

# CALTECH NEWS

PUBLISHED FOR ALUMNI AND FRIENDS OF THE CALIFORNIA INSTITUTE OF TECHNOLOGY

## Fuel from the sun: Three endowed professors chosen a step closer

An important advance in the use of light-capturing molecules to transform sunlight into fuels such as hydrogen has been announced by Caltech scientists.

Chemist Harry Gray described the development at the annual meeting of the American Association for the Advancement of Science (Gray is the William R. Kenan, Jr. Professor and professor of chemistry at Caltech, and chairman of the Division of Chemistry and Chemical Engineering).

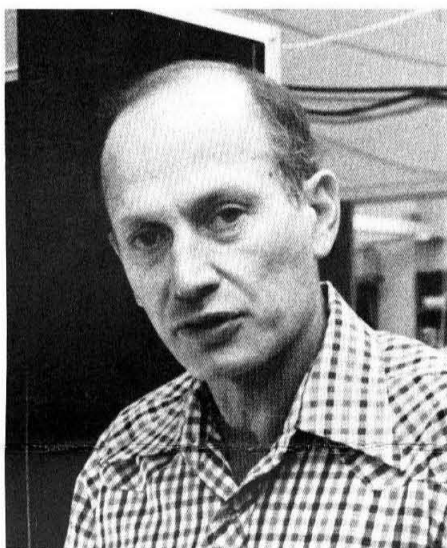
At the center of the advance is a rhodium compound that causes hydrogen to be released when it is placed in water and acted on by sunlight. The conversion of sunlight into chemical energy — at a high level of efficiency — could open the way over the next decades for the development of solar energy farms, perhaps located offshore in the ocean.

But Gray said that two major problems remain before commercial applications of solar catalysts become a reality: producing them cheaply and finding ways to give them long-term stability. It would be difficult to produce enormous quantities of the rhodium catalyst because the metal is rare and expensive. The search for a more abundant and durable catalyst is centering on tungsten and molybdenum molecules. Fundamental research in this area is being done in Gray's laboratory by John Buhr and Dan Nocera while the nature of the molecular light-capturing process needed for solar chemical conversion is being explored by Steve Rice, Jay Winkler, and Vince Miskowski.

The process described by Gray uses water solutions of acids as a raw material. These solutions, in the presence of sunlight and the rhodium molecule, can be induced to produce hydrogen through an oxidation-reduction reaction. These solutions contain hydrogen ions — hydrogen atoms that have been

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Three distinguished members of the Caltech faculty have been chosen to fill three newly endowed professorships, President Marvin L. Goldberger has announced. They are Amnon Yariv, professor of electrical engineering and applied physics, to the Thomas G. Myers Professorship of Electrical Engineering; John H. Seinfeld, professor and executive officer for chemical engineering, to the Louis E. Nohl Professorship, and Roy W. Gould, professor of applied physics and chairman of the Division of Engineering and Applied Science, to the Simon Ramo Professorship of Engineering.



Amnon Yariv

Dr. Goldberger said endowed professorships meet an important need at Caltech. He praised the donors' contributions to the Institute, and the stature of the men chosen to fill the chairs.

### The Myers Professorship

The Myers Professorship was made possible through gifts of Thomas G. Myers and his daughter and son-in-law, Barbara Myers Garlinghouse and Albert Garlinghouse. Myers graduated from Caltech in 1922 with a bachelor's degree in electrical engineering and became president of U. S. Electrical Motors, which merged with the Emerson

Electrical Company. After the merger he continued as president of Emerson Electric's Electrical Motors Division.

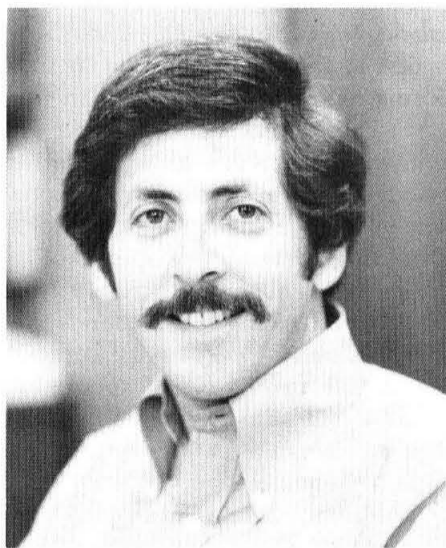
Myers was a life member of the Caltech Alumni Association and a member of The Associates. He died January 25, 1978, and the professorship is a memorial to his dedication to the Institute.

The new Myers Professor, Amnon Yariv, is internationally known for his contributions to lasers and integrated optics. Integrated optics is a new technology invented and developed by Yariv's research group, in which laser light is generated, modulated, and otherwise manipulated in hair-thin layers of semiconductor crystals. These micro-optical electronic circuits, which combine lasers and transistors, can be used as terminals in optical fiber communications systems. They hold promise for becoming more economical in size and cost, and can carry many times more information than conventional electrical communications networks.

A native of Israel, Yariv worked as a research physicist at Bell Telephone Labs and as head of the Electro-Optical Division of the Watkins Johnson Company before coming to Caltech in 1964.

### The Nohl Professorship

The Louis E. Nohl Professorship was endowed by Nohl, a retired banker and rancher and a life mem-



John H. Seinfeld

ber of the Institute's Board of Trustees. Nohl was born in Santa Fe, New Mexico, and received his BS degree in business administration from Columbia University. He was vice president of the Bankers Trust Company in New York and executive vice president and director of the Elliott Company in Pittsburgh, manufacturer of electrical equipment, before coming to California in 1944. Here he became a cattle rancher in Orange County.

Nohl is a member of The Associates and was named to the Institute's Board of Trustees in 1966. In 1973 he became a life trustee. Nohl endowed the Beno Gutenberg Fellowship in Geophysics at Caltech in 1971.

Seinfeld, the new Nohl Professor, has been a pioneer in the development of the mathematical models of air pollution behavior now being used by California and the U. S. Environmental Protection Agency in analyzing emission regulations in Los Angeles and other urban areas. He is also recognized for developing techniques for estimating the properties of dynamic systems, such as underground oil fields.

Seinfeld received the Donald P. Eckman Award of the American Automatic Control Council for his early research in systems and control theory. He received a Camille and Henry Dreyfus Foundation Teacher-Scholar grant for his potential as a young scientist-educator and has been the recipient of both the Curtis W. McGraw Research Award of the American Society for Engineering Education and the Allan P. Colburn Award of the American Institute of Chemical Engineers for his excellence in publications.



Roy W. Gould

### The Ramo Professorship

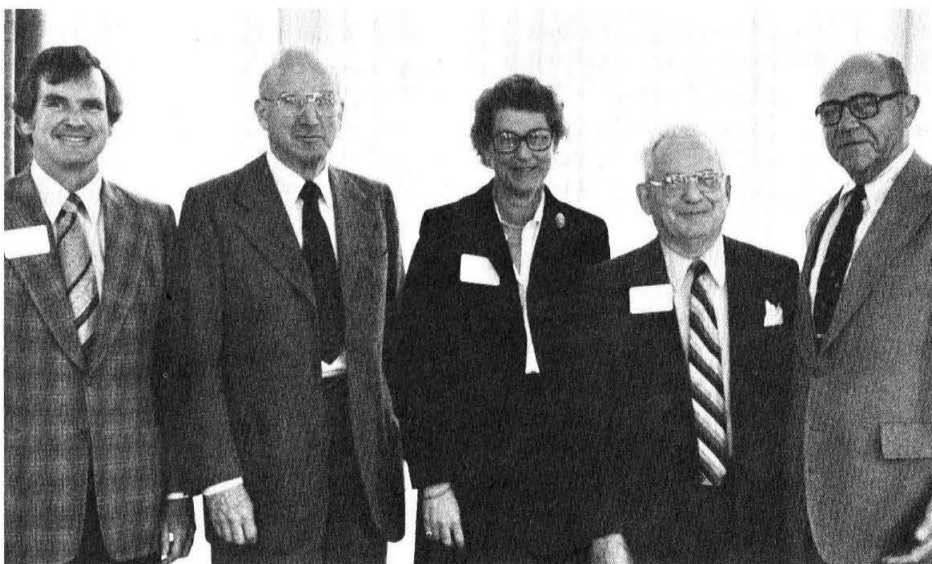
The Ramo Professorship honors Caltech alumnus Simon Ramo, who retired in 1978 as vice chairman of the Board of Directors and chairman of the Executive Committee of TRW Inc. Ramo continues as a member of TRW's Board of Directors and chairman of its Science and Technology Committee. A \$1 million endowment for the professorship was made possible by gifts from Dr. Ramo and the TRW Foundation.

Ramo received his PhD degree magna cum laude from Caltech in 1936. He is a member of the Institute's Board of Trustees, chairman of the Visiting Committee of the Division of Engineering and Applied Science, and a Life Member of The Associates. A research associate at Caltech from 1946 to 1974, he became a visiting associate in engineering in 1974 and a visiting professor of management science in 1977.

During his career, Ramo has won distinction as an industrialist, scientist, educator, and leader in the cul-

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## New Associates' officers



Members of the 1980 Executive Committee of The Associates, from left; C. H. Holladay, Jr., treasurer; Edward E. Tuttle, first vice president; Hannah G. Bradley, president; Samuel P. Krown, secretary; and Oscar T. Lawler, second vice president.





New Associates members Mr. and Mrs. John F. Knox, left, with their sponsors (and Mrs. Knox's parents), Mr. and Mrs. Horace Gilbert. Gilbert is Caltech professor of business economics, emeritus.



Mr. and Mrs. J. C. de Graaf, new members from San Clemente, with their sponsors, Janet and John Delmonte, The Associates' President Hannah Bradley, and Caltech President Marvin L. Goldberger.

## "Big Bang" gas cloud remnants discovered

Astronomers from Caltech and University College London have reported detecting the first pristine material in outer space left over from the beginning of the universe. The diffuse clouds of hydrogen that they have found far outside our own galaxy will open the way for what the astronomers term "unprecedented insights" into the Big Bang that began the universe.

The clouds' existence also makes possible a sort of "cosmic weather report" of conditions in space between the galaxies, and indicates that this intergalactic medium is cooler and more tenuous than was previously believed.

The scientists, who published their findings in the January issue of the *Astrophysical Journal Supplement Series* are Caltech Professor of Astronomy Wallace L. W. Sargent and Assistant Professor of Astronomy Peter J. Young, and University College London Professor of Physics Alec Boksenberg and Astronomer David Tytler. The work is supported by the National Science Foundation.

The astronomers detected the intergalactic clouds by analyzing alterations in the spectrum of light from distant quasars — alterations produced as the light passed through the clouds on its way to earth. Quasars are ideal beacons for this kind of study because they are the most distant and the brightest objects in the universe, outshining entire galaxies of hundreds of billions of stars.

The hydrogen in the intervening clouds, however, absorbs this light at certain wavelengths, producing

spectral features called "Lyman-alpha" lines, which the scientists use as benchmarks to locate the clouds.

The quasar observations were made with the 200-inch Hale Telescope at Palomar Mountain in California, and the Anglo-Austrian telescope near Near South Wales. The astronomers were able to gather enough light to perform the spectral analyses by using an Image Photon Counting System developed by Professor Boksenberg with funds from the United Kingdom Science Research Council. The device contains a special intensifying television camera that amplifies more than ten million times the extremely faint images from a telescope.

The astronomers have proposed that the clouds are pristine material from the Big Bang because they produce only hydrogen absorption lines and no carbon absorption lines. Carbon lines would show that the clouds had been "polluted" by material formed after the Big Bang, in the nuclear furnaces of stars. All nuclear substances with atomic weights heavier than hydrogen, helium, deuterium, or lithium were formed after the Big Bang by thermonuclear fusion processes in stars.

The scientists were able to deduce that the intergalactic medium was relatively cool (about 300,000° Kelvin) and tenuous, because higher temperatures and densities would have caused the clouds to evaporate within 100,000 years of their formation, long before the 10 billion or so years that have passed since the universe began.

## The Associates welcome their new members

The Associates welcomed 220 new members at a dinner in the Athenaeum on February 4—an event that honored both newcomers and their sponsors. Guests heard Harry B. Gray speak on "Solar Fuels for the Future." Gray is the William R. Kenan, Jr. Professor and professor of chemistry, and chairman of the Division of Chemistry and Chemical Engineering.



Mr. and Mrs. Kenneth F. Montgomery (center) with their sponsors, Mr. and Mrs. John Y. Pashgian. The Montgomerys traveled to Pasadena from Northbrook, Illinois, for the event.



Graduate students in John E. Bercaw's laboratory are preparing an organometallic compound that they will treat with hydrogen gas. Methanol will eventually be produced in the process that results. The work is of fundamental importance for the development of synthetic fuels from coal. The students are (from left) Peter Wolozanski, Nancy McGrady, and Paul Barger. Bercaw is professor of chemistry at Caltech.

## National Medal of Science recipients Feynman, Ramo, Knuth honored

Two members of the Caltech faculty, one of them a Trustee and alumnus, and a second alumnus have been awarded the National Medal of Science by President Carter. They are among 20 outstanding men and women to receive the highest honor accorded United States scientists and engineers by the Federal Government.

The recipients are Nobel laureate Richard P. Feynman, the Richard Chace Tolman Professor of Theoretical Physics, for his explanation of the behavior of subnuclear particles; Simon Ramo, PhD '36, a member of the Caltech Board of Trustees and a visiting associate in engineering and visiting professor of management science who is vice chairman of the board of TRW Inc., for his development of microwave electronics; and Donald E. Knuth, PhD '63, the Fletcher Jones Professor of Comput-

er Science at Stanford, for design of efficient algorithms that form the basis of computer programs.

The National Medal of Science was established by Congress in 1959 after the Soviet Union sent its Sputnik aloft. At that time, many felt that the United States' technological capabilities were falling behind the Soviets'. The Congressional act creating the award said it should be given to individuals who are "deserving of special recognition by reason of their outstanding contributions to knowledge in the physical, biological, mathematical or engineering sciences."

Caltech faculty members who previously have received the medal include John Pierce, Allan Sandage, William A. Fowler, Linus Pauling, and William H. Pickering, and the late Theodore von Kármán, Alfred H. Sturtevant, and Arie J. Haagen-Smit.





James Morgan checks a device atop Keck Laboratory that he and Howard Liljestrand used in measuring the acidity of rainfall. The device opens automatically when it begins to rain and sends the rainwater for analysis, in increments of one-quarter inch, down to a sequence of bottles enclosed in the base. Because the water is analyzed in increments, it is possible to learn about changes in the acidity during the progress of a storm.

## Dour duo: acid smog, rain

Pollution-beleagured Los Angeles is experiencing not only acid rain but also acid smog, according to scientists at Caltech in a study of the phenomenon for the California Air Resources Board. The researchers are Howard M. Liljestrand (now an assistant professor at California State University, Los Angeles, Liljestrand worked on the study as a Caltech graduate student) and Professor of Environmental Engineering Science James J. Morgan.

In measuring the acidity of rainfall throughout the Los Angeles basin during 1978-79, the scientists found mean pH values ranging from 4.4 (Pasadena) to 5.4 (Big Bear). The variations were due to such factors as the proximity of pollution sources, or natural influences such as alkaline soil dust and basic ammonia gas in the atmosphere.

The pH scale is a logarithmic measure of acidity and alkalinity with each unit representing a tenfold change. A pH of 7 is neutral; higher than 7 is alkaline; lower than 7 is acidic. (The natural pH of rainwater is about 5.6 due to the acidity of the dissolved carbon dioxide that it carries. But over wide regions of the western United States, the natural pH ranges as high as 6.5 to 7.5 because of the alkalinity of desert soil dust).

In their measurements, the researchers learned that the acidity of rainwater varied according to the storm. For example, the pH of rainwater briefly reached 2.8 during one mild winter rain in Pasadena —

almost as acidic as vinegar and capable of damaging paint on automobiles. But during the heavy rains over the winter of 1977-78, acidity was diluted and the average pH increased to around 4.6.

Liljestrand and Morgan found that about 20 times more acidity reaches the floor of the Los Angeles basin as gases and solid particles than as rain, and these pollutants in smog can be at least as damaging as acidic rainwater. For example, the concentrated acidity of deposited smog particles is capable of burning holes in the surface of a leaf.

In the eastern United States and Europe acid rainfall is widespread and generally has its origins in acid sulfates (mainly SO<sub>2</sub> from industrial smokestacks and power plants) and acid nitrates (primarily NO<sub>x</sub> from automobile exhausts) in a proportion of two to one. But in Los Angeles these proportions are reversed because of a high level of pollutants from automobiles and a lack of sulfates from coal-burning plants.

Liljestrand and Morgan began their study in February 1976 by collecting rainfall samples in Pasadena. In September 1978 they expanded to nine collection sites: Pasadena (4.4 average pH), Los Angeles (4.5), Westwood (4.5), Long Beach (4.5), Riverside (4.9), Azusa (4.6), Big Bear (5.4), Wrightwood (4.9), and Mount Wilson (4.9). They gathered information about acid deposits from smog by exposing to the atmosphere flat plates coated with a sticky substance.

## Catalytic advance

# Sunlight into energy

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stripped of their electrons. Sunlight energizes the electrons in the rhodium molecule to its active form. These electrons then convert the hydrogen ions into molecules of hydrogen gas. Other reactions are required to restore the catalyst to its active form.

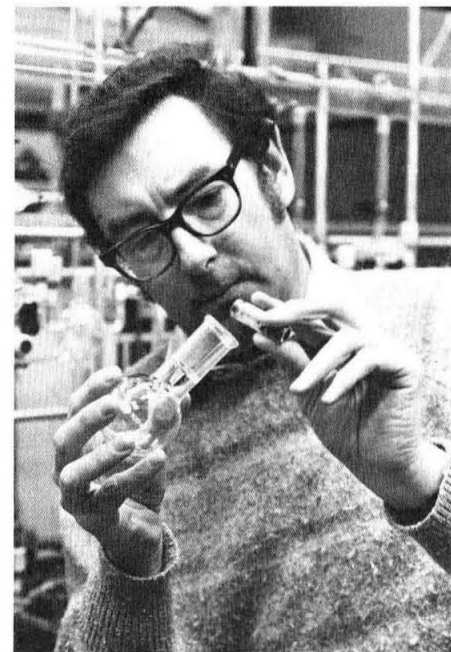
In the active form of the molecule, four atoms of rhodium are held in clamp-like structures composed of carbon, hydrogen, and nitrogen atoms. The compound's structure resembles a windmill with metal atoms trapped at the hub and the clamp-like structures protruding like the vanes of a windmill.

Initial work on the molecule was announced at Caltech in 1977 by Gray, Kent Mann, and Nathan Lewis. The scientists discovered that the rhodium molecule, when dissolved in water solutions of mineral acids and irradiated with sunlight, captures solar energy and transforms it into chemical energy in the form of hydrogen gas. Research that has shown how the rhodium molecule works has been done in Gray's laboratory by Irving Sigal, Andrew Maverick, and John Chesick.

The discovery marked the first time that a single compound had been used successfully to do the entire job of capturing solar energy and transforming it into chemical energy. But the photochemical reaction was only about 2 percent efficient in producing hydrogen gas. In recent experiments, however, Gray and Steven Milder have found that electrons needed in hydrogen production can be added to the rhodium molecule with efficiencies as high as 90 percent. The new photochemical

process involves a molecule which contains only two rhodium atoms. It should be possible to produce hydrogen when the electron-rich two-rhodium molecule reacts with water. However, this important step in the process has not been achieved yet. The photoreactions of similar electron-rich iridium molecules are being studied by Terry Smith, Penny Slusser, and Jan Najdzionek.

Cheap, durable solar catalysts could have an important impact on



Harry Gray with a sample of the solar catalyst that he and his co-workers have developed.

world energy production. In addition to hydrogen fuel, solar catalysts potentially could be used to produce many other useful chemicals. Research in these new areas of solar chemistry is being performed by Virginia Houlding and Michel Goldberg. Houlding's work is in collaboration both with Gray and with Ami Gupta of JPL.

## Endowed professors named

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tural life of his community. He is the co-founder of Ramo-Wooldridge Corporation and when Ramo-Wooldridge merged with Thompson Products in 1958, he became the executive vice president of the combined firm. In 1961 he was named chairman of its Board of Directors and in 1969, chairman of its Executive Committee. He was also president and founder of TRW's former affiliate, Bunker-Ramo Corporation. Ramo has been a top level adviser to the U.S. government on science and technology and has written several texts that are widely used by engineers and scientists in university courses.

Roy Gould, BS '49, PhD '56, the Ramo Professor, is a leader in research on controlled thermonuclear fusion. He was Caltech's executive officer for applied physics from 1973 to 1979, when he became division chairman. Gould joined the Caltech faculty in 1955 as assistant professor of electrical engineering, becoming professor of electrical engineering and physics in 1962 and professor of applied physics in 1974. From 1970 to 1972 he was on leave from Caltech as the assistant director of the Division of Physical Research and then director of the Division of Controlled Thermonuclear Research for the Atomic Energy Commission.

From 1950 to 1955 Gould conducted research with North American Aviation, Caltech's Jet Propulsion Laboratory, and Hughes Research and Development Laboratories, helping to develop nuclear reactors, missile guidance systems, and military radar components.



Pik-Chun Beatrice Lee, a senior engineering major, received the first Henry Ford II Scholar Award to be presented to a Caltech student. The \$5,000 award is given each year to the student with the best academic record in Caltech's Division of Engineering and Applied Science.



1979VA:

# Comet, asteroid, or missing link?

Caltech planetary scientists may have discovered a missing link — a link between comets and a class of asteroids that travel in elliptical orbits that cross the orbit of the earth and of other inner planets.

Some scientists have suggested that these small earth-approaching asteroids are the residue of comets that have been stripped of their gases, dust, and small ice particles by close approaches to the sun. The new find may represent a transition between the earth-crossing asteroids and comets.

The discovery was made by planetary scientist Eleanor F. Helin assisted by Schelte Bus. Both have been engaged in a search for earth-crossing asteroids with Caltech Professor of Geology Eugene M. Shoemaker. Their aim is not only to locate these objects but also to find out more about them and their relationship to the processes by which the solar system was formed.

Helin and Bus first detected the object on November 15 on photographic plates taken with the 18-inch Schmidt Telescope at the Hale

Observatories' Palomar Mountain Observatory. Designated as 1979VA, the asteroid orbits the sun about every four and a quarter years, passing from just within the orbit of the earth outward well into the sphere of influence of Jupiter. Its own orbit is inclined only 2.8 degrees from the ecliptic (the plane of the earth's orbit around the sun). When it was discovered, 1979VA was about 13 million miles from the earth.

Brian G. Marsden of the Smithsonian Astrophysical Observatory and James G. Williams of Caltech's JPL calculated its orbit, and Planetary Scientist Allan Harris of JPL obtained photometric observations that show that 1979VA is an almost neutral gray in color. This may mean that the asteroid is composed primarily of dark carbonaceous rocky material comparable to rare black carbonaceous meteorites. Several astronomers have been searching for trace amounts of gas escaping from 1979VA — an indication that it is a comet in the final stages of its existence.

The asteroid search that resulted in the discovery of 1979VA is supported by NASA's planetary geology program and by the Hale Observatories, the latter operated jointly by Caltech and the Carnegie Institution of Washington. The search, begun in 1973, has resulted in the discovery of hundreds of new asteroids, including seven that cross the orbit of the earth.



Eleanor Helin with a photograph showing 1979VA.

## Breakthrough in brain tumor removal

A new surgical technique, in collaboration with computer technology, is making it possible to find and remove far smaller brain tumors than ever before — and with less damage to healthy brain tissues. The procedure was developed by surgeons at the Huntington Institute of Applied Medical Research and by Caltech computer scientist Gilbert McCann, professor of applied science. The medical instrumentation was crafted by engineers at JPL.

The technique is "the most significant event in neurosurgery in the last 25 years," according to Robert Rand, MD, of UCLA. Traditionally, tumors are only found when they are large and difficult to remove without damaging other parts of the brain, and after surgery, the malignant cells that are left behind respond poorly to chemotherapy, immunotherapy, or radiological therapy. But the new method precisely locates and describes tumors as small as a pencil eraser — a fifth to a tenth the size of the smallest tumors that are normally discovered.

The heart of the procedure is a new method of enhancing and interpreting the results of a sophisticated x-ray machine that performs computerized axial tomography — the CAT scanner, whose key developers this year won the Nobel Prize for medicine. The device provides a sharply detailed view of cross sections of tissue. Caltech computer scientist McCann developed a computerized system to enhance the

CAT scan results so effectively that surgeons can calculate a tumor's location, size, axis, contour, and something of its consistency before they start to operate.

The new procedure also may offer a more effective means of following



Dr. C. Hunter Sheldon and Dr. Deane B. Jacques discuss the stereotactic apparatus used to perform a delicate new surgical technique for the removal of brain tumors.

surgery with chemotherapy. Instead of taking chemotherapy drugs orally, the tubular pathway to the tumor created by the surgeon might be used to deliver a highly concentrated dose directly to the site of the tumor.

C. Hunter Sheldon of the Huntington Institute for Applied Medical Research headed the team that developed the "Sheldon Stereotactic Procedure." Efforts toward that end formally began in 1975 and the first

operation was successfully performed at the Huntington Memorial Hospital in Pasadena in September.

Immediately before an operation, a patient receives a CAT scan with a steel ring surrounding his head like a halo. Then surgeons cut a small hole into his skull, and a small instrument mounted on the halo is lowered into place. A device that looks like opera glasses mounted on a metal rod is inserted through the hollow instrument to provide binocular vision for the surgeon who removes the tumor with tiny scalpels and suction tubes, also operated through the instrument.



Caltech's Gilbert McCann developed a computerized system that greatly increases surgeons' effectiveness in locating brain tumors and calculating their size and consistency.

"We can now reduce a forest fire to a bonfire," Dr. Hunter said. "And using the auxiliary therapy available to us, it may be possible to extinguish the flame."

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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:

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Please send me: (Check one)

- ☐ An application for placement assistance.
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Name .....

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

Address .....



## Seminar Day speaker



Paul MacCready's aeronautical creations — the Gossamer Condor and the Gossamer Albatross — have won two Kremer Prizes for man-powered flight. MacCready, MS '48, PhD '52, will discuss these achievements when he speaks at the Alumni Seminar Day general session on May 17.

## He's bullish about Caltech

Caltech has always been fortunate in having a wide variety of friends who show up at odd moments bearing gifts or bringing cheer. Robert L. Nellis did both a few days ago with a letter to President Marvin L. Goldberger and a check to the Institute. The letter, which found its way to the Caltech News office, follows:

Dear Dr. Goldberger: Our oldest son, Donald Charles Nellis, got a bachelors degree in chemical engineering from Caltech in 1937 and a masters degree in 1938. We were proud that he had the ability and opportunity to attend Caltech for which we've been eternally grateful.

It was a sad day when I sold the the 1929 model A Ford that Donald drove to Caltech (it was also the family car). It had a Caltech sticker in the back window that made me feel a little special when driving it.

I just passed my 90th birthday, and being a believer in making gifts with warm hands, to celebrate the occasion I'm making some gifts. I'm enclosing a check for \$500 to be used for whatever you feel the need is greatest at Caltech.

I have a request that at my demise, in lieu of flowers, friends donate to their favorite school or college. As you can see, I'm very bullish on education and I guess the reason is that I got so little.

Sincerely,  
Robert Nellis

Caltech has also been very bullish on education for almost as many years as Mr. Nellis has been around. And the people here are grateful to be selected as one of the recipients of his birthday largess.

Many happy returns, Mr. Nellis, many happy returns.

## ALUMNI ACTIVITIES

## March 7 and 14

The 15th annual alumni wine tasting program. Champagne, 8 p.m., followed by a lecture and wine tasting, the Athenaeum.

## March 9

Gnome Club Founders' Night Dinner, the Athenaeum.

## Alumni Fund on way to new record

If trends continue, the 1979-80 Alumni Fund will set records again this year. The fund on January 18 was running ahead of 1978-79 in donors, according to Arne Kalm, BS '56, MS '57, national fund chairman. Workers (575 of them) by that date had raised \$534,926 from 2,336 donors toward a goal of one million dollars from 5,000 alumni.

In the next phase of activity, workers will be busy talking with alumni who have pledged money but have not yet contributed, and letters will be mailed to alumni who have not been reached in person. Plans also are being made to contact graduates throughout the country via the Sears,

Roebuck and Company telephone system. Over the past several years, Sears' WATS system has been made available by Charles H. McDougall, BS '47, a Sears executive, several nights during the spring for these telephone contacts.

A new development in the fund this year, according to Kalm, is the establishment of areas in several foreign countries. Under the leadership of Richard Smyth, BS '51, areas have been established in Australia, Belgium, England, Japan, Korea, Nigeria, Switzerland, Saudi Arabia, West Germany, and Capetown, South Africa. Kalm said the fund's Long Range Planning Committee

met early this year to consider other new programs and ways to improve existing activities.

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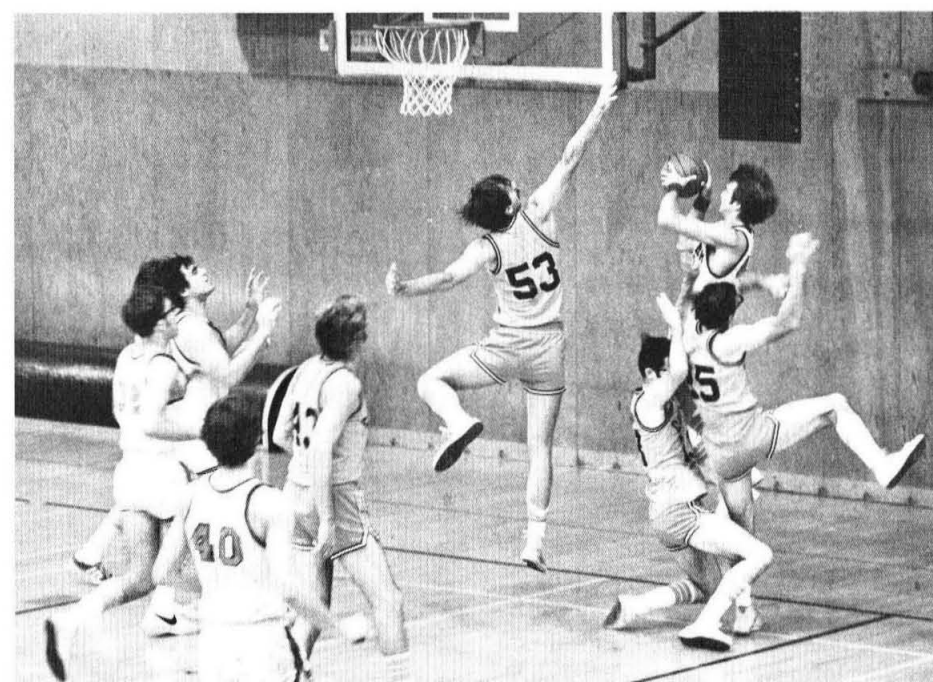
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USPC 085-640



1979VA:

# Comet, asteroid, or missing link?

Caltech planetary scientists may have discovered a missing link — a link between comets and a class of asteroids that travel in elliptical orbits that cross the orbit of the earth and of other inner planets.

Some scientists have suggested that these small earth-approaching asteroids are the residue of comets that have been stripped of their gases, dust, and small ice particles by close approaches to the sun. The new find may represent a transition between the earth-crossing asteroids and comets.

The discovery was made by planetary scientist Eleanor F. Helin assisted by Schelte Bus. Both have been engaged in a search for earth-crossing asteroids with Caltech Professor of Geology Eugene M. Shoemaker. Their aim is not only to locate these objects but also to find out more about them and their relationship to the processes by which the solar system was formed.

Helin and Bus first detected the object on November 15 on photographic plates taken with the 18-inch Schmidt Telescope at the Hale

Observatories' Palomar Mountain Observatory. Designated as 1979VA, the asteroid orbits the sun about every four and a quarter years, passing from just within the orbit of the earth outward well into the sphere of influence of Jupiter. Its own orbit is inclined only 2.8 degrees from the ecliptic (the plane of the earth's orbit around the sun). When it was discovered, 1979VA was about 13 million miles from the earth.

Brian G. Marsden of the Smithsonian Astrophysical Observatory and James G. Williams of Caltech's JPL calculated its orbit, and Planetary Scientist Allan Harris of JPL obtained photometric observations that show that 1979VA is an almost neutral gray in color. This may mean that the asteroid is composed primarily of dark carbonaceous rocky material comparable to rare black carbonaceous meteorites. Several astronomers have been searching for trace amounts of gas escaping from 1979VA — an indication that it is a comet in the final stages of its existence.

The asteroid search that resulted in the discovery of 1979VA is supported by NASA's planetary geology program and by the Hale Observatories, the latter operated jointly by Caltech and the Carnegie Institution of Washington. The search, begun in 1973, has resulted in the discovery of hundreds of new asteroids, including seven that cross the orbit of the earth.



Eleanor Helin with a photograph showing 1979VA.

## Breakthrough in brain tumor removal

A new surgical technique, in collaboration with computer technology, is making it possible to find and remove far smaller brain tumors than ever before — and with less damage to healthy brain tissues. The procedure was developed by surgeons at the Huntington Institute of Applied Medical Research and by Caltech computer scientist Gilbert McCann, professor of applied science. The medical instrumentation was crafted by engineers at JPL.

The technique is "the most significant event in neurosurgery in the last 25 years," according to Robert Rand, MD, of UCLA. Traditionally, tumors are only found when they are large and difficult to remove without damaging other parts of the brain, and after surgery, the malignant cells that are left behind respond poorly to chemotherapy, immunotherapy, or radiological therapy. But the new method precisely locates and describes tumors as small as a pencil eraser — a fifth to a tenth the size of the smallest tumors that are normally discovered.

The heart of the procedure is a new method of enhancing and interpreting the results of a sophisticated x-ray machine that performs computerized axial tomography — the CAT scanner, whose key developers this year won the Nobel Prize for medicine. The device provides a sharply detailed view of cross sections of tissue. Caltech computer scientist McCann developed a computerized system to enhance the

CAT scan results so effectively that surgeons can calculate a tumor's location, size, axis, contour, and something of its consistency before they start to operate.

The new procedure also may offer a more effective means of following



Dr. C. Hunter Sheldon and Dr. Deane B. Jacques discuss the stereotactic apparatus used to perform a delicate new surgical technique for the removal of brain tumors.

surgery with chemotherapy. Instead of taking chemotherapy drugs orally, the tubular pathway to the tumor created by the surgeon might be used to deliver a highly concentrated dose directly to the site of the tumor.

C. Hunter Sheldon of the Huntington Institute for Applied Medical Research headed the team that developed the "Sheldon Stereotactic Procedure." Efforts toward that end formally began in 1975 and the first

operation was successfully performed at the Huntington Memorial Hospital in Pasadena in September.

Immediately before an operation, a patient receives a CAT scan with a steel ring surrounding his head like a halo. Then surgeons cut a small hole into his skull, and a small instrument mounted on the halo is lowered into place. A device that looks like opera glasses mounted on a metal rod is inserted through the hollow instrument to provide binocular vision for the surgeon who removes the tumor with tiny scalpels and suction tubes, also operated through the instrument.



Caltech's Gilbert McCann developed a computerized system that greatly increases surgeons' effectiveness in locating brain tumors and calculating their size and consistency.

"We can now reduce a forest fire to a bonfire," Dr. Hunter said. "And using the auxiliary therapy available to us, it may be possible to extinguish the flame."

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San Francisco Peninsula luncheons: Ming's Restaurant, Palo  
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2706 St. Paul Street, Baltimore, MD 21218

### 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 .....



## Seminar Day speaker



Paul MacCready's aeronautical creations — the Gossamer Condor and the Gossamer Albatross — have won two Kremer Prizes for man-powered flight. MacCready, MS '48, PhD '52, will discuss these achievements when he speaks at the Alumni Seminar Day general session on May 17.

## He's bullish about Caltech

Caltech has always been fortunate in having a wide variety of friends who show up at odd moments bearing gifts or bringing cheer. Robert L. Nellis did both a few days ago with a letter to President Marvin L. Goldberger and a check to the Institute. The letter, which found its way to the Caltech News office, follows:

Dear Dr. Goldberger: Our oldest son, Donald Charles Nellis, got a bachelors degree in chemical engineering from Caltech in 1937 and a masters degree in 1938. We were proud that he had the ability and opportunity to attend Caltech for which we've been eternally grateful.

It was a sad day when I sold the the 1929 model A Ford that Donald drove to Caltech (it was also the family car). It had a Caltech sticker in the back window that made me feel a little special when driving it.

I just passed my 90th birthday, and being a believer in making gifts with warm hands, to celebrate the occasion I'm making some gifts. I'm enclosing a check for \$500 to be used for whatever you feel the need is greatest at Caltech.

I have a request that at my demise, in lieu of flowers, friends donate to their favorite school or college. As you can see, I'm very bullish on education and I guess the reason is that I got so little.

Sincerely,  
Robert Nellis

Caltech has also been very bullish on education for almost as many years as Mr. Nellis has been around. And the people here are grateful to be selected as one of the recipients of his birthday largess.

Many happy returns, Mr. Nellis, many happy returns.

## ALUMNI ACTIVITIES

## March 7 and 14

The 15th annual alumni wine tasting program. Champagne, 8 p.m., followed by a lecture and wine tasting, the Athenaeum.

## March 9

Gnome Club Founders' Night Dinner, the Athenaeum.

## Alumni Fund on way to new record

If trends continue, the 1979-80 Alumni Fund will set records again this year. The fund on January 18 was running ahead of 1978-79 in donors, according to Arne Kalm, BS '56, MS '57, national fund chairman. Workers (575 of them) by that date had raised \$534,926 from 2,336 donors toward a goal of one million dollars from 5,000 alumni.

In the next phase of activity, workers will be busy talking with alumni who have pledged money but have not yet contributed, and letters will be mailed to alumni who have not been reached in person. Plans also are being made to contact graduates throughout the country via the Sears,

Roebuck and Company telephone system. Over the past several years, Sears' WATS system has been made available by Charles H. McDougall, BS '47, a Sears executive, several nights during the spring for these telephone contacts.

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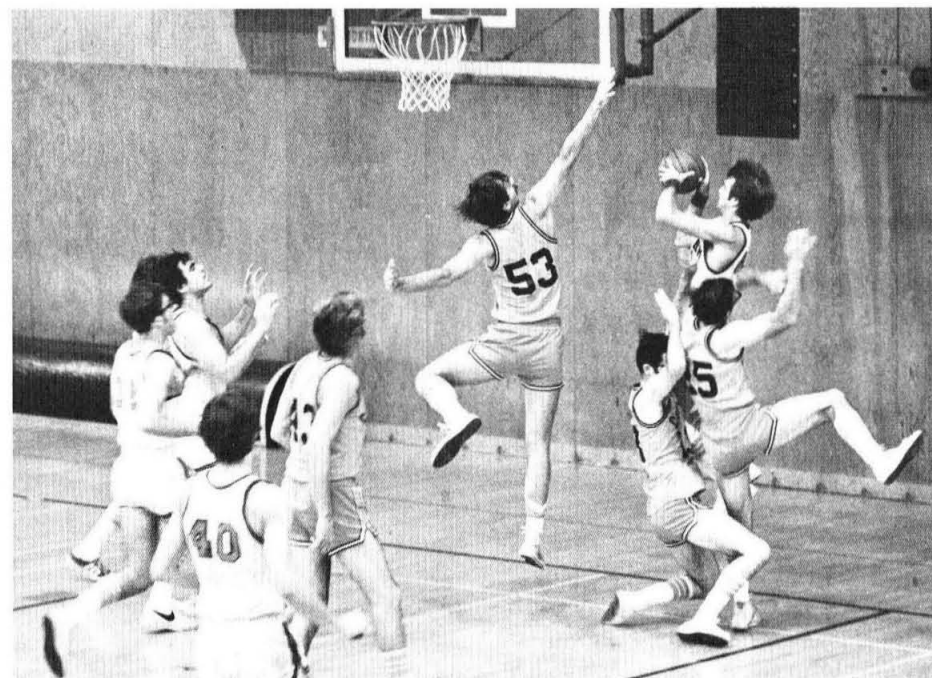
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USPC 085-640



Open at new site

## Coffee house traditions live on

Caltech students, well known for their nocturnal appetites, were hard pressed over the fall to satisfy their hunger pangs with a 2 a.m. hamburger. The coffee house, for 12 years the haunt of students seeking a late-night study break, was demolished during the summer to make way for the new Braun Laboratories of Cell Biology and Chemistry, after the structure was judged too fragile to be relocated.

But happily the lack of a late-night feeding spot was only temporary and was remedied when the coffee house held a grand opening at a new location at 300 South Holliston, four houses south of Del Mar. This event took place after renovation of the Institute-owned house—an effort that involved new gas lines, water and electrical work, construction of a new counter, and rearrangement of a few walls.

Then business recommenced in a setting that offers traditional amenities from the old building: a fireplace, the stereo system and 10-year-old collection of records, the house's legendary collection of comic books, and an assortment of games. New amenities include a patio dining area in the back yard with a huge shade tree and a fountain, and — still in the future — a pinball machine. The student managers (Brian Doyle, Victor Wickerhauser, Dan Erwin, and John McCluskey) say they hope they can put the house on a profit-making basis and invest the profits in furnishings.

The original coffee house, as many alumni may recall, came into being after prolonged efforts by undergraduates to find a place, just ever so slightly off campus, where they could get something to eat during the hours when their appetites were most vigorous. The idea originated in a Caltech Y committee, and a student delegation eventually laid it before President Lee DuBridge.

The minutes report that the students sought his help in finding a place that would "permit them to gather for conversation and refreshments from 9:30 p.m. to 2 a.m., a place with atmosphere, low lights, music and people, and a hope that even faculty will join in conversations."

The Institute responded favorably to the request and gave them the use of the house at 1101 San Pasqual Street, one of three in this block that belonged to Caltech. The Institute agreed to pay for utilities and maintenance, and to furnish a salary for a student manger who would live upstairs.

The house had been built in 1925 by the late Harry Bateman, Caltech professor of mathematics, theoretical physics, and aeronautics, and the Institute purchased it from his daughter in 1958. For a time it was rented to faculty members, including the late Jurg Wäser, professor of chemistry, and later to graduate students.

During this phase of its history the English stucco and frame structure acquired the name Prufrock House. According to a popular theory of the time, it was christened by a graduate student who lived there and, like T. S. Eliot's J. Alfred Prufrock, fell to musing morosely about the empti-

ness of life. The name later became attached to the residence directly to the west, where several graduate students lived. This building was moved during the summer to 373 South Wilson Avenue.

Before its opening, Caltech paid to have the old coffee house suitably remodeled. The students raised about \$4,000 to redecorate and furnish it, purchase a music system, and pay for initial operating expenses. They contemplated carrying out an Old English decorating theme to match the exterior, but being limited in funds, they settled for 100 chairs, of "vaguely Spanish derivation" that had been in the campus dining hall and were donated by the Institute, and for cable spools from the telephone company that they turned into tables.



"There's no place like this place anywhere near this place so this must be the place," reads a sign on the door of the new Caltech Coffee House, as a student prepares to investigate the premises for himself.

Before giving the students the use of the building, the Institute had run a test survey of the need for it via an arrangement with Roma Gardens, a pizza parlor near the campus. Roma Gardens offered a special 25 cent discount to Caltech students on hamburgers and pizza, and the Institute reimbursed the restaurant. The marketing test showed that about 75 Techers took advantage of the offer every evening—an indication that a coffee house probably would be successful.

The number of customers swelled to 100 when the facility opened, and that figure has remained constant. Donald Brotemarkle, who managed the coffee house over the past three years, says that about 100 people

came each evening—three-fourths of them undergraduates. Most of the others were graduate students, but a few faculty members and staff trickled in, along with off-campus people who had been to an event in Beckman Auditorium or who enjoyed the society of Caltech students. The peak hours were between midnight and 1 a.m.

"Everybody finds his own reason for coming," said Brotemarkle. "If you want to talk science, you can find lots of people to talk to. If you want to sit and read comics, or stare into space because your mind is so exhausted, then nobody will hassle you. Some people come in just long enough to get a hamburger; others stay for hours."

The students who initially worked to create the coffee house antici-

pated that it would only serve coffee and ice cream, but the menu has been expanded considerably. Last year it offered a bill of fare ranging from hamburgers, cheeseburgers, and hot dogs, to bagels, tuna fish sandwiches, mocha, hot chocolate, hot cider, sundaes, floats, shakes, and exotic tease. The latter item, offered for 35 cents, was given its final "e" by a late-night trickster.

Last June, as the academic year concluded, the coffee house served its final hamburger at its 1101 San Pasqual location, and closed its doors. Now coffee house II begins a new tradition as a haven from study and a place to sample solitude, romance, hamburgers, coffee, or even exotic tease.

## Earth-mantle theories upset

Current theories about the structure of the earth's mantle—the deep layer between the crust and the core—envision it as one enormous, rolling cauldron of near-molten material. But a new discovery by Caltech and UCLA scientists has seriously challenged this belief and could require an extensive reappraisal of current concepts of mantle structure. In fact, the scientists say the mantle may contain a layer of material unmelted since the beginning of the earth.

The findings, by Caltech Professor of Geology and Geophysics Gerald J. Wasserburg and Assistant Professor of Geology and Geochemistry Donald J. DePaolo of UCLA, have been published in *Proceedings of the National Academy of Sciences*.

The scientists found that certain lava samples taken from the continents differ markedly from ocean-bottom lavas in their ratio of isotopes of the element neodymium. Because all lava that has erupted from deep within the earth contains mantle material, all samples should contain the same ratios of isotopes if current findings are correct.

But the continental samples and the ocean floor samples were absolutely different, a total surprise, according to Wasserburg.

In their research the scientists studied samples from a two-million-square-mile lava flow in Siberia and samples from South Africa, India, and the northwestern United States. They compared these continental lava samples with those from mid-ocean ranges beneath the Atlantic, Pacific, and Indian oceans.

They analyzed the samples for two isotopes of neodymium—those with atomic weights of 143 and <sup>143</sup>neodymium is continually made as a product of radio decay of another element—samarium—with an atomic weight of 147.

From careful calculations, scientists know what the ratio of the two neodymium isotopes for mantle material should be. They know what the ratio was in the original material that formed the solar system and the planets, and precisely how that ratio has changed over the eons. Normally, mantle material would be enriched in <sup>143</sup>neodymium in comparison with the solar system as a whole, because billions of years ago, when the lighter crustal material that makes up the continents floated to the surface and solidified, it carried away more neodymium than <sup>147</sup>samarium.

Using precise measurement techniques, Wasserburg and DePaolo found this enriched neodymium ratio (by about 0.1 percent) in the lava samples from the mid-ocean ridges. The surprise came when they analyzed samples from volcanoes that had erupted from beneath continents. In those samples they found isotope ratios indicating material that had never been altered. In other respects, the two kinds of lava were similar.

"This means that somewhere down there is mantle material that has never been melted," Wasserburg said. The scientists theorize that lava flows from deep beneath the continents tap this primitive material while oceanic flows, which originate from shallow mantle sources, do not."

## Eshelman: Dreyfuss poet-in-residence

Clayton Eshelman, poet and essayist, will be the Doris and Henry Dreyfuss poet-in-residence and lecturer in creative writing at Caltech during this academic year.

Well known as a translator, editor, and educator, Eshelman this year received the National Book Award of the American Association of Publishers, along with co-author Jose

Rubia Barcia, for the translation of the poetry of Cesar Vallejo. He has more than 20 volumes of his own poetry in print, and has translated the works of at least a half dozen other poets. His latest translation, in collaboration with Annette Smith, Caltech lecturer in French—*Notebook of a Return to the Native Land* by Aime Cesaire—was published this fall.



## Fabian Naismith Who?



His name isn't actually recorded in any history books, but Caltech undergraduates insist that Fabian Naismith was Benjamin Franklin's lab assistant and that he held the key registering the electric shock when Franklin flew his famous kite in a thunderstorm. The students decided this was reason enough to honor the lowly lab assistant, and they worked with Master of Student Houses James Mayer and his staff to throw a party in Naismith's honor. Fabian Naismith Day was organized as a block party set on Holliston street just above San Pasqual with students in off-campus houses and alleys taking the lead; the event featured camel and pony rides, music, popcorn, cotton candy, and ascensions in a hot air balloon, and it drew an enthusiastic cross-section of the Caltech community. Above: guests at left sample refreshments while a camel rider at right pensively contemplates his mount.

## Coming: new particle accelerator

Caltech has received an \$800,000 grant from the National Science Foundation to purchase a unique new particle accelerator, and a grant of \$130,000 from the W. K. Kellogg Foundation to modify the W. K. Kellogg Radiation Laboratory to house the instrument.

The accelerator has an unequaled capacity for producing proton or other subatomic particle beams with high current and high stability. At Caltech it will be used in a wide range of basic and applied nuclear studies and will be available to researchers from other government, academic, and industrial laboratories as well as to scientists on campus.

The particle accelerator is basically a long evacuated tube. Its center is held at a very high voltage, millions of volts above what can be achieved on earth under normal circumstances. Charged particles are speeded along the tube by this voltage and are formed into intense beams aimed at a target. By studying the reactions when the beam particles collide with various target materials, scientists can gather basic information on the nature and interactions of atomic nuclei.

Among the fundamental research projects planned for the reactor are studies of the "weak interaction" in atomic nuclei. The weak interaction is one of four basic forces in nature, the others being strong, electromagnetic, and gravitational forces.

The accelerator will be used to study the same nuclear reactions that occur in the sun and other stars — studies that will increase insight into how stars are born, develop, and finally die in supernova explosions. The program for the device also includes biomedical research on the distribution of trace elements in normal and abnormal cells, engineering studies on the effects of radiation damage on materials (an important problem to designers of energy-producing reactors), and studies of the kinds of nuclear reactions that scientists eventually hope to use in energy-producing controlled thermonuclear fusion devices.

The particle beam from the accelerator will also be used as an extremely precise probe for analyzing samples of such materials as lunar or terrestrial rocks, meteorites, or components of biological cells. By narrowing the stream of particles from the accelerator to a tiny "micro-beam," scientists will be able to bombard a single grain of material and study its composition and structure.

The Kellogg Radiation Laboratory at Caltech was first established in 1931 with a grant from W. K. Kellogg to explore the effects of high-voltage x rays, and to conduct the first clinical testing of high-voltage x-ray therapy for the treatment of cancer. Later, the laboratory became the focus of Caltech's research in nuclear physics. Scientists there have carried out pioneering research in many areas of basic physics and astrophysics, as well as in the applications of these studies to other areas of science and technology.

## Debate makes comeback on campus

Debate is back on the Caltech campus after a decade or so of absence, and Caltech students are again proving their prowess as competitors in this demanding activity.

In an initial debate, Wally Walter, a sophomore, and Lisa Flitz, a freshman, captured first place in the novice division of the Loyola Marymount Debate Tournament. After this victory, debate coach Lee Garrison moved the duo into the varsity division for subsequent tournaments where they have consistently been reaching the elimination rounds. The season, which continues until mid-April, will include a total of 18 tournaments.

The debate revival was inspired by student interest, particularly that of Wally Walter. Last year, Walter contacted Roger Noll, BS '62, chairman of the Institute's Division of the Humanities and Social Sciences, to ask for support in getting a program under way. Walter found a sympathetic listener — especially since Noll debated at Tech during his four years as a student here. The teams in those years consistently won major tournaments; they included such future campus personalities as Gary A. Lorden, BS '62, Caltech professor of mathematics, and Kip S. Thorne, BS '62, Caltech professor of theoretical physics.

But interest in debate died out in the late 1960s, partly because the form of debate in which Caltech competed (National Debate Topic) became increasingly demanding in the research it required for success. Today NDT debaters devote about 40 hours a week to research, and Caltech students found it impractical to meet such a demand.

Meanwhile, the Cross Examination Debate Association became increasingly popular on campuses throughout the country, and it is in this form of debate that the Caltech students compete today. CEDA debaters devote some 10-20 hours a week to research, working on topics that are more narrowly defined than those of NDT.

This year the CEDA competitors are debating the merits of compulsory military service — a topic with

technical dimensions that suit the Caltech team just fine. "A Tech team can usually munch its opponents on a technical topic," Walter explains candidly, and Noll concurs. "Caltech students do very well on any topic that requires technical and analytical skills," he says. "For example, when I was a student we were especially successful the year the topic was a nuclear test ban."

Noll, pleased that debate is once more offered as a student activity on campus, believes the activity provides students an important opportunity for analytical thinking about

non-scientific topics, and a chance to learn to express themselves clearly and precisely in a way that is not readily accessible in a laboratory.

Lee Garrison, the Caltech debate coach, is the assistant director of debate at USC where he teaches speech and communication courses. He speaks enthusiastically about the new program that he heads at the Institute. "I didn't know what to expect in terms of student ability and interest when I was asked to coach debate at Caltech," he says, "but what I found exceeded my wildest expectations."

## Techers take chess trophy

Challenging the competition in a new field, Caltech students in December entered the Panamerican Intercollegiate Chess Tournament for the first time — and won top prize among institutions with enrollments under 3,000. Members of the winning contingent included Steve Rabin, Eric Peterson, Robert Scheid, and Dean Hart.

This year marked the first time for the tournament to be held on the

west coast, according to Rabin, and Caltech students decided they couldn't pass up the opportunity to enter. Techers tend to do well at chess, Rabin notes, although he says several good prospects for the competition preferred to spend Christmas vacation at home rather than on campus practicing for the meet. Tech defeated Swarthmore to win the small college prize. The University of Florida carried off the top trophy.

## A muddy marvel



No, they're not members of the Caltech swim team. That's mud they're swimming in, and they're contestants in Caltech's annual Mudeo, a competition that pits the freshmen against the sophomores in a series of messy events. Following a traditional pattern, the freshmen defeated the sophomores in this year's mud pit mudastrophe.



# PERSONALS

1927

R. CARTER BLANKENBURG writes from Alhambra, California, "My wife (Ruth) and I went to the IEEE Power Engineering Society show in Atlanta earlier this year. A nostalgic trip for me, having been the instigator of those IEEE events and having spent two years of my Army duty at Ft. McPherson, in Atlanta, during WW II. How things have grown. In 35 years Atlanta has changed from a rather sleepy city to a booming metropolis. In 15 years those shows have grown several fold in attendance, exhibits and net proceeds."

1935

JAMES A DAVIES, MS '36, informs us, "I retired on becoming 65 years old 10-1-79 from being general manager of Texaco's engineering department after 43 years with the company. My immediate plans are to stay in Houston to help my daughter raise her son. They live with us and she works. I also own a restaurant in Crested Butte, Colorado, which a son-in-law manages and which will take up some of my spare time, although hopefully not in mid-winter since Crested Butte gets over 30 feet of snow a year and temperatures get to below  $-40^{\circ}$ ."

1938

JOHN L. MERRIAM, a fellow of the American Society of Civil Engineers and an expert in irrigation and soil conservation, won the ASCE's 1979 Royce J. Tipton Award in recognition of his contributions to the two fields. Professor emeritus at California Polytechnic State University at San Luis Obispo, Merriam is noted throughout the world for his concern with on-farm efficiency in modern methods of land irrigation.

S. BROOKS WALTON, MS, the first faculty member and chairman of the mechanical engineering department at San Jose State University, has been honored by the dedication on that campus of the S. Brooks Walton Laboratory. Establishment of the Walton facility, formerly known as the Heat-Power Laboratory, honors the retired professor for "his years of untiring devotion to promoting excellence in laboratory facilities and instruction." The university has also established the S. Brooks Walton Scholarship Annual Award in Mechanical Engineering.

1944

GEORGE SHOR, MS '48, PhD '54, has been doing marine geophysical studies as well as serving part time as associate director of Scripps Institution of Oceanography in La Jolla, California. Becoming involved in an effort to save, strengthen, and restore the oldest building at Scripps — the George Scripps Laboratory, built in 1909 — Shor discovered that it was built using a unique reinforcing method that was touted in that day as "earthquake-proof." He writes, "Have any of you heard of the 'Kahn Method' of reinforced concrete construction? It was invented in the early 1900s, used in a number of buildings that stood up in major earthquakes, and disappeared so thoroughly that the firm that made the reinforcing materials for it has only a dim recollection of the whole procedure. Can anyone tell me about buildings that used the Kahn System, and why it was abandoned? From the point of view of an ex-M.E., it looks better than most of the methods used later and half of the design methods used in areas of recent earthquakes!"

1947

WILLIAM BALLHAUS, PhD, president of the Fullerton-based Beckman Instruments, Inc., has been selected the 1979 Manufacturer of the Year by the California Manufacturers' Association. The award has been presented annually since 1964 to a leading California industrialist who has made a major contribution to the state's industrial progress, has demonstrated an active interest in state and local affairs, has worked for better employee relations; and has been an "outstanding example of the opportunities offered by the American system of free enterprise." Ballhaus was the recipient of a Distinguished Alumni Award from Caltech in 1978.

1948

WILLIAM J. CARROLL, MS '49, president of James M. Montgomery Consulting Engineers, with headquarters in Pasadena, has been elected president of the American Academy of Environmental Engineers by its Board of Trustees. Carroll has served as president of the Pasadena firm since 1969, and has also served

as president of the Consulting Engineers Association of California, and as national director of the American Society of Civil Engineers. He was president of the Alumni Association in 1975-76.

1950

FREDERICK W. DRURY, JR., has accepted a special two-year assignment as senior consultant to the Construction and Development Corporation of the Philippines (CDCP) in Manila.

1951

L. RUPERT (DUTCH) VREUGDE writes from Danbury, Connecticut, "Just a note to let you all know that I have after all those years in California made the move to the other side of the continent. I joined the Perkin-Elmer Corporation as manager of the Systems Technology Department in the Optical Technology Division this summer. I am enjoying the challenges of this new endeavor, the beautiful countryside of western Connecticut, and the change of seasons (so far!)."

1952

RICHARD R. DICKINSON, general manager of alternate energy for Texaco, Inc., in Harrison, New York, has been elected vice president for strategic planning.

HENRY L. RICHTER, JR., PhD '56, reports, "Left Los Angeles County Sheriffs Department (communications engineer) two years ago. Spent last two years on staff with Christian Business Mens Committee of USA as Southwestern U.S. Division Director. Now am President of TeleComm Consultants Inc. TCI concentrates in the public safety communications field, with particular emphasis on computer aided dispatch systems. Am living in Arcadia, California, with wife, Beverly; children all grown up and have five grandchildren now!"

1954

HOWARD L. CROSWHITE writes from Livonia, Michigan, "I am still alive and well — and still working for the Ford Motor Company through all these 25 years. I have specialized in the design of automatic transmissions, and suffered the anonymity this product usually affords. But not any more. I have finally upstaged the stylists. The new Ford automatic overdrive transmission, being featured in national TV commercials, was born in the department I managed for the past ten years. It took a long time to make believers out of the 'bean counters' but technology finally won out. And there is more on the way. But there is something lost in every victory and for me the challenge that is no longer there. So in engineering, as in poker, it may be wise to bow out while ahead in the game. I'm seriously considering an early retirement and hope to find another small mountain to climb."

1955

RAY HEFFERLIN, PhD, was an NAS exchange scholar to the USSR in 1978-79, working at Leningrad State University in the laboratories of Nikolai Petrovich Penkin on lifetimes of excited atoms and on potential curves for exotic molecules. As professor of physics at Southern Missionary College in Collegedale, Tennessee, he is now constructing a periodic system for free diatomic molecules.

1960

FRED L. NEWMAN, who broke the world record for the highest percentage of free throws over a 24-hour period in 1974 (in the Caltech gymnasium) has set another world record for the most accurate basketball shooting. He made 88 consecutive free throws while blindfolded. Newman is a computer programmer in San Jose, California.

1964

ROD McCALLEY, research scientist at Lockheed Palo Alto (California) Research Laboratory, reports that he was assistant professor of chemistry at Dartmouth College in Hanover, New Hampshire, from 1972 to 1979. He married Peggy Hock in December 1976 and their son, Roddy, was born in September 1978.

1966

GARY L. NEIL, PhD, received the W. E. Upjohn Award from The Upjohn Company, a producer of pharmaceuticals and health care services. Neil, who is research manager of experimental biology at Upjohn in Kalamazoo, Michigan, was cited for his "important contributions to the development of Cytosar and several other anticancer agents."

1968

STEVE WOODWARD sends the following: "My wife Clare and I have a new son, Kevin Kiehle Woodward, who was born March 1, 1979. Our older son, Jonathan, is now 4. I still work for the chemistry department of the University of North Carolina-Chapel Hill, and also have my own company, Digital Specialties."

1970

ARTHUR OGAWA reports from Stanford, California, "I received my PhD from Cal Berkeley in December 1978. After a lengthy and enjoyable vacation, I have taken a position at the Stanford Linear Accelerator Center, working with BILL ATWOOD (BS '70) on the development of a novel particle detector."

JOSEPH R. VANCE III sends this update: "A lot has happened since the last news I wrote. I married a lovely woman, Debra, and on August 13th we were blessed with a beautiful little girl, Haylee Denise. I am now Director of Software Development for Southern Business Machines, Inc., in Atlanta. In addition, four partners and I have formed our own data processing services company, Shared Business Services, Inc., serving the small business market."

1972

DAN HEISMAN, Ex, a software engineer for the U. S. government, writing about another matter to the alumni office, adds some interesting information about his activities during the last decade: "In 1972 I won the Philadelphia Invitational Chess Championship and in 1976 the Philadelphia Open Chess Championship. In 1979 the Association for the United States Chess Journalists voted me as the Outstanding Local Columnist for North America. Currently I'm making a name for myself in local backgammon circles."

PAUL S. ZYGIELBAUM, MS '73, reports that he has returned to California, where he is project manager at the Electric Power Research Institute in Palo Alto, after a two-year loan assignment to Portland General Electric Company. He adds, "Our second child, Beth Rachel, was born in Hermiston, Oregon, last February. Our son, Sam, will be four in April. My wife, Michelle, has managed to survive well after all the household moves, cold winters, and a new baby."

1975

DAVID BEATTY, MS '76, writes that he and his wife, Shirley, have just moved to West Bloomfield, Michigan. "The new home is much larger and very secluded (about 100 acres of forest behind us), a real change from the urbia/suburbia we both grew up in. I am now half finished with my MBA at the University of Michigan (evening program only as I still am in engineering at Ford). I've recently changed assignments at Ford and am now in engine design in a task force charged with introducing a new concept V-6 engine in the near future."

CAPT. DOUGLAS HERBERT, of Seabrook, New Hampshire, shares with us the following: "My wife, Pam, and I are enjoying our tour in New England with our two dobermans, Salem and Terry. Air Force life is interesting with no dull moments. Right now I'm preparing for my second deployment to England this year. Between these trips and strategic alert back here, I'm barely spending any time at home. My congratulations to the football team. Keep up the good work."

1976

KAREN MAPLES, a fourth year medical student at UCLA, is recipient of the National Medical Fellowship's McLean Award. The \$3,000 grant is awarded annually to the most outstanding minority medical student in the nation. Maples, who is applying for a residency in obstetrics and gynecology, was one of the first black women at Caltech and was the first woman president of the Caltech Y.

1977

JOHN W. HICKS writes from Tehachapi, California, "As a flight test engineer at the Air Force Flight Test Center, I was recently selected by the Air Force for the 1980 AFSC Exchange Scientist/Engineer Program with the Federal Republic of Germany. This is a program where every two years a total of six civilian and military scientists/engineers are selected from the Air Force to study and work in West Germany. My family and I first go to the Defense Language Institute at Monterey,

California, to attend a very intensive six-month German language course. In the summer of 1980 we then head for Germany to begin a two-year assignment at the DFVLR Institute for the Dynamics of Flight Systems near Munich. We're really excited about living on the local German economy and having the chance to meet the people and experience the German culture firsthand."

## OBITUARIES

1925

A. PRESTON COLLINS, Ex, on October 12. Collins, a retired architectural engineer, lived in Arcadia, California. He is survived by his wife, Lucile.

1928

JOHN G. (GUS) GILBERT, Ex, on November 24 in San Gabriel, California, following a short illness. He was a geologist with Texaco for 42 years, retiring in 1971. For several years he had served as vestryman in charge of buildings and grounds of the Episcopal Church of Our Saviour, in San Gabriel. He is survived by his wife, Virginia, and a daughter, Nancy.

DOUGLAS KINGMAN, MS '29, on December 20. He worked for 35 years for General Petroleum Corp., which became Mobil Oil Corp. He retired in 1964 to his avocado ranch near Poway, California. He leaves his wife, Marian, two sons, three daughters, fifteen grandchildren, and one great grandchild. Kingman's eldest granddaughter, BECKY HARTSFIELD REA graduated from Caltech with her BS degree fifty years after her grandfather received his BS.

KENNETH H. ROBINSON, MS '29, on November 19 of leukemia. He was one of the pioneer scientists at the Naval Weapons Center in China Lake, California, working there from 1944 to 1971. Robinson was active in many Indian Wells Valley civic organizations. He helped establish the Maturango Museum, a Dixieland jazz band, the China Lake Civic Concert Association, and the Desert Community Orchestra. He is survived by two sons, Alan, currently in Indonesia, and Charles, of Ridgecrest, California, and six grandchildren.

1931

GLENN M. WEBB on October 16. A resident of Western Springs, Illinois, he served in the research division of Standard Oil of Indiana, AMOCO.

1932

WILLIAM R. BERGREN, PhD '41, in June. He was professor of biochemistry at the USC School of Medicine and head of the biochemistry research division of Children's Hospital in Los Angeles. He is survived by his wife, Marguerite, of Altadena, California.

1933

RICHARD L. RUSSELL in August. He was an appraiser with the T. F. Merrick Co. in Long Beach, California, and active in many professional organizations as well as in the Alamitos Bay Yacht Club, an organization founded by his father 50 years ago. He is survived by his wife, Margaret, sons Richard and Robert, and three grandchildren.

1938

JOHN B. PARRISH, JR., MS. He retired in 1978 and was living in Berkeley, California.

1948

ROBERT E. SCOTT on November 10 after a short illness. He was a principal lecturer in the electronic engineering department at Hong Kong Polytechnic, Kowloon, Hong Kong. Scott is survived by his wife, Mary Jo.

1951

WAYNE M. BEEBE, MS '53, PhD '66, on July 27. A resident of St. Paul, Minnesota, he worked in the information management department of 3M. He was a QM 3/c for 31 months in the South Pacific during World War II.

1960

MALCOLM L. WHITT on October 24. He was a consultant for Brown and Caldwell Engineering in Pasadena. Survivors include his wife, Bonnie Ingen, and two daughters, Rachel and Elizabeth.