure sodium is like a brick wall. There are no gaps for us to look between."

The result to appeals for help have been encouraging in many instances. Riverside County's Board of Supervisors approved a special LPS-only lighting district in the corner of the county closest to Palomar Mountain; city councils in Hemet, Vista, and Poway agreed to convert to LPS lighting; Hewlett-Packard and TRW agreed to use LPS lamps for parking lots in their new plants in San Diego County; and Caltrans agreed to use LPS lighting on I-15 in the vicinity of Palomar.

(Palomar is not the first to make such requests. San Jose acceeded to a request from the University of California's Lick Observatory to adopt a LPS system.)

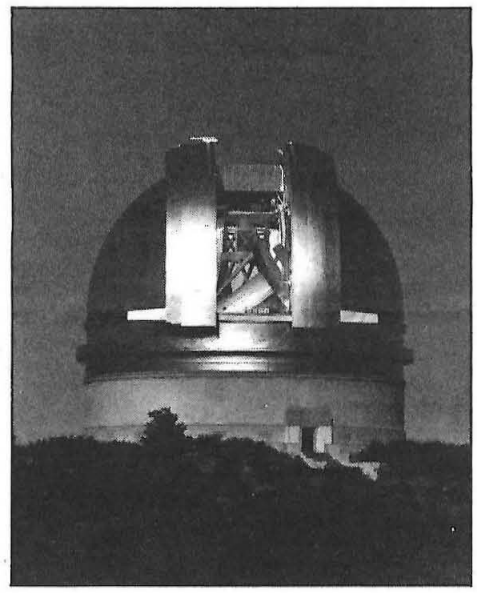
(Several California communities — notably Long Beach, Norwalk, Burbank, Santa Maria, and Redwood City — have adopted LPS lights strictly on the basis of economics. Last year, the city of Long Beach saved $641,000 in reduced energy costs through the use of LPS rather than HPS lighting.)

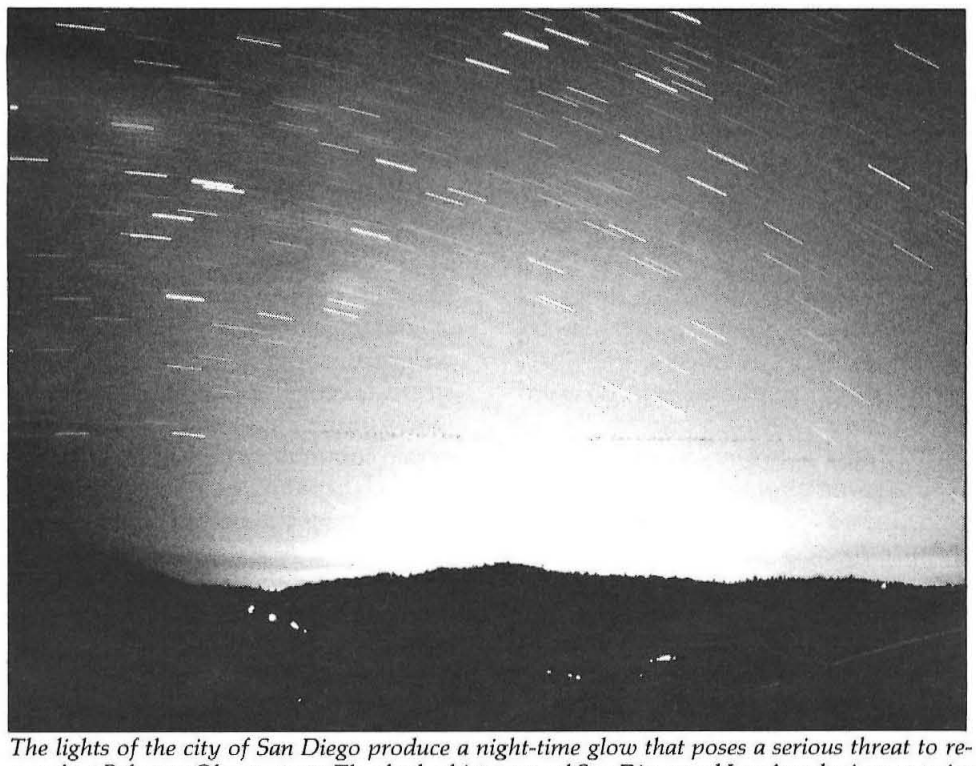
Particularly damaging to the work at Palomar, because of their volume, are the 27,000 lights of San Diego. In November 1982, the San Diego City Council voted to adopt LPS lights as the city-wide standard. The decision was reaffirmed in March 1983. But in June, on a 5-4 vote, San Diego reversed itself and opted for HPS lamps — a decision that Brucato said "will lead to catastrophic degradation of the efficiency of the observatory over time." Also affected by the decision is San Diego State's Mount Laguna Observatory.

The switch came after about 40 residents of Rancho Bernardo, where the new LPS lamps have been tested, attended a city council meeting and complained that the color of the lights was "depressing." "Bug lights," one councilman branded them.

As *Caltech News* went to press, there had been no change in the situation in San Diego, but Caltech and Palomar officials were continuing to work with the council to try to get the situation reversed. They were also working with several other communities such as San Marcos and Escondido.

Throughout the country, other scientific institutions were watching anxiously, fearing that San Diego could set an unfortunate precedent for other areas where astronomers are trying to reduce light pollution. Meanwhile, individuals close to the situation in San Diego reminded residents that observers outside the scientific community were also taking notes.





The lights of the city of San Diego produce a night-time glow that poses a serious threat to research at Palomar Observatory. The sky looking toward San Diego and Los Angeles is now twice as bright as the sky looking away from the cities.

Said San Diego City Councilman Michael Gotch, a LPS proponent, "San Diego is being watched by a number of high-tech companies. They are waiting to see what kind of support we give the academic and technical communities before they move here."

The light pollution problem has evolved at a time when new technological instruments have made the 200-inch even more powerful as a research tool than before.

Because of its versatility, the telescope can be used for both infrared and microwave astronomy in addition to dark-sky astronomy. "Some scientific instruments have a very short life," said President Marvin L. Goldberger. "There aren't many that are more important today than 35 years ago."

Also at Palomar are a 60-inch reflector telescope and a 48-inch Schmidt telescope. Equipped with a new corrector lens, the Schmidt is about to embark on a new sky survey.

As far as its long-term future is concerned, light pollution is the major problem for the telescope, according to Palomar Observatory Director Gerry Neugebauer: "Without light pollution, we should be able to keep on using Palomar far into the next century," he said. "The only limit is our imagination in building new instrumentation, and we can keep on doing that. The limit set by light pollution, however, will soon be a fundamental limit; that is, because of it, we won't be able to keep on pushing to fainter and fainter objects."

Whatever the problems imposed by light pollution, the observatory's only alternative is to stay on Palomar Mountain. Atmospheric turbulence there is very low, and visibility is good. A national forest surrounds the observatory, so that development will at least be kept a minimal distance away. Also, there aren't many good sites left. And besides, to duplicate the facility today would cost $50 to $100 million, Neugebauer has pointed out.

Teaching fellowships: corporate aid for crisis in engineering education

By Winifred Veronda

Steve Toner (BS '79) gave up a lucrative job in industry more than a year ago to return to graduate studies in mechanical engineering at Caltech. Here he is involved in rotor dynamics research having to do with pumps, turbines, and other rotating machines that experience vibration problems.

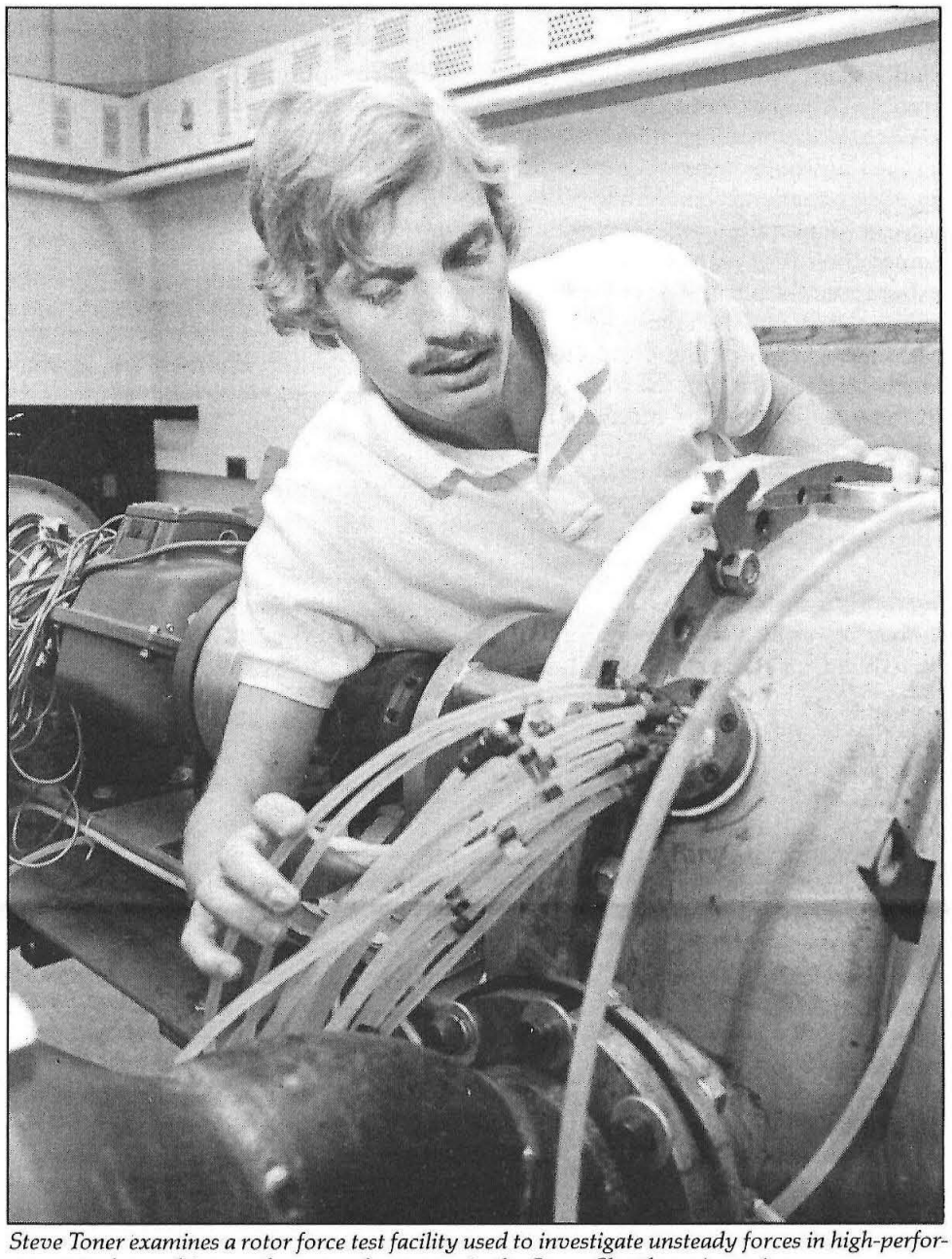
Supported by an Exxon Teaching Fellowship, Toner plans on an academic career after he earns his PhD. He says he wants to teach "in a top school where the students go to learn."

Toner figures that his initial faculty position, some three years in the future, will pay less than the job in industry that he quit last year — and industry increases employee salaries at about 10 percent annually.

Why was he willing to face such a big cut in pay? "When I was a student here, the professors were simply incredible in the way they helped students," he says. "I wanted to help other students in the same way. I can live comfortably working either in industry or at a university. It's just a matter of how comfortably I insist on living." He says that the Exxon fellowship "has given me much more freedom to take the time I need to do a good job on my research."

Exxon, which launched the fellowship program in 1981, is one of a number of corporations to become concerned about the drain on academic talent in engineering and related fields because of high salaries available in industry, and to take steps to help through grants to major universities throughout the country. At Caltech, fellowships for students planning on academic careers are offered by the Atlantic Richfield Foundation, the Exxon Educational Foundation, the General Electric Foundation, the Hewlett-Packard Company, the Shell Companies Foundation Inc., and the American Electronics Association.

"The shortage of high-caliber science and engineering faculty at our universities is reaching crisis proportions," said William F. Kieschnick, president of the Atlantic Richfield Company, when the foundation announced its program in 1981.



Steve Toner examines a rotor force test facility used to investigate unsteady forces in high-performance turbomachines — for example, pumps in the Space Shuttle main engine.

"Some of this is due to the high salaries offered for engineers in industry. Academic careers in science and engineering must be made more attractive to talented young people."

In general, the fellowship programs simply ask that the recipients plan on pursuing academic careers. The Hewlett-Packard Company program is unique in offering a combination of fellowship funds, and of loans that are forgiven after an academic career is launched. The American Electronics Association fellowship carries the same stipulation.

By and large, the fellowships carry specific students through their doctoral programs, but the General Electric program is unique in targeting its support to first-year students for whom funding — among graduate students — is generally most limited.

At Caltech the fellowships make a highly welcome contribution to shrinking funds for graduate support.

Stirling L. Huntley, associate dean of graduate studies, said, "The fellowships designed specifically to encourage careers in teaching are a welcome innovation. They demonstrate a recognition in the corporate world of the importance of the academic community in supplying basic research capabilities — and of the need to keep our research universities strong.

"We all recognize the importance of graduate students to our future technological strength. But we are limited by our financial resources in our ability to train them and every year there are slightly fewer fellowships and traineeships available. The corporate awards help to fill that need.

"We welcome not only these fellowships, but any innovative approaches in support of graduate education."

Roy Gould, chairman of Caltech's Division of Engineering and Applied Science, said the shortage of young engineers for university research and teaching positions continues to be critical. "We appreciate these fellowships and hope they will have a positive effect on the situation," he noted. "We're grateful for the awareness of the problem among corporate leaders, and for their efforts to help resolve it."

At Caltech, graduate enrollment has been rising slowly despite the lure of corporate positions for holders of BS degrees. Graduate enrollment in 1982-83 totaled 955 — the largest in Caltech's history — up from 897 in 1981. That year had also set a record. Enrollment this year is holding steady at 941. Applications to graduate engineering programs at the Institute were up 6 percent in 1982 and holding level in 1983-84. Two more students applied this year than last year.

Also up substantially over previous decades is foreign student enrollment. In 1981-82, 31 percent of all Caltech graduate students — and 44 percent of those in engineering — were from foreign countries. The same percentages have held for 1982-83 and 1983-84.

Corporate fellowships to support persons intent on academic careers constitute only a small part of corporate fellowship assistance.

At Caltech, current corporate fellowship donors also include Eastman Kodak Company, Honeywell, IBM, Rockwell International Corporation, Schlumberger, Standard Oil Company of California (Chevron), Standard Oil Company (Indiana) (Amoco), Standard Oil Company (Ohio), and Sutherland, Sproull, and Associates.

IBM has the largest program, with ten Caltech graduate students receiving IBM fellowships for the 1983-84 academic year. In addition, General Electric Company and Gulf Oil Corporation have endowed fellowships at the Institute.

Caltech trains Chinese technicians in joint seismological project

An array of 40 strong-motion seismographs is installed and operating in several earthquake-prone regions of China, as part of a joint U.S.-Chinese project. Using seismographs installed deep in several Chinese coal mines, the array, designed to accurately monitor large damaging earthquakes, includes a unique feature that allows the study of quakes in three dimensions.

Early this fall, technicians from China visited Caltech to receive training in operation of the system and to analyze earthquake records obtained thus far.

Principal investigators for the project in the United States are Caltech Professor of Applied Mechanics Wilfred D. Iwan, David Boore of the U.S. Geological Survey, and Ta-liang Teng of USC. Funding is from the National Science Foundation.

The instruments in one part of the array near Tangshan have already recorded more than 70 aftershocks since the 1976 Tangshan earthquake. The largest was a magnitude 6.2 quake last fall. Data were obtained as close as two miles to the fault where the quake occurred.

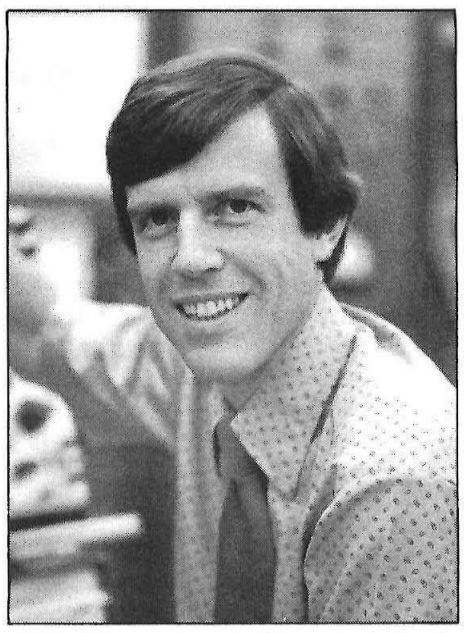
(At magnitude 7.8, the Tangshan earthquake was one of the largest ever to strike a heavily populated area; it resulted in several hundred thousand deaths.)

Installation of the China array marks a significant increase in the number of strong-motion instruments in China. Before its installation, only about 100 strong-motion seismographs existed in that country, in comparison to almost 3,000 in the United States.

Because of the high level of seismicity in China, earthquake engineers expect the installation to yield much valuable data on the motions from large earthquakes and their effects on buildings.

The China strong-motion array is highly mobile, and can be redeployed within days to the site of a major earthquake to measure aftershocks or in response to a predicted earthquake. Some 15 instruments of the system are currently deployed in a dense "parking" array in a seismically active area west of Beijing, straddling the Baboshan Fault. This array runs along a line perpendicular to the fault, and ends in a two-dimensional array of instruments near a medium-rise apartment building that is also instrumented.

"We hope to be able to obtain three kinds of measurements of a large earthquake with this type of arrangement," said Dr. Iwan. "The line of instruments will give us information about the attenuation of ground motion with increasing distance from the fault, the two-dimensional array will tell us about the coherence of ground motion over a relatively small area, and the building instruments will tell us how all this relates to the response of a typical building structure."



Wilfred Iwan, a principal investigator in the U.S.-Chinese project. Iwan is professor of applied mechanics at Caltech.

Another five instruments are currently deployed in a seismically active area in Sichuan Province, near Kangching. Chinese seismologists expect that there may be a magnitude 6 or greater earthquake there in the near future. A third group of instruments is deployed near the site of the Tangshan earthquake, including three instruments installed deep within coal mines, up to 900 meters below the surface.

The three-dimensional array is believed to be the only one of its kind, according to Iwan. "We have a unique situation here, with coal mines and earthquakes in the same region," he said. "This means that we can place and service instruments at significant depths without having to drill special holes or design special instruments."

The system, which is self-triggering, consists of a combination of analog records, which use a light beam to record earthquakes on 70-mm film, and digital recorders, which record on magnetic tape. The digital instruments have a pre-event memory of up to five seconds, so that the full record of an earthquake can be obtained even if there is a slight triggering delay.

Geoffrey Fox: new dean for educational computing

Professor of Theoretical Physics Geoffrey C. Fox has been named the first occupant of the new post of dean for educational computing at Caltech. In this capacity, Fox will oversee the Institute's investment in computing facilities and the development of creative ways to use those facilities in education.

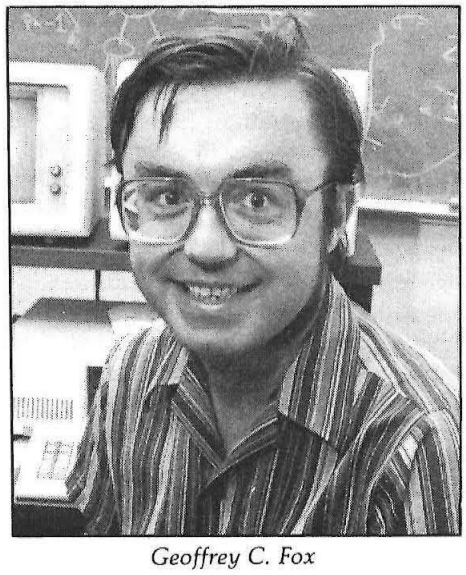
Caltech Provost Rochus E. Vogt said the Institute is determined to use the revolution in computer hardware to the greatest possible advantage in educating students, and thus has taken the unusual step of designating a major academic post to the overseeing of educational computing.

According to Fox, educational computing at the Institute will be distinguished by several features. Students themselves will govern the major student central computing facility, to include three recently purchased Data General MV 4000 computers. A fourth Data General computer will be for use by faculty for general student and academic computing.

"We want to provide a highly diverse environment for our students," Fox said. "We don't want them to graduate knowing about only one type of computer and one operating system."

Besides the Data General computers, the Institute has upgraded or purchased numbers of computers from Hewlett-Packard, IBM, Zenith, and Digital Equipment Corporation, which are available for student use, Fox said. Many of these facilities are tied together by the Institute's campus-wide computer network, which became operational this fall.

"But the real challenge will not be in choosing hardware, but in developing the use of computers for educational aims in a wide variety of disciplines," Fox said. He noted that there are potentials for their uses in physics, chemistry, biology, and the humanities, as well as in the traditional area of engineering education.



Geoffrey C. Fox

"This year, we added courses in computer science and in computational physics and engineering, and we plan to continue to explore new instructional uses," he said. "At Caltech we have a concentration of very able and technically literate students and faculty. For this reason, the Institute should be a leader in innovative uses of computers in education.

"On the other hand, while computers will be extraordinarily helpful to education, we realize that they aren't a be all and end all. We will need to assure a balance in our education that maintains rigorous, excellent teaching."

In addition to his work in high-energy physics, Fox has served as executive officer for physics and is a leader in a major project at Caltech to develop a new kind of supercomputer based on concurrent processor architecture.

Mauna Kea, Hawaii: home for Caltech's new radio astronomy telescope

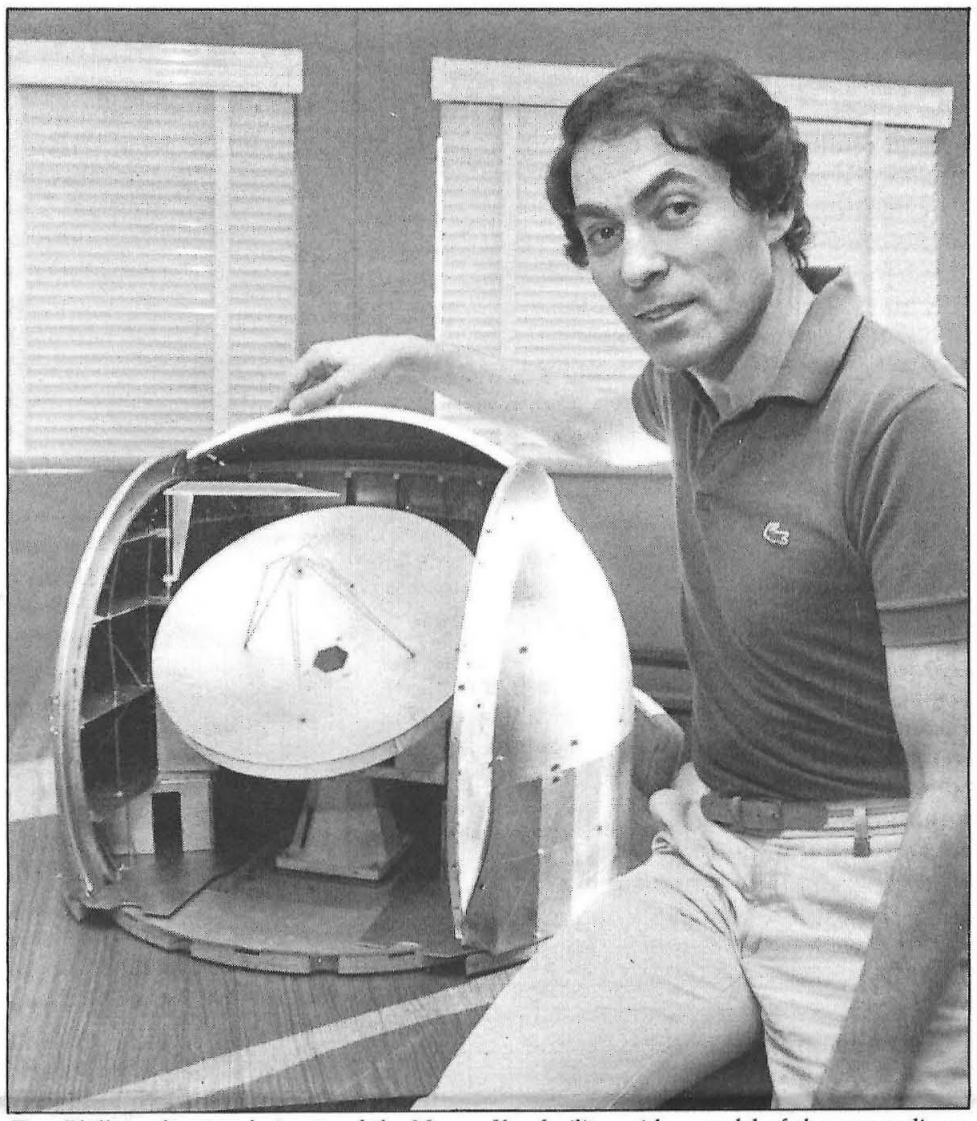
A $3.9 million grant for Caltech's new radio astronomy telescope — the first in the world to be designed specifically for submillimeter-wave astronomy — has been given to the Institute by the National Science Foundation.

The new 10.4-meter (34-foot) telescope will be located on 13,796-foot Mauna Kea in Hawaii, one of the world's highest, driest observatory sites — chosen because of the telescope's extreme sensitivity to water vapor in the earth's atmosphere. (Water vapor weakens the signals from astronomical sources.) The instrument is scheduled to be in operation by 1986.

A relatively new field, submillimeter-wave astronomy covers one of the few unexplored regions of the electromagnetic spectrum and promises to be a major contributor to the exploration of our galaxy and other galaxies. Until now, no telescope has had the high-surface accuracy needed to focus the submillimeter waves, or the high-frequency radio detectors to measure them.

Caltech Professor of Physics Thomas G. Phillips, director-designate of the observatory, says that the new telescope has both the extremely high surface accuracy and a new generation of detectors (including superconducting and balometer detectors) that will enable high-sensitivity studies of both spectral lines and continuum radiation. The telescope will be able to scan wavelengths from one millimeter down to 300 micrometers — one eightieth of an inch — one-third the radio wavelength detectable by any other radio telescope.

The telescope was designed and constructed by Caltech Professor of Physics Robert Leighton. The new NSF funds will be used primarily for the construction of a 60-foot dome to house it. The dome has two novel design aspects — large, lightweight doors that slide back to expose the full "dish" antenna to the sky, and an internal wall and floor structure housing the control, data collection, and support systems for the telescope, and rooms for the astronomers — all of which will rotate so that the telescope will always point through the open doors. The dome and the dish are being built on the Caltech campus and will be shipped to Hawaii and reassembled on the Mauna Kea site.



Tom Phillips, director-designate of the Mauna Kea facility, with a model of the new radio astronomy telescope and the dome that will house it.

The backup structure of the new antenna is a network of steel tubes. The reflecting surface consists of hexagonal aluminum honeycomb panels machined to an accuracy of somewhat better than a thousandth of an inch. The panels are insulated with layers of foam to help reduce distortion from fluctuating air temperatures. A small optical telescope will be mounted on the backup structure to aid in pointing the telescope more accurately.

Over the last two decades, astronomers studying the emission lines in spectra taken at radio and infrared wavelengths have found that the space between the stars is inhabited by dozens of different molecules — including carbon monoxide, formaldehyde, ammonia, methanol, and other compounds of hydrogen, nitrogen, carbon, and oxygen. Research in the submillimeter range will greatly enhance studies of these molecules.

Most of the lighter interstellar molecules emit energy at specific wavelengths in the submillimeter wave region, when their individual atoms change from one rotational mode to another. And many of the molecules (for example, hydrides of magnesium, calcium, aluminum, and silicon, as well as hydrogen chloride) are extremely difficult to observe except within the wavelength range of the new Mauna Kea telescope.

Using the new telescope, astronomers will be able to study the distribution of metals through the galaxy by detecting their hydrides. In this way they will gain insight into the chemistry of the clouds between the stars.

Astronomers also will have access to submillimeter emissions from atomic carbon, and from such heavy molecules as carbon monoxide, hydrogen cyanide, and formaldehyde. This information will yield other insights into conditions within interstellar clouds.

The telescope is the first in the world to be designed specifically for submillimeter-wave astronomy.

In addition to the detection of spectral lines from molecules, the new telescope will also enhance studies of continuum lines from quasars and other violent galactic centers, and from regions in molecular clouds where stars are forming.

Mauna Kea is a well known observatory site, already accommodating four large optical/infrared telescopes — one belonging to Canada, France, and Hawaii, one to the United Kingdom, one to NASA, and one to the University of Hawaii. Caltech and the University of Hawaii expect to use approximately 50 percent of the observing time on the new telescope; the rest will be available to the national astronomy community.

The telescope is the fourth such instrument built at Caltech. The other three, which have lower precision, are installed as an interferometric array at Caltech's Owens Valley Radio Observatory and are used for millimeter-wave studies.

Funding for the project has been furnished by previous NSF and NASA grants, by the Kresge Foundation of Troy, Michigan, and by gifts from Francis L. Moseley and Prince Charitable Trusts of Chicago.

Among the guests at The Associates' annual dinner in the Athenaeum: Mrs. Edward F. Eubanks, Dr. Robert L. Boardman, and his guest, Mrs. James F. Real, Mrs. Joseph B. Earl, and Edward F. Eubanks. About 360 members of The Associates attended the black-tie event.

Judge Cynthia Holcomb Hall, with dinner speaker Dr. Lewis Thomas.

Associates' speaker stresses human responsibility for the earth, its life

The capacity of the human race for folly "has never been matched by any other species," Lewis Thomas, MD, author of the award-winning *Lives of a Cell*, told members of The Associates at the organization's 57th annual dinner in the Athenaeum. "As humans, we are a living part of the earth's life. We are owned and operated by the earth and probably specialized for functions on its behalf that we have not glimpsed. Our biggest folly is to think that we own the place, to envision it as ours — part kitchen garden and part zoo."

Thomas, who currently is chancellor of the Memorial Sloan-Kettering Cancer Center of New York City, stressed that "all species other than humans accommodate one another. They live in patterns of symbiotic arrangements, as part of a coherent body of connected life. They give a little, take a little."

The earth is an exciting place to live as a species, said Thomas, describing it as "a living system, making its oxygen, keeping its parts — including us — interdependent. The earth can keep us awake for years ahead with a thousand questions if we learn not to meddle and not to destroy and how to ask the right questions."

At present, he observed, the human race is altering the balance of constituents in the atmosphere, and the cyclic exchange of nutrients between land and sea, and is endangering the land by deforestation and marine life by pollution.

"We're crowding out other forms of life, and if we keep at it, we'll do ourselves in. But our brains are ideally constructed for looking ahead, for monitoring the planet, and for spotting evidence of trouble — especially the kinds of trouble for which we humans are responsible. I can't think of a better work for the international scientific community, and I hope they'll get on with it."

Thomas expressed hope for the funding of a NASA-proposed Global Habitability Program, designed to take a close look at the "anatomy and physiology of the earth itself. This program is no quick fix; it will involve decades of research and collaboration between science and industry and between virtually all the countries on the earth."

"The military people," he concluded, "are competitive for their kind of scientific prize, but they are more interested in biological phenomena as targets than as objects for affection. Already their photography is so good that they can make pictures of people with up-turned faces — even with tears on the faces. Keep them at it, and make them take a real long look. And meanwhile, give NASA a piece of their budget."

Robert L. Zurbach presided as the president of The Associates, and Caltech President Marvin L. Goldberger made welcoming remarks and introduced the speaker.

Mrs. Robert L. Zurbach (wife of Robert L. Zurbach, 1982-83 president of The Associates) with former Associates' President Howard G. Smits and Mrs. Smits.

Dr. David J. Dahl with Dr. and Mrs. John F. Balog.

Geologist Peter Wyllie:

A new chairman talks about himself— and about the future of the division

By Winifred Veronda

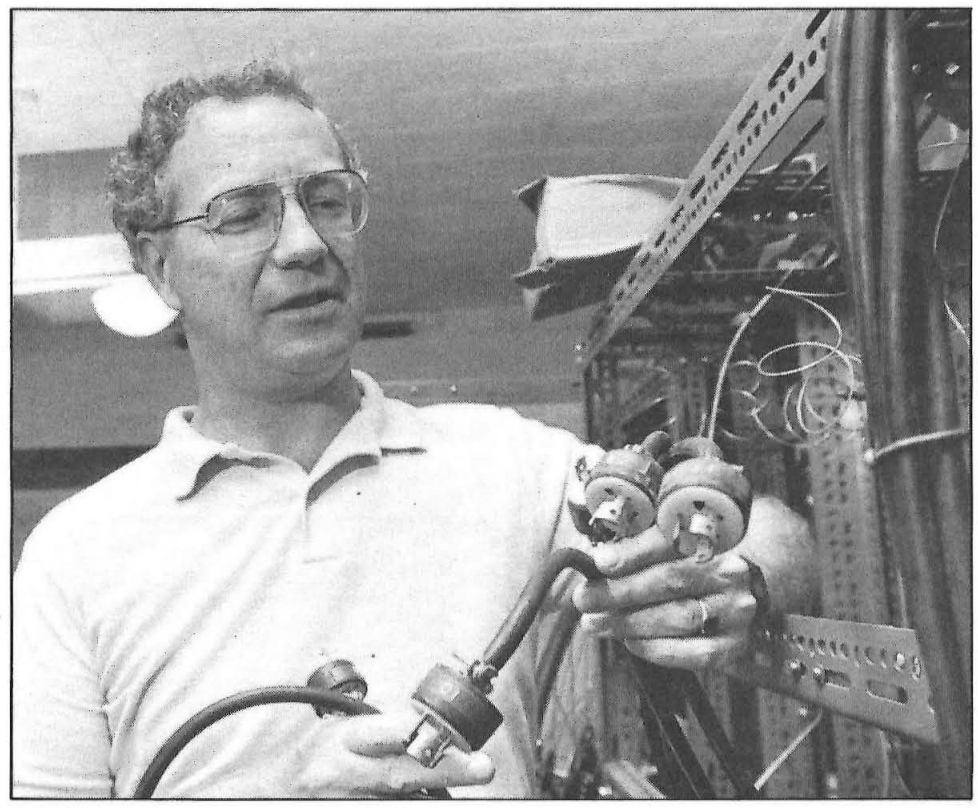
Peter John Wyllie is living proof that if you want a good man for your faculty, it pays to make him more than one offer. Caltech made the geologist its first offer — to be an assistant professor — in 1961 and its second — to become chairman of the Division of Geological and Planetary Sciences — in 1982.

Wyllie regretfully declined the first invitation (he had agreed two weeks earlier to become an associate professor at Pennsylvania State University) but he accepted the second. He arrived in July to step into his role as chairman of a division that he says is "the top in geology and planetary science in the United States--and probably in the world."

A native of London, Wyllie, who was age 9 to 14 during World War II, retains early memories of air raids and food rationing and competing with classmates to find the biggest piece of shrapnel on the way to school.

"My family lived 12 miles from the center of London," he says. "We and the people in six other apartments shared an air raid shelter under the railroad. For awhile, we went there to sleep every night but then we began to stay at home. Our beds would jump from the bombing, but my brother and I would sleep through it all. Meanwhile, my parents would be up monitoring our situation. Young people my age simply accepted the conditions we were living with; for us, they often simply meant a lot of excitement."

The war over and a spell of Royal Air Force service completed, Wyllie went on to do his graduate and undergraduate work at the University of St. Andrews, Scotland, earning his PhD in 1958. In speaking of his choice of universities, Wyllie says, "I had never been allowed to forget that I was one quarter Scottish. My grandfather came from St. Andrews. He had been a draper's apprentice there."



In his role as a researcher, Division Chairman Peter Wyllie conducts experiments at high pressures and temperatures that reproduce conditions deep in the earth. In Arms Laboratory, his Caltech lab is being readied so that he can plug in his equipment and get down to work.

Wyllie noted that the bright young scientists appointed to the faculty were spread over a wide spectrum. They ensured the continuing vitality of division programs.

Wyllie attributes the fact that he is a geologist to some pleasant contacts with members of this discipline that his father had had as a young man. The senior Wyllie worked early in his career as a camp boss for Shell Petroleum at an oil field in Venezuela. As Wyllie was choosing four scientific subjects for his first year at St. Andrews, his father, in memory of his friends in the bush, suggested that his son add geology as the fourth science.

Wyllie responded as a dutiful son, and came to enjoy geology for its own sake. It leapt from the bottom to the top of the list — a position initially held by physics. In the summer of 1950 he was invited to join a three-month expedition to the west coast of Greenland — the first non-Danish group permitted to go there since World War II.

"By this time," he says, "I had decided that I wanted to be a geologist. I believed that a career in geology would be a great way to do science out of doors and to see the world."

After earning his BSc degree in 1952, Wyllie, who planned to become a classical geologist, applied for a two-year appointment as assistant geologist with the British North Greenland Expedition. Here he was one of 25 men engaged in various scientific surveys, with three months of dark time and bunks the size of "a third-class sleeper compartment.

"I never regretted the experience," he says, "but I think I would have declined an invitation to join a second expedition of such long duration."

Back in Scotland, he earned an honors degree in geology and began work on his PhD, studying rocks on Soay, an island south of Skye.

Meanwhile, his professor, Harold Drever, arranged for him to get involved in high pressure studies at Penn State University. "Frank Tuttle was the leading man there, with a very active group," says Wyllie. "Thus I was seduced from the field and into the laboratory from which I had escaped as an undergraduate."

Wyllie brought with him to central Pennsylvania his bride of two weeks, Romy, the daughter of a Scottish surgeon. She had wanted to become an artist but had settled for an MA in the more respectable fields of English and history followed by postgraduate study in secretarial and business college. Later, at 39, she would renew her artistic interests through three years of study for a diploma in interior design. She now has her own company and expects to become involved in design and space planning projects for commercial firms and private residences in southern California.

The couple settled in the rural environment around Penn State and began to assimilate culture shock: people who didn't know where England was, confusion at the drug store over requests for cotton wool and face flannels, four times as much food per meal in restaurants as seemed reasonable, news of urban crime, terrible bread and bacon.

"People from Europe had told us that if we could survive the shock of the first year, we would be OK," says Wyllie, "and we survived with a minimum of frustration and a lot of pleasure."

During these years the couple began a family that now includes a son born with Down's syndrome, who lives in a residential facility in Illinois and works as a checker in a

supermarket, a daughter at Smith majoring in psychology and special education, and a son who is a freshman at UC San Diego.

The three-year research assignment completed, the Wyllies went back to England where he joined the faculty at Leeds University. One year later, at an international geological conference in Denmark, he renewed contacts with friends from the United States and shortly afterward was asked to return to Penn State as associate professor in petrology. Two weeks later came the first offer from Caltech.

Discussing his reasons for returning to a university in this country, Wyllie says, "At a university in the United States, there was much interest in, and incentive to do, research, and a scientist was rewarded for productivity. In England, less priority was placed on research and faculty members were paid according to a standard salary structure."

After four years at Penn State, Wyllie received and accepted a "call" to come to the University of Chicago as professor of petrology and geochemistry. "As we walked around the campus and looked at that marvelous pseudo-Gothic architecture, we realized how much we had missed this kind of university environment," he says.

"The University of Chicago was a terrific place to do research that one wanted to do, the students were bright and creative, and the teaching was challenging and stimulating. We only lived a 10-minute walk from campus, in an area that was tremendously rich intellectually."

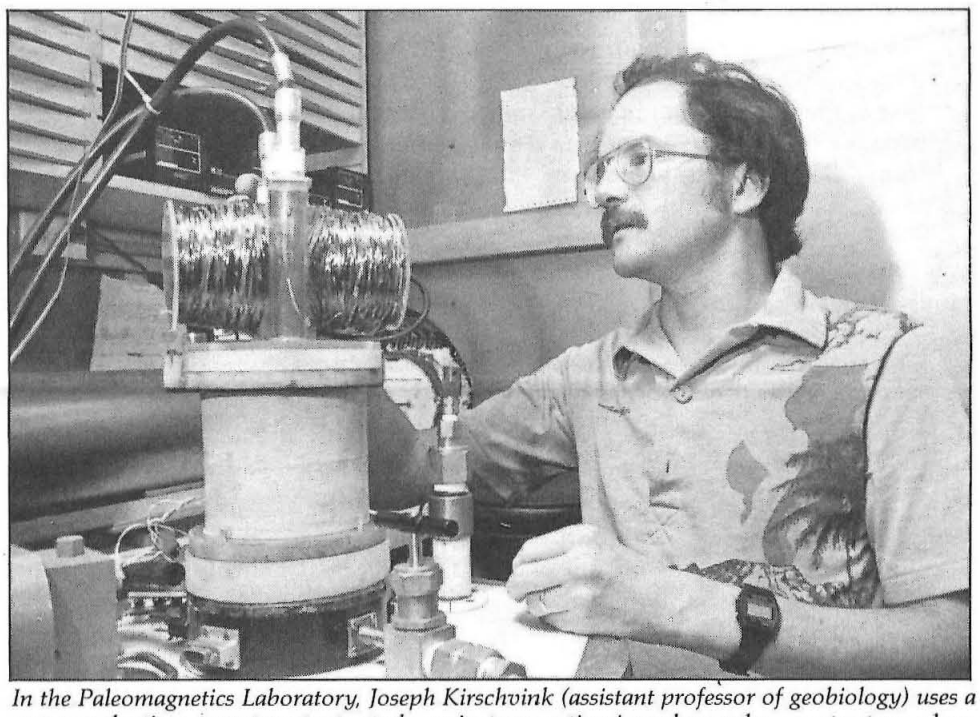
Wyllie stayed at the University of Chicago for 18 years, becoming the Homer J. Livingston Professor and entering the maze of academic duties. He had a term as master of physical sciences for the collegiate division, and concurrently as associate dean of the college, and as associate dean of the physical sciences division, and most recently as chairman of the department of geophysical sciences.

By now he had achieved international renown for his research into the role of volatile components in the genesis of igneous and metamorphic rocks, and on the evolution of the continental crust and the upper mantle. He had written three books and almost 200 papers, and had received numerous honors — among them, the Mineralogical Society of America Award and the Wollaston Medal of the Geological Society of London. He is a Foreign Associate of the National Academy of Sciences. He adds that his application for U.S. citizenship is being processed.

Wyllie had accepted his administrative roles with some reluctance. "Like most researchers, I wanted to keep on in the laboratory, full time," he says, "and being pulled away was difficult."

Two years ago, Wyllie received the offer of yet another administrative position — to become the department chairman at MIT. "We liked the look of MIT and of Boston," he says, "but with 18 percent mortgages and so on, we found that we couldn't afford to move. But the MIT offer prepared us emotionally for a change."

A year later, when interest rates were declining, the offer from Caltech came.



In the Paleomagnetics Laboratory, Joseph Kirschvink (assistant professor of geobiology) uses a superconducting magnetometer to study ancient magnetism in rock samples — a step toward unraveling the history of the earth's magnetic field.

The offer was accepted, and today the Wyllie family lives in the foothills of the San Gabriels where, says Wyllie, "there's a lot of interesting geology in my garden.

"Geologists like to be able to put their hands out and touch their favorite rocks," he says, "and here, a lot of my favorite rocks are within easy reach. And despite the hazards of earthquake, fire, and mud slides, living in the foothills of the San Gabriels brings a lot of satisfaction."

Academically attractive was the nature of the chairmanship itself. "This is a different kind of administrative position than most," says Wyllie. "At Caltech, the major decisions are made by the president, the provost, and the division chairmen. The administrative structure is much less cumbersome than at most universities where there are both division chairmen and deans, and so there is more opportunity to get things done."

As he assesses the strength of the division itself, Wyllie notes that "here we have an outstanding program in geochemistry and planetary sciences, and a seismological lab with a long history of excellence in research. The faculty are able to interpret their specialties in terms of geology. The combination is very attractive — as is the proximity of the tremendous research capabilities at JPL."

Perhaps even more impressive were the "relatively large numbers of recent appointments of young scientists to the faculty. These were spread across a wide spectrum, and this ensured the continuing vitality of programs in geochemistry, geology, geophysics, and the planetary sciences."

As he assesses the reasons for the division's strengths, Wyllie says he feels that much of its eminence has to do with "decisions made 20 to 30 years ago when Bob Sharp was chairman. This was a more classical geology division at that time, and it is my understanding that Sharp made the decision to develop a thrust into geochemistry. He made some excellent appointments in geochemistry — people with a flair for instruments who went on to create laboratories with instruments that worked better than those at other places — and this gave us a whole new way of seeing the insides of rocks.

"Geologists like to be able to put their hands out and touch their favorite rocks, and in southern California a lot of my favorite rocks are within easy reach."

"Then came the space program, an influx of NASA money, and the decision to develop an active program in planetary science, no doubt influenced by the strength at JPL. Programs were developed in planetary surfaces and planetary atmospheres, and the geochemists sharpened their analytical techniques on rocks returned from the moon."

To develop a program in resource geology has long been a priority of the division, and this concept received a major stimulus when Leon

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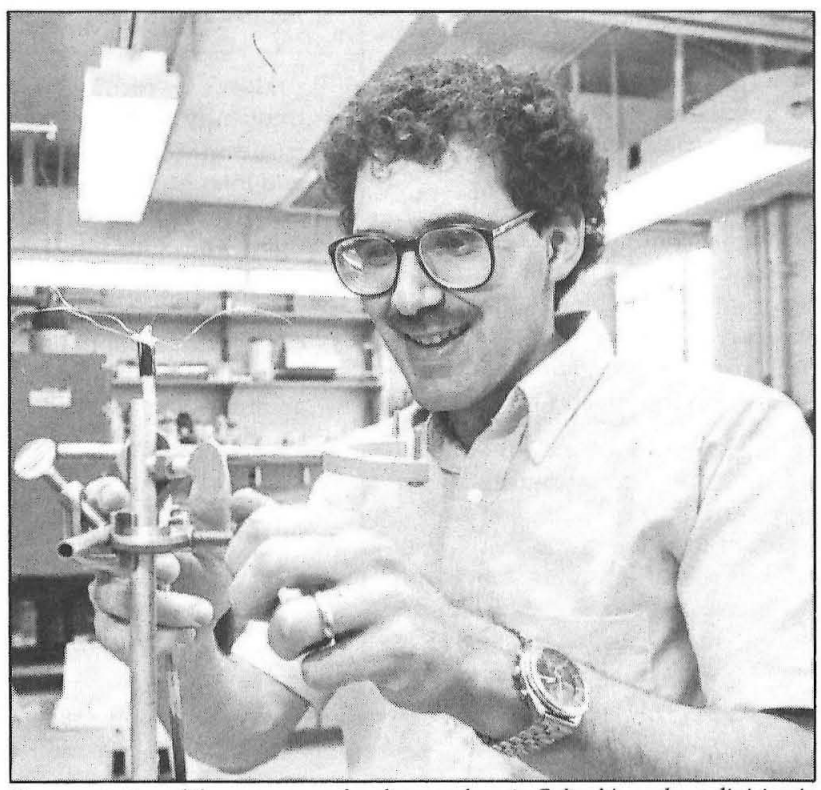


Representative of the new young faculty members in Caltech's geology division is Professor Edward M. Stolper. Here Stolper examines an apparatus used to hang samples of rock in a furnace where they are heated at ultra-high temperatures. His work helps us understand how rocks are formed in the earth's interior and how they behave at the extremely high temperatures that exist there.

Continued from page 9

Silver was named the W. M. Keck Foundation Professor for Resource Geology earlier this year.

"Lee has taken on the charge of identifying and presenting the basic research under way in the division that has applications for resource geology," says Wyllie, "and we are working with other aspects of a resource geology program which were identified by Barclay Kamb during his tenure as chairman."

"What the division does best," says Wyllie, "is to discover things. Our future depends upon appointing talented young faculty members who will make discoveries of a fundamental nature. Many of their discoveries may be of great importance to resource geology and it is in everyone's best interests for the potential applications to be identified, packaged, and made available to our resource-hungry society."

As the geological sciences continue to evolve, Wyllie believes that major new developments will come in areas between disciplines — for example, between geophysics and geochemistry — by applying the ideas and techniques of physics, chemistry, and biology to geological problems.

Computer technology also will have an enormous impact. "Earth and planetary sciences have compiled enormous data sets, much too monumental for any individual or group to handle," he says. "The intelligent use of computers to process these data has given us insights into many aspects of earth and planetary sciences, and will continue to do so."

As he summarizes, Wyllie sets these priorities for the division: To continue appointing bright young scientists to the faculty; to acquire and maintain the equipment necessary for innovative research in the earth sciences — an increasing problem as costs of equipment for modern research increase and as federal funding declines; to find ways of providing continuity and stability for the funding of the large research programs that go along with large, expensive labs; and to maintain the best academic programs in the country for undergraduates and graduate students.

"We're proud that — in contrast with many institutions — what we produce here are scientists and not geological technicians," he says. "I'd like to increase our visibility among potential students, and to persuade them that this division offers a good home and a good prospect for their futures. I also hope that recruiters from industry realize that although we produce relatively few graduates, they have special qualities."

Working to meet these goals seems unlikely to leave Wyllie with much time for endeavors other than geology. What he would like to do with that time — if it existed — would be to attend operas, symphonies, and the theater, and to go fishing, sailing, and camping in the mountains.

He substitutes for time at the opera or a symphony by playing tapes at home while he's working, and, with the mountains so close by, he plans to make some time for family camping trips.

Meanwhile, there's the geology in his garden and his favorite rocks nearby. And for a geologist in such an environment, the lines begin to blur between work and play.

Goldberger analyzes state of Caltech in *President's Report*

How's Caltech? President Marvin L. Goldberger shares his views on this subject in his introduction to the newly published President's Report. *A portion of his remarks are reprinted here.*

How's Caltech? This is a question frequently addressed to me by trustees, faculty, students, visitors, and interested friends. The general answer is, I believe, quite all right, thank you. Our research programs are strong and well supported for the most part by federal funding agencies; our educational programs are judged by our power to be merely great in some areas and truly outstanding in others; and thanks to alumni, friends, industry, and foundations we have had a highly successful fund-raising year. Notwithstanding the above, we do have problems, both immediate and long range, which we must solve if we are to insure for the future the unique position the Institute now enjoys.

Among the most pressing money-type needs, in no particular order, are the following: Financial aid for undergraduates in both low-cost loan funds and scholarships; graduate fellowships; an expanding program of elite postdoctoral fellowships; substantial new funds for instrumentation and rehabilitation of laboratory and office space; endowed professorships; an endowed research fund providing unrestricted support for the divisions on an annual basis; a major fund for innovation as areas and opportunities arise; a growing interaction with industry in pursuing generic basic research areas of mutual interest.

It is obvious that these needs are ones felt by all universities, particularly private universities. Caltech has some special characteristics that create both problems and, more importantly, great opportunities. We are small and intend to stay that way, which means that we must change without growing substantially. We cannot afford to become complacent over our current excellence and must be continuously alert to new opportunities in developing areas of research. There must necessarily be hard choices ahead as we move into new fields and out of old ones. We have made these changes in the past, and our small size has allowed us to move quickly when necessary. Given the financial resources, we shall meet these challenges in the future.

Liepmann appointed von Kármán Professor

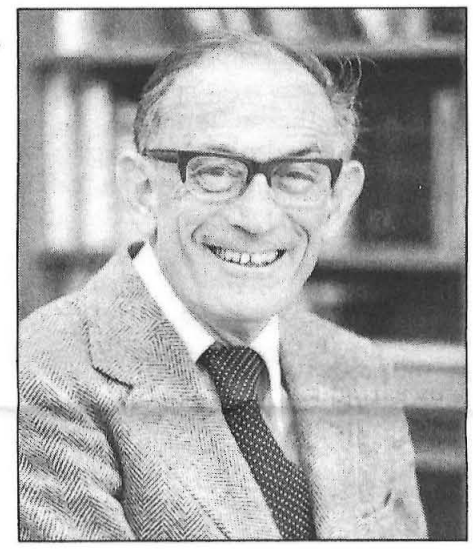
Hans W. Liepmann has been appointed the first Theodore von Kármán Professor of Aeronautics at Caltech. The professorship was endowed by aerospace and other corporations, foundations, and individuals — many of whom were friends, colleagues, or former students of von Kármán.

T. F. Walkowicz, president of National Aviation & Technology Corporation, was chairman of the committee that sought funds to endow the chair. Walkowicz died five days before he was to preside at a dinner celebrating endowment of the chair and the appointment of Liepmann to fill it.

Liepmann (formerly the Charles Lee Powell Professor of Fluid Mechanics and Thermodynamics) has earned a reputation as one of the world's outstanding researchers in fluid mechanics — and one of the most notable contributors to modern aviation.

He is well known as an excellent teacher and for his influence on graduate students who have studied with him and have moved on into influential roles in industry and the academic world. Caltech students honored him with an ASCIT award for outstanding teaching.

Born in Berlin in 1914, Liepmann came to Caltech as an assistant professor in 1939. He has received many awards for his work — among them, the Ludwig Prandtl Ring, the highest honor of the German Society for Aeronautics and Astronautics, and the Worcester Reed Warner Medal of the American Society of Mechanical Engineers.



He is a member of both the National Academy of Engineering and the National Academy of Sciences.

Von Kármán, as director of GALCIT from 1930 to 1949, and in a variety of advisory positions thereafter, profoundly influenced industry, the military, and international cooperation in engineering, as well as aspects of aeronautical research and engineering education. Under his leadership, GALCIT became the world's leading academic center for teaching and research in aeronautics, and a magnet for outstanding students.

Bridges named Braun Professor of Engineering

William B. Bridges, an expert in microwave and quantum electronics and a pioneer in the development of lasers, has been named the Carl F Braun Professor of Engineering at Caltech.

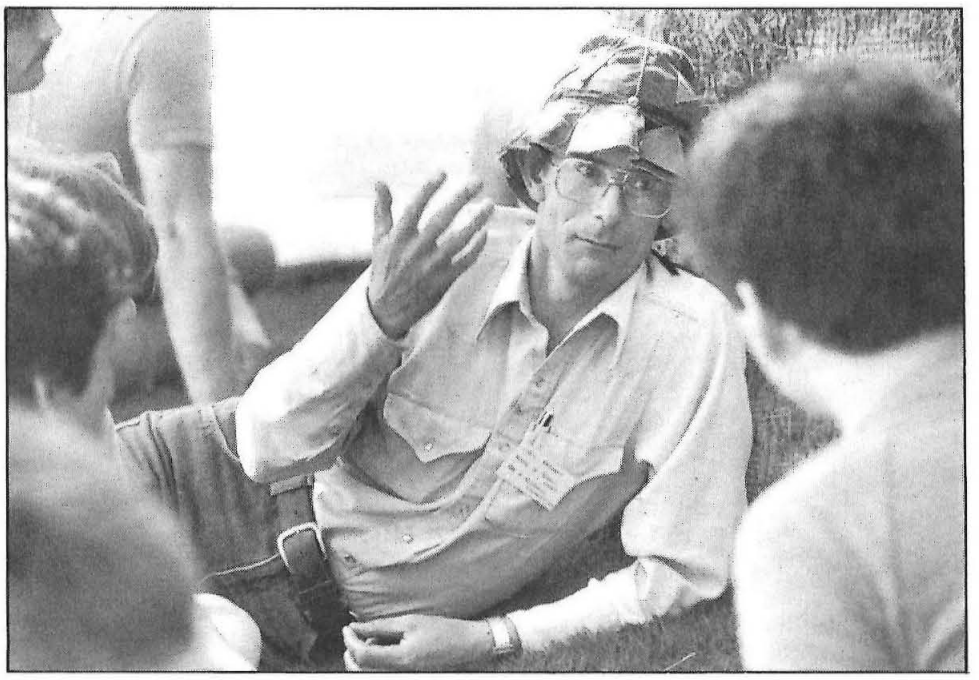
The endowed chair is made possible by grants from the Braun family

through the Carl F Braun Trust Estate. The chair was previously held by earthquake engineer George Housner, now the Carl F Braun Professor of Engineering, Emeritus.

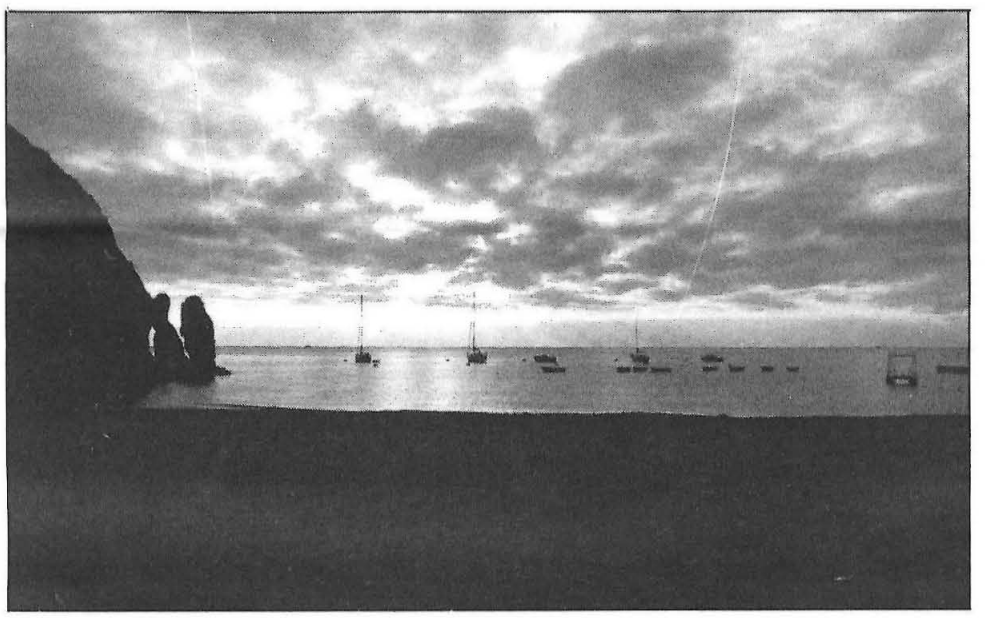
Bridges joined the technical staff of the Research Laboratories of the Hughes Aircraft Company in 1961. In a landmark discovery in laser physics, he developed the argon-ion laser, a device now used in laser surgery, photocopy machines, laser animation displays in entertainment, and other applications. He was appointed professor of engineering and applied physics at Caltech in 1977 and has studied opto-galvanic effects, optically-assisted laser isotope separation, millimeter and submillimeter wave systems, and laser spectroscopy.

He is a member of the National Academy of Sciences and National Academy of Engineering, and has twice received ASCIT awards for outstanding teaching.

Freshman camp launches new students

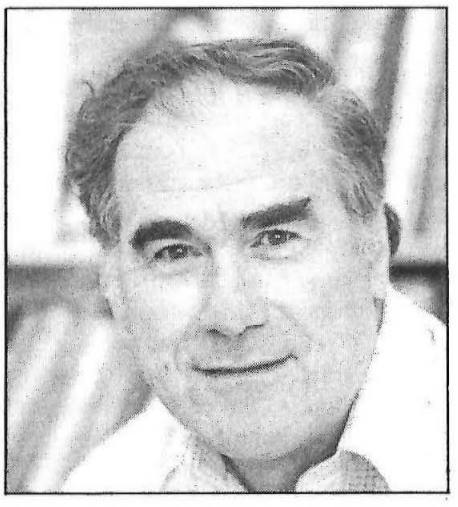


Catalina Island played its traditional role in the orientation of Caltech freshmen, as new students met at Camp Fox with a wise core of Institute veterans consisting of upperclass counselors, faculty members, and administrators. Above: Christopher Brennen, master of student houses, talks with new freshmen. Below: Sunset creates a scene familiar to alumni of Freshman Camp.



Gerald Whitham: new Powell Professor of Applied Mathematics

Applied mathematician Gerald B. Whitham, an expert on fluid mechanics and the theory of wave propagation, has been named the



Charles Lee Powell Professor of Applied Mathematics at Caltech.

The professorship is made possible by a gift from the Charles Lee Powell Foundation of San Diego, named in memory of a prominent engineer whose career included both work in this country and in Mexico.

Whitham came to Caltech in 1961 as a visiting professor of applied mechanics. He was named professor of aeronautics and mathematics in 1962, and professor of applied mathematics in 1967. He is a Fellow of the Royal Society and of the American Academy of Arts and Sciences. In 1980, he was awarded the Wiener Prize in Applied Mathematics.

Three on faculty beneficiaries of new IBM program

Three members of the Caltech faculty are beneficiaries of a new IBM Corporation program designed to help talented young faculty members to get their research programs underway.

The $30,000 faculty development awards went to Randal Bryant, assistant professor of computer science; David B. Rutledge, assistant professor of electrical engineering; and Peter Thompson, assistant professor of electrical engineering.

Bryant's research is concerned with switch-level modeling of complex digital systems, such as very-large-scale integrated systems, and with computer-aided verification and analysis tools for these systems.

Rutledge makes integrated circuits for millimeter waves with applications for radar and plasma diagnostics.

Thompson is involved in work in multivariable control theory and sample-data control theory with applications for aerospace systems and robotics.

The IBM grants go to young engineers who received their PhD's no earlier than 1980. Caltech and other universities were asked to nominate faculty members for the program and IBM made the selections. All eligible Caltech nominees were chosen.

Marcus honored for "landmark research" in theoretical chemical kinetics

Rudolph A. Marcus, the Arthur Amos Noyes Professor of Chemistry at Caltech, is recipient of the Charles Frederick Chandler Medal. The award is presented by Columbia University for achievement in pure or applied chemistry and was awarded to Marcus for his "landmark research" in theoretical chemical kinetics, the study of the rates at which chemical reactions occur.

Marcus joined the Caltech faculty in 1978. He is a member of the National Academy of Sciences and the American Academy of Arts and Sciences, and he received the Irving Langmuir Award in Chemical Physics from the American Chemical Society.

Legends of Caltech reprises student pranks

The best of five decades of Caltech pranks are compiled in the Alumni Association's new publication, Legends of Caltech, *now available for $9 each. To whet the appetites of potential readers, two of the alumni-submitted prank episodes are printed here. An order blank is available on page 13.*

The Great Piano Protection Racket

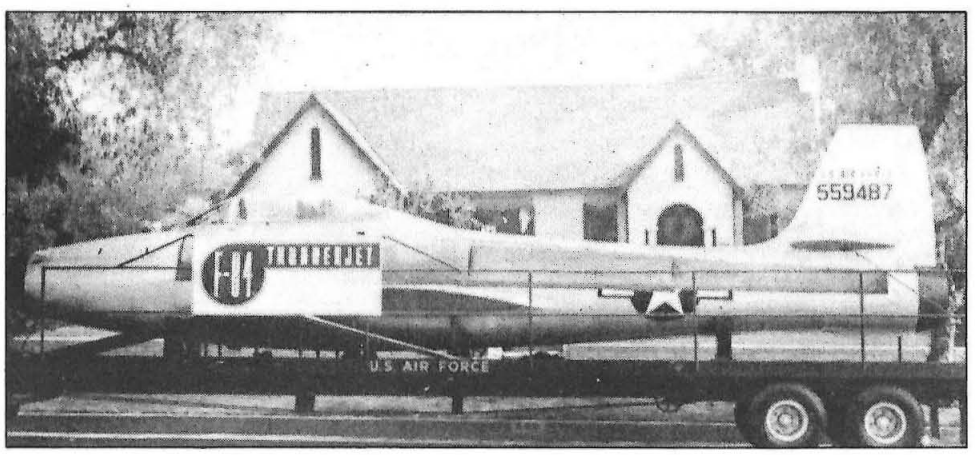
It all started one night when the level of piano playing in Blacker House became obnoxiously unbearable. David Kubrin '61 tells us that his friend Chris Larsen thought it would be a good idea to "take their pianos away from them." So it came to pass that at 3:30 a.m. one morning, the two, along with Allen Bernstein '62 proceeded to steal Blacker House's piano (Chris lived in Blacker at the time; Kubrin and Bernstein were off-campus affiliates of Blacker).

The stolen piano soon found itself cozily in Larsen's room, a single at the end of the first floor alley between Blacker and Dabney.

Encouraged by the rather low-key reaction to the theft by Blacker, a week later the trio proceeded to steal Dabney House's piano, and hid it in Larsen's room along with the first one. Dabney, not nearly as docile as Blacker, called the Pasadena police and the student house manager to report the theft, and soon the local Pasadena press had published the story of the two missing pianos.

After the police had investigated and left, the Board of Control became interested in the case, and initiated a room-to-room search of the houses. Since the pianos obviously couldn't be stored in any room smaller than a double, no single rooms, including Larsen's, were searched, and the mystery remained unsolved.

After another week or so, with the group having grown from three to seven by absorbing those who happened to find out what was happening, Fleming's piano was the next victim, and was dutifully jammed into Larsen's room with the first two instruments. By this time, all of Larsen's furniture, including his bed, resided atop the pianos.



He had taken to only opening his door a crack when greeting callers or coming and going, and allowing no one to see inside.

With no storage room left, the next move was obvious. An anonymous note, typed on a rental typewriter from the public library, was sent to Ricketts and the Athenaeum, suggesting that 10 dollars, placed in a particular but obscure reference book in the physics library, would "protect" their piano from the same fate which had befallen the others. Predictably, Ricketts ordered a 24-hour guard established, and chained its piano to the house wall. The Athenaeum, however, called in Officer Newton, who noted that the extortion letters had been sent through the U.S. mail, and called the FBI. The FBI did not view the matter as humorous.

Enough was enough, so anonymous letters were directed to the presidents of Blacker, Dabney and Fleming, all to be read at the end of a given meal. The notes said that "the work you requested to be done on your piano has been completed, and the piano may be picked up in room ____ ," (Larsen's room). The objective, of course, was the precipitation of maximum chaos, which indeed resulted when roughly 300 Techers descended upon Larson's room (at the end of the narrow alley), all at once. Kubrin notes that, even under the best of circumstances, getting the pianos out of Larsen's room would have taken extraordinary engineering skill. With all of the bodies pressing close, the circumstances were IDEAL!

While all of this was going on, Bernstein and Kubrin were attempting to negotiate swaps of pianos between houses, and Larsen was nowhere to be found for several days.

David Kubrin '61

The Limited Peregrinations of a Wingless F-84

So what would you have done? There it was. Irresistible. An F-84 Thunderjet sans wings sitting on a trailer parked on the Olive Walk in front of the student houses. The year was 1954 and the Air Force, it seems, brought the fighter onto campus to try to recruit students into their ranks. But what really interested the residents of Rickets House was the fact that the jet-plus-trailer wasn't being guarded at night.

Clearly, the proper thing to do was borrow a tractor, hitch up the trailer, and take the jet someplace else so that others could enjoy it too. This turned out to be a little tougher than the conspirators first thought.

The appropriate tractor was found and hitched up to the trailer. The forward support wheels on the trailer were cranked up off the ground and the tractor started forward. Unfortunately, the locking pin on the tractor's "fifth wheel" did not engage and the tractor indeed drove off — out from under the trailer. The front of the trailer came crashing down, severing brake lines and doing the jet no good whatsoever.

Well, in the true Tech spirit, the conspirators did not want simply to abandon a job badly handled. So they decided to raise the trailer, back the tractor under the trailer tongue once again, and hitch the two together properly (now having had a first-hand education in these matters).

A fork lift was borrowed from Building and Grounds to lift the trailer. Regrettably, the fork lift could only be taken by driving it through a bush, since B&G had thoughtlessly locked the heavy equipment yard for the night. And, as these things go, a ditch beyond the bush added its part by subsequently tipping the fork lift onto its side. These minor irritations were overcome and the tractor/trailer rig became operational.

At this stage, the group decided there was no better place to park their prize than in front of the AFROTC Colonel's house on North Allen Avenue near the campus. The photo clearly shows the jet in its new surroundings.

In the morning, Col. Small was awakened by his three small children, who shouted gleefully, "Daddy, you brought us home an airplane!" After assuring his offspring that the jet parked in front of their home was not a present for them, Col. Small tried to explain things to authorities and "cool things down." Unfortunately, he was too late to head off an early-rising "red hot" sergeant who noticed that the plane had wandered and called the FBI.

The sign on the F-84 also didn't help matters: "ENLIST NOW. FLIGHT TRAINING. WARNING: U.S. GOVERNMENT PROPERTY. PROTECTED BY THE FBI."

Well, the FBI indeed showed up. The G-men gave speeches in each house at lunchtime reminding everyone that taking government property like an F-84 could be construed as Grand Larceny.

Neither the FBI nor the students could keep a very straight face during these lectures.

When confronted by the Air Force about Caltech's lax protection of government property, President Lee DuBridge simply responded, "I thought *you* were supposed to protect *us*!"

And the AFROTC never recruited at Caltech again.

G. Edward Bryan '56
Budd LeTourneau '53
Sam Phillips '56

Help us find these lost alumni

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 the Alumni Office.

George R. Vanden Heuvel MS 47
Blake Beatty BS 22
Robert J. Hammond BS 23
Warren B. Leavitt BS 24
Williard H. Tracy BS 24
Carrol M. Wakeman Ex 24
William H. Allen BS 25
Wilfred G. Thompson BS 25
Conrad J. Waller BS 25
Nathan F. Scudder BS 26
MS 28
Frank F. Peterson BS 27
Francis C. Martin MS 28
Kam H. Lau BS 29
Julius Nelson BS 29
True W. Robinson BS 29
Willem Uyterhoeven PhD 29
Donald K. Allison BS 30
William Kelley BS 30
Frank N. Moyers BS 30
MS 31
William T. West BS 31
MS 32
Carl K. Yoshioka BS 31
Thomas C. Burk Ex 33
A. Arthur Koch MS 33
William A. Larsen MS 33
Edwin E. Michal MS 33
Winston H. Rice BS 33
Maple D. Shappell PhD 33
Warren H. Smith BS 33
Edward A. Bertram MS 35
M. Harrison Evans BS 35
MS 36
Paul F. Genachte PhD 35
Fun-Chang Huang MS 35
Dagoberto Rivas BS 35
Neil W. Snow Ex 35
Larry L. Young MS 36
Thomas R. Burnight BS 37
Ju-Yung Cheng MS 37
Roderic C. Davis MS 37
Anthony Easton MS 37
Paul F. Jones MS 37
Thomas N. Shaw BS 37
Ellis W. Shuler MS 37
Clark H. Wiget BS 37
Hyman D. Goodman MS 38
Arthur G. Gross BS 38
Arnulfo G. Gutierrez MS 38
Frank C. Lowe BS 38
Noble R. Maines Ex 38
William Rhett BS 38
Chi-Cheng Tsao BS 38
MS 38
James W. Watson BS 38
Winthrop G. Jones MS 39
Spencer W. Oakley BS 39
Lester G. Zukerman BS 39
Arthur M. Compton BS 40
R. Adm. W. Gentner MS 40
Arville C. Gibson MS 40
William J. Green MS 40
Ruhollah Y. Karubian MS 40
Adolph Lovoff MS 40
Luigi Menis BS 40
Norman L. Peterson MS 40
Tsung-Su Wang MS 40
James M. Watkins, Jr. BS 40
Morris R. Clark BS 41
Samuel J. Easley MS 41
Glyn Frank-Jones BS 41
Robert C. Geitz BS 41
Donald L. Harvey BS 41
George I. Reimers BS 41
Frederick G. Robinson BS 41
C.B. Stadum BS 41
Clyde T. Standridge MS 41
Robert L. Weaver MS 41
Colman Zola MS 41
Mehmet F. Bebe Eng 42
Orhan M. Emre Eng 42
Frank I. Given BS 42
Chong-Hu Go MS 42
Victor H. Martinez MS 42
Russell Rhyne BS 42
MS 43
John Spizizen PhD 42
Kenneth E. Anspach BS 43
James M. Brown MS 43
Ted L. Crosthwait MS 43
Benjamin A. Daleon MS 43
Warren V. Eaton MS 43
Oleg C. Enikeieff BS 43
Leon Katz PhD 43
Edward G. King MS 43
Robert H. Koch MS 43
William L. Leeds MS 43
Roland E. Lundquist MS 43
Klaus Mampell PhD 43
Fred D. Roberts MS 43
Dan R. Scholz MS 43
Leslie A. Shannon MS 43
Thomas B. Smitherman MS 43
Peter A. Tileston Ex 43
Ernesto Vicente MS 43
Courtland L. Washburn MS 43
Warren H. Amster BS 44
MS 47
Eng 48
William O. Ballard, Jr. BS 44
Francisco Barriga MS 44
William E. Bell MS 44
Donald G. Benjamin MS 44
Mehmet N. Berkant MS 44
Ertugrul Birlik BS 44
MS 44
Joseph E. Burch MS 44
William G. Burke MS 44
Ahmed Cebeci MS 44
Carlos a de Medeiros MS 44
E.J. Goehring Ex 44
Charles P. Harrison MS 44
Paul J. Labanauskas MS 44
Carl O. Mattinson BS 44
Kenneth L. McBreen MS 44
Merrill E. Onstad MS 44
Ethem Ozkaragoz MS 44
Te-Hsien Pi PhD 44
Jim M. Ridlehuber MS 44
Mayo G. Shults MS 44
Enrique F. Silgado MS 44
Roberto L. Stein MS 44
R.S. Tanyildiz BS 44
MS 44
Garland S. Taylor BS 44
William M. Trimble BS 44
D. Roger Wight MS 44
John J. Writt MS 44
Victor A. Ari MS 45
MS 46
Chung-Pen Ho MS 45
Eng 46
PhD 48
Roy G. Killian BS 45
Jonathan F. Rice BS 45
Necat Turkbas MS 45
Bruce R. Vernier BS 45
Charles W. Allison, Jr. BS 46
Khosrow Behroon MS 46
Harvey H. Brinkhaus BS 46
Ke-Yuan Chen MS 46
Robert H. Conradt BS 46
Jerome F. Dyson BS 46
David R. Esner BS 46
Hassan F. Fateh MS 46
Robert W. Foote BS 46
R. Bruce Foster MS 46
Luis E. Freire BS 46
MS 47
George S. Gill BS 46
Benjamin S. Hayne III BS 46
H.T. Huang BS 46
Frederick J. Lewis MS 46
Norman J. MacDonald BS 46
MS 47
Stanley R. Nixon BS 46
K.V. Krishna Prasad MS 46
Carl K. Salbach MS 46
Elmer R. Shepard BS 46
Lt. Col. Harvey F. Smith MS 46
Yu-Sin Tung MS 46
Thomas F. Weldon MS 46
Eng 47
Rolland S. Asher BS 47
Adolfo J. Atencio MS 47
Paul K. Charlu MS 47
Ta-San Chung MS 47
Fredric E. Clarke Eng 47
Hugh H. Collins Eng 47
Brian D. Dagnall MS 47
Eric Gillam MS 47
Walter Harrington MS 47
Ea-Qua Huang MS 47
Fiorello Leo MS 47
James S. Lesko MS 47
Eng 48
John Manoukian MS 47
Michael K. Molloy MS 47
Basil E. Moorehead BS 47
Raymond L. Olson BS 47
John L. Orr MS 47
Francis D. Sullivan BS 47
Russell A. Thompson, Jr. Eng 47
Fao K. Wan MS 47
Alonzo H. Wellman, Jr. Eng 47
Clifford M. Wimberly MS 47
Edward B. Winters, Jr. BS 47
Lai-Chao Ying MS 47
Yin-Ching Au BS 48
Capt. J. Bunce MS 48
Tao-Hung Chu MS 48
Eng 49
Albert R. Clark MS 48
Burgess F. Collins BS 48
Patrick N. Glover BS 48
Robert J. MacNeill MS 48
Herman A. Mason BS 48
John T. Slusher MS 48
John S. Swain BS 48
Robert K. Swank MS 48
William H. Voelker MS 48
James E. Whitney MS 48
Robert S. Winniford MS 48
Thomas E. Allen Eng 49
Thomas J. Andrews MS 49
Laurence I. Baumann BS 49
Cdr. Arthur R. Benton, Jr. BS 49
BS 50
John R. Brown Eng 49
Harold D. Cooper MS 49
Harold W. Davidson MS 49
Eng 51
Francis C. Foster Eng 49
Jarvin R. Heiman BS 49
Frank G. Hylton BS 49
Fred E. Krasin BS 49
Max Krauss PhD 49
William E. Lamb Eng 49
Pierre J. LeRoux MS 49
PhD 51
Dan M. Parker BS 49
Thomas G. Petrulas BS 49
Charles C. Petty MS 49
William C. Roesch PhD 49
Ltc. Dale D. Ryder BS 49
MS 50
Salim Solomon MS 49
Eng 51
John W. Wilkening Ex 49
Jean F. Wiren BS 49
Joseph B. Alexander MS 50
Weldon O. Bergreen BS 50
Julian Brody BS 50
Kenneth J. Hammond BS 50
Robert McMillan MS 50
Robert W. Paulson MS 50
Howard R. Schmidt MS 50
William P. Schneider MS 50
Robert S. Welte BS 50
Norris D. Whitehill BS 50
Ricardo M. Arosemena MS 51
Howad C. Goodell MS 51
Jacob P. Lafdjian MS 51
Joseph E. Padgett, Jr. MS 51
Allan J. Summers MS 51
Albert E. Van Hise BS 51
MS 52
Paul E. Arbo Eng 52
Smith V. Bucy MS 52
Frank C. Lang, Jr. BS 52
Basil R. Parnes BS 52
William C. Roeison MS 52
Eng 53
Donald E. Sutton BS 52
Richard W. Weeks BS 52
Howard E. Wilson MS 52
Charles A. Davies BS 53
Stuart G. Lennox MS 53
Fred P. Storrer MS 53
Nobuyoshi Takahashi BS 53
Ltc. David S. Twining BS 53
Christian P. Dambrine MS 54
Jassim M. El-Hussaini MS 54
Wesley R. Guebert MS 54
Irvin G. Henry MS 54
Herberto Jimenez MS 54
Berdine H. Rogers MS 54
Francis F. Scott BS 54
Herbert H. Winters MS 54
Alain Brethes MS 55
Lewis F. Ellmore BS 55
William E. Huber MS 55
James Meacham BS 55
Ltc. William T. Moore MS 55
Robert W. Edwards MS 56
Jacques Feige MS 56
E. Mark Gold BS 56
Maurice Granier MS 56
David W. Hill MS 56
Ltc. W. Hugh Jenkins, Jr. MS 56
James L. Kelly MS 56
Duncan E. MacDuffie BS 56
William N. Spence BS 56
John F. Edsforth MS 57
Alan E. Farley BS 57
Jon W. Harford BS 57
Douglas B. Holdridge MS 57
Robert T. Moore BS 57
Wolfgang Rockenhauser MS 57
Joseph E. Stuteville BS 57
Andre A. Treyer MS 57
John C. Uhthoff MS 57
Ray H. White BS 57
Cpt. E.M. Wisenbaker Ret. USN Eng 57
David G. Byles BS 58
John L. Gardner, Jr. MS 58
Jean P. Lacrouts MS 58
Hugh D. Palmiter Ex 58
Gerald M. Pjerrou BS 58
Gunnar E. Stenberg MS 58
Victor Baekelandt MS 59
Chai B. Byun BS 59
Clark E. Carroll BS 59
Ronald A. Christensen MS 59
Charles K. Daniels BS 59
Thomas E. Dawson Eng 59
Andre J. Fossard MS 59
Michel P. Guillemet MS 59
Richard E. Hemmingway Eng 59
Ronald B. Leonard BS 59
Stanley Roth BS 59
Joseph M. Cauley BS 60
MS 61
Alain N. Genko MS 60
Ernest A. Isaacs BS 60
Pierre E. Joffres MS 60
William A. Sinoff BS 60
Paul R. Widess BS 60
MS 61
Capt. Allen D. Williams Eng 60
Roland Kitten MS 61
Etienne Macke MS 61
Dwain J. Reed BS 61
Lewis L. Smith MS 61
Clement C. Audet MS 62
Michel M. Cousin MS 62
Michel D'Arbaumont MS 62
Jean-Pierre Dorlhac MS 62
Jean C. Dubois MS 62
Cpt. Larry D. Fitzgerald MS 62
Peter W. Hammond BS 62
Barry N. Pines BS 62
Robert C. Ruddick BS 62
John E. Baldwin PhD 63
Michael F. Behrens BS 63
David C. Cartwright MS 63
PhD 68
Pierre J. Facon MS 63
Richard W. Griffith BS 63
PhD 69
Lee W. Samuelson Ex 63
Will G. Spiegelman BS 63
John Y. Wu BS 63
MS 64
Eudoxia Aliferis MS 64
Tzeu-Ching Chang MS 64
Jean-Marie F. Grange MS 64
Eng 66
Takehiko Ikeda MS 64
Karl H. Kanus MS 64
Chung-Mo Kwok BS 64
Jacques A. Parisot MS 64
Harold F. Waits PhD 64
Philippe R. Chalier MS 65
Inder Cheema MS 65
Ronald E. Hutton BS 65
Michel A. Lagorce MS 65
William P. O'Neill BS 65
Roger L. Peterson PhD 65
Samir D. Sayegh MS 65
Bernard C. Solelhac MS 65
Melvin M. Stephens II BS 65
Matias J. Turteltaub MS 65
PhD 68
Philippe Vidal MS 65
Felix S. Wong MS 65
PhD 69
Robert T. Barron MS 66
Harold T. Couch PhD 66
Altan K. Eris MS 66
Dario Iacuelli BS 66
Robert E. Serafin BS 66
Surendra N. Adodra MS 67
Philippe J. Blondy MS 67
Cpt. James R. Boyd MS 67
John B. Davies MS 67
Robert E. Goldwasser MS 67
Eitan Gonen MS 67
G. Laurie Hatch PhD 67
Louis Kircos MS 67
Duane P. McClure BS 67
Jean M. Moysan MS 67
Robert C. Neveln BS 67
John C. Perrin MS 67
Vivian L. Steadman MS 67
Duke A. Sun BS 67
Alain A. Artaud MS 68
Gerald M. Cotreau MS 68
William J. Driskell MS 68
PhD 74
Jacques F. Fleuret MS 68
David M. MacKenzie BS 68
Brian M. Schaefer MS 68
James B. Andrew BS 69
Thomas D. Baze BS 69
James P. Cerne MS 69
Mark P. Goldstein MS 69
PhD 71
Henri M. Horgen MS 69
PhD 75
Luis N. Ikwueke MS 69
Ching-Lin Jiang MS 69
PhD 73
Donald D. Rintala BS 69
MS 70
Richard L Sweet III MS 69
William E. Wright MS 69
PhD 73
David Boss MS 70
Richard F. Doyle BS 70
George P. Drake BS 70
Helio Fagundes MS 70
Atef I. Girguis MS 70
James D. Hutchinson MS 70
Nicole H. Imbert MS 70
Juan E. Leon MS 70
Isaac A. Majerovicz BS 70
MS 71
Jovka Michova MS 70
Denis R. Rydjeski MS 70
Juan L Steimle MS 70
Ralph B. Graham BS 71
Jean-Marie Quitin MS 71
Richard J. Schwall BS 71
William M. Weigel BS 71
Robert M. Westervelt BS 71
Carl R. Anderson BS 72
Richard J. Blint PhD 72
Eric R. Boissaye MS 72
Emmy T. Chan MS 72
Robert L. Derham MS 72
William D. Schwaderer MS 72
Frederick H. Auld, Jr. MS 73
Bruce W. Bennett BS 73
Vijay Chatoorgoon MS 73
Wayne K. Warzecha MS 73
Neil S. Berkey BS 74
John E. Geltosky PhD 74
Kar-Shing S. Lee BS 74
Howard C. Morris PhD 74
Vinod Shekher MS 74
Melvin J. Knight II PhD 75
Vincent K. Leung MS 75
Rhett G. Butler MS 76
PhD 79
Chiu-Yuen J. Ng BS 76
Ibrahim M. Rashed MS 77
Michael J. Savage MS 77
Nain H. Al-Adhadh PhD 78
Yuk-Sun Chan BS 78
Reazuddin A. Chaudhuri MS 78
Kenji Shintani MS 78
Ping Y. Chiu BS 79
Bo H. Cho BS 79
MS 80
Fred J. Crimi BS 79
Ahmad F. Khorrami MS 79
Brian T. Lew BS 79
Tak-Yiu Wong MS 79
Eng 82
Reda Abdu E. El-Damak MS 80
Peter M. Goodwin BS 80
Jeffrey B. Johnson MS 80
Charles S. Reynolds BS 80
Luen-Hin Kwok MS 81
Charles R. Nichols BS 81

Bedford McIntosh to head Caltech's annual giving program

Bedford D. McIntosh, Jr., has been appointed Caltech's director of annual giving, replacing Thomas S. Garrow, now director of development at the USC School of Engineering. McIntosh will be responsible for Caltech's alumni fund raising efforts and for the coordination of the activities of more than 1,100 Alumni Fund volunteers. Working with him are Margaret Banuelos and Lori Gross, assistant directors of annual giving.

Before coming to Caltech, McIntosh was associate director of the UCLA Annual Fund. His responsibilities included the solicitation of prospects in the School of Engineering and Applied Science, the student telethon, and the improvement of matching gift contributions. He also managed the Blue and Gold Circle, UCLA's largest donor support group.

Aerojet General award honors deceased alumnus

Aerojet General has established an award honoring the life and work of the late Robert B. Young (BS '40), vice president of engineering at Aerojet when he died in 1979. Considered one of America's leading aerospace innovators, Young joined Aerojet in 1943 and directed the firm's development of new rocket engines during the 1950s. During the 1960s, he helped guide development of propulsion systems for the Titan, Polaris, and Minuteman ballistic missiles, and for the Apollo spacecraft propulsion engine that put astronauts in orbit around the moon.

The R. B. Young Technical Innovation Award is presented annually for outstanding technical innovations by Aerojet employees in safety, manufacturing, and product research and development.

ALUMNI ASSOCIATION FINANCIAL STATEMENTS

ALUMNI ASSOCIATION
CALIFORNIA INSTITUTE OF TECHNOLOGY
Pasadena, California

BALANCE SHEET

June 30, 1983

ASSETS

Cash on Hand and in Bank	$ 14,050.85
Investments:	
C.I.T. Consolidated Portfolio	661,451.35
Money Market Funds	103,373.43
Investment Income Receivable	12,000.00
Other Receivables	1,717.97
Advance for Landscaping Costs	24,000.00
Deferred Program Expenses	4,095.46
Postage Deposit and other Deferred Expenses	3,028.75
TOTAL ASSETS	$823,717.81

LIABILITIES, RESERVES AND SURPLUS

Accounts Payable	$ 34,346.79
Deferred Income:	
Annual Membership Dues paid in advance	33,196.00
Investment Income from C.I.T. Consolidated Portfolio	34,000.00
Program Income	2,400.00
Life Membership Reserve	679,524.05
Reserve for Directory	8,922.35
Surplus	31,328.62
TOTAL LIABILITIES, RESERVES AND SURPLUS	$823,717.81

STATEMENT OF INCOME, EXPENSES AND SURPLUS
For the Year Ended June 30, 1983

INCOME

Dues of Annual Members	$ 66,701.00
Investment Income:	
C.I.T. Consolidated Portfolio	49,716.83
Money Market Funds	9,630.47
Annual Seminar	19,425.50
Program and Social Functions	67,583.02
Class Reunions	9,217.50
Area and Chapter Meetings	5,975.00
TOTAL INCOME	$228,249.32

EXPENSES

Publications	$ 12,000.00
Annual Seminar	24,740.55
Program and Social Functions	63,473.81
Class Reunions	14,871.60
Area and Chapter Meetings	11,063.14
Student Programs	12,985.83
Institute Secondary School Relations	2,217.00
Administration	47,694.62
Membership	8,124.62
Directory	9,000.00
TOTAL EXPENSES	$206,171.17
EXCESS OF INCOME OVER EXPENSES	$ 22,078.15
Surplus, June 30, 1982	9,250.47
Surplus, June 30, 1983	$ 31,328.62

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, 1983, 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, 1983, 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

November 17, 1983

Yellowstone trip rescheduled to June 17-24

Dates for the trip to Yellowstone National Park and the Grand Tetons, sponsored by the Alumni Association, have been changed from June 24-30, 1984, to June 17-24, one week earlier.

Robert Sharp, the Sharp Professor of Geology, Emeritus, will lead the expedition.

Obituaries

1918
FRANCIS M. PEASE in May. He had retired from Graybar Electrical Company in Los Angeles as a radio specialist and was living in Pioneer, California.

1920
JAMES R. WILSON. He had worked at Bell Telephone Laboratories in New York, and was retired and living in Boonville, California, at the time of his death.

1923
ALVA C. HALL in March. He had retired as director of the Apple Valley (California) Water District and was living in Lake San Marcos.

1924
GEORGE SCHROTER, Ex. Before his retirement he was general manager of G. Austin Schroter & Associates, consulting mining and engineering geologists in Los Angeles.

1927
VAINO HOOVER, MS '28, PhD '31, on July 31. He had been chief engineer with Hoover Electric Company in Los Angeles.

1932
BRIAN O. SPARKS, MS '33, MS '40. He had retired from his position as manager of JPL's facilities office and was living in Laguna Beach, California.

1933
JOHN D. MENDENHALL on July 30 after suffering a stroke. Former chief structural and civil engineer with Ralph M. Parsons Company in Pasadena, and had retired in 1978 and was residing in Seattle, Washington. He and his wife, Ruth, were avid mountaineers and climbed extensively in the United States, Canada, and Europe, and they wrote the popular book *Introduction to Rock and Mountain Climbing*. Mendenhall's wife survives him, as do two daughters and a grandson.

GEORGE MUNRO, PhD, on September 3, following a long illness. His career had been in research in the paper industry, serving as a faculty member of the Institute of Paper Chemistry in Appleton, Wisconsin, and he was employed by companies including the Champion Paper Company in Hamilton, Ohio, and Scott Paper in Philadelphia. For the past 15 years he had lived in Portland, Maine.

1934
HOWARD GULICK on September 5. He had retired as assistant general manager of the Glendale, California, Public Service Department.

GEORGE MARMONT, PhD '40, on April 26. He had been chief engineer with McCulloch Motors Corporation in Los Angeles.

1938
CARROLL CHATHAM on July 3. Founder of Chatham Research Labs in San Francisco in 1947, he perfected the technique of growing emeralds in a crystalline solution. After a five-year battle with the Federal Trade Commission over labeling of the gems, which were identical in crystalline structure and chemical makeup to emeralds found in nature, he marketed Chatham-Created Emeralds and went on to develop a similar process for growing rubies. He is survived by his wife, Barbara, two sons, and four grandchildren.

1939
UDENE YOUNGER in June. He had retired as a physicist with the Naval Undersea ' Center in Pasadena.

1943
HAROLD BRADLEY, MS '47, on August 19 at his home in Ridgecrest, California. He worked at the Naval Weapons Center at China Lake from 1952 until 1980, moving to the Computer Scences Corporation, where he was employed in applied technology. He is survived by his wife, Ramona, and two sons.

JOHN LAUFER, MS, Eng '44, PhD '48. He was professor and chairman of aerospace engineering at the University of Southern California.

1944
T. F. WALKOWICZ MS, president of the National Aviation & Technology Corporation, and a managing partner with Advanced Technology Ventures, on October 6. A long-time friend of Theodore von Kármán, Walkowicz was the chairman of a committee seeking funds to endow the first von Kármán Professorship of Aeronautics at Caltech. He died suddenly five days before he was to preside at a dinner announcing completion of the endowment and the appointment of Hans Liepmann to the professorship. Walkowicz earned his BS degree in 1941 and his ScD in 1948 from MIT. He was with the U.S. Air Force from 1941 to 1952 and was a member of the Memorial Sloan-Kettering Cancer Center Board of Overseers. He is survived by his wife, MaryLucy, and three children.

1945
RICHARD TEITSWORTH on June 14. He was manager of supply and sales planning for Mobil Oil Corporation in New York.

1947
THOR STEPHENSON, MS, on June 3 of lung cancer, at his home in Mansonville, Quebec. He was chairman of Pratt & Whitney Aircraft in Longueuil, which he had joined in 1956, until 1977, when he served as a consultant for Canadair and for the Philippines Aerospace Development Corp. He was also director of Mansonville Plastics and Potton Chemicals and founding director and consultant for North Wind Power Company of Mooretown, Vermont. Survivors include his wife, Joan, three daughters, and one son.

1948
GEORGE FEIGEN, PhD, on May 22 of a ruptured aorta. He was professor of physiology at Stanford University Medical School, where he had been a faculty member since 1949. His wife, Ruth, survives him.

1951
REUBEN KACHADOORIAN on June 30 of lung cancer. He was a geologist with the U.S. Geological Survey in Menlo Park, California. His wife, Donie, survives him.

1956
WILLIAM HILDEMANN, PhD, of Lou Gehrig's Disease. He was a professor in the department of microbiology and immunology at UCLA.

Personals

1936
ALEX KOSSIAKOFF, chief scientist of Johns Hopkins University Applied Physics Laboratory, retired as director in July 1980 and is now working on developing 13 new graduate courses for a master's degree program in technical management.

1939
FREDERICK G. HOFF reports from Vacaville, California, "I retired December 31, 1982, as corporate consulting engineer for Basic Vegetable Products Division of Ampco Foods, Inc. I now do a limited amount of engineering and financial consulting for a small group of clients."

1948
WALTER P. EATHERLY, MS '49, manager of graphite programs in the metals and ceramics division at Oak Ridge National Laboratory, has received the American Carbon Society's 1983 George Skakel Memorial Award. Eatherly, the third American to receive the international award, was cited for "development of graphites for use in unique and severe environments, such as very high temperatures for civilian and military aerospace systems and intense irradiation exposures associated with molten salt, high temperature gas-cooled, and pebble-bed nuclear reactors."

JOHN McCARTHY, professor of computer sciences at Stanford University, has been elected president of the American Association for Artificial Intelligence.

1949
CROGER JOHNSON reports that he has changed jobs, moving from Central Soya Company in Belmond, Iowa, to Eaton Corporation, in the same city. He also shares the news that he recently lost two sons; Eric, 20, his youngest son, was killed by a hit and run driver in 1980, and Gregory, his oldest son, age 27, died of cancer in 1982. Earlier this year his three other sons helped celebrate the marriage of his daughter, Christie.

ALLEN PUCKETT, PhD, chairman and chief executive officer of Hughes Aircraft Company, has been elected to the University of Southern California's board of trustees.

1951
HARRY SUTCLIFFE, MS, has just completed a much enjoyed seven-year assignment as manager of Bechtel's Boston office. He found the lean beauty of New England much to his liking and had mixed feelings about returning west, even to Mill Valley. He says he is concerned that his Caltech alumnus standing may be in jeopardy as he was a member of the MIT faculty for two years, teaching courses in project management. Sutcliffe has been with Bechtel since 1953, and opened the Boston office to design the Red Line subway extension from Harvard Square northward. He reports that Lloyd Kaechele is happy Rolfing and consulting from his Malibu Canyon retreat and that he had a wonderful family visit with Jose Rodriguez in Guatemala two years ago. He has kept tabs on the whereabouts of Dick Merritt, Ray Gardner, Al Grote, and Johnny Jannarone, but the rest of that distinguished class he can only assume, he says, have taken vows of silence in some obscure monastic order, however unlikely a prospect that would have seemed to their classmates in 1951.

1952
JAMES SHOOLERY, PhD, applications chemist in the nuclear magnetic resonance (NMR) application lab of Varian Associates in Palo Alto, California, has been named Scientist of the Year by *Industrial Research & Development* magazine. He was recognized for his numerous contributions as an inventor and for his efforts to expand the use of NMR technology.

1957
JEROLD L. SWEDLOW, PhD '65, professor of mechanical engineering at Carnegie-Mellon University, has been named a 1983 recipient of the Award of Merit by the American Society for Testing Materials. He was cited for original contributions to the theoretical bases for fracture mechanics and for dedicated service to the ASTM committee on fracture testing.

1963
MICHAEL KRIEGER writes, "I've been in Belo Horizonte (third largest city in Brazil with 2.5 million people) for two years as Fulbright Scholar and, subsequently, visiting professor of computer science. Amazing country — the bureaucracy is as difficult as the people are friendly. Expect to return at the end of the year to practice computer-related law."

1971
ERIABU LUGUJJO, MS, PhD '74, reports, "I spent last summer (1982) at the Institute of Semiconductor Electronics in Aachen, West Germany, under a three-month UNESCO fellowship. I found the work very interesting. In January 1983 I was promoted to associate professor, besides being head of the electrical engineering department and dean of the faculty [at Makerere University in Kampala, Uganda]. Surely managing these heavy daily duties is a facet I owe to Caltech disciplinary spheres of influence!"

KIRK MATHEWS writes, "I'm still in the U.S. Navy. After four years as navigator and operations officer of U.S.S. Birmingham, I came here to Wright-Patterson A.F.B. to attend the Air Force Institute of Technology, and completed my MS (nuclear engineering) in December '82. I was the recipient of the General Mervin E. Gross Award for outstanding academic achievement at the graduation ceremony. At the moment I'm engaged in research in numerical methods of neutral particle transport and have recently been admitted to candidacy in the AFIT PhD program (in nuclear engineering). It has really felt great to have some shore duty and get back in the academic community, but I'll be back to submarine duty next year, and I'm sure it will be equally good to get back to sea."

1974
ANTHONY ZUCCARELLI, PhD, was appointed associate professor of microbiology at Loma Linda University School of Medicine, Loma Linda, California, in 1980.

1975
ELLEN ELLIOTT ROHWER, PhD, and BOB ROHWER, PhD, who were married in October 1982, spent six months in 1983 traveling and sailing in Micronesia, Polynesia, and Southeast Asia. They were accompanied by Caltech friends (with whom they had learned to sail on Arnold Beckman's boat, *Aries*, while they were in grad school). Before they set out on their travels, Ellen was a research fellow at Carnegie Institution of Washington and Bob had a senior staff fellowship at the National Institutes of Health in Washington, D.C. At the tropical medicine laboratory there he worked on Creutzfeldt Jako Disease (scarpie) and looked for information on the disease during his travels.

ELIAS S. W. SHIU, PhD, has been promoted to professor of actuarial and management sciences at the University of Manitoba.

ERIC VELLA received his PhD in high-energy physics from UC Berkeley in December 1981 and is now working at CERN (European Organization for Nuclear Research) in Geneva, Switzerland, on a post-doctoral research fellowship from the University of Pennsylvania.

1976
RONALD CARSON writes, "I finally graduated from the University of Washington (PhD, nuclear engineering), and Merrie and I have come to Redondo Beach. I'm working for TRW as a systems analyst in the energy development group, working on advanced isotope separation systems with BRAD FLANDERS (MS '77, PhD '81)."

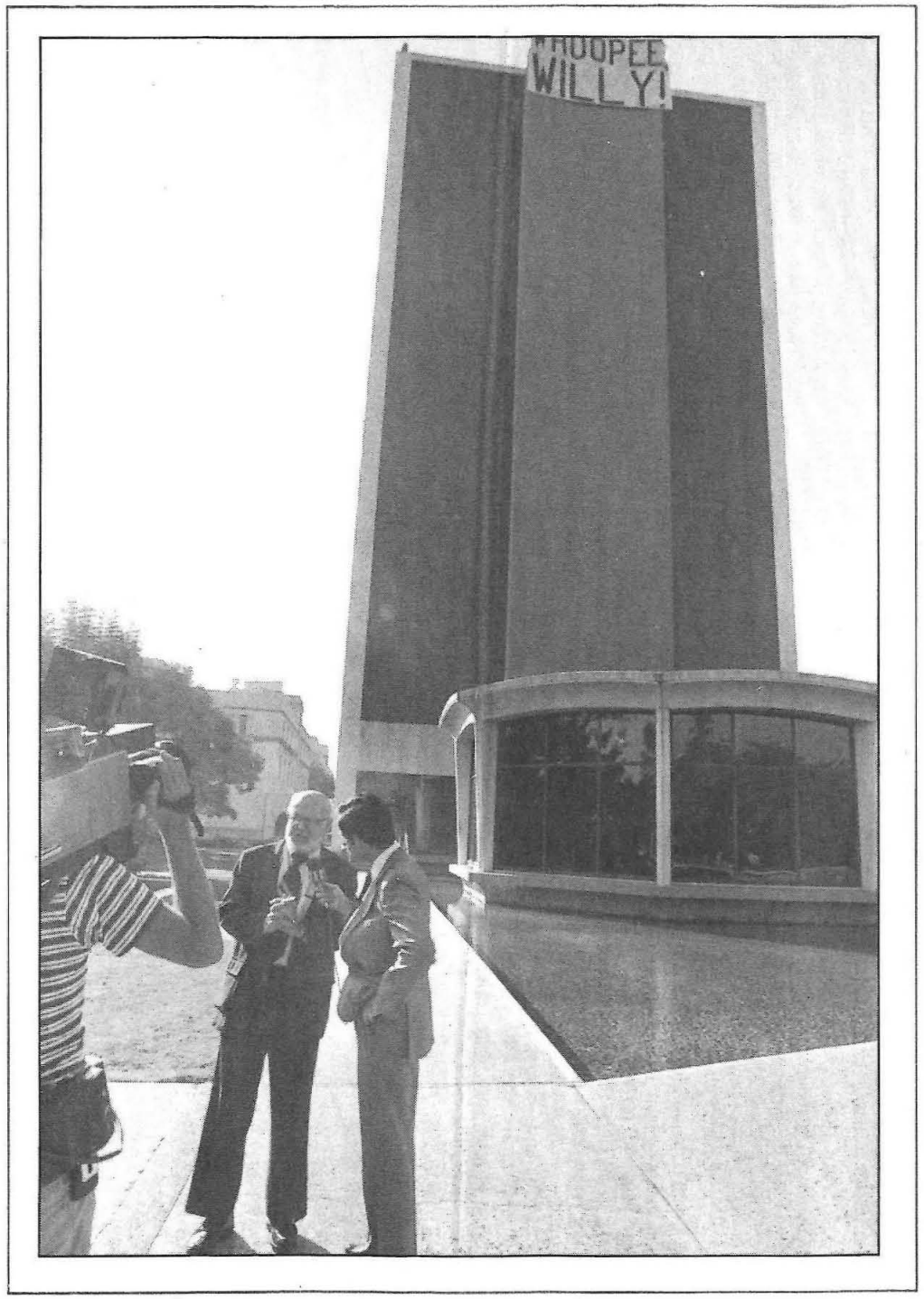
UY-LOI LY, MS, Eng '78, has received his PhD from the aeronautics and astronautics department at Stanford University and has resumed work at the Boeing Company in Seattle as lead engineer in the flight controls research group. He writes, "Hope to hear from former roommates residing at 290 S. Holliston in 1975-78."

1977
ELLIOT FISCHER, PhD, and his wife, Kathryn, announce the birth of their daughter, Alexandra Anne, on July 5. Elliot is working on pattern recognition and artificial intelligence at Bell Labs in Whippany, New Jersey.

1980
ROBERT SULLIVAN MAIER, MS, received his PhD in mathematics from Rutgers University and has accepted the position of instructor at the University of Texas in Austin.

1981
JAMES ANGEL writes, "Yes, it's true! After working for two years at Pacific Gas and Electric Co., I will be entering the Harvard Business School's MBA program so I can be like David Morrisroe when I grow up!"

1984
DANIEL NOCERA, PhD, assistant professor of chemistry at Michigan State University in East Lansing, has received an award from The Camille and Henry Dreyfus Foundation to help support his basic molecular research.



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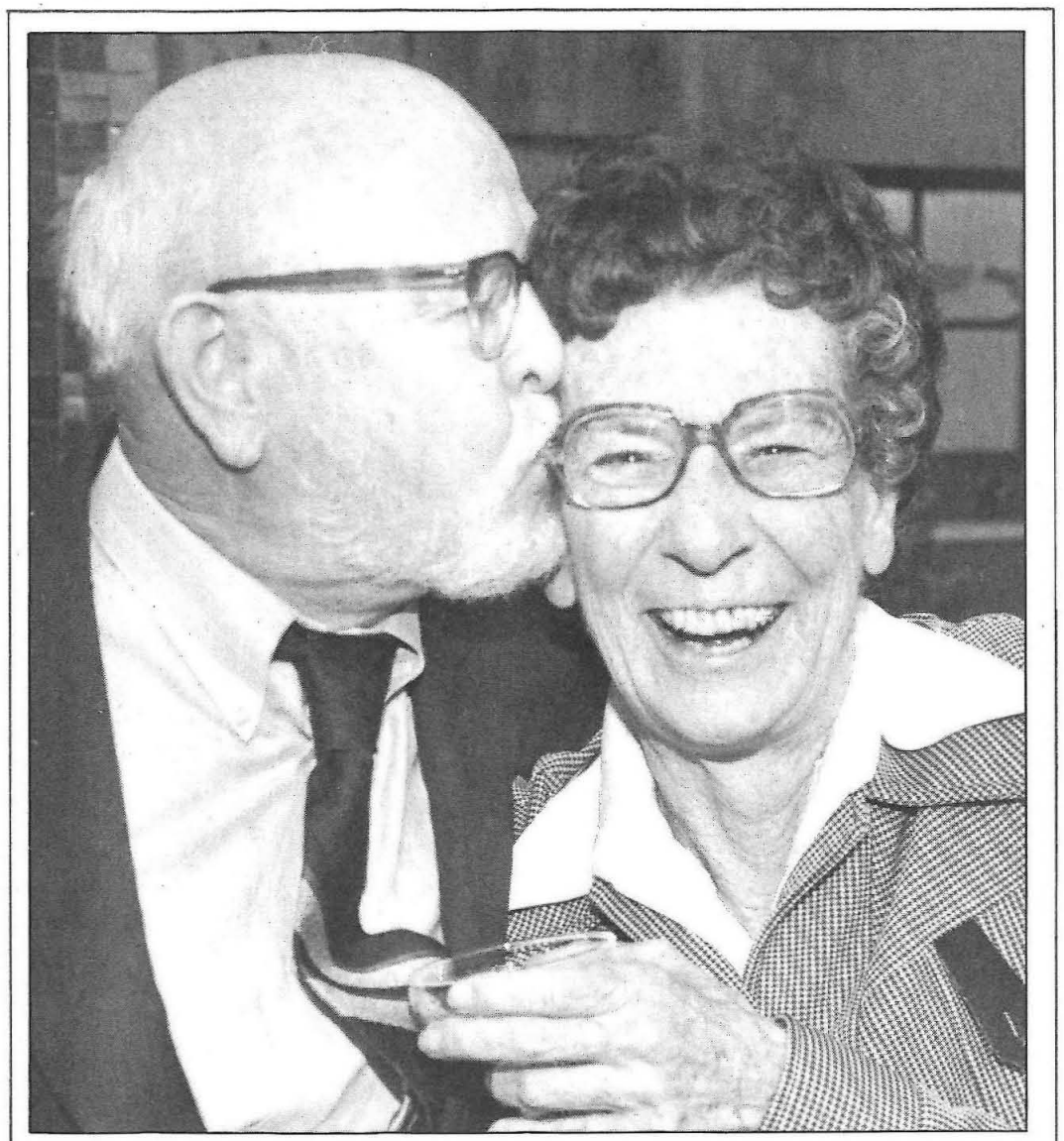

Ardiane Fowler shares triumph with her husband, William A. Fowler, 1983 Nobel laureate in physics.

December 1983