

PUBLISHED FOR ALUMNI AND FRIENDS OF THE CALIFORNIA INSTITUTE OF TECHNOLOGY



Honored this year by Caltech as Distinguished Alumni are, from right: Warren Fenzi, Bruce Ames, Paul Emmett, and William N. Lipscomb. Acting President Robert Christy presented silver medals and certificates to the honorees at the Alumni Seminar Day general session.

## Four graduates honored on Alumni Seminar Day

Four Caltech alumni received the highest honor the Institute can confer on a graduate — the Alumni Distinguished Service Award — on Caltech's 40th Alumni Seminar Day. In presenting silver medals and certificates to the four recipients, acting president Robert Christy noted that they join a group of 56 alumni who have been so honored for achievement in science, business, and engineering.

The new distinguished alumni are Bruce Ames, PhD '53, professor of biochemistry at UC Berkeley; Paul Emmett, PhD '25, distinguished for his work on the mechanism of catalytic reactions; Warren Fenzi, BS '37, president of Phelps Dodge Corporation; and William N. Lipscomb, PhD '46, the Abbott and James Lawrence Professor of Chemistry at Harvard and 1976 recipient of the Nobel Prize in Chemistry.

Ames, at UC Berkeley since 1968, has been involved in research concerning the detection of environmental chemicals that cause damage to DNA. Recently he developed a bacterial model for testing and screening mutagenic agents. His model offers a relatively inexpensive and highly accurate way to screen a large number of compounds in the environment.

Before coming to UC Berkeley, Ames was with the National Institutes of Health for 14 years. There he

## Two on faculty cited by NASA

Two Caltech faculty members were honored by NASA this spring for their contributions to the success of the Viking Program. Norman H. Horowitz, professor of biology, received the Public Service Medal, and Don L. Anderson, director of the Seismological Laboratory and professor of geophysics, was awarded the Exceptional Scientific Achievement Medal.

was chief of the microbial genetics section of the Laboratory of Molecular Biology from 1962-1967. He is a member of the National Academy of Sciences and the American Academy of Arts and Sciences.

Emmett is internationally recognized for his fundamental work on the mechanism of catalytic reactions. He has been honored for this research by Spain's Council for Scientific Research, the University of Lyon in France, and Hokkaido University in Japan.

Now a part-time visiting professor at Portland State University, Emmett previously was with The Johns Hopkins University as W. R. Grace Professor of Chemistry; the Mellon Institute; the Manhattan Project at Columbia; and in the U.S. Department of Agriculture's fixed nitrogen laboratory. He is a member of NAS and has received four honorary degrees and the Kendall Award of the American Chemical Society.

Fenzi was elected president of Phelps Dodge Corporation in 1975 after a 38-year career with the firm. He joined Phelps Dodge, a metals refining and manufacturing corporation, in 1937. He was named vice president in 1962 and executive vice president and a director in 1966.

Fenzi is also a member of the board of trustees of St. Joe Minerals Corporation and a director of Southern Peru Copper Corporation and Consolidated Aluminum Corporation. He is a member of the American Institute of Mining Engineers.

Lipscomb, who was awarded the Nobel Prize for his work on the structure and bonding of boranes, has been a member of the chemistry faculty at Harvard since 1959. Before that he was a faculty member at the University of Minnesota for 13 years.

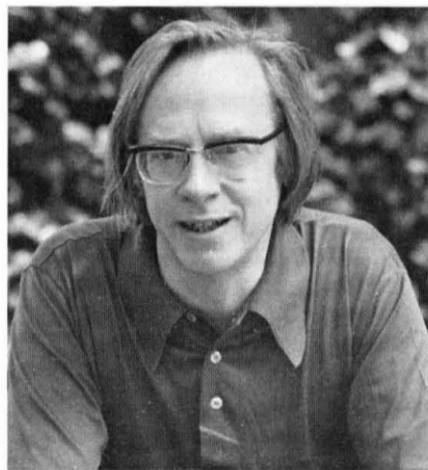
Lipscomb was elected to the National Academy of Sciences in 1961. Among the honors he has received are the Peter Debye Award in physical chemistry, Harvard's George Ledlie Prize, and the Harrison Howe Award in chemistry.

## Renaissance scholar named to Dreyfuss chair

Angus J. S. Fletcher, nationally known scholar in Renaissance literature and literary criticism, has been named the first Doris and Henry Dreyfuss Professor of English and Comparative Literature at Caltech.

"The Doris and Henry Dreyfuss chair was conceived in memory of two people who believed in humanistic education in the most universal sense," said Robert Christy, acting president of Caltech, when he announced the chair and its first occupant. "In Dr. Fletcher we have not only one of the nation's leading scholars in Renaissance literature, but also a man of such unique breadth of interest as to be a humanist in the finest sense."

Fletcher, 46, has been, since 1974, Distinguished Professor of English and Comparative Literature at the City University of New York's (CUNY) Lehman College and Graduate School. His areas of major research are general literary theory, Renaissance literature, and the theory of literary symbol, but he admits to being entranced by physics because "it reduces the problems of the universe to fundamental theorems."



Angus J. S. Fletcher

Fletcher is currently teaching "Literature and Time: A Course in Irony and Surrealism," emphasizing the investigation of the authors' expression of the experience and theory of time — phenomena understood on a different level by scientists.

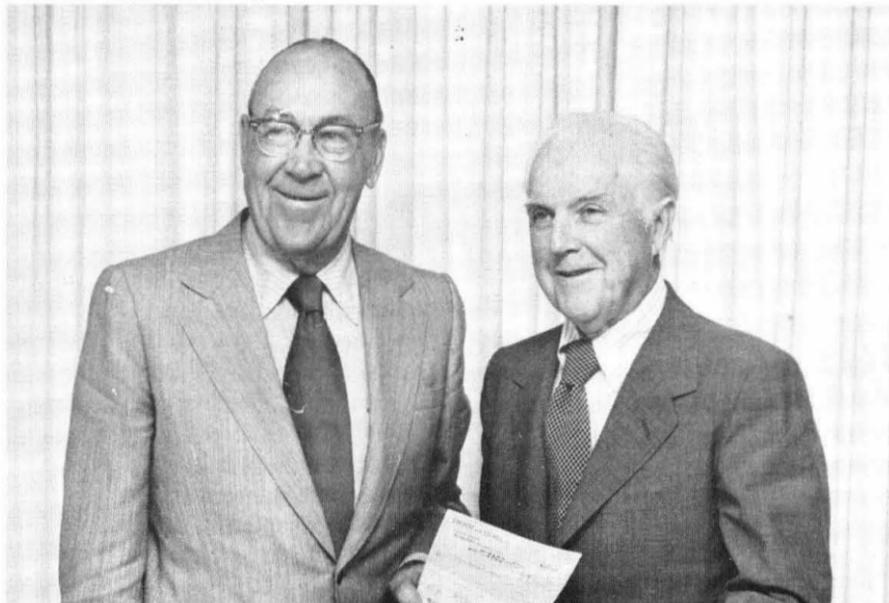
The Dreyfuss Professorship was initiated by a bequest from the estate of the late Doris and Henry Dreyfuss of South Pasadena. Dreyfuss, an internationally known industrial designer, was a trustee of Caltech from 1963 until his death in 1972, and was chairman of the visiting committee of Caltech's Division of the Humanities and Social Sciences. He was also an associate in industrial design on the Caltech faculty. His late wife, Doris, served as a member of the board of directors of The Associates of Caltech.

Efforts to raise the remainder of the funds necessary to endow the chair were led by William A. Hewitt, chairman of Deere & Company and a member of the Caltech Board of Trustees. A major gift was made by Edwin H. Land, who was a close friend of Henry Dreyfuss, and is founder and chairman of the board of the Polaroid Corporation of Cambridge, Massachusetts.

That gift and others from the Dreyfuss family and nearly 70 friends of the family completed the endowment fund of \$1 million.

The Dreyfusses were advocates of the value of humanities education for Caltech students, and their bequest was an expression of their desire to help provide a professorship that "would bring to the campus a humanist of intellectual distinction who would considerably influence the lives of the students as human beings as well as professionals."

## Underwood gift to support scholarships



On his 70th birthday, Vernon O. Underwood, left, chairman of the board of Young's Market Company, received a gift from the Christian Brothers of Mt. La Salle Vineyards and Fromm and Sichel, Inc. — checks for programs of his choice at Caltech. Here Underwood presents the checks to Harry J. Volk, right, of the Caltech Board of Trustees. The funds will be used for scholarships for undergraduates in biology whose work is related to medical science.

## Glee Club concert features original compositions



A premiere performance of "Whispers of Heavenly Death" — six songs composed for the Caltech Glee Club by Los Angeles composer Richard Slater — pleased alumni who attended the Spring Jubilee, the Glee Club's annual spring concert. "Whispers" featured Caltech student body president, Bert Wells, as harpist. The men's and women's sections of the Glee Club, the Apollo Singers, the Chamber Choir, and the Barbershop Quartet joined in the program of choral music — a part of Alumni Seminar Day.

## Schmitt tells alumni

# Research, development hold answers to energy challenge

An energy policy that promises positive long-term solutions based on research and development — while calling for short-term sacrifices — was advocated by U.S. Senator Harrison H. Schmitt, BS '57, in his talk at the Alumni Seminar Day general session. More than 1,600 alumni converged on campus for the day to hear Schmitt and to choose from among 12 faculty research lectures.

Alluding to Schmitt's earlier career as an Apollo astronaut and the first scientist to walk on the moon, Philip L. Reynolds, BS '58, MS '59, general chairman of the Seminar Day Committee, drew a laugh from the audience when he noted in his introduction that the Senator is "not your ordinary politician."

Schmitt told alumni that he feels President Carter's energy message created an environment for positive action. But he said he believes the message "goes against the grain of most Americans" because it asks for sacrifices in freedom without promising victory.

"The American character as forged is positive in outlook," he said. "We want to move forward in the face of challenge rather than infer that a problem can't be solved. Our energy policy should call on our creativity, competitiveness, and compassion. It should be consistent with a thrust to solutions."

## Four Caltech faculty members awarded Sloan Fellowships

Four scientists at Caltech have been awarded two-year fellowships from the Sloan Foundation for basic research. The recipients, among 95 scientists from 53 colleges, universities, and research institutions, are: Peter Dervan, assistant professor of chemistry; Steven E. Koonin, BS '72, assistant professor of theoretical physics; Lily Kung-Chung Jan, MS '70, PhD '74, research fellow in biology; and Darryl Smith, assistant professor of applied physics.

Schmitt stressed the need to develop clean, long-term energy sources: fusion, solar and hydrogen fuel, and others. He said he believes that research and development efforts, if properly focused, can relieve our most serious energy problems in 25 years.

"In the short term," he said, "we must implement an energy preparedness plan through sacrifice, hard work, and conservation."

Schmitt then shifted to recollections from his career as a NASA astronaut as he shared his feelings during his voyage to the moon and while exploring Taurus Littrow — which he described as "one of the most beautiful valleys I've ever seen."

"I can't transfer this experience to you without having you think of a special experience of your own where being there was the important ingredient," he said. "The need to be there is why I believe mankind will never be content with an automated exploration of the solar system or of the universe — although this exploration is a necessary precursor to satisfying that basically human urge to touch and understand."

"I spend a lot of time with young people and they want to go into space," he said. "I believe a few of them have the opportunity to become the parents of the first Martians. We have the technological base to establish a colony there within a couple of decades. Then, a few decades or centuries later, we'll receive a communication: 'We're tired of taxation without representation. We're declaring ourselves the United States of Mars.'"

"Then we'll have replanted the seed of individual freedom where it isn't accessible to our folly here on earth. One reason I ran for the U.S. Senate was to help avoid the kind of folly that could destroy that seed. But the only way to guarantee its protection is to plant it somewhere away from earth — and plant it as many times as we can."

"If you want to communicate with the future, talk to young people," he concluded. "To go into space and plant that seed is what they intend to do."

# Sinsheimer, Huttenback appointed UC chancellors

Two Caltech division chairmen have been appointed to chancellorships in the University of California system. They are Robert L. Sinsheimer, chairman of the Division of Biology and professor of biophysics, and Robert A. Huttenback, chairman of the Division of the Humanities and Social Sciences and professor of history.

Sinsheimer will become chancellor at UC Santa Cruz, effective in Sep-

174, illuminated the workings of genetic processes.

He has been a leading spokesperson concerning recombinant DNA experiments. A member of the National Academy of Sciences, he received his BS, MS, and PhD degrees from MIT.

Huttenback became chairman of the humanities division in 1972 after serving as dean of students and master of student houses. One of his books, *Gandhi in South Africa*, won the third annual Walter D. Love Memorial Prize in 1971.

Under his leadership the social sciences have become an increasingly influential part of the Caltech curriculum and a program to grant BS, MS, and PhD degrees in this field has been inaugurated. Huttenback received his BA and PhD degrees in history from UCLA.



Robert L. Sinsheimer

tember. Huttenback will join the UC system as chancellor at UC Santa Barbara on January 31, after completing his commitments at Caltech.

Sinsheimer has been chairman of the biology division since 1968 when he was named California Scientist of the Year. His investigations during the 1950s and early 1960s into the physical and genetic characteristics of a bacteriophage, the virus Phi X



Robert A. Huttenback

# Eight alumni elected to engineering academy

Three members of the Caltech faculty — all alumni — and five other alumni were elected this spring to the National Academy of Engineering. The election results bring to 26 the number of Caltech faculty members in the academy.

The faculty members are Paul C. Jennings, MS '60, PhD '63, professor of applied mechanics and executive officer for civil engineering and applied mechanics, for contributing knowledge in earthquake engineering and in the design of high-rise buildings that are resistant to earthquake damage.

Vito A. Vanoni, BS '26, MS '32, PhD '40, professor of hydraulics, emeritus, for leadership in developing hydraulic sedimentation mechanics and applying it to the construction and maintenance of engineering structures; and Dean E. Wooldridge, PhD '36, visiting associate in engineering, and a member of the Institute Board of Trustees, for contributions to physical electronics, analog computers, and the management of research and development.

The other alumni elected to NAE

membership are Robert N. Hall, BS '42, PhD '48, physicist, General Electric Research and Development Center, for contributions to alloyed junctions, p-i-n, tunnel and laser diodes, and ultra-purification of semiconductors; John Laufer, MS '43, Eng '44, PhD '48, professor and chairman of the department of aerospace engineering at USC, for contributions to the understanding of turbulence and for creating and giving leadership to an excellent aerospace engineering educational center.

Artur Mager, PhD '53, vice president and general manager, the Aerospace Corporation, for his work in turbulent flow aerodynamics and for engineering leadership in the space and missile programs; Kenneth H. Olsen, MS '54, PhD '57, group leader, Los Alamos Scientific Laboratory, for leadership in the design and manufacture of computers; Robert H. Widmer, BS '39, vice president for science and engineering, General Dynamics Corporation, for innovations and improvement in the design of aircraft and weapon systems.

Haagen-Smit, Lacey, Yost

## Death claims three emeritus faculty members

Three Caltech faculty members with emeritus standing — one in the Division of Biology and two in the Division of Chemistry and Chemical Engineering — died this spring.

The three men, all of whom made outstanding contributions in their fields, are Arie Jan Haagen-Smit, 76, professor of bio-organic chemistry, emeritus, who for 25 years led a battle against air pollution; William Noble Lacey, 86, professor of chemical engineering, emeritus, whose research on the behavior of hydrocarbons made enormous contributions to petroleum production and the refining and manufacture of petrochemicals; and Don M. Yost, 83, professor of inorganic chemistry, emeritus, whose major research interests included carbon-14 dating and the rates of chemical reactions.

In 1950 Haagen-Smit, who died of lung cancer, discovered the sources and processes of air pollution and re-created them in a test tube. Then, after learning how smog was produced, he worked for federal and state standards and laws that would control the polluting emissions of industries and motor vehicles.

His honors included the Smithsonian Medal, Alice Tyler Ecology Prize, and the Rhineland Award for Western Europe. In 1973 he was named winner of the National Medal of Science. Haagen-Smit was elected to the National Academy of Sciences of both the United States and his native Holland. Recently the California state legislature unanimously voted to rename the state Air Resources Board Laboratory in El Monte as the Haagen-Smit Laboratory.

Haagen-Smit joined the Caltech faculty in 1937 as associate professor, becoming professor of bio-organic chemistry in 1940. He was named professor emeritus in 1971. The Arie J. Haagen-Smit Memorial Award has been established at the Institute. The award will be made to a biology or chemistry student with a good academic record and recognized contributions to campus life. Gifts may be made through the Caltech Development Office.

Lacey, who died after a heart attack, was active as a chemical engineer in industry in administrative and consulting capacities. He established and directed the research laboratory of the Riverside Cement Company at Riverside, California, and made a detailed study of operating processes for the American Potash and Chemical Corporation at Trona, California. He was the author or coauthor of six books.

He was widely known for elucidating the properties and behaviors of hydrocarbons — work that was of great importance in petroleum production and refining and in the manufacture of petrochemicals. In 1953 the American Petroleum Institute noted that the research in which he participated would "save tens of millions of barrels of high-grade distillates which otherwise might have been lost forever."

A member of the Caltech faculty for 60 years, Lacey also served as dean of graduate studies from 1946 to 1956 and as dean of the faculty in 1961-62.

During World War II he was honored with the Presidential Certificate of Merit for his work in rocketry. Among other honors that he received were the Hanlon Award of the Natural Gas Association of America, the Lucas Medal of the American Institute of Mining and Metallurgical Engineers, and the Certificate of Appreciation of the American Petroleum Institute. He was a member of the California State Board of Registration for Civil and Professional Engineers.

Yost, who died of emphysema, be-

came a research fellow at Caltech in 1926 and an instructor the following year. He was National Research Council Fellow at the University of Uppsala, Sweden, and at the University of Berlin before returning to the Institute faculty in 1929. He also was a visiting professor at the Massachusetts Institute of Technology in 1953 and at the University of California in 1964. During his career he was the author of several books.

During World War II he was associated with the Manhattan Project as a section chairman of the Office of

Scientific Research and Development and was awarded the Presidential Certificate of Merit for this work. He was a member of the National Academy of Sciences, the American Physical Society, the American Association for the Advancement of Science, and Sigma Xi.

Yost was known for allowing his graduate students a great deal of latitude in their research projects. He once termed "the care and feeding of scientists of imagination" as one of his major interests and he received wide recognition for his teaching.

### After spring elections

## Faculty percentage in NAS is still highest

Caltech and individuals close to it received their share of attention again this spring when the National Academy of Sciences announced its newly elected members.

Among the 60 people elected for achievements in original research were three faculty members: Samuel Epstein, professor of geochemistry; James E. Gunn, professor of astronomy; George Worrall Preston III, a staff member of the Hale Observatories; and former President Harold Brown, now U.S. Secretary of Defense.

Also elected were three alumni: Roderick K. Clayton, BS '47, PhD '51, professor of biology and biophysics, Cornell University; David Harker, PhD '36, research professor of biophysics, the State University of New York, Buffalo; and Richard Macy Noyes, PhD '42, pro-

fessor of chemistry, University of Oregon.

The election of Epstein, Gunn, and Preston to the NAS brings to 47 the number on the Caltech faculty who are members. The Institute continues to have the highest percentage of NAS members of any faculty in the country.

Epstein has been using geochemical "thermometers" in the form of isotopes to obtain information about the climatic history of the earth. Oxygen isotopes can be used as natural fingerprints to identify the source of a water sample and discover its history of evaporation and condensation. Recently his work revealed hints that the earth was much warmer three billion years ago — perhaps as high as 160 degrees Fahrenheit — than today.

Gunn, a Sloan Foundation Fellow in 1972-74, has been an influential

advocate for the "open universe" theory. This theory maintains that the universe will continue expanding forever because there is too little matter in it to provide the gravity to pull it back together again. Gunn and his colleagues arrived at this conclusion after adding up the total mass and the total amount of gravity observed from motions of objects in the universe and comparing them.

Preston, the assistant director for the Mount Wilson Observatory, recently has been conducting research concerning the chemical composition of stars in the galactic halo, using objective prism spectroscopy. He has studied shock wave phenomena in the atmosphere of pulsating stars, and stellar magnetic fields, and he has conducted extensive research on the motions and compositions of three star groups: RR Lyrae, RV Tauri, and Mira variable.

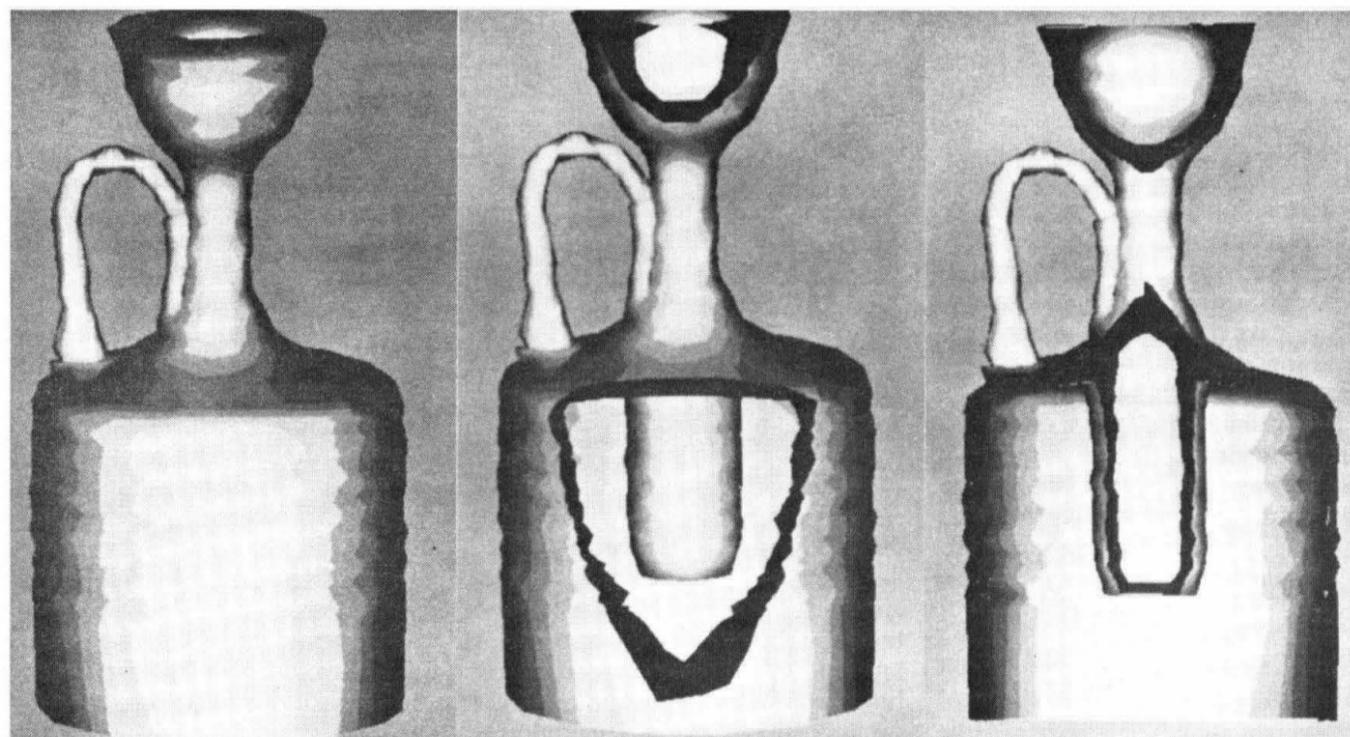
## Two seniors awarded Watson Fellowships

Two Caltech students are among 70 graduating seniors from private colleges and universities throughout the United States who have been awarded Thomas J. Watson Fellowship grants of \$7,000 each for a year

of study and travel abroad.

Ryn Miake, a microbiology major and president of Caltech's senior class, will spend the year at a marine biology station on Italy's Ischia Island, where she will be a member of

an international team studying a specific undersea grass. Christopher L. Henley, a physics and mathematics major, was awarded a fellowship to study functional equations at File-sian University in Poland.



An x-ray scanner from a hospital and a computer guided by Gilbert McCann, professor of applied science at Caltech, combine to take a look inside this ancient Grecian funeral urn to reveal a small inner cavity. The urn, from the mid-fifth century and now housed in the J. Paul Getty Museum at Malibu, California, contained oil that was offered to the gods. The left-hand photo shows a computer reconstruction on a television screen of the urn's outside. X-ray eyes look through the urn so that the computer in the middle photo can reveal a small container inside the large one. The photo on the right shows the inside of the small container — apparently the only part of the urn that contained oil. This technique is expected to be useful to archaeology.

## Alumni Fund chairmen

# Would you sign pledge cards for these men?

by Phyllis Brewster

What kind of person takes on the assignment of area chairman for the Alumni Fund? Currently, 83 different people are filling such slots for Caltech — and their approaches and motivations are as individual as their fingerprints. They vary in age — from the class of 1926 to the class of 1973 — and in fund raising success from 19 percent to 70 percent of their prospects.\* Their geographic areas vary widely, from towns as small as San Marino to all of Canada and from about 40 alumni in San Luis Obispo County to more than 550 in Washington, D.C.

Caltech News can't cover all 83 chairmen, and a composite picture wouldn't be real. So here, for sampling, are profiles of four of the men behind the successful Alumni Fund, which will raise over \$650,000 this year.

\*Compared to the 17 percent alumni participation for all colleges and universities throughout the country.

### Don McFadden

Don McFadden comes on mellow about Caltech. "We all like to belong to something," he says. "For me it has been Caltech. It's an essential part of me."

This strong sense of identification is the major reason for McFadden's long service as a fund raiser — although a close second reason may be that he is retired (in 1969 after 40 years with Union Oil). McFadden is in his seventh year of seeking contributions for the Institute — four as



Don McFadden

worker, three as chairman — and he has no intention of abandoning the assignment.

This alumnus, class of '28, obviously enjoys the association with Caltech's fund raising organization. "Things are done properly," he says, "nothing slipshod — all details attended to."

McFadden himself gives careful attention to detail. He has a luncheon for the ten workers he recruits to help him and he makes personal calls on those who can't attend. (Sixty percent of his workers repeat a second year.) He carefully evaluates the 111 cards representing the alumni his callers will contact, and calculatingly mixes and matches donors and callers. His advice, as he doles out the cards: "Now, if there's anyone here you've had an argument with, pass that card on to someone else."

Last year his group's ratio of contributions to contacts was 50 percent. His area is consistently in the top half dozen in percentage of alumni giving.

In making his own fund raising calls, McFadden finds reminiscing both profitable and pleasurable. He talks happily about "those years" after he left Chaffey J.C. to go to the school in Pasadena he had never heard of. McFadden's father was reluctant to let him come. A strict Presbyterian, he was worried about Robert Millikan's "modernist" views, and had to be reassured by the family minister.

At Caltech, religious education was not ignored. Students were encouraged to take Bible literature from Dr. Theodore Soares, who sought to polish not only the morals, but also the manners of his charges with Sunday evening dinners at his home. And dean of freshmen Dr. John McArthur treated small groups of seniors to a weekend at the proper old Palm Springs Hotel in an effort to teach them about polite society. (A remembered bit of McArthur advice: "If she invites you in before 9 p.m., you can go. If it is after 10, under no circumstances.")

McFadden's Caltech memories include a fervor for competitive sports. He talks of "the year we won the conference," and about beating USC and Occidental "more times than they beat us."

It is this competitive spirit, perhaps, that leads Don McFadden to relish comparing fund raising statistics from Princeton, Harvard, Yale, Stanford — and USC and Occidental — with those of Caltech and to find we are "beating them more times than they beat us."

### Gordon Weir

He answers the phone "Weather Weir," putting it correctly and succinctly. Gordon Weir, BS '40, meteorologist, forecaster, has made his living predicting weather since he graduated from Caltech.

Weir didn't learn his trade in the geology division, however. In 1940 the Army Air Corps, desperately needing to provide weather service for pilots, offered a year of post-graduate meteorology training at Caltech to a carefully selected group of 30. Following military training, Weir was finally shipped to North Africa and eventually was put in charge of a joint British-American weather forecast center for the Mediterranean.

Thirty months and thousands of predictions later, Weir was back in Pasadena working for a private weather service. Today he has his own (Allied) subscription weather service, and has had a 22-year career on television as a weather reporter.

Among Weir's major customers are movie and TV studios, who need to know about sun and shadows. A business call may go like this: "We have John Wayne for April. Should we shoot in Silverton, Colorado, or in Lone Pine, California?"

One of Weir's favorite customer calls is from the man who orders his weather as if from a menu: "Hey,

Weir, I need three hours of sunshine tomorrow."

Predicting, a scientific matter, is easy for Weir. Not so with fund raising. "Asking for money is not my favorite thing," he says, "but Martin Poggi (1976-77 National Fund chairman) asked me, and, after all, he was a Ricketts man."

Weir recruited four men for his team, divided the 130 calls to be made, and so far has a 30-percent-success record. Two of his workers received contributions from all of their prospects.



Gordon Weir

Although some turndowns are annual, Weir believes in never taking "no" as a conclusive answer — probably because one person in his area who had never contributed before made a six-figure gift last year.

Since fund raising isn't Weir's favorite pastime, why does he do it? He believes that progress in society is made by a handful of men and women, and that many of them come out of Caltech.

Weir calls his degree his "14-carat gold diploma," and helping finance Caltech is one way he connects to the past — and the future.

### Jeff Williamson

"It's like looking at a bridge hand and bidding four hearts."

That's how William J. (Jeff) Williamson approaches the game of raising money for Caltech. Except that this year he had 140 cards to count, one for each of the 140 alumni living in the San Fernando Valley area that includes his Sherman Oaks home.

The logic in his statement — tempered by a touch of humor — was what you might expect from an aeronautical engineer. Williamson explained what he meant in steps.

1) One-third of all Caltech alumni contributed to the fund last year. So it follows that two-thirds didn't.

2) The reasons for not contributing boil down to only two: a) poverty ("I just can't afford to give anything this year.") and b) disenchantment ("I don't think Caltech deserves my support.").

3) If Caltech graduates were swelling the ranks of the poor and the disenchanted by a 2:1 ratio, then Caltech would be a Bad School and should not be supported by its alumni.

4) If, on the other hand, the Institute is performing a useful function, its alumni ought to assay at least 2:1 in its favor.

This is the ratio of contributors that Jeff Williamson selected as his goal.

Williamson has obviously enjoyed the game. He speaks of it with the same sense of pride and pleasure that he does about all his Caltech ties — ties kept active through continuing contact with some of his Ricketts House friends.

Williamson's entrance to, and exit from, the Institute spanned 15 years, although he did not spend all of them in Pasadena. He entered as a freshman in 1940. After an interruption for military service, he got his mechanical engineering degree in 1948, his master's degree in 1949, and — five years later — returned for an additional graduate year in aeronautics and an engineer's degree.

Looking back on his Caltech experience, Williamson has words of praise for the humanities and English requirements. "Roger Stanton and Harvey Eagleson taught me the value of clear writing," he says. "Too few people today can write a good English sentence."

Last year Williamson became involved in the Alumni Fund when he agreed to make calls as an area work-



Jeff Williamson

er; this year he volunteered as area chairman.

His recruitment of workers is based on the premise that if the help asked is reasonable, it won't often be refused. Figuring that eight calls per worker is reasonable, he needed 14 workers besides himself. Williamson got the 14th on the 28th phone call.

Is Jeff Williamson going to make his bid (not four hearts, but 66-2/3 percent)? Right now he's 50 percent of the way to his goal.

continued on page 5

#### Placement Assistance To Caltech Alumni

The Caltech Placement Service may be of assistance to you in one of the following ways:

- (1) Help you when you become unemployed or need to change employment.
- (2) Inform you of possible opportunities from time to time.

This service is provided to alumni by the Institute. A fee or charge is not involved.

If you wish to avail yourself of this service, fill in and mail the following form to:

Caltech Placement Service  
California Institute of Technology  
Pasadena, California 91125

Please send me: (Check one)

- An application for placement assistance.  
 A form indicating a desire to keep watch for opportunities although I am not contemplating a change.

Name .....

Degree(s) ..... Year(s) .....

Address .....

.....

# Owl and pussycat: stars in vision research

On the wall of the cement enclosure where Dr. Jack Pettigrew parks his car at Caltech is a colorful five-by-eight-foot mural of The Owl and the Pussycat — at sea in a beautiful pea-green rendition of Darwin's *Beagle*.

This American primitive is a humorous but pertinent statement about the work of the man who parks there. Associate professor of biology, neurobiologist Pettigrew has



Jack Pettigrew and his research companion.

long been involved in research on the development of the brain and its relationship to optics. Because the cat and the owl have front vision, and are relatively easy to work with, they have been close companions of Pettigrew and his research teams.

Now, in the most recent of his vision-related projects, Pettigrew and Professor Mark Konishi, along with graduate student Eileen Bagdonas, are training an owl to wear glasses and watch television. The experiment may provide the key to early detection of stereo-blindness in children.

Something like five percent of the human population fails to develop stereopsis — three-dimensional vision. If the binocular neurons in the brain that are responsible for coordinating the information from each eye do not receive the proper visual input before a child is two, the ability to see three-dimensionally may be lost forever.

According to Pettigrew and Konishi, until now there has been no way to test children this young for stereopsis.

The Caltech work is being done to substantiate the theory that owls have stereopsis. Bagdonas is training a great horned owl to wear special goggles — with one red lens and one green one — and to look at a television screen on which two scrambled images will appear. However, when the TV images are coordinated in the owl's visual cortex, they become a figure moving across the screen. If the goggled owl moves his head (owls cannot turn their eyes) to follow the image, it will be proof of stereopsis.

Stereopsis operates via an eye-brain process called partial decussation, in which both sides of the brain receive messages from both eyes at the same time. Add the coordinating neurons and you get three-dimensional sight.

Stereoscopic vision in humans is vital in such close-up work as watch repairing or assembling electronic microcircuits. This visual ability is also important to prey-catching creatures because it enables them to spot

their intended victims standing out from camouflaged backgrounds. Until recently, however, it was believed to exist only in the visual systems of binocular mammals, including man. The eye-to-brain nerve fibers of the owl and other birds were presumed to be connected to only one side of the brain each.

However, last year, in experiments with barn owls, Konishi and Pettigrew were able to show that nerve

cells in the owl's brain would be activated by both eyes because of a complicated crossover system in the owl's eye-to-brain pathways. These cells were specifically responsive to stereoscopic depth. Thus, it was suggested that stereopsis exists.

Pettigrew, a physician who practiced medicine until 1970 and who is interested in optical problems of children, returned to research to learn more about brain development

and its relationship to optics.

"We never know ahead of time what the application of pure research will be," says Pettigrew.

Now it appears it may lead to methods of detecting, and eventually correcting, the absence of stereopsis in humans.

Pettigrew, Konishi, and Bagdonas are currently working under a grant from the Spencer Foundation and the National Institutes of Health.

For the second straight year

## Engineering is most popular option

For the second straight year, engineering is the most popular option among members of the freshman class. At the beginning of the spring term, 38 percent of Caltech freshmen selected engineering as their option, compared with 33 percent who chose options in the Division of Physics, Mathematics and Astronomy.

Last year engineering pulled out of a tie with physics when 39 percent of the freshmen chose majors in engineering, compared with 28 percent in physics. The previous year each option attracted 35 percent of the new students. In 1973-74, students majoring in the physics division substantially outnumbered those in engineering 40 to 28 percent.

Ray D. Owen, vice president for student affairs and dean of students, attributes the shifting pattern to two factors: a perception on the part of students that an engineering major opens more doors in the job market today, and the desire to work in

fields that seem relevant to society's needs.

"Students know that government support for scientific research has decreased and that academic jobs are limited — and will become more limited," he said. "Applied science is attractive because it offers the chance to work on serious problems like the energy shortage. The shift

to engineering isn't unique to Caltech. It's happening at schools throughout the country."

The number and percentage of students majoring in all the divisions at the beginning of spring term (when option choices were due) are given below. (Figures do not total 100 percent because they have been rounded off.)

	1976-77		1975-76		1974-75		1973-74	
	%	No.	%	No.	%	No.	%	No.
Engineering and Applied Science	38	77	39	83	35	66	28	54
Physics, Mathematics and Astronomy	33	63	28	60	35	66	40	77
Chemistry and Chemical Engineering	16	31	19	41	15	29	15	29
Biology	8	16	10	22	10	19	12	24
Geological and Planetary Sciences	3	5	2	5	6	11	3	5
Humanities and Social Sciences	2	3	0	1	0	0	2	4
Independent Studies	0	0	0	0	0	0	1	1
Total Declared	100	191	98	212	101	191	101	194

Alumni Fund chairmen

## Their enthusiasm for Caltech is contagious

Doug Strain

*continued from page 4*

Was it inviting the wives that made the turnout more successful? Doug Strain, '48, asks himself the question, but never answers it. Including wives in meetings is just one of the moves he has made since he became Oregon area chairman for the Alumni Fund two years ago.

Last year Strain organized a statewide gathering for Caltech alumni. His announcement was right out front with his motive "to recruit all of you as workers." Ten Tech alumni turned up. Undaunted, Strain this year invited wives. Twenty-five came with spouses.

At the meeting Strain, now president of Electro Scientific Industries in Portland, displayed a large reproduction of the picture of the infamous Caltech Rose Bowl hoax. Each card spelling out Caltech was to be blacked in as prospects were successfully solicited for gifts and at the end of a goal-achieving campaign, the triumph would be recreated.

Strain's education-dedicated parents moved to California from Idaho expressly to give their children the advantage of the free junior college system, at that time the only one in the country. In 1939 Strain entered

Pasadena JC and transferred to Caltech as a junior in September 1941.

"I'm a sucker for education," he says to explain why he has worked on Caltech's fund raising programs since the early sixties. Sucker may be



Douglas C. Strain

his word, but by others' measures, he is public servant to education on a grand scale.

He is a trustee of Pacific University and has been involved in building-fund drives for that institution, as well as a bond drive for the development of Portland State University. He served as a director of the Ore-

gon Council on Economic Education and Colleges for Oregon's Future.

Strain had only been enrolled at Caltech for three months when news of Pearl Harbor sent the campus, along with the rest of the country, into a frenzy of activity. He volunteered for OSRD (the Organization for Scientific Research and Development) and worked on medical research and for instrumentation projects.

Back at Caltech in 1946, Strain worked for his degree, then a year for Beckman Instruments, and then headed for Oregon with his wife and three children. There, in addition to building a business, he has helped build education.

CALTECH NEWS

Vol. 11 No. 4

June 1977

Issued nine times a year (Sept., Oct., Nov., Dec., Feb., Mar., Apr., June, and July) and published by the California Institute of Technology and the Alumni Association, 1201 East California Blvd., Pasadena, California 91125.

Second-class postage paid at Pasadena, California.

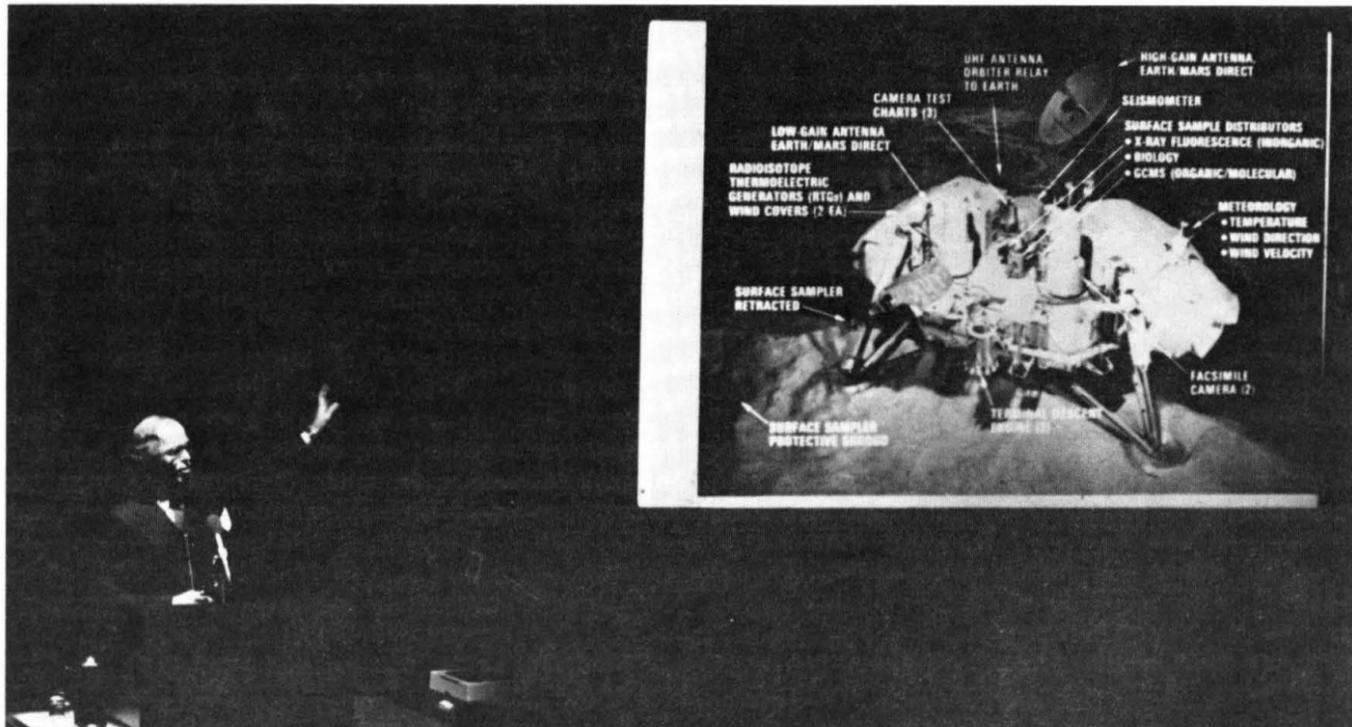
EDITORIAL STAFF

Executive editor: Winifred Veronda.

Staff associates: Phyllis Brewster, Paula Hill, and Kay Walker.

Photographer: Floyd Clark.

# Seminars survey current research



B. Gentry Lee describes the Viking landers and their technological capabilities.

## The meaning of Viking

When historians 500 years in the future describe the important events of our decade, they'll give top billing to the Viking touchdown on Mars in 1976. B. Gentry Lee, manager of the mission design section, JPL, predicted.

Through the Viking missions, man's definition of the phrase, "the world," underwent a great change, Lee told alumni. "This is part of what Viking was all about. The explorations brought man face to face with himself against a large scale of time and distance."

Lee described the Viking landers' technological capabilities, including their 18,000-word vocabularies, and said their intelligence has been compared to that of grasshoppers. Challenging those who've said that this isn't very impressive, he noted, "It took evolution on the earth four-and-a-half billion years to produce a grasshopper. Man, after 6,000 years of recorded history, has equalled this feat."

Lee then showed slides of the Martian surface taken while Viking 1 was in orbit and after it landed. In assessing Vikings' contributions he stressed the three most important pieces of information the missions have given us. "We've learned that there are large quantities of water on the planet, that its atmosphere is 2 to 3 percent nitrogen, and that something on its surface mimics life — although we don't know what it is," he said. "We may have encountered a surface chemistry that — unlike anything we know on earth — is able to take carbon from the atmosphere and put it into more sophisticated compounds. Or we may be dealing with a primitive form of life. At present, evidence favors the non-biological theory but we don't yet have the answer."

## The role of Congress

"There is a Washington establishment," Morris P. Fiorina, associate professor of political science, told alumni. "But contrary to popular belief, the bureaucrats are not the basic problem. Congressmen are."

Fiorina said that he began to develop this thesis several years ago when he sought an explanation for the growing incumbency advantage

evident in congressional elections. Research revealed that the obvious explanations — redistrictings and advertising by incumbents — couldn't account for the phenomenon. The puzzle led him to do field studies of selected congressional districts.

The theory which emerged from these studies is broad, Fiorina reported. It indicates that in recent decades, the role of the American congressman has changed. Congressmen are serving increasingly as ombudsmen (i.e., officials who represent constituents in dealing with remote bureaucracies and as dispensers of federal largesse), rather than as formulators of national policy. This shift in emphasis is reflected in the increased time congressmen spend in their districts and in the increased staff time allocated to district services.

The shift in congressional behavior results partly from the greatly expanded role of the federal government, Fiorina pointed out. He added that congressmen have a vested electoral interest in maintaining a strong central government whose internal workings they understand and can affect.



Edwin S. Munger surveys African unrest.

## Exploding Africa

Just back from his 40th visit to Africa, Edwin S. Munger, professor of geography, gave a wide-ranging description of that continent's troubled spots in a talk on Alumni Seminar Day entitled "African Explosions I Know."

Munger was gloomy concerning prospects for peaceful change in

Rhodesia/Zimbabwe. "Animosities among the black exile groups portend revengeful executions, if not civil war, depending on which factions attain power," he said.

While Munger is pessimistic about conditions in Rhodesia, he said he is relatively hopeful about the prospects for peaceful transition in South West Africa/Namibia. A peaceful change to majority rule is receiving support through the attitudes of the German-speaking population in that country, he said.

Munger, who has been with the Savimbi guerilla forces in southern Angola, reported that this former Portuguese territory is far from stabilized by the presence of Cubans.

The African specialist traced the rise of Ugandan President Idi Amin, who was a bellboy when Munger first knew him in 1949. He gave examples from the general's life to explain why Amin has treated the British colonials and Asian businessmen harshly. Munger strongly condemned Amin's wholesale execution of Africans. He said that two recent plots by Uganda exiles to overthrow Amin have been thwarted by former President Obote. Obote is in exile and is unwilling to see Amin replaced by anyone other than himself.

## Evolution of the Nautilus

The graceful Nautilus is the sole survivor of a once highly diverse group of organisms with an evolutionary history that can be traced, via fossils, 515 million years into the past, Heinz A. Lowenstam, professor of paleoecology, told alumni. Found as recently as 80 million years ago in oceans throughout the world, the Nautilus now lives only in parts of the Indian and (western) Pacific Oceans.

Lowenstam showed a movie illustrating the swimming behavior of the living Nautilus and compared its ecology with that of extinct species. He described its engineering mechanism — an intricate evolutionary product that makes the Nautilus almost completely buoyant — and the way this device developed.

Lowenstam also discussed the Nautilus's balancing organs — recently clarified through his research — and other organs in the

species that resemble kidneys but seem to act as reservoirs of calcium for building chamber partitions in the shell.

In his current research, he said he is studying the shell proteins of Nautilus to clarify the genetic relationship of living species and of the group's molecular evolution.

## Quasar expansion

Seven years after it was first observed expanding at what appeared to be faster than the speed of light, the quasar 3C-273 continues to expand with enormous velocities, radio astronomer Marshall Cohen told alumni.

In fact, radio observations with a technique called very long baseline interferometry (VLBI) reveal much greater detail than is possible optically. Observations with VLBI show the radio structure of the quasar to be expanding apparently at about four times the speed of light.

Because this apparent velocity violates the law of physics which says that nothing travels faster than light, it must be some sort of illusion, the radio astronomer said.

Cohen favors phase velocity as the most acceptable explanation for this phenomenon. This means that the phenomenon could be a reflection on some distant object — perhaps on a great cosmic cloud — of an expansion or explosion. As the reflections moved outward along the cloud in opposite directions, light from the object could reflect off the cloud and appear to be moving at several times the velocity of light. A shock wave could produce the same effect.

Cohen said there are four cosmic objects that appear to be expanding at enormous velocities. All are billions of light years distant.

## How songbirds learn to sing

Despite their many differences, songbirds and humans share one important characteristic. Unlike dogs, cats, and even chimpanzees, they must be able to hear in order to learn the vocal patterns of their own species, Mark Konishi, professor of biology, told alumni on Seminar Day.

Still other shared characteristics, Konishi explained, are the centralization of language control in the brain's left hemisphere and the existence of a critical learning period that is essential for the development of normal speech.

One of only a few scientists in the world who are studying birdsong, Konishi works primarily with the white-crowned sparrow, a small brown bird about four inches long, found along California beaches. Konishi and his co-workers bring baby sparrows into the laboratory when they are about five days old and raise them in soundproof rooms.

Through his research, Konishi explained, he has learned that the second and seventh weeks after birth are critical in song learning. If the birds in his laboratory don't hear their own song during this time — played for them on tapes — they develop an abnormal pattern that can't be corrected by later exposure to

# Faculty reports inform alumni visitors

their normal one. Similar critical periods in the acquisition of human speech appear to exist, when children are best able to learn their own speech patterns.

In laboratory isolation, the young song birds choose their own song and reject that of another species if they're given a choice, Konishi has found. By using a computer and systematically varying the song, he's trying to find out how young birds know which one to choose.

## Energy policy goals

Striking a balance among conflicting goals is the key to the development of an energy policy for the nation, W. D. Montgomery, assistant professor of economics, told his alumni audience.

The four goals that Montgomery designated as the most central to energy policy formulation were 1) efficient use of alternative energy resources, 2) insuring security of energy supplies and protecting ourselves from embargo, 3) environmental protection, and 4) holding down consumer costs.

A basic problem of policy making, Montgomery points out, is that no single energy policy can perform equally well in terms of all of its goals. In fact, the contrary is true. A solution for one goal can work to the detriment of another.

A further complication, he warned, is that "we really aren't certain which policies promote which goals."

In his discussion of sample "policies packages," Montgomery emphasized the importance of the energy balances — levels of energy use, production, and imports — which must result.

## Earthquake prediction

Earthquake prediction eventually may be able to reduce the toll from these natural disasters but the science is still too inexact to be very useful, Hiroo Kanamori, professor of geophysics, told his alumni listeners.

Attempts to predict earthquakes are based on measurements of strain in the earth's crust, but Kanamori said we still don't know how to measure and analyze the strain precisely enough to determine when it is likely to produce a quake.

Kanamori stressed that any earthquake prediction should be based on an assessment of several factors. These include magnetic anomalies, measurements of strain, gravity, and ground water changes; and changes in seismic wave velocity.

Seismic wave velocity measurements are used in attempts to predict earthquakes based on dilatancy. According to the dilatancy theory, strain increases abruptly in rocks before an earthquake. Analyses of dilatancy alone aren't sufficient for prediction, Kanamori said.

The geophysicist described the different types of quakes that occur: strike-slip, thrust, normal, intra-plate, and interplate, and the dynamic factors that produce them. He noted that various models suggest that stress along the San Andreas fault in California is building up gradually. This stress build-up will eventually lead to a major earthquake in south-

ern California such as the one in 1857. But at this point, it's hard to be specific in pinpointing a time, he said.

## The immune system

As embryos in the uterus, we begin to learn to recognize ourselves as distinct human beings. Recognition occurs via the immune system — an incredibly sophisticated mechanism that can pinpoint tiny differences in molecules to determine which are our own and which are foreign to us.

This system, which enables the human body to survive through its ability to resist infections, destroy incipient cancers, and protect itself against any foreign material, was described by John H. Richards, professor of organic chemistry, in his Seminar Day talk, "Am I Me: Molecular Immunology."

Richards outlined the functioning of the immune system at the molecular level, as he described the ways that it recognizes a foreign substance and acts to destroy it. This description led to a discussion of the way allergic reactions are produced and how the system functions in immunization, organ or skin transplantation, Rh incompatibility, and cancer immunotherapy.



John H. Richards outlines the functioning of the body's intricate immune system.

Tumor cells generally signal the immune system that they are foreign through markers on their surfaces, Richards said. But in some instances these cells, when challenged, can mask the markers and continue their destructive action. A major objective of immunotherapy is to stimulate the immune system to find the unusual markers so they can deal with the foreign cells, Richards explained.

## Nuclear fusion

One of the few and most promising long-term prospects for satisfying the human appetite for energy is nuclear fusion — a process that "tames" the thermonuclear reactions in the hydrogen bomb. Achieving the conditions for net energy release in the laboratory is proving more difficult than scientists anticipated when they began to conduct research in this area 25 years ago, but Roy W. Gould, professor of applied physics, remains optimistic that the necessary

technology can be developed.

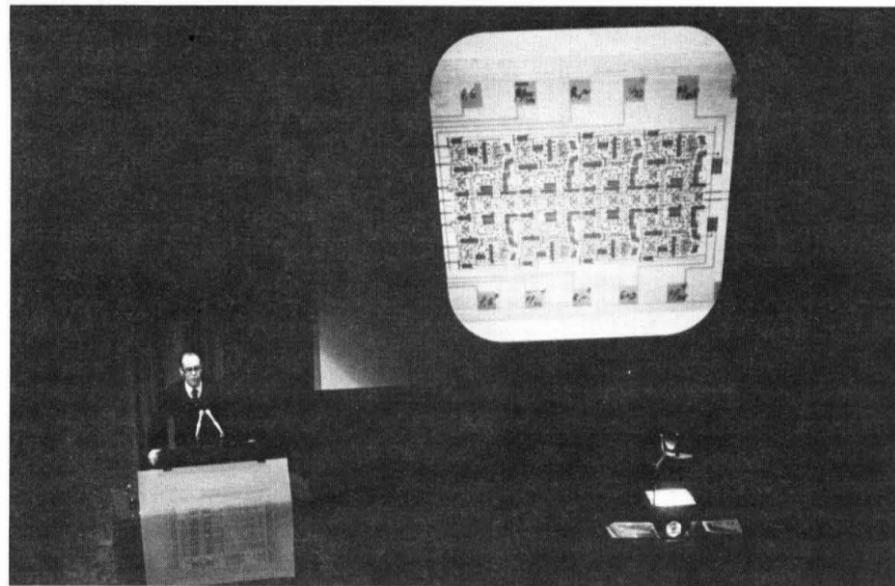
One of the problems still to be resolved is how to achieve the enormously high temperatures that are necessary for fusion to occur, Gould told alumni. For a fusion reactor to produce energy, deuterium and tritium fuel must be heated to about one hundred million degrees above absolute zero before it will burn. At this temperature the fuel is in the plasma state — a form of matter in which atoms have broken up into electrons and ions.

The plasma must be contained — free from any contact with a solid

land's wrist watch analogy will have come to fruition.

Caltech will make important contributions because of its approach to computer science, Sutherland said — an approach based on outstanding capability in the design of integrated circuits. "Caltech is far ahead of any other school in this proficiency," he observed.

The program here focuses on the relationship between hardware and software through the medium of integrated circuits. It has a faculty of three full-time professors and two research associates, will double in



Ivan E. Sutherland describes the revolution, via integrated circuit technology, in computer science.

matter (such as the walls of a container) or from contamination by impurities — long enough for a significant fraction of the fuel to burn. The energy released from burning must be extracted and converted into useful form, such as electricity.

"We've made substantial progress in the heating and confinement of plasmas," Gould told alumni, "and we're getting rather close to the time when we can do real nuclear burning experiments." The first will be conducted at Princeton in the early 1980's, he said. A primary objective of this experiment will be to confront new problems involved when significant burning takes place and to learn more about how to handle them. At this point it is not expected that a practical fusion power plant could be in operation much before the year 2000.

## Revolution in computing

A wrist watch with all the power of today's biggest computers? It's entirely possible, thanks to advances in integrated circuit technology, Ivan E. Sutherland, professor of computer science, said in his Alumni Seminar Day talk, "The Revolution in Computing — You Ain't Seen Nothing Yet."

An integrated circuit, Sutherland explained, involves placing — by means of photographic process — a large number of components on a small piece of silicon at a reasonable price. The digital watch and pocket calculator are two results of the development of this technology in the past 15 years. Currently the maximum number of circuits that can be placed on a silicon chip smaller than a fingernail is 20,000, but that number may soon rise to a million. When it does, then Suther-

land's wrist watch analogy will have come to fruition.

## Medical science at Caltech

The focus of Caltech's new Medical Science Program — immunology — is at the frontier in both fundamental and applied science, Leroy E. Hood, the Ethel Wilson Bowles and Robert Bowles Professor of Biology told alumni. "In no other discipline is there a more rapid translation of fundamental observations into relevant medical practice," Hood said.

Research concerning the body's immune system has important applications for the treatment of cancer, infectious and autoimmune diseases, and organ transplantation.

This increasingly important field will play a crucial role in Caltech's medical science program as a bridge between basic science and medical practice, Hood explained. He said that Caltech plans to appoint three new immunologists who will work with an immunologist now on the faculty — Ray D. Owen, professor of biology. Their work will be centered in the Braun Building of Cell Biology and Chemistry to be constructed at the Institute.

"Caltech is a particularly favorable site for a medical science program in immunology," Hood explained. "First, we can attract high quality people, and people who are interdisciplinary in their approach, because of the high quality of our students and staff. Second, Caltech is small. Small places encourage the kind of interaction that we'll need. Third, Caltech offers a fertile environment for immunology research because of our expertise in the basic sciences."

# PERSONALS

1924

ALBERT S. GOULD moved to Rosewood Gardens, a retirement community in Bakersfield, California, in July 1976. He had been living in Ridgecrest, California.

HAROLD F. POPE has retired. He had been the vice president of the Vinnell Company, Inc.

1925

CARYL KROUSER has retired as director of Courier Enterprises of Colton, California, and is living in Barstow.

1927

GEORGE K. S. DIAMOS, MS, retired on May 15 as a research assistant in liberal arts at the University of Arizona in Tucson.

1929

HOMER C. REED, MS '30, has retired from the Kerr-McGee Corporation. He lives in Laguna Beach, California.

1930

ROLAND F. HODDER writes that he has been retired for nearly 15 years. "I've spent most of my time traveling by freighter and trailer," he says, and adds that Santa Rosa, California, is now his home.

1932

PATRICK B. LYONS, retired for six years as general manager of manufacturing operations with Western Electric Company, is now mayor of Vero Beach, Florida. A staunch conservationist, he's been active with the local Audubon Society and in programs to protect mangroves in Florida's Indian River.

1935

HERBERT S. RIBNER, professor of aerospace studies at the University of Toronto, has returned from his sabbatical at NASA's Langley Research Center, where he was working in the acoustics and noise reduction division.

1936

DON Z. ZIMMERMAN, MS, received the Karl Koon perpetual award from the Seattle chapter of the American Rhododendron Society for the best truss [flower cluster] of a rhododendron hybrid at the 1976 Rhododendron Show. Zimmerman is a retired brigadier general in the U.S. Air Force.

1940

GEORGE J. TODD, MS '41, writes, "In June 1977 I plan to take early retirement from the Aerospace Corporation. My wife, Laura, and I will then start a 15-month, 30,000-mile trailer trip around the North American continent: north to Alaska, east to Nova Scotia, south to Florida, west and south to Mexico (3 months in Mexico), then back to Alberta and British Columbia before returning to southern California for Christmas 1978. We will look up many Caltechers on the way." Todd lives in Sherman Oaks, California.

GILBERT R. VAN DYKE, MS '41, writes, "I have survived one year of cancer, for which I praise the Lord." Van Dyke lives in Long Beach, California.

1947

ROY G. ANDERSON, Eng., retired from the U.S. Navy on September 1, 1974, after serving as a rear admiral for nine years. He writes, "My Caltech education gave me many advantages which were well used in Regulas, Polaris, and other technical Navy programs." He now lives in Neosho, Missouri.

GEORGE B. MELROSE, JR., MS, was given a special award of merit by the U.S. Environmental Protection Agency in recognition of his efforts as chairman of the Erie County, New York, Environmental Management Council. Melrose was cited for his planning and negotiating skills and his "ability to get the job done." He is manager of aerospace and advanced technology marketing with Bell Aerospace Textron of Buffalo, New York.

NORRIS WOERNER, MS, writes, "We have retired to the west side of Montana's Flathead Lake, one of the most beautiful spots anywhere! I've just completed 30 years with the National Weather Service, mainly as a lead forecaster."

1950

PETER T. KNOEPFLER is a psychiatrist in private practice in Bellevue, Washington.

1951

GEORGE S. CAMPBELL, MS, PhD '56, is spending the spring semester on sabbatical leave from the University of Connecticut as a visiting fellow in the aerospace and mechanical sciences department at Princeton University. He writes that he and his family will be returning to Connecticut in July.

1952

MICHAEL J. CALLAGHAN writes, "My post-CIT job with Shell Oil Company was interrupted by three years in the U.S. Navy and four in graduate school at Stanford. I'm now a senior staff engineer and working in process engineering design and training in Shell's head office in Houston, Texas. Ann, our son Kelvin, three cameras, and I still enjoy camping in what I claim is the world's best packed VW. Wave at the folks in the spherical Bug. We'll wave back."

1954

GEORGE L. JOHNSTON is a research associate in the research laboratory of electronics at MIT, where he is engaged in research in theoretical plasma physics applied to problems of controlled thermonuclear fusion. He's on leave of absence from California State College, Sonoma, where he is an associate professor of physics.

1955

BASIL P. ROMAN (formerly VASILE MURARU), MS, is professor of mechanical engineering at California State University, Long Beach. He is living in South Laguna with his wife and four children.

1960

KENNETH E. HARWELL, MS, PhD '63, is director in the Gas Diagnostic Division at the University of Tennessee Space Institute in Tullahoma.

1961

WARREN L. SIMMONS, MS, has been appointed director of admissions and registrar at the U.S. Air Force Academy in Colorado Springs, Colorado. The lieutenant colonel recently received his second award of the Meritorious Service Medal from the academy for outstanding performance as tenure director of counseling and scheduling.

1962

BRUCE R. ABELL is head of the National Science Foundation's Communications Resource Branch. He writes, "Our small group publishes the best government magazine — *Mosaic* (write to me for a copy) — and some of the best government films ("The Reading Machine," a new award-winning film on teaching learning-disabled children, will go into distribution later this year). Nancy and I, and daughters Julie and Robin, are happily ensconced in Reston, Virginia. Nancy, a social worker, is the foster home finder for Loudoun County, Virginia."

JOHN R. GOLDEN last year was made senior international systems consultant of the corporate systems staff at Xerox. He lives in Pittsford, New York.

1963

DONALD R. DAVIS writes, "Since 1973 I have been pursuing an unanticipated career in nutrition research at the Biochemical Institute of the University of Texas at Austin, with summers and future dreams in southern California."

RICHARD E. PETERSON writes that he is now the father of a third child, Karin Elizabeth, born August 7, 1975. He's conducting research on tornadoes and duststorms at Texas Tech University where he's an associate professor of geoscience.

1964

JONATHAN A. FRENCH, MS, PhD '70, writes, "Work with the environmental engineering firm of Camp, Dresser & McKee brought Sarah and me to Alexandria, Egypt, for one year. By the week we seek improvements to the water and sewerage system. On Fridays (Muslim sabbath) we soak up the history, from Saqqara to El Alamein."

1966

WILLIAM G. HERKSTROETER, PhD, senior research chemist for Eastman Kodak Company in Rochester, New York, is author of a paper, "Quenching of Singlet Molecular Oxygen in Solution by Azomethine Dyes," selected for inclusion in Kodak's four-volume annual, *Scientific Publications from Eastman Kodak Laboratories*. He also contributed the chapter, "Absorption Spectroscopy of Transient Species," to the reference series *Physical Methods of Chemistry*.

M. YANCE HIRSCHI is practicing corporate and business law with the firm of Calfas and Williams in Santa Monica, California. He received his degree in law from Loyola University (Los Angeles) in 1974.

1969

MELVIN H. BERNSTEIN, an analyst with Exxon Corporation in New Jersey, received his

PhD in chemical engineering from the University of Pennsylvania in May 1976. He lives in Rockaway.

1970

JOHN R. BORN, MS, opened his own firm in Cambridge, Massachusetts, last year, providing structural consulting services to architects, contractors, and owners in the design of buildings.

THIERRY D. FAURE, MS, an installation engineer with Single Buoy Moorings, Inc., of Monaco, writes that he and his wife, Sheila, had a son, Philippe Alexandre, on February 28.

STEVEN FERSHTUT says that he is planning to build a geodesic dome 10 miles north of Salmon, Idaho. He writes, "My plans include a methane digester for toilets, an ice house instead of refrigeration, a wood cookstove for cooking, heat, and baths, and a portable electric generator for my stereo." He is a member of the technical staff at Aerojet in Idaho Falls.

ERIC B. JENSEN received his PhD in astronomy from the University of Arizona in February and is now a research fellow at Rice University in Houston, Texas. His thesis dealt with the chemical evolution of spiral galaxies.

ALEXANDER C. LIVANOS, MS '73, PhD '75, is a member of the technical staff of the exploratory department at Hughes Research Laboratory in Malibu, California. He lives in Thousand Oaks.

THOMAS J. NOYES, MS, writes, "I am now working in the Detroit area as an EDP consultant for a new firm, Logical Design Services. Mary is starting on her PhD in the fall at the University of Detroit. Jamie and Phil are 4-1/2 and 3 and growing like weeds!"

1972

ROBERT C. DULLIEN writes that he married Vivian Karr on May 28. "I'm residing in Cambridge and going back to school in the fall — this time it's the Harvard Business School. Otherwise, I'm having a good time writing and traveling a lot." Dullien is a senior analyst with Data Resources, Inc., in Cambridge, Massachusetts.

## OBITUARIES

1926

WAYNE H. CLARK of cancer on March 27. He was retired and lived in Los Angeles.

MANLEY W. EDWARDS of cancer on March 16. A San Diego resident, he was retired.

1927

HENRY P. ANDERSON of cancer on May 2. Surviving are his wife and a son. He was a civil engineer with James M. Montgomery of Pasadena.

THURMAN S. PETERSON on March 3 in Portland, Oregon, after a long illness.

1929

THOMAS H. BRIGGS, JR., MS, in September 1975. He was retired and had been living in Phoenix, Arizona, with his wife, Joyce.

1932

FRANKLIN J. CLINE, JR., on September 25, 1974. A CPA, he lived in Fullerton, California. Surviving is his wife, Madeline.

1933

BRUCE M. DACK at his home in Loomis, California, on April 6. He retired in 1966 from the State Office of Architecture and Construction in Sacramento. Surviving are his wife, Margaret, three sons, and three grandchildren.

1934

ROBERT BROWN of cardiorespiratory collapse early in 1977. He was a staff engineer with IDECO of Long Beach, California.

1937

BOYD RICHARD HOPKINS on July 17, 1976. He lived in Louisville, Kentucky, and is survived by his wife and two sons.

1958

STEPHEN F. HOLTZMAN in December 1975. He was an assistant professor of anthropology at Northern Illinois University, De Kalb.

1972

JOSEPH H. SMITH, PhD, in a Southern Airlines plane crash in Georgia on April 4. He was a senior chemical engineer with the 3M Company in St. Paul, Minnesota.

## Class of 1952 celebrates its 25th reunion



A festive weekend program — combined with Alumni Seminar Day — brought 105 members of the class of 1952 back to the Institute for their 25-year reunion. A Friday dinner in the Athenaeum, campus tours, and a luncheon and cocktail party on Saturday — plus Seminar Day lectures and informal visits with old friends — filled their visit to the campus. Above left, at the reunion dinner, Stanley R. Rawn, Jr., BS '52, MS '53, a member of the Caltech Board of Trustees, describes changes at the Institute from a trustee's perspective. Center: During the social hour, Robert C. Perpall, BS '52, MS '56, talks with Barclay Kamb, BS '52, PhD '56, chairman of Caltech's Division of Geological and Planetary Sciences. Right: Robert E. Stanaway, BS '52, and Jesse L. Weil, BS '52, visit during reunion social hour.