

CALTECH NEWS

Volume 18, No. 3, June 1984

Caltech students create policy for educational computer network

Each Tuesday at 5 p.m., a group of Caltech students meets in a small conference room of the campus computing center to do what few, if any, of their peers at any campus in the country do — to make policy governing computers devoted to student use. In what is likely an unprecedented move in higher education, Caltech has turned over three computers to be governed solely by members of the student body.

The Data General MV/4000 computers were donated by the company, along with a full complement of software and peripherals. They can accommodate about 30 students at a time and are connected to a high-speed campus-wide network, enabling them to draw on other Caltech computing resources. Besides the three student-run systems, a fourth Data General computer is dedicated to joint faculty-student research.

"Our hope was that a committee of students would be more responsive to needs of the student body," says senior mathematics major Joe Decker, who heads the student computing policies committee that has charge of the computers.

According to Decker, the computers will be used for experimenting with new programs, and also for word processing, data analysis for courses, and game playing.

The campus computing support services continues to maintain and operate the student computers and provides the students with the

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New software programs are installed on a Data General computer by Adam Greenblatt and Joe Decker, two of the students who make policy for Caltech computers used by the student body.

Corporate grants support educational computing project

Caltech has received major grants from IBM and from Hewlett-Packard to support its educational computing project.

From IBM, Caltech will receive several hundred IBM Personal Computer workstations, a host processor, several graphics subsystems, and technical support, all to be used in the development of educational software.

From Hewlett-Packard, Caltech will be recipient of 22 color desktop computers and supporting equipment for an introductory computing course, an introductory solid-state electronics course, and a solid-state electronics laboratory. In the first course, freshmen will use the Hewlett-Packard computers to learn

programming, and in the last two, undergraduates will use the computers to design electronic devices. The equipment is worth \$528,694.

Along with the IBM equipment will come a cash grant of \$150,000 to purchase adapter cards to tie the IBM workstations to Caltech's campus-wide high-speed computer network. IBM has also assigned a technical support person to the project during the three years that the company is involved.

"Over the next five years, we expect to see a revolution in teaching at the Institute, with computers as tools in almost every academic discipline," says Geoffrey Fox, professor of theoretical physics and dean for educational computing. "Caltech is well-placed as a leader for these developments because of its stature in science and engineering education and research."

The Institute already has made great progress toward computerizing its courses. Computer courseware is in use or under development in many

areas — particularly in computer science, engineering (including computer-aided design), and physics.

When it is fully implemented over the next three years, Fox envisions that the Caltech educational computing project will include more than 800 workstations. Linked by the campus computer network, they will be grouped in clusters of up to 10 or 20 machines in classroom areas, laboratories, the computing center, and libraries.

Faculty and teaching assistants will have individual workstations to prepare courseware. Students will have network outlets in their dormitories, enabling them to communicate with the campus system, using their personal computers. All the individual units will be tied to campus mainframe computers.

Fox says the Institute doesn't plan initially to put workstations in every student's room. "The small size of the campus and generally pleasant weather in Pasadena make it easy to get from the houses to clusters of workstations or terminals," he explains.

The Caltech project is aimed primarily at developing courseware for all the disciplines at the Institute. Educators will emphasize creation of specialized graphics software that will enable students to "see" abstract concepts in visual terms. According to Fox, computer graphics research and its educational uses will intertwine.

"We've received ideas from faculty members in all six divisions for applying graphics to their disciplines," says Fox. "For example, biologists and chemists might use the computer and three-dimensional graphics simulations to reveal structure and reactions in large molecules. Geophysicists could routinely use the techniques now used by NASA to display

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Donald Bren, Irvine Company Board chairman, elected Caltech Trustee

Donald L. Bren, chairman of the board of directors of the Irvine Company, and a major developer of master planned real estate in California for the past 27 years, has joined the Caltech Board of Trustees. Bren is known as a leader and innovator within the development industry, and has achieved a reputation as a national expert in the fields of planning, design, construction, marketing, and finance.

He began his business career as a builder and community developer in 1957, when he formed the Bren Company in Newport Beach and he presided over its evolution into one of California's primary developers of planned, quality residential communities.

In 1963, as founder and president of the Mission Viejo Company, he established the community of Mission Viejo in Orange County — now a national model for residential areas. In 1967 he founded Bren Investment Properties, which designs and builds for ownership quality commercial office buildings and industrial parks.

In 1977, he joined a group of investors who purchased the Irvine Company and in April 1983, he attained majority ownership of the company. He has served as a member of its executive committee since 1977, became co-chairman of the board in September 1982, and chairman in April 1983.

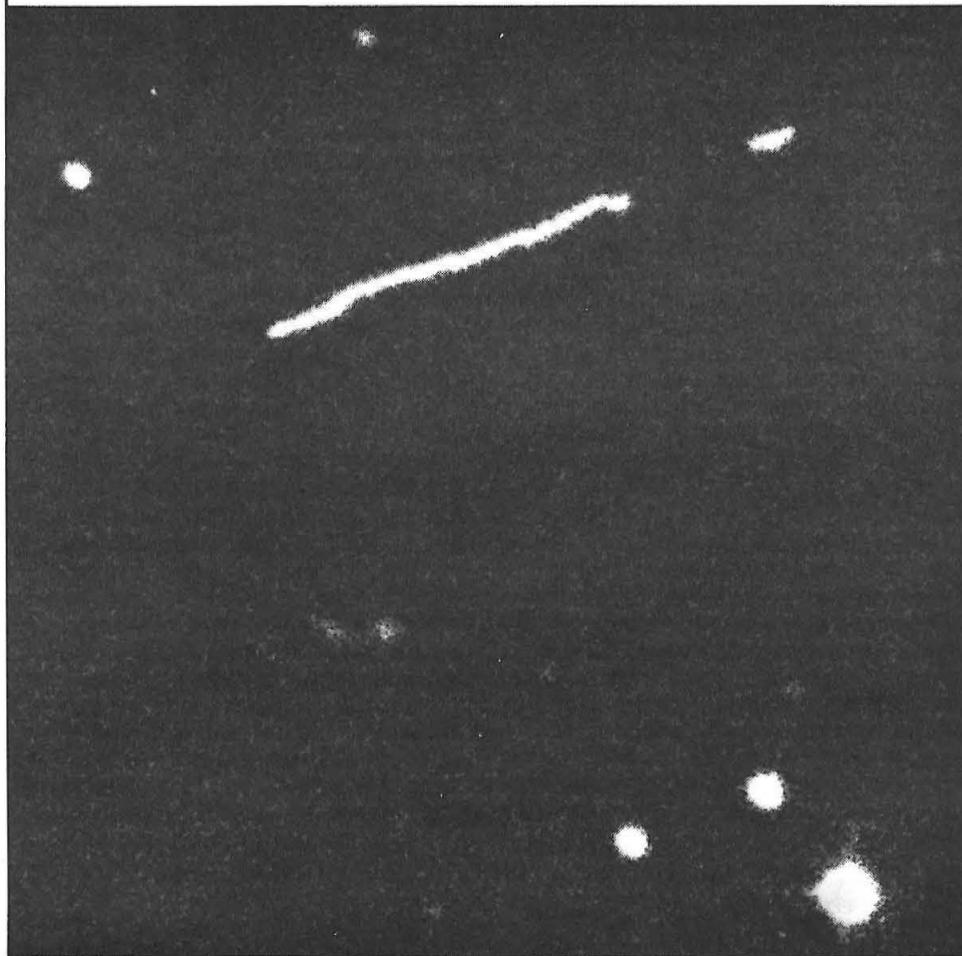
William R. Gould receives state's highest award

Caltech Trustee William R. Gould, chairman and chief executive officer of the Southern California Edison Company, has been named co-winner of the 1984 California Industrialist of the Year award, the highest award given by the state.

The award is sponsored by the California Museum Foundation, the non-profit support arm of the California Museum of Science and Industry.

Also named was Robert R. Dockson, chairman of the board of the California Federal Savings and Loan Association.

A christening for Asteroid San Diego



A three-mile-wide asteroid orbiting the sun millions of miles from earth has been named for the City of San Diego in appreciation of the city's responsiveness to appeals for a street-lighting policy that will help restore dark skies to the area. The announcement was made at a ceremony in San Diego during May. On April 23, the San Diego City Council voted 6-3 to implement, over a three-year period, a previous decision to install low-pressure sodium lights throughout the city. The first lights will be installed in early summer.

Three alumni, including two on faculty, elected to NAE

Two members of the Caltech faculty, both of them alumni, and a third alumnus have been elected to the National Academy of Engineering — the highest professional distinction that can be conferred on an engineer.

The faculty members are Donald E. Coles (MS '48, PhD '53), professor of aeronautics, and Carver A. Mead, (BS '56, MS '57, PhD '60), the Gordon and Betty Moore Professor of Computer Science. The alumnus is Eli Reshotko (PhD '60), professor of engineering, Case Western Reserve University.

Coles was honored for "contributions to the science and engineering of turbulent flows through his own experiments and critical compilations of other measurements." Mead was elected for "great insight into the problems and potentialities of VLSI (Very Large-Scale Integrated) Circuits, and for helping to advance the art."

Reshotko was selected for "pioneering fundamental research on compressible boundary layers and their stability and transition and innovative applications of that work."

The three men were among 58 new members elected to the Academy this year.

European scientific societies honor Wyllie, Wasserberg

Two members of the Division of Geological and Planetary Sciences have been honored by European scientific societies. Peter J. Wyllie, chairman of the division and professor of geology, has been elected a Fellow of the Royal Society of London. Gerald J. Wasserburg, the John D. MacArthur Professor of Geology and Geophysics, has been designated one of the first group of six Foreign Honorary Fellows of the European Union of Geophysics.

Students set policy for educational computers

Continued from page 1

equivalent of a full-time programmer to create needed software. The student committee will determine what software is needed, and assign both the programmer and student volunteers to write it, according to Decker.

"We expect a lot of students to get involved in writing software — for example, data analysis routines that the others will find useful," says Decker.

"We believe that giving the students themselves responsibility for their own computers will not only improve our ability to answer their needs, but also give them an important educational experience," says Geoffrey Fox, dean for educational computing.

Caltech has also begun a major program to integrate computers into all areas of education, an effort that will result in some 800 computers for educational use on campus over the next three years. Students will play a major role in this process, and in deciding how best to use the evolving high-speed campus computer network in the houses, according to Fox.

On the cover

A tour of the Caltech Seismological Laboratory was on the agenda for a visit to southern California by Prince Andrew of Great Britain. Here the Prince hears a description of the Caltech/USGS Southern California Seismological Network from Charles Koesterer of the U.S. Geological Survey. President Marvin L. Goldberger is at the left.

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Scientific communication and national security

The freedom to communicate openly within the scientific community about the results of research — and the needs and goals of national security — are potentially conflicting priorities. Recently these priorities have been the focus of considerable controversy within academic and governmental circles. President Marvin L. Goldberger discusses the issues involved in the article below.

By Marvin L. Goldberger

For the past two years, there have been extensive discussions between the Department of Defense and the academic community in connection with scientific communication and national security. This issue was joined following a speech by Admiral Bobby R. Inman on January 7, 1982, when he stated, in part: "There is an overlap between technological information and national security which inevitably produces tension. The tension results from the scientific desire for unconstrained research and publication on the one hand, and the federal government's need to protect certain information from potential foreign adversaries who might use that information against this nation. Both are powerful forces. Thus, it should not be a surprise that finding a workable and just balance between them is quite difficult."

This speech, which suggested the possible need for rather stringent regulations to stop what has been referred to by some administration spokespersons as a "technological hemorrhage," provoked a great deal of discussion.

The conflicting forces described by Admiral Inman are not new, but the already heightened concern over technology transfer during the Carter years has escalated sharply under the present administration. The intelligence community is particularly sensitive to the growing dependence of military systems on such high technologies as microelectronics, lasers, etc., and the fact that these same technologies have both military and non-military applications, with the concomitant difficulty of controlling leaks in the latter categories. In addition, it is said, there is an

increased effort on the part of the Soviets to absorb all the technical literature in applications in forefront areas.

In an attempt to clarify the issues, the National Academy of Sciences appointed a distinguished committee under the chairmanship of Dr. Dale Corson, former president of Cornell University. The committee was primarily concerned with those aspects of the problem that are peculiar to



Marvin L. Goldberger

universities: Universities integrate research and education, and restrictions on research will adversely affect the next generation of scientists and engineers; and universities have abhorred controls on access to information of any kind, and any such would pose an unfamiliar and very unwelcome challenge.

After a very careful examination of the nature of the technology leakage issue, with access to the highest level of classified intelligence information, the committee came to some general conclusions and made a number of important recommendations. They found there is a substantial and serious technology transfer problem with information being obtained by the Soviet Union by both overt and covert means from the U.S. and its allies. Although much information has been transferred through open scientific communication, in comparison with other channels, that coming from the research community does not threaten our near-term military security.

The general conclusion reached was that the best way to ensure long-term national security lies in what the committee members term "security by accomplishment." An essential ingredient of technological accomplishment is open and free communication. The obvious risks are acceptable because of our industrial and military establishment's capacity for rapid development of new technologies, rapid enough to give the U.S. a continuing military advantage over adversaries.

The Corson panel came to these conclusions:

- 1) No limitation on access to, or publication from, the vast majority of university research programs.
- 2) When specific information has direct military relevance it should be classified. Individual universities must make their own decision to accept government support for such work.
- 3) There are gray areas, sensitive from a security standpoint, but where classification is inappropriate. These fall mostly where there is a fuzzy boundary between basic and applied research and where the time from discovery to application is short. An example is the field of microelectronics.

There is a serious problem in defining the gray areas precisely, but the panel urges no restrictions in any area of university research unless four conditions are all met:

- 1) Rapidly developing technology with a short time between basic science and application; and
- 2) Identifiable direct military applications or in dual use, and involves process- or production-related techniques; and
- 3) Transfer of the technology to the USSR would give the Soviets a significant near-term advantage; and
- 4) Either the U.S. is the only source of the information or other friendly nations that could also be the source have control systems at least as secure as ours.

In these limited instances where all of the above criteria are met but classification is felt to be unwarranted, both university and government needs could be met by written agreements or contracts no more restrictive than the following:

- 1) No direct participation by nationals of designated foreign countries, but no limits on physical access or enrollment in courses.
- 2) Simultaneous submission for publication to journals and federal agency contracting offices with a 60-day period for the latter to seek manuscript modifications. However, changes cannot be ordered and the freedom to publish remains with the university.

It is the latter issue that has recently been raised in a proposed Pentagon regulation. Namely that in connection with research called "applied" and "sensitive" (and the term "sensitive" is very ill-defined as yet) there would be a requirement to send draft manuscripts 90 days in advance of journal submission, with Pentagon reviewers making the final decision on whether the material could be published. In a letter to Undersecretary of Defense for Research and Engineering Dr. Richard DeLauer, and to Presidential Science Adviser Dr. George A. Keyworth II, the presidents of Caltech, Stanford, and MIT flatly stated that their universities would be unable to accept any research contracts with such restrictions. They urged the Department of Defense to reconsider their proposed position. There has been no answer as yet.

In conclusion, it should be said that Caltech at present has no funds from DOD in the so-called applied area, and so is not directly affected at present. The principle, however, is very important, and will, we hope, be opposed by the whole academic research community.

Financial Aid Office faces growing gap between needy students and traditional funds

By Winifred Veronda

Caltech's Office of Financial Aid continues to be faced with a shortfall between traditionally available funds and the number of eligible students seeking support. That shortfall in 1983-84 amounted to almost \$300,000 and is estimated at \$500,000 for 1984-85.

The gap is caused by the decline over the past three or four years in government funds allocated for financial aid — and by an increase in the number of eligible applicants as the cost of attending Caltech (\$9,400 tuition plus room, board, and other expenses) has risen to \$14,289 for 1984-85.

This year, the gap was closed by by an increased appropriation from the Institute's general fund, and by spending a larger than average proportion of the interest earned on Caltech's scholarship endowment — 7 percent compared with the standard 5-3/4 percent. "Normally," says Ruth Gilmore, Caltech's director of financial aid, "we try not to spend more than 5-3/4 percent of the interest, and to reinvest the remainder."

Annual gifts for scholarships are up, she adds, but they are not rising in proportion to the need.

Federal programs for financial aid remained fairly constant in 1983-84 and funds available for Caltech will actually increase in 1984-85 by 5 percent. (In real dollars, this is a substantial decrease from the 1980-81 funding level.) Meanwhile, changes in federal financial aid programs that were initially projected for 1984-85 have been postponed, and no sub-

stantial changes are expected in 1985-86.

But 1986-87 is another story. The Higher Education Act, under which federal funds are allocated to academic institutions, is due for reauthorization during the next 12 months, and the administration's recommendations for the act would sharply cut funds available to the Institute. If these recommendations are accepted, Caltech's aid funds in 1986-87 would be cut by 18 percent, or about \$185,000.

About 75 percent of the Caltech undergraduate student body receives some financial aid, either from the Institute or from another source. Across the country, approximately one out of four students receives some form of financial aid. But at private colleges and universities with steep tuition costs, the percentage is much higher.

As the decrease in available federal aid funds has shifted a larger percentage of educational costs to students and their families, student are working longer hours — both on and off campus — and also trying to find outside employment and off-campus scholarships. Of the Caltech student body, 85 percent hold part-time jobs, according to Gilmore.

Students are also borrowing more money, and this concerns financial aid officials. "We try to control the size of the loan burden that students take on," says Gilmore. "If that burden becomes too large, those unable to pay face the danger of default. Other students who had planned to go on to graduate school may change their plans because of the loans they are carrying."

Undergraduates may borrow up to \$18,500. The largest loan carried by a student receiving a BS degree in 1983 was \$14,300.

Gilmore noted that Caltech's student default rate on loans continues to be well below the national average of 9.5 percent. But between June 1982 and June 1983 it rose from 2.9 percent to 3.9 percent. This was the year when students began to assume average loan burdens higher than \$5,000.

Students may decide not to go on to graduate school because of the loan burdens they are carrying. The result is a drain on the academic community at a time when individuals with graduate degrees are badly needed.

When students make the decision not to go on for graduate degrees, the result is a drain on the academic community at a time when individuals with graduate educations are badly needed. Some 2,000 vacancies exist in colleges and universities and in industry for engineers with graduate degrees, Gilmore points out.

An apparent consequence of the tightening in financial aid funds is a decline in the number of students coming to Caltech from California families with incomes in the \$28,000 to \$40,000 range. Many of these have chosen to attend the University of California, Institute officials believe. Across the board, the family income of students applying to the Institute

has risen to an extent that cannot be fully accounted for by cost-of-living adjustments in wages and salaries.

The concern on the part of families and students is partially valid. The Institute is continuing to offer admission to students on the basis of merit, irrespective of financial ability, and the amount of aid offered, in dollars, remains constant.

But the aid package today contains a larger percentage of loan and part-time-job income, and a smaller percentage of direct aid, than was true in 1980, because total costs have risen.

At the national level, a consequence of the tightening of federally available funds has been a search for creative ways that parents can plan, on a long-term basis, for their children's college educations. For the past two years, a new federally guaranteed loan program enables parents to borrow up to \$3,000 a year at 12 percent interest toward the education of dependent children enrolled in school. Pending in Congress is a plan to allow parents to create tax-exempt education savings accounts along the lines of an Individual Retirement Account (IRA).

At the Institute, a consequence of the tightening has been a concerted effort within the administration to increase Caltech's scholarship endowment, so that the Institute can continue to accept any student whose qualifications merit admission, and to maintain its traditionally diverse student body.

The ability to do so is especially important at a time when the number of college-age students is shrinking and when competition for those who are academically talented is intense.

Balmy weather tempts Eleanor Searle, professor of history, and her students to a class in the open air.



Caltech's math team wins the Putnam competition

Caltech's three-member mathematics team won the 44th annual William Lowell Putnam Mathematics Competition this year, in competition with some 1,900 students from throughout the United States and Canada. Senior Alan Murray placed in the top ten individual scorers. The top ten winners are not individually ranked.

Since the first Putnam competition in 1938, Caltech teams have taken first place nine times, second only to Harvard's ten. Tech last won the Putnam in 1976 and received an honorable mention in 1981.

Seniors Charles Cuny and Bradley Brock, the other members of the faculty-selected Caltech team, received honorable mentions, according to Professor of Mathematics Richard Dean, who administers the exam for the Institute. Also winning honorable mentions among the approximately 40 Caltech students who took the test were junior Eric Kawamoto and sophomores Jung Im and Everett Howe. Their success this year bodes well for Caltech in next year's Putnam, Dean points out, since all of the members of this year's team are graduating.

Alan Murray received \$250 for his top-ten standing, in addition to the \$200 that each member of the winning team was awarded. The victory earned \$5,000 for Caltech, and the money is used to maintain the Eric T. Bell and Morgan Ward prizes for Caltech undergraduate work in mathematics.

According to Dean, Caltech does not train students for the Putnam competition. It does, however, stage a warm-up session a few days before the exam, when former Putnam participants who are now members of the mathematics faculty — Professor of Mathematics Gary Lorden and Professor of Mathematics and Theoretical Physics Barry Simon — talk with the students about the nature of the forthcoming mental meet.

"To be good at the Putnam, you need brute cleverness and agile thinking," says Dean. "You need the capacity to shift gears when you come to what seems a dead end, and to try another approach. The skills that make a good Putnam scholar are not necessarily the same as those that make a person good at research, where long-term, consistent efforts are what tend to pay off."

As Lorden has expressed it, the emphasis in the Putnam is on working at full steam, not getting discouraged easily, and above all, being a problem solver. "Success doesn't rest," he says, "as much on specialized mathematics techniques as on the ability to call on a general mathematics background and to analyze and work through a tough problem quickly."

An example of one of this year's challenges:

Let $f(n) = n + \lfloor \sqrt{n} \rfloor$ where $\lfloor x \rfloor$ is the largest integer less than or equal to x . Prove that, for every positive integer m , the sequence $m, f(m), f(f(m)), f(f(f(m))), \dots$ contains at least one square of an integer.

In some Putnam events, particular problems have defied the efforts of all contestants to solve them. In this year's competition, for example, no one achieved a perfect score on one of the problems.

The exam is given in two parts — morning and afternoon sittings that run from 9 a.m. to 5 p.m., with a two-hour lunch break. This year,

some 41 Caltech students turned out for the event, held in individual rooms in Baxter Hall of the Humanities and Social Sciences.

The Putnam Competition was established in 1927 by Mrs. William Lowell Putnam when she created the William Lowell Putnam Intercollegiate Memorial Fund in honor of her late husband.

Students who rigged Rose Bowl scoreboard fined \$330

After two months of negotiations, the two Caltech students who rigged the scoreboard at the 1984 Rose Bowl game pleaded no contest on March 27 to a single misdemeanor trespassing charge. A no contest plea is pleading guilty.

The students, Dan Kegel and Ted Williams, were fined \$330 each and placed on summary probation until the fines are paid. Three other misdemeanor charges were dropped. With payment of the fines, the conviction will no longer show on the students' records.

Kegel and Williams were charged in January after electronically altering the Rose Bowl scoreboard to show Caltech defeating MIT near the end of the nationally televised UCLA-Illinois game.

Pasadena city officials had asserted that the prank caused about \$4,200 in damage to the scoreboard

computer and its wiring. But they said \$1,000 should enable "imperfect but acceptable" repairs to be made until other alterations previously planned for the Olympics are in place. The fines paid by the two will cover most of the costs.

City officials had mentioned the possibility of asking the students to help design a security system for the scoreboard as compensation, but this was not included in the settlement.

On campus, where Kegel's and Williams's efforts were more appreciated than in the city prosecutor's office, the two students gave a first-hand account on Seminar Day of how they "won" the Rose Bowl.

Caltech's fall tuition rises from \$8,700 to \$9,400

Students entering Caltech in the fall of 1984-85 will face tuition costs of \$9,400 and a total educational budget (tuition, plus room, board, and miscellaneous expenses) of \$14,289 — up from \$8,700 in tuition and \$13,229 estimated costs for the current year.

The Institute's 1984-85 tuition compares with \$9,700 for Stanford, \$9,999 for MIT, \$9,800 for Harvard, \$11,002 for Princeton, and \$8,500 for Harvey Mudd.

Corporate grants boost educational computing program

Continued from page 1

Voyager data, physicists could develop educational uses such as displays of spinning tops, and engineers might map the acoustics of auditoriums."

Caltech has made a major commitment to educational computing, designating \$850,000 for the project over the past year. In addition, it has received pledges of cash and equipment from computer vendors totaling more than \$1 million.

Besides IBM and Hewlett-Packard, other manufacturers contributing to the project include Data General, Digital Equipment Corporation, Evans & Sutherland, and Tektronix.

A royal visitor charms students

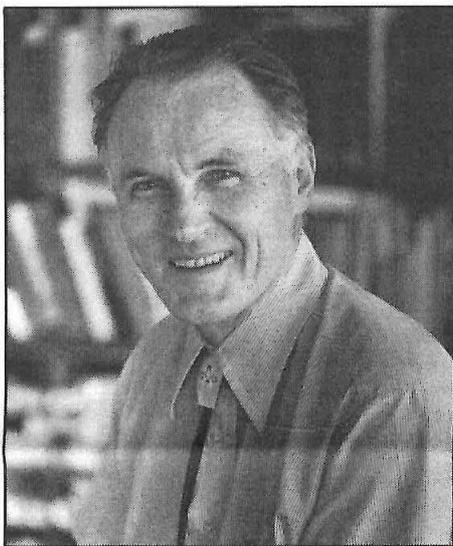


Caltech and JPL were just two of the stops on the itinerary for Great Britain's Prince Andrew during a week-long tour of southern California. At the Institute the 24-year-old prince toured the Seismological Laboratory, where unknown persons managed to insert an image of the British flag onto a video display that featured a modeling of convection calculations in the earth's mantle. Then the royal guest dined with a group of students at the Athenaeum, later remarking, "They're a lot brainier than I am."

Leighton named the Valentine Professor of Physics

Robert B. Leighton (BS '41, MS '44, PhD '47), Caltech professor of physics, has been named the William L. Valentine Professor of Physics. Widely known as a physicist, astronomer, and developer of innovative scientific instruments, Leighton will be the first occupant of the newly endowed position.

The professorship is a gift to the Institute from the late Edward Robinson Valentine of Santa Barbara, a Caltech trustee from 1948 to 1965.



Robert B. Leighton

A long-time resident of Pasadena, Valentine was a trustee of the Huntington Memorial Hospital and a director of the Security Pacific Bank. The Professorship is named in honor of his father, William L. Valentine, who co-founded the city of San Marino in 1913, served as its mayor, and was a member of its city council for over 25 years. He was also an early member of The Caltech Associates.

Leighton became a member of the Caltech faculty in 1949 and has been chairman of the Division of Physics, Mathematics and Astronomy, and a staff member of the Hale Observatories and of the Owens Valley Radio Observatory.

His contributions to scientific research have ranged from significant findings in particle physics to major discoveries in solar physics, planetary science, and infrared and millimeter/submillimeter astronomy.

Leighton is currently conducting research in millimeter and submillimeter wave astronomy. In collaboration with other researchers at the Institute, he has built three paraboloidal reflecting radio telescopes at Owens Valley Radio Observatory to study these phenomena. He and Professor of Physics Thomas G. Phillips are completing another dish, scheduled for installation on Mauna Kea Mountain in Hawaii in late 1985.

Leighton is a member of the National Academy of Sciences, the American Astronomical Society, and the American Association of Physics Teachers, and a Fellow of the American Academy of Arts and Sciences.

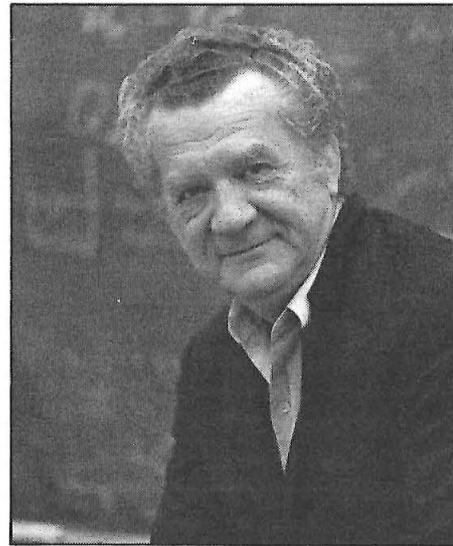
Epstein: the William E. Leonhard Professor of Geology

Samuel Epstein, professor of geochemistry in Caltech's Division of Geological and Planetary Sciences, has been named the first William E. Leonhard Professor of Geology, President Marvin L. Goldberger has announced.

The Leonhard Professorship is named for its donor, William E. Leonhard, chairman and chief executive officer of The Parsons Corporation.

Leonhard began his career in the Army and Air Force, from which he retired at the rank of brigadier general. He next served as director of the Titan III program at the United Technology Center before joining The Parsons Corporation in 1966. He is a member of the National Academy of Engineering and the Council on Foreign Relations. The recipient of numerous awards, he was recently named Southern California Engineer of the Year by the Institute for the Advancement of Engineering.

Much of Epstein's career has been devoted to studies pertaining to the origin and history of geological formations by analyzing their stable isotope composition. Stable isotopes are non-radioactive variants of any given atom which differ only in their mass. Epstein has used studies of isotopic abundances of hydrogen, oxygen, carbon, and silicon to understand the history of lunar and terres-



Samuel Epstein

trial rocks, including ore deposits and petroleum, glaciation, ancient climate, fossils, archeological finds, and to examine photosynthesis and animal physiology.

He joined the Caltech geology faculty as a research fellow in geochemistry in 1952, and was appointed professor of geochemistry in 1959.

Epstein's contributions have been widely recognized by his peers in the scientific community. In 1977, he received the Goldschmidt Medal of the Geochemical Society, followed in 1978 by the Arthur L. Day Medal of the Geological Society of America. He was elected a member of the National Academy of Sciences and a member of the American Academy of Arts and Sciences in 1977, and

served as president of the Geochemical Society for 1978-1979. In 1980, he received an honorary doctorate from his alma mater, the University of Manitoba.

Geology Division receives \$500,000 for new instruments

Atlantic Richfield Foundation has awarded Caltech \$500,000 for new scientific instruments in the Division of Geological and Planetary Sciences, President Marvin L. Goldberger has announced.

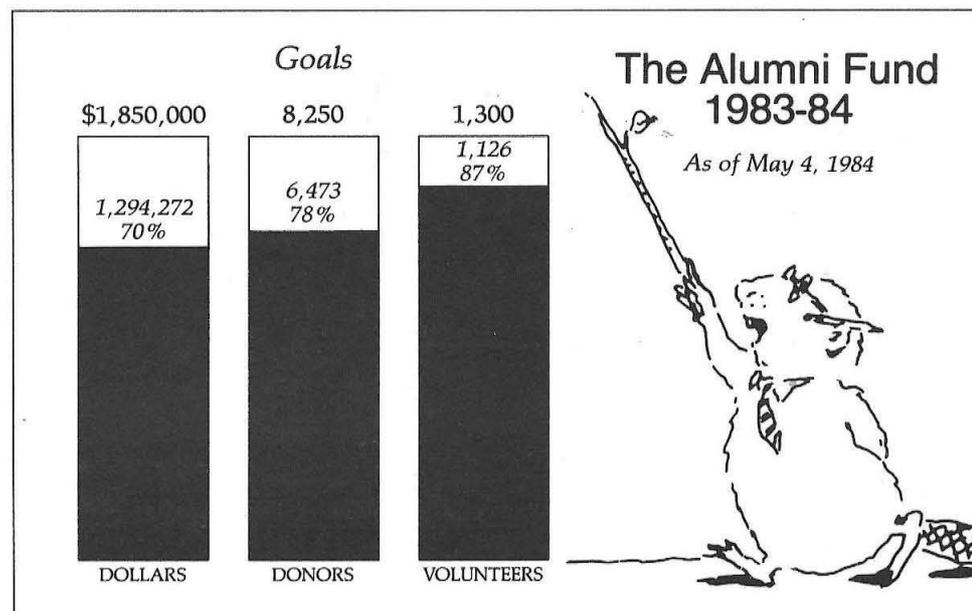
The grant will be used to help purchase two new analytical devices for the division — an automated electron microprobe and a Fourier transform infrared analyzer.

The electron microprobe is a device that provides a precise chemical analysis of a selected tiny volume (less than one cubic micron) on the polished surface of a mineral or rock. It measures the x rays excited by an electron beam that can be focused to a point and scanned across the surface. The instrument produces compositional maps that are used to study mineral growth, as well as precise analyses of mineral grains too small to remove from the rock for analysis.

Caltech's electron microprobe facility, established in 1963, was among the first in the nation. Using that facility, Caltech Professor of Geology Arden Albee and his colleagues devised analytical methods for automated EMP analysis that are now used worldwide for analyzing complicated minerals.

The Fourier transform infrared analyzer measures the spectrum of infrared radiation passed through a sample to determine the amount of water or other forms of hydrogen it contains.

These instruments are used by geologists to analyze both terrestrial and lunar rock samples, as well as meteorites, for clues to the origin of geological features on earth, and the origin and evolution of the solar system.



This article is one of a type that will appear occasionally in Caltech News, featuring programs at the Industrial Relations Center that are of general interest to alumni.

Apple Computer, a pacesetter in the highest of high-tech industries, uses a combination of the newest manufacturing technology and emphatically old-style manual assembly to make its latest machine, the Macintosh. Machines and workers on the high-speed line churn the advanced computers out at a rate of 2,000 per day. The workers are motivated only by the need to keep up with the machines and exhortations to get the job done.

A Japanese bank instills commitment in its new workers by giving them a three-month training program that includes a 25-mile hike.

Data General, the Massachusetts computer manufacturer, does little to motivate its engineers, except to throw them the toughest problem it has and demand a brilliant solution. The results of this approach were outlined in the bestselling book by Tracy Kidder, *Soul of a New Machine*.

Lincoln Electric Company has for 70 prosperous years obtained dedication from its workers with cold, hard cash, paying them generous piece-work rates and large year-end bonuses for assembling arc-welding equipment.

All the strategies are part of the manager's tool kit for generating commitment in workers, said industrial engineering expert James V. Jucker in a workshop at Caltech on organizational productivity.

The workshop, part of a week-long program for managers on the "Effective Management of Production Operations," was sponsored by the Caltech Industrial Relations Center. Jucker is a professor of industrial engineering and engineering management at Stanford University.

The conference featured experts in production and manufacturing management who presented case studies in such areas as inventory control, manpower and production scheduling, and technological planning.

The Industrial Relations Center sponsors some 65 seminars and conferences a year for more than 1,000 technical and general managers representing a wide range of technology-based industries in the greater Los Angeles area.

How to motivate workers? U. S. firms take a hard look

By Dennis Meredith

"Managers are becoming much more interested in gaining worker commitment," said Jucker, "and one of the main reasons for this is the need for higher quality in products. If the workers don't care about the goals of the organization, then achieving quality is very difficult."

U.S. manufacturing, goaded into action by the higher quality of Japanese manufactured goods, is modernizing its way of managing workers, as well as building high tech factories, according to Jucker. He says the efforts to build worker incentive will intensify as the Japanese challenge moves into new arenas.

"Japanese electronic equipment is beginning to enter new areas of the U.S. market, and as a consequence we're seeing the domestic electronics industry become much more interested in ways of improving quality without increasing cost." In deciding how to motivate workers, says Jucker, managers must consider workers and their environment.

"At Data General, managers of the project to develop a new computer found it easy to obtain commitment. They had a work force of young engineers committed to a challenging and interesting task. One of them asserted, 'I don't do it for the money,'" Jucker says.

Even when the task is not so glamorous, there are other, more traditional ways to excite workers, Jucker says. For example, there is renewed interest in the incentive system used by Lincoln Electric to encourage its workers to perform, he notes. "People on the factory floor typically make twice as much as workers at similar companies, and the year-end bonuses sometimes equal their annual salary." Jucker also discussed the Japanese method of engendering corporate loyalty, which he says could be applied in this country, despite cultural differences.

"For example, a Japanese bank sends its new employees through a rigorous three-month training pro-

gram that even features a 25-mile hike. The idea: to instill some institutional values such as hard work into the new employees. "It's much like the team-spirit building that goes on in baseball spring training.

"Ironically, this bank felt it necessary to embark on such a strenuous program because its managers were worried that Japanese society itself wasn't indoctrinating its members in traditional values as well as it used to. Such extensive training was worthwhile for the bank because its managers expect employees to be with them for a lifetime."

Would U.S. workers tolerate such a demanding regimen? "Suppose a plum corporation like IBM established such training as a condition of employment. In that case, a great many people would be willing to endure the program."

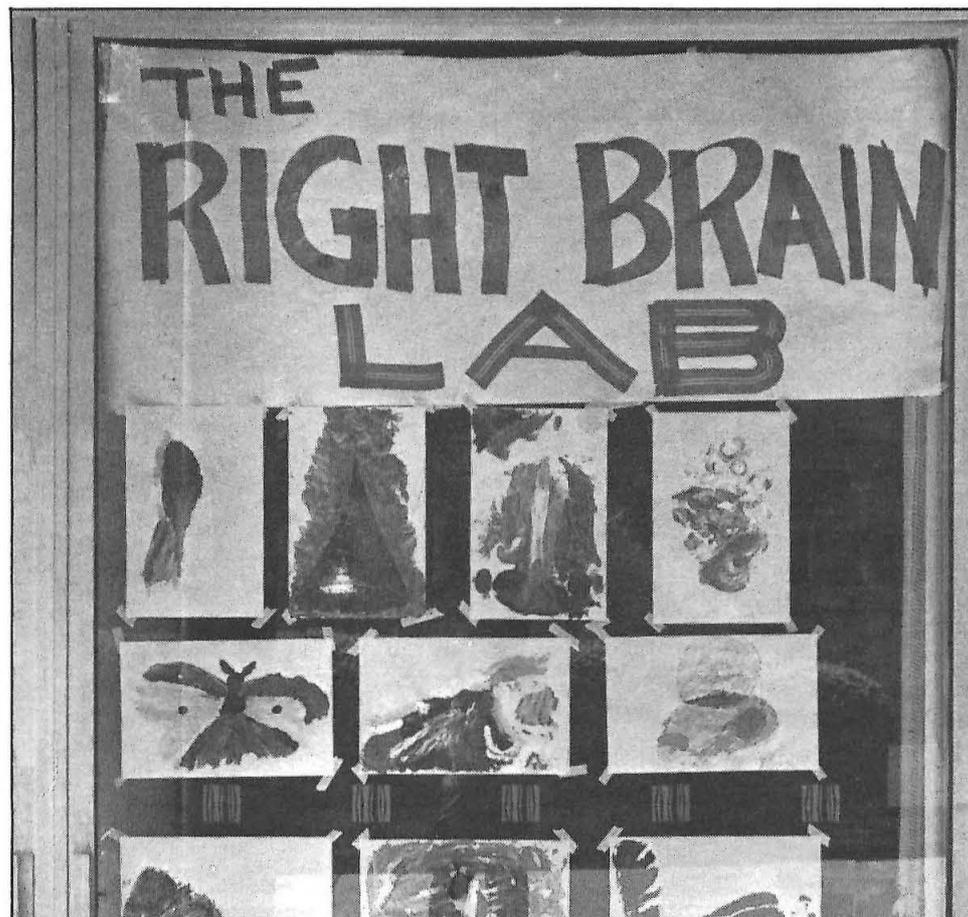
The electronics industry has been successful at assembling machines largely without using employee motivation programs, observes Jucker, but this will soon change.

"There seems to be a bit of inconsistency in the industry," he says. "The computers are designed by highly motivated engineers, but when they get down to designing the assembly jobs, they're willing to accept a whole different set of standards — even though achieving consistent quality requires worker commitment."

Discussing Apple Computer's new product, the Macintosh, Jucker says, "Right now there's a lot of excitement on the line about beginning a new product and getting all the machinery working right. But after the plant runs for six months or a year, the 27-second cycle time will get old very rapidly."

According to reports, says Jucker, Apple will soon drastically re-engineer the Macintosh assembly line, adding robots and computer controls. Such automation is becoming possible in computer assembly because product lines such as the Macintosh are stabilizing. This means that factories no longer need to rely as much on hand assembly for greater flexibility.

Caltech students swing to the right



Tapping the creative potentials of the brain's right hemisphere for the creation of art projects — and for inner enrichment — was the goal of the Caltech Y-sponsored Right Brain Lab. Art Therapist Cynthia Corngold originated and conducted the lab, which was in session on Friday afternoons, and open to any interested student. A few laboratory projects adorn the door above.

Paul Graven

"Getting involved" on campus led to the ASCIT presidency

As a student in Hopkins, Minnesota, Paul Graven heard from a friend about a good school in Pasadena for bright students in science and engineering, and he decided to apply. He hasn't regretted the decision.

"I'm getting a good education," he says, "and Caltech has given me a lot of opportunities to get involved, opportunities I wouldn't have had at a bigger school — to know the faculty and administration, for example, and to be on the water polo and swimming teams."

This winter, another opportunity for involvement came to Graven: He was elected ASCIT president by a landslide vote. He enjoys going around campus and talking with people, so he did a lot of one-to-one campaigning, and he spoke at each of the houses. The students liked what they heard. "As ASCIT president," he says, "my goal is to improve student life in any way I can."

A junior majoring in engineering and applied science and in economics, Graven is a member of Ruddock House and a social member of Dabney and Page. He has been junior class president and a member of the ASCIT executive committee advisory board, and he is a student representative on the administration's transfer admissions committee. Because his goal is management in a technological company, he plans to earn a graduate degree in business or law, or perhaps also a master's degree in engineering.

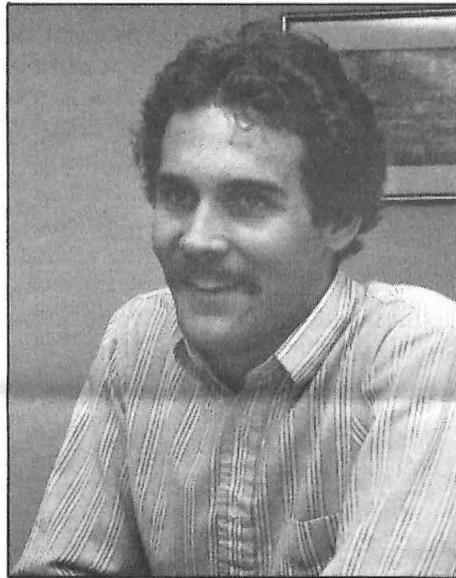
Graven's work on the transfer admissions committee has given him special insight into students who transfer into and out of Caltech, and as ASCIT president, he wants to take a special look at those who need to leave the Institute. How can their situation be eased?

He notes the phenomenon called "flunking in," through which Caltech students find themselves with GPAs too low for success at Caltech — and too low for admission to good but less rigorous institutions where they could succeed. He wonders how more can be done to reach them sooner.

"Part of the problem for these students is a feeling of failure if they transfer," he says. "I believe it's important for the administration to let undergraduates know that it supports them whether they're doing well or not, and that it wants them to

get the best educations they're capable of, either here or somewhere else. They need to know that the administration doesn't regard them as failures if they don't stick it out."

Other presidential interests for Graven involve exchange programs between Caltech and universities in foreign countries, and expansion of the research handbook to include a broader range of information — on fellowships, for example.



Paul Graven

He is also concerned about how Caltech requirements could be modified to give undergraduates better communications skills, both oral and written. "Most Caltech graduates won't be 'just good scientists or engineers,'" he says. "They'll go into leadership positions and they'll need to communicate effectively." He would like to see humanities division courses that would better address this need.

Morale among students is generally good these days, Graven feels, although most of them are not emotionally stirred by causes beyond their daily lives. But then, he notes that "Caltech students are very rational people. They look at the facts; they ask what can be done about a problem; they don't get out of control. This is how they reacted when the Arroyo Center became an issue. They thought about it and they went to the meeting with Dr. Goldberger, and listened to the facts."

As ASCIT president, Graven will be using that same approach as he seeks ways to make life better for Caltech undergraduates — and the odds look promising that helpful changes will result.

The Way It Was

1921

Tau Beta Pi Association, engineering honor society, has granted a charter to CIT, reports the *Star-News* on January 3. This is the third charter to an institution west of the Rocky Mountains, the others being at the University of California and the University of Washington.

Robert A. Millikan, professor of physics at the University of Chicago and a scientist of considerable repute, is coming to Pasadena permanently as director of the Norman Bridge Physics Laboratory at CIT and chairman of the Executive Council. The *Star-News* reports on July 27 that he is declining the position of president "because of the public and administrative functions usually attached to that office, and his desires to devote himself to the development here of one of the most important centers of research in the country . . ."

1939

Within 100 years or less, the invasion of neurology by biochemistry will be able to control the evil in mankind on a scientific basis, predicts Henry Borsook, Caltech professor of biochemistry, as reported in the *Pasadena Post* on January 11. "One hundred years from now, we will not say, 'A man is a criminal or vicious; but that there is too much pyruvic acid accumulating in his thalamic cells, that there is not enough co-carbohydase operating in his thalamus, and that he does not have enough neurons descending from his cortex . . .'"

Dr. Otto Schmauss, an exchange fellow in biochemistry at CIT, presents the Nazi viewpoint before a student group in Dabney Hall, as reported in the *Star-News* on January 22. Referring to the seizure of Austria and parts of the Sudetenland, he says the German people felt these areas really belonged to the Reich and regarded the Versailles-made country of Czechoslovakia as an arrow aimed at Germany's heart. Concerning the Jews' expulsion and persecution, Schmauss explains that after the revolution, Germany found itself invaded by 250,000 Jews to "add to the large number already there," and that this "broke the camel's back."

Formal dedication of CIT's two new geology laboratories, the Charles Arms Laboratory and the Seeley W. Mudd Laboratory, erected with \$550,000, is scheduled for March 14, according to the *Star-News* on the preceding day.

Young scientists at CIT, in addition to conducting fascinating research experiments, are also doing some experiments on how to live a happy married life on \$75 a month, the final session of the "Building a Happy Marriage" series at the YWCA reveals, as related in the *Star-News* on April 25.

Important research in Crellin Laboratory suffers in an explosion that wrecks a laboratory room in the new \$250,000 structure and damages all scientific work in the vicinity of the blast. Spilled ether either caused the explosion or ignited when the blast occurred, according to the *Pasadena Post* on August 7. Leo Brewer, a student at work in the room, escapes with only minor burns.

1954

Eulogies are paid to Robert A. Millikan, Nobel laureate and chairman of Caltech's Executive Council, who died December 19, 1953. Until his final illness, reports *Engineering & Science* magazine, Millikan kept regular office hours at the Institute — his one concession being to spend an eight-hour day there instead of the 16-hour one that had been his standard.

The men of Dabney House are rewarded with a formal four-course banquet and an after-dinner show featuring distinguished members of the faculty, for their victory in the ASCIT Consolidated Charities Drive interhouse competition. Headwaiter George Beadle is assisted by Professors Pauling, Davidson, Kyropoulos, Paul, and Eagleson, and by Deans Strong and Eaton. Professor Whaling is toastmaster as Professor Cowan leads off the program with a lecture on the velocity of escape of flies from flypaper, according to the April *E&S*.

William H. Pickering, professor of electrical engineering, is appointed new director of the Jet Propulsion Laboratory, succeeding Louis G. Dunn, who resigned to join the staff of the Ramo-Wooldridge Corporation, according to October *E&S*.

The 1954 Nobel Prize in chemistry goes to Linus Pauling for research into the nature of the chemical bond and the structure of proteins, *E&S* relates in November.

William Howard Taft had recently become president, succeeding Theodore Roosevelt, when Virgil P. Morse enrolled as a freshman at the new Throop Polytechnic Institute campus at California and Hill. His was the first class to attend all four years at the new Throop Hall, surrounded by orange groves on the outskirts of Pasadena.

Born in 1886 and a native of the Midwest, Morse had come here with his family from their farm in Illinois in 1906. In Pasadena they managed a relative's orange groves at what is now 300 South Hill in Pasadena.

In 1910, Morse, then 25, had a good job sorting mail for the railway mail service, and he had just received a nice raise, boosting his salary to \$100 a month. He was wooing Stella, three years his junior, and, encouraged by the new income that his raise provided, he asked her to marry him.

But Stella felt that Morse could make better use of his talents than as a mail sorter, and she urged him to go on to college. "I'll wait for you," she told him. Six years older than the average undergraduate, Morse enrolled at Throop Polytechnic Institute in the fall of 1910 to major in electrical engineering.

He was a straight-A student at Throop, and he went on to win the coveted travel prize awarded to the graduate with the highest grade point average: a ticket to Europe and expense money good for several weeks of travel.

Soon after graduation, he sailed for Europe in the company of 300 mechanical engineers who were to be guests of the German Engineering Society. The Americans were royally entertained for three weeks in each of the German cities that they visited, and then Morse went on with a friend to Venice, Switzerland, Paris, and London. Back in London six weeks after his departure, he learned that his father had died a month earlier and he sailed for home.

Morse married his sweetheart, who had waited. Today they have five children, 13 grandchildren, and 16 great grandchildren. After graduation he worked for a time as an electrician, and then at Occidental College as a mathematics teacher. From there he went to work for the city of Los Angeles as an engineer, staying until

Virgil Franklin Morse was a senior when this picture appeared in the 1914 Throop Tech. Morse wrote his thesis on "Some Implications of the Permeability of Iron and Steel."



How to live to be 98? Caltech's oldest alumnus shares his secret

he retired in 1956 at age 70. He had worked 49 and a half years without missing a day due to illness.

Morse had no trouble keeping busy after retirement. He and Mrs. Morse bought a motor home and they traveled, setting out on a 14,000-mile trip across the United States when he was 73. They lived for nine years in a home at Big Bear, and then in a mobile home park in the San Fernando Valley before a fall confined Mrs. Morse to a wheelchair.

Today the couple lives in a nursing home in Granada Hills, California. It was there that the 98-year-old Caltech graduate was discovered this fall by an Alumni Fund worker. In March he came to the campus for lunch in the Athenaeum with President Marvin Goldberger, and a tour of the campus. "The place looks like a city now," he said of the Institute, which he had not seen in several decades.

At the nursing home, Morse continues to keep busy, cutting firewood, gardening, helping to take care of Mrs. Morse, watching sports events on television (he concentrates on action events because of his hearing) — and writing poems and playing word games.

Morse attributes his longevity to 69 years of happy marriage, and many of his poems are dedicated to Stella. He wrote this one for her two years ago, when she was 94 and he was 96: To Stella: I'm reaching out to you, my love/ I'm handing you my heart/ I love you now; I always will/ I loved you from the start/ Now that our days are nearly done/ Our sun is setting too/ thank God, my dear, that you are here/ For all I want is you!! Your adoring husband, Virgil. "We're still very much in love," he says, "and we never had an argument. There wasn't any need to. We both learned to adjust a little."

Morse also writes short humorous rhymes like this one, also inspired by Stella:

Love is the glue that makes one out of two.

And he poses riddles: What do a baker, a beggar, a deer, and a choir-master have in common? They all need dough, dough, doe, do.

Morse acknowledges that, in addition to his happy marriage, there may be another factor contributing to his long life: heredity. His sister, who is 101, takes care of the daughter with whom she lives. How old is the daughter? "I believe," says Morse, "that the girl was born in 1904."

Would he change anything about his 98 years of living? "Not very much," he remarks. "It's been a peaceful life. I'm happily married, and I sure wouldn't want to change that." Asked if he had been frightened of getting old, he looks puzzled and says, "Well, I guess I never thought about it. It's not something you can do anything about, you know."

Morse, who remembers when Cleveland was president and when he saw his first automobile (a horse and buggy equipped with a motor), and the first automobile that he himself owned (a little Maxwell) says he is shooting to live to be 100, "and I think I'll make it." Then, he says, "I hope I'll get invited out for lunch again."

Berg honored for distinguished research

Howard Berg (BS '56), Caltech professor of biology, has been named co-recipient of the 1984 American Physical Society Biological Physics Prize for outstanding achievement in biological physics research.

Berg is a leading authority in the field of bacterial behavior, particularly locomotion. In 1978-79, he was recipient of a Science Faculty Professional Development Award from the National Science Foundation. His work with bacteria was featured in a 1977 episode of the BBC series "Horizons," and was repeated in 1980 on a Nova program entitled "Living Machines."



Morse dines at the Athenaeum with President Goldberger on a visit to the campus.

Alumni Association life membership dues go up August 1

Life membership dues in the Alumni Association are being raised, effective August 1, to \$400 in one payment or four equal payments of \$125 each. Life memberships for alumni during the first year of graduation will rise to \$360 in one payment, or four annual payments of \$112.50 each.

The dues increase is necessary to match rising costs, guarantee a consistent quality of services and programs, and fulfill the needs of a growing alumni body, according to the Alumni Association's Board of Directors in voting the action.

Members can continue to purchase life memberships at the existing rate through July: \$300 or, for new alumni, \$270.

Caltech Day in San Francisco: September 8

San Francisco Caltech Day will be September 8 at the San Francisco Airport Hilton. Save this date for dinner with Nobel Laureate William A. Fowler (the Institute Professor of Physics emeritus), who will describe his experiences as a 1983 nobelist in Stockholm in a talk entitled "The Queen and I." Cocktails begin at 5:30 p.m., with dinner at 6:30.

Legends of Caltech

Legends of Caltech is in its third printing. This Alumni Association-published chronicle of 50 years of pranks by Caltech students is available through the Association office. Use this coupon for convenient ordering.

Please send me _____ copies of *Legends of Caltech* at \$9.00 each.

Name _____

Address _____

Mail your check or money order, made payable to the Caltech Alumni Association, to:
Caltech Alumni Association
Mail Code I-97
California Institute of Technology
Pasadena, CA 91125

Alumni to explore Mt. St. Helens, Columbia River Gorge

The Alumni Association is planning a trip to the Mt. St. Helens and Columbia River Gorge on August 22-27. Leaders for the two-day circuit of the Columbia River Gorge to Mt. Hood via Hood River Valley will be Robert Sharp, the Sharp Professor, emeritus, and John Allen, professor emeritus from Portland State University and an outstanding authority on, and guide to, the geology of the Gorge.

Caltech alumni Donald Petersen (PhD '55) and Dan Dzurisin (MS '75, PhD '77) of Cascades Volcano Observatory will lead a two-day circuit of Mt. St. Helens, focusing on the area devastated by eruption.

Trip participants will assemble in Portland on Wednesday, August 22, and conclude the trip on Monday, August 27. More information and a detailed flyer is available from the Alumni Association office.

Obituaries

1920

THERON C. HOUNSELL, on March 11, at the age of 84. He was retired from his job as electrical engineer with the Los Angeles Department of Water and Power and was living in Glendale, California.

1926

JAMES M. CARTER, age 80, on December 3, of congestive heart failure. He had been a self-employed consultant for many years in Pasadena.

1931

JOHN B. OSBORNE, Ex, in Santa Monica, California, on November 5, 1983. He had been retired for many years

HSUEH-CHOU WU (formerly spelled Sho-Chow Woo), PhD, on October 31, in Changchun, China, at the age of 81. He had been director of the Changchun Institute of Applied Chemistry. He is survived by three children.

1932

THOMAS W. BELL, MS '33, in August, of leukemia. Bell was retired from Texaco, Inc., where he had spent most of his career in the drilling and production departments, and was living in Rocklin, California. He is survived by a son, a daughter, and three grandchildren.

CLARK GOODMAN, on June 23, 1983, in Coronado, California, at the age of 73. A noted nuclear physicist and pioneer in nuclear engineering, he had been a senior physicist at Oak Ridge National Laboratory, a faculty member at MIT, assistant director of the division of reactor development with the Atomic Energy Commission, and a member of the LAMPF advisory committee to the director of Los Alamos.

DONALD B. GRAFF, on February 10, from chronic heart disease. Mrs. Graff writes from their home in Modesto, California, "Don had particularly enjoyed reading *Legends of Caltech*, and the subsequent follow-up of the scoreboard caper on January 2, as we were watching the Rose Bowl game on TV."

1936

WALLACE L. KIGER, in March. He was retired from his job as manager with Kemper Insurance in San Francisco and had been living in Laguna Hills, California. He is survived by his wife, son, Ron, and brother, Chester.

1937

DOUGLAS K. ROLLOW, on December 19, 1982. He had retired from his position as senior systems engineer at Hughes Aircraft Company in Canoga Park, and was living in Oxnard, California.

Letters

Dear Editor:

I have enjoyed my copy of *Legends of Caltech*, including the recent accomplishment at the Rose Bowl. I hope the city of Pasadena will drop its charges.

Here is another event that took place in the late 1930s. Fleming House, where I lived, had a beautiful brass cuspidor, liberated, I think, by house member Austen and used as the trophy in inter-Alley contests. Appropriately, it was called the "Austen Inter-alley Trophy," and was prized by house members. Anyway, it was stolen by Ricketts House, and when recovered, was filled with concrete.

This posed no great problem until it was discovered that the concrete contained various ampoules of volatile liquids prepared during experi-

ments by the chemistry students. Such rude treatment required retaliation, so an invasion of Ricketts was planned for about 2 a.m. one night.

All would have gone on schedule except that Holland was invaded by the Nazis that night. The many students who remained awake to listen to the news destroyed the surprise aspect of any invasion of Ricketts, so it was called off.

This happened about 45 years ago, and my memory is rather dim concerning the details. In fact, I may have confused two separate events. Write J. B. Stevens of the class of 1940. He could probably give you a more accurate version.

Truly yours,

G. R. Brown (BS '40)

ROBERT D. TOWNSEND, MS '38, on February 9, of a heart attack in the late stages of Lou Gehrig's Disease. He was retired from his job as chief engineer for facilities with Mobil Oil in Norway, and had been living in Carrollton, Texas. The family requests that in lieu of flowers, memorial contributions be sent to Caltech.

1942

GEORGE H. MAGUIRE, Ex, of a massive coronary on March 3. He had been an airline captain and pilot with TWA, and was living in Solvang, California.

1948

FRANK J. WOLF, on December 29, 1983, of cancer. He had been assistant manager of defense systems division, Hughes Aircraft, where he worked for 25 years. He was involved with many space programs, among them the Surveyor landings on the moon. He is survived by his wife, Noreen; his mother, Victoria Wolf; son, Brian; and daughter, Deborah Victoria.

1955

RAYMOND G. GRIESER, on September 28. He was the owner of Acadian Farm in Clarence Center, New York. He is survived by his father, Allen Grieser.

Personals

1927

ENGLE F. RANDOLPH writes from Laguna Hills, California, "Retired from Randolph, Johnson, Miller in 1977. Wife of 50 years died Sept. '82; married Irma, March '83. Busy with new wife, three old cars (which will have to go), tennis, and racketball. Enjoying life in Leisure World, Laguna Hills."

1933

GEORGE H. PICKETT, MS, '34, sends this note from his home in Pasadena: "After celebrating my 50th graduation from Caltech, and wife's 50th from Pomona, our children honored us with a party at the Caltech Alumni House, in celebrating our 50th wedding anniversary. In July '83 we moved into a condominium — a very lucky spring and summer!"

1934

RAYMOND W. TRAYNOR, of Santa Rosa, California, reports, "Death of my wife, Mary, early 1983 — cancer. I still have five grandchildren and a great-granddaughter in the oven. Recently married Eileen Budaeff, a friend of many years. Retired a year ago August. Was west coast manager of Daigger Scientific for last eight years."

1936

HUGO A. MENEGHELLI, a very busy retiree, with a mailing address in Cuyahoga Falls, Ohio, writes us, "I've just returned from my second tour as a volunteer executive assisting engineering and transportation

company, Alexandria, Egypt, in computerizing their functions. I belong to the International Executive Service Corps, a volunteer group based in Stamford, CT."

FRED B. STITT, PhD, has retired from the Public Health Research Institute, and has been working for the past three years as a volunteer with Dr. Linus Pauling at the Linus Pauling Institute for Science and Medicine in Palo Alto, California.

1939
DAVID H. SCOTT sends news from Flagstaff, Arizona: "I have been working for the past several years as project chief of the Mars geologic mapping program in the astrogeology branch of the US Geological Survey. Currently, we are completing a new geologic map of Mars, using Viking data."

1940
A. FINLEY FRANCE, until recently vice president of procurement, Burroughs Corporation, writes from Birmingham, Michigan, "I retired from Burroughs, Jan. '83. Am now building an amphibious biplane in the garage basement. Hope to be airborne in about one year."

1942
JOHN W. MILES, MS '43, Eng '44, PhD '44, sends word from La Jolla, California, "I retired as vice chancellor of UC San Diego at La Jolla on 6/30/83, but am still continuing my research along with three graduate students, a programmer, and a secretary (a much more manageable group than the UCSD faculty!").

1944
NEVILLE S. LONG, MS '48, writes from Jubail, Saudi Arabia, "After nearly four years we will be leaving Saudi Arabia in April '84, where I have been responsible for the planning, design, and construction of infrastructure for the new industrial city of Jubail."

1948
DAVID B. WILFORD, MS '51, sends news from La Mesa, California, "I have been elected math department chairman at Grossmont High School, and look forward to the challenge of improving math education there in the coming years."

1950
WILLIAM C. CULBERTSON, geologist and project chief with the US Geological Survey in Lakewood, Colorado, is the recipient of a Superior Service Award, the third highest honor bestowed by the US Department of the Interior. He is regarded as an expert on coal geology and resources throughout the United States.

HARRY L. MASSER, JR., Eng, is currently in the VA Hospital in Sepulveda, California, being treated for complications following a stroke in 1978. A friend writes, "Phone calls, letters, and cards, and espe-

cially visits (but call the ward first) would be most welcome by him." He is on Ward 52A, at (213) 891-7711.

1958
ALLEN KLINGER, MS, professor of computer science at UCLA, was elected a Fellow of the Institute of Electrical and Electronics Engineers in January, with the citation "For contributions to image analysis by means of computers."

BRUCE L. WILKINSON, director of advance development for Pioneer Magnetics in Santa Monica, California, and his wife, Mary, write that they celebrated their 25th wedding anniversary on February 11 with a renewal of their marriage vows in their Torrance, California, home, with their four children and granddaughter serving as attendants. The ceremony was followed by a cruise to the Caribbean. They add, "Congratulations to the undergraduates for their wonderful stunt at the Rose Bowl game."

1959
PETER ALBERSHEIM, PhD, professor of biochemistry and molecular, cellular, and developmental biology at the University of Colorado, was honored in February with the 1983 Kenneth A. Spencer Award, for his significant contributions in the field of agricultural and food chemistry.

AKIRA KOBAYASHI, MS, professor with the Institute of Interdisciplinary Research, Faculty of Engineering, University of Tokyo, has been appointed director of the Japan Society for Aeronautical and Space Sciences, and also director of the Japan Society for Composite Materials.

1962
JOSEPH HELLER, the founder in 1978 of Hellerwork, a bodywork therapy designed to promote health by structurally realigning the body and freeing it from stored tension, has just trained his 100th practitioner at the Body of Knowledge training institute he founded in Mill Valley, California. Heller credits his ten years with JPL and his training as an aerospace engineer with fostering his awareness of the importance of gravity in maintaining the structural integrity of the body.

1963
JAY BRENTJES, MS, writes, "After 20 years with Hexcel, developing a variety of composite structural materials, I have joined the Lawrence Livermore Lab. The work in the ME department will involve design, fabrication, and analysis of advanced composite structures for various weapons programs. I am always looking forward to receiving the *Caltech News* and reading about what's happening at the old alma mater."

1965
TOM K. GREENFIELD writes from Pullman, Washington, "Nancy and I happily announce the arrival of first child, Patrick. Despite this preoccupying event, we both continue trying to be productive, she as an economist, and I as a clinical psychologist. What was that about dual careers, burnout, faculty stress. . . ?"

1966
DOUGLAS C. KUBLER, systems engineer with Hughes Aircraft, reports from Westlake Village, California, "Our family has finally achieved parity; we started off with two girls, Kristina and Kimberly, and added twin boys, Robert and Thomas."

J. HERMAN RICKERMAN and Janice Rickerman announce the birth of their new baby boy, Seth Edward, born August 9, 1983.

1967
MARY BAKER (PFEIFFER), MS, PhD '72, and **WAYNE W. PFEIFFER**, PhD '69, write from Del Mar, California, "We are happy to announce that we now have a very cheerful little girl named Betsy, who was born April 1, 1983." The couple works in San Diego — Mary as a manager of analytical services, Structural Dynamics Resource Corporation, Wayne as a manager in the applied theory branch of the General Atomic Company.

1968
MICHAEL J. LINEBERRY, PhD '72, has been chosen by the US Department of Energy to receive a Lawrence Award for his outstanding contributions to the field of atomic energy. He is currently associate director of the applied physics division of Argonne National Laboratory in Idaho Falls, Idaho.

1970
JOHN L. FIRKINS, PhD, sends word from his new home in Menasha, Wisconsin, "I have taken a position as manager, commercial development, with Thilmany Pulp and Paper Company. My wife, Sharon, and my daughters Jenny (12) and Jacqui (10) are getting used to the snow and cold — but spring isn't too far away."

BOB GRAY writes from Framingham, Massachusetts, "Since leaving Tech, I have been a: math graduate student, high school teacher, computer science graduate student, software engineer, research engineer (until my company dissolved its research department), and full-time father. The last job was created when my wife, Robin, and I had our son, Scott. When Robin returned to work (she's a special education teacher), I took a six-month leave from PRIME Computer, where I'm a senior software engineer. Full-time fathering has been a busy, sometimes hectic job — but I've gotten to know Scott well. I've learned a lot about babies, and I only wish my leave were much longer."

HANS P. ZASSENHAUS reports from Richmond Heights, Missouri, "Received my PhD at OSU in 1980, then spent three years in Dallas on my postdoc fellowship at the University of Texas Health Sciences Center. Am now assistant professor in the department of microbiology at the University of St. Louis Medical School. We're all well and happy. Christina is now 13 years old, and Brigitte, with great pleasure, retired from the working world."

1974
LARRY A. BERGMAN, MS, writes from Reseda, California, "In November 1983, I received my PhD at Chalmers University of Technology in Gothenburg, Sweden. Subsequently I joined the technical staff of the information systems division at JPL. Presently, I am working on high speed local area networks for various NASA applications."

1975
RONALD L. KINCH sends word from Seattle, "I work for Boeing Computer Services on the inertial upper stage program. I was one of five people awarded the Silver Snoopy by the astronauts for figuring out how to separate the TDRS satellite when the IUS tumbled. I am also employee of the year for my BCS division."

ROBERT W. PRINDLE, MS, writes from Albuquerque, where he is a member of the technical staff of Sandia Labs, "I've been singing now for two years with the New Mexico Symphony Orchestra chorus. Also, I've often thought about attending the Alumni Association's Rose Parade special, but never quite made it. But I've had a slightly different perspective on the parade recently, as a driver on the Union Oil (1982) and Rand McNally (1983) floats."

1976
KAREN MAPLES, resident in obstetrics-gynecology at Harbor General Hospital, and **GREGORY GIBSON**, BS, MS '77, member of the technical staff at TRW, report from Hawthorne, California, the birth of their first son on 10/8/83, Marcel Tousaint Gibson. They write, "Marcel was 21 inches, 8 lbs., 8 ozs. He is named after Tousaint L'Ouverture [18th century Haitian general and liberator]."

1977
MAURICE S. ZWASS reports from San Diego, "I am completing my residency in pediatrics in San Diego this year and will continue next year as chief resident in pediatrics."

1979
EDMUND W. BERTSCHINGER sends word from Fredericksburg, Virginia, "On October 1, 1983, I married a civil engineer, Beverly Hjorth. **JOHN HATTICK** ('79) was my best man, and **FAN-CHIA TAO** ('81) was viola soloist. In December 1983, I finished my PhD in theoretical astrophysics at Princeton University. I am now a postdoc in astronomy at the University of Virginia."

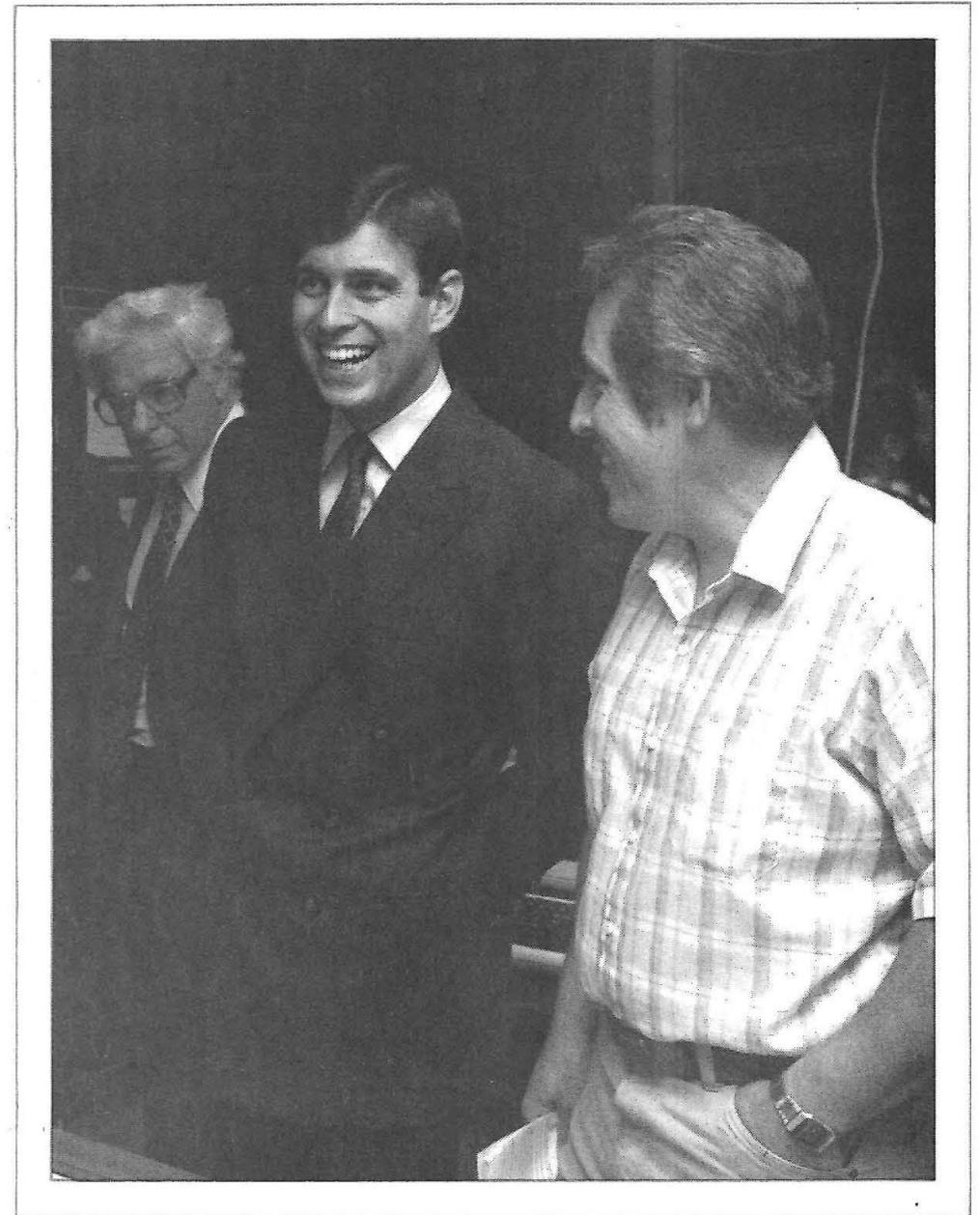
EDWARD B. HAMRICK, writes, "I married my wife, Margaret, in May 1981. Bought a house in Kent, Washington, and have a 15-month-old daughter, Monica. Currently working for Boeing Aerospace Company in Kent."

1980
ALAN S. KATZ, MS, sends news from Burlington, Vermont, "I will be receiving my MD degree from the University of Vermont in May of 1984, and am in the process of selecting my residency in internal medicine."

DAVID R. MATHOG, graduate student in biochemistry at UC San Francisco, writes, "I was married June 5, 1983, to Pamela Lum. We are living in San Francisco, where I am working on a degree in genetics."

1982
CHARLES A. WIGHT, PhD, and his wife, Lee Ann, welcomed a baby daughter, Linda Michelle, on December 20, 1983. Chuck is currently a research associate at the University of Colorado in Boulder and has accepted a position as assistant professor of chemistry at the University of Utah, starting in the fall of 1984.

CALTECH NEWS



Prince Andrew visits the Caltech campus. See page 2.

June 1984

CALTECH NEWS

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