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CALTECH NEWS

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Caltech honors four graduates on Seminar Day

Four Caltech alumni received the highest honor that the Institute can confer on a graduate — its Distinguished Alumni Award — on Caltech's 41st Alumni Seminar Day. The awards were presented by Robert F. Christy, acting president.

The new Distinguished Alumni, honored at the general session, are William F. Ballhaus, PhD '47, the president of Beckman Instruments; Donald Knuth, PhD '63, the Fletcher Jones Professor of Computer Science at Stanford University; Paul MacCready, MS '48, PhD '52, winner of the Kremer Prize for man-powered flight and president of AeroVironment Inc.; and Henry William Menard, BS '42, MS '47, the director of the U. S. Geological Survey.

After the general session the Distinguished Alumni met with other graduates who have been so honored for the unveiling of a new plaque in Dabney Hall. The plaque, a gift of the Alumni Association, is engraved with the names of all of Caltech's Distinguished Alumni Award recipients.

Ballhaus joined Beckman Instruments, Inc., in 1965 as president and a member of its Board of Directors. He has been largely responsible for establishing the company's new product lines — clinical and industrial instruments and equipment. Ballhaus came to Beckman Instruments from Northrop Corporation. He joined that firm in 1953 and became assistant chief engineer for the company's Norair Division. In 1957, he was named a corporate vice president and general manager of Northrop's new Nortronics Division.

Ballhaus was elected a member of the National Academy of Engineering in 1973 for his contributions to engineering in aeronautics and for initiating and managing complex research programs. He is a fellow of the American Institute of Aeronautics and Astronautics and a director of the Scientific Apparatus Makers' Association.

Knuth has won an international reputation for his work in the theoretical aspects of computer science. He has published three of seven volumes in a projected series entitled *The Art of Computer Programming* — already designated as one of the great mathematical works of this century. He served as an assistant and associate professor of mathematics at Caltech until 1968 when he was appointed professor of

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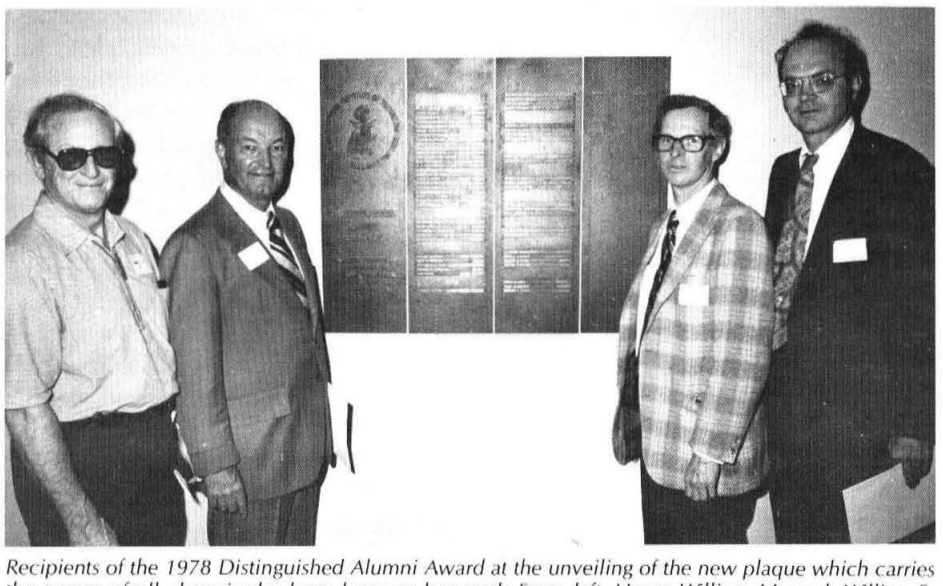
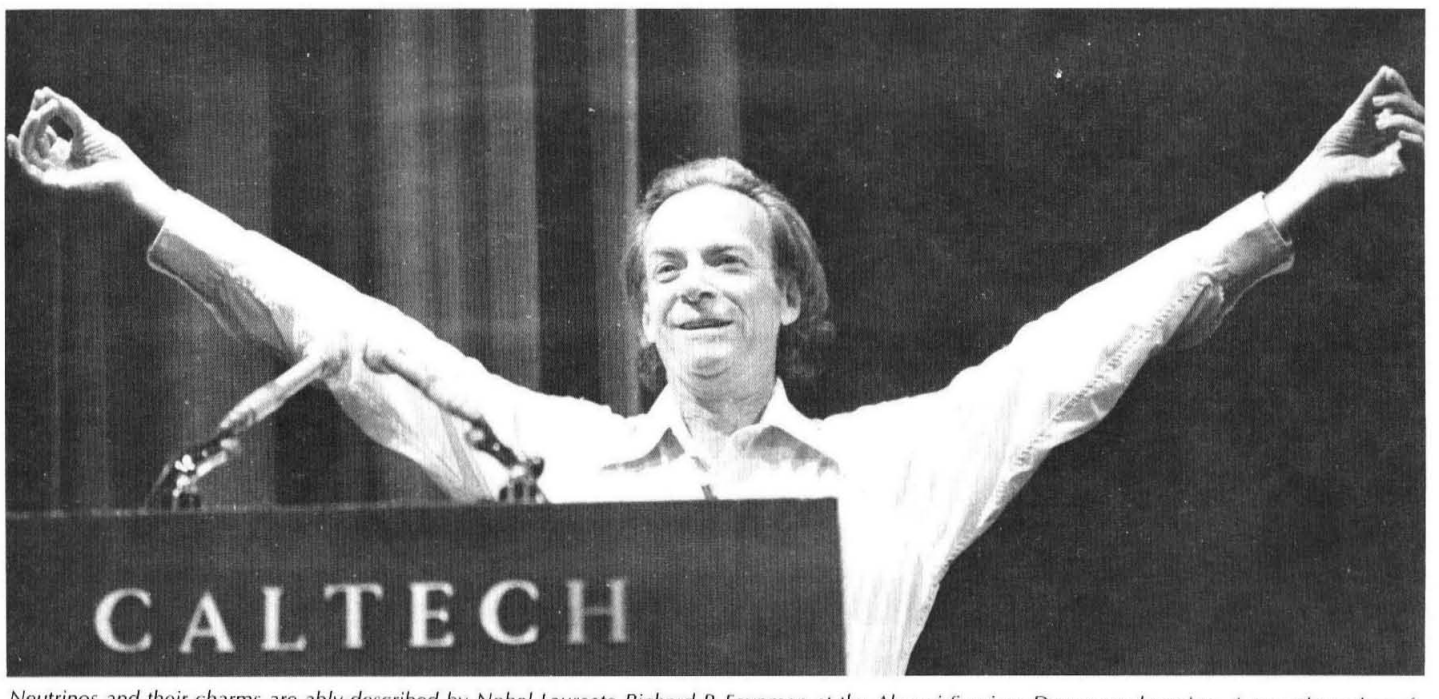


Recipients of the 1978 Distinguished Alumni Award at the unveiling of the new plaque which carries the names of all alumni who have been so honored: From left–Henry William Menard, William F. Ballhaus, Paul MacCready, and Donald Knuth.



Neutrinos and their charms are ably described by Nobel Laureate Richard P. Feynman at the Alumni Seminar Day general session. A record number of alumni—about 1900—attended Seminar Day this year to hear 12 research seminars by faculty members.

Habits of neutrinos bared by Feynman

From the moment he informed alumni that neutrinos do practically nothing — "like your son-in-law" — until he concluded with John Updike's poem, "Cosmic Gall," Richard P. Feynman, the Alumni Seminar Day general session speaker, held his audience in the palm of his hand. Feynman is the Richard Chace Tolman Professor of Theoretical Physics at Caltech.

"I wish I'd understood what he said," one alumnus remarked to a friend, "but he said it so interestingly that it doesn't really matter."

"He looks more mature than I remembered," the wife of another alumnus commented, ". . . but then of course it *has* been 25 years."

Contagious in his sense of excitement about his subject, and delightful in his dramatic presence, Feynman took his audience on a verbal, mathematical, and pictorial tour of the neutrino and the history of research concerning it. This atomic particle with no electric charge and a mass approaching zero can travel through matter for a light year without any effect whatsoever, Feynman told alumni.

As he described techniques and apparatus used to detect neutrinos, the Nobel Laureate said that our understanding of them is now substantial enough to help us determine the fundamental properties of other particles.

Do these elusive neutrinos ever do anything at all? Yes, Feynman explained, because their role inside certain types of stars — particularly white dwarfs — can produce spectacular effects. These large dying stars cool rapidly and as they do their center is heated by compression. As the interior temperature rises, increasing numbers of neutrinos, antineutrinos, and electrons are created and zoom away from the star, accelerating its rate of collapse.

Eventually the stars are transformed into supernovae, the brightest bodies in the galaxy. Thus neutrinos, these tiny particles that can travel almost indefinitely

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Revel named Ruddock Professor of Biology

Jean-Paul Revel, Caltech professor of biology since 1971, has been named Albert Billings Ruddock Professor of Biology at the Institute. One of the world's leading microscopists, the 47-year-old biologist is studying how cells communicate and interact with one another. Revel was named by the Caltech Board of Trustees to the endowed chair that was established in 1970 by Margaret Kirk Ruddock in honor of her husband, a Caltech Trustee from 1938 to 1971 and chairman of the board from 1954 to 1961.

The first person to hold the Ruddock chair was Caltech's Max Delbrück, winner of the 1969 Nobel Prize for physiology and medicine. When he retired last year at the age of 70, Delbrück became Board of Trustees Professor of Biology, Emeritus.

Revel, a native of France and a 1949 graduate of the University of Strasbourg, came to the United States in 1953. He received his doctorate in biochemistry from Harvard University in 1957. He was a member of the faculty of Harvard Medical School until he came to Caltech seven years ago.

Revel is conducting research on intercellular communication in animals, using electron microscopy to search for "gap junctions" — the cell membrane structures that allow cells to communicate.

Jean-Paul Revel

At the private Tut exhibit, Dr. and Mrs. Arnold O. Beckman admire the hand-woven motif on the belt of a skirt purchased in Egypt by Mrs. Edward E. Tuttle, at left. Dr. Beckman is the chairman emeritus of the Caltech Board of Trustees; the Beckmans and the Edward Tuttles are Life Members of The Associates.

Dr. Henry Lee, program chairman for the private viewing, at left, greets guests at the event, Mr. and Mrs. Jack Edwards.

Associates view Tut exhibit in private spring showing

The Associates of the California Institute of Technology have been gathering, up and down the coast of California this spring, for various social occasions.

A highlight of the calendar was on May 3 in Los Angeles when some 1,400 Associates, their guests, and Caltech faculty members, turned out for a private viewing of the Treasures of Tutankhamun at the Los Angeles County Museum of Art and for a reception in the nearby Ahmanson Gallery.

While waiting for their viewing times — arranged at about 15-minute intervals — guests sampled the cheeses and fruits and wine on tables in the Atrium, and compared notes and impressions with those who had just returned from the exhibit gallery.

Later the same month, some 40 Associates and other friends of the Institute dined together at the Bankers' Club in San Francisco and heard Caltech Professor of Biology Felix Strumwasser talk on "Nerve Cells, Brain, and Behavior."

The Harrison Sigworths (he is chairman of the Northern California Membership Committee) were in charge of the affair, assisted by the Howard Vespers, the Walton Wicketts, the Thomas Tischs, and Dr. and Mrs. Hubert E. Dubb.

On June 15 Mr. and Mrs. Fritz Huntsinger were hosts at a dinner for about 60 members of The Associates and other persons in the Ventura area who are interested in Caltech and its programs. Dedicated friends of the Institute, the Huntsingers are life members of The Associates.

Speaker at the dinner was Clarence R. Allen, professor of geology and geophysics. The event was held at the Holiday Inn in Ventura. Guests came from throughout the Ojai, Oxnard, and Ventura area to hear Allen's discussion on seismology and related research at the Institute.

Crass neutrinos described

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through almost any substance without doing anything about it, play a major role in one of the most dramatic phenomena in the cosmos.

Noting that hundreds of billions of neutrinos pass through our bodies every second, Feynman concluded with John Updike's poem, "Cosmic Gall":

Neutrinos, they are very small.
  They have no charge and have no mass
And scarcely interact at all.
The earth is just a silly ball
  To them, through which they simply pass,
Like dustmaids down a drafty hall
  Or photons through a sheet of glass.
  They snub the most exquisite gas,
Ignore the most substantial wall,
  Cold-shoulder steel and sounding brass,
Insult the stallion in his stall,
  And, scorning barriers of class,
Infiltrate you and me! Like tall
And painless guillotines, they fall
  Down through our heads into the grass.
At night, they enter at Nepal
  And pierce the lover and his lass
From underneath the bed — you call
It wonderful: I call it crass.

But his conclusion wasn't really a conclusion because the session offered one final surprise. As Feynman started to leave the podium, several members of the Caltech Glee Club, comfortably clad for the day's 95-degree weather, trooped down the aisles and onto the stage, surrounding Feynman and singing, "Happy Birthday to you . . . happy birthday Dear Dickie!"

"Thank you," Feynman wrote on his overhead slide projector for viewing on the auditorium screen. "I'm 60." On that note, the program ended.

Distinguished Alumni honored

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computer science at Stanford University. Knuth has been elected to membership in the National Academy of Sciences.

MacCready is founder and president of AeroVironment Inc. This firm is involved in atmospheric, aeronautical, environmental, energy science, and engineering projects.

In 1976-77 MacCready designed the "Gossamer Condor," the first human-powered aircraft to stay aloft and complete a designated course. For this feat MacCready won 50,000 pounds, the Royal Aeronautical Society's Kremer Prize, the largest in aviation's history. MacCready in 1956 became the first American to win the International Soaring Championship.

Menard was appointed the new director of the U. S. Geological Survey in February. A pioneer in the use of scuba diving to map underwater terrain, Menard has been leader or member of 20 deep-sea oceanographic expeditions in many areas of the Pacific and across the Atlantic.

Since 1955, he has been a distinguished professor at the Scripps Institution of Oceanography, UC San Diego, where his internationally recognized work in marine geology has played a key role in the development of modern concepts of plate tectonics. Earlier he was a marine geologist with the U. S. Navy Electronics Laboratory in San Diego. He has been elected to the National Academy of Sciences and the American Academy of Arts and Sciences.

An asteroid with a future

Man's next trip into deep space could be to asteroid 1977 VA, or another asteroid with a similar orbit that may be discovered in the future. In the meantime, 1977 VA offers good prospects for unmanned exploration.

The asteroid, whose orbital characteristics make it one of the two best

Eugene Shoemaker

candidates to date for an exploratory mission, was discovered by Caltech Professor of Geology Eugene Shoemaker and Planetary Scientist Eleanor Helin. An unmanned rendezvous would permit it to be mapped in detail. The mission could also return samples to the earth for laboratory analysis.

Shoemaker and Helin discovered 1977 VA and two others, 1977 VB and 1977 VC, on photographic plates made on November 7 and 8. Less than half a mile in diameter, 1977 VA may be either metallic or related in composition to a class of unusually stony meteorites.

The scientists view it as a good candidate for exploration because its orbit is inclined only about 2.9 degrees from the plane of the earth's orbit, and because it approaches the orbit of the earth at the point of its closest approach to the sun (the perihelion). This means that relatively little energy would be required to boost a spacecraft from the earth to the asteroid's orbit, and then to match the spacecraft's velocity with that of the asteroid's.

According to Shoemaker and Helin, two different types of asteroids pass near the earth, and both types would make fascinating targets for exploration. Some are fragments of larger bodies from the main asteroid belt betwen Mars and Jupiter, diverted into orbits that approach the earth, and others may be cores of extinct comets from more distant parts of the solar system. Exploring the first type would give evidence about how the bodies in the main asteroid belt were formed; exploring the second type would offer valuable insights into the way bits of solid matter collected to form larger bodies.

"Our discovery of 1977 VA, and our earlier discovery of another earth orbit crosser, convinces us that there must be other asteroids that would be relatively easy to reach by spacecraft," Shoemaker said. "By using the space shuttle system that's being developed, it would be possible to launch a manned spacecraft on a six-month voyage to an asteroid. The journey would include a month or two of exploration and sample gathering.

"I believe the importance of the problems that could be investigated would make the effort well worthwhile. Next to the moon, near-earth asteroids are the easiest places for man to visit. A near-earth asteroid may be the next goal in manned exploration of deep space."

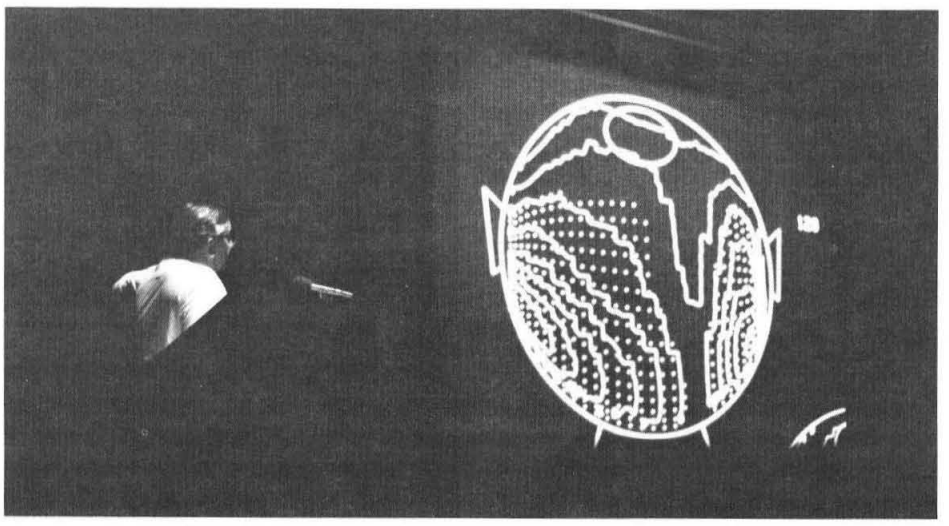
Eventually it may be possible to mine near-earth asteroids to supply material for large space projects such as solar energy satellites, but formidable engineering problems must first be solved, the scientists cautioned. "A special search for asteroids with orbits similar to the earth's would have to be pressed," Shoemaker said. "Then the asteroids would have to be explored carefully to assess the feasibility of mining them."

Research reports inform alumni

Taking the brain apart

What goes on in the brain when it's thinking, what patterns nerve impulses in it follow when they're activated by light, and how it sees textures — these are some of the problems under study by Derek H. Fender, professor of biology and applied science. Fender described methods he is using to answer questions like these in his Seminar Day talk, "Taking the Brain Apart Gently."

Fortunately for the experiment, Fender explained, most of man's thinking is done at shallow depths of the brain — in the cortex at the surface of the hemispheres — rather than in the brain's deeper structures. This makes it easier to locate active neural populations from the scalp.



Derek Fender describes efforts to learn more about thought processes.

Through a helmet apparatus that they designed and assembled, and computer software they developed, Fender and his coworkers can visually follow the interactions among parts of the brain as it performs low-level perceptual and cognitive processes, he explained. The helmet he uses bristles with many electrodes that are linked to an IBM 360-75 computer. Brain waves are picked up, recorded on digital tape, and transmitted to the computer, which turns the signals into a visual pattern on a cathode ray tube. The result is a contour map of the peaks and troughs of electrical activity as "seen" through the top of the subject's head.

To deal with the problem of the brain's low voltage — and resulting interference from stray voltages — Fender conducts the tests in a specially built cubicle with copper mesh walls. The computer is instructed to recognize and ignore unwanted signals from the subject's own body.

Heart valve engineering

Heart valves have been installed in about 500,000 patients since physicians became proficient in the use of heart-lung machines and open-heart surgery in the early 1960s, and these prostheses have made enormous contributions to the quality and length of life of their wearers, William H. Corcoran told alumni. "But we can do even better," he said as he described heart valves' functions and design.

Corcoran, professor of chemical engineering and vice president for Institute relations, noted that "the human body is an excellent place to apply chemical engineering knowledge. From the viewpoint of the chemical engineer as well as the physician, it is a fantastically interesting structure." Then he showed slides of several types of valves as he compared their construction and effectiveness.

After outlining points for improvements in heart-valve designs, he described the characteristics of an ideal device. They include sterility and non-toxicity, surgical convenience for insertion, minimum of resistance to blood flow, and minimum reverse flow in a closed valve. Structurally and mechanically sound, the valve would last for as long as 25 years. It would cause a minimum of hemolysis from shearing of red blood cells and have little thrombogenicity (formation of clots). It would be economical.

William H. Corcoran

Continuing progress in chemical and engineering studies on valves is bringing us closer to this ideal device, Corcoran concluded.

The politics of water

Water and water rights involve highly charged emotions and complicated politics, James P. Quirk, professor of economics, told alumni as he discussed "The Simple Economics of Water as Applied to the Colorado River."

For example, Quirk explained that current allocations of Colorado River water are based on the Old West's appropriative doctrine of 1850: *First in time; first in right.* For the first 50 years after 1870, Quirk said, the major users of Colorado River water were the Palo Verde and Imperial Valleys' irrigation districts. The upper basin states — Colorado, Utah, Wyoming, and New Mexico — began to worry about losing their water rights under the appropriative doctrine, Quirk explained, and in 1922 they concluded an agreement to deliver to the lower basin states — California, Arizona, and Nevada — seven-and-a-half million acre feet (maf) a year. This is half the river's annual flow.

To keep their half, the upper basin states built Glen Canyon Dam in 1963. Drought or no drought, Quirk pointed out, the upper basin holds back every drop over the agreed-upon seven-and-a-half maf, and Lake Powell currently contains about 15 maf. (Evaporation losses from Lakes Powell and Mead run about 1.5 maf a year).

The assignment of water rights that emerged from the 1963 Arizona vs. California case eventually will result in a loss of water for California, Quirk noted. Under this decision, California was to get 4.4 maf a year and Arizona 2.8. Arizona, however, was unable to get funding to bring the water to Phoenix and Tucson and had to give up its unused portion to its neighbor. But when the Central Arizona Project is completed in 1985, California's supply will be cut back.

Seven Caltech faculty, alumni elected to NAE

Two members of the Caltech faculty, one of them an alumnus, and five other alumni have been elected to the National Academy of Engineering.

They are James J. Morgan, professor of environmental engineering science, Caltech; Anatol Roshko, MS '47, PhD '52, professor of aeronautics, Caltech; Satish Dhawan, Eng '49, PhD '51, director of the Indian Institute of Science, Bangalore, India; Jack L. Kerrebrock, PhD '56, professor of aeronautics and astronautics, MIT; and Harold S. Mickley, BS '40, MS '41, executive vice president, the Stauffer Chemical Company; William W. Moore, BS '33, MD '34, senior consultant and partner, Dames & Moore; and Peter Swerling, BS '45, president and board chairman, Technology Service Corporation.

Meanwhile, Robert H. Cannon, Jr., has been reelected for a second three-year term on the academy's governing body, the NAE Council. Cannon is professor of engineering and chairman of Caltech's Division of Engineering and Applied Science.

The election of Morgan and Roshko brings to 24 the number of Caltech faculty members elected to the prestigious academy. Morgan was honored for his contributions to the engineering profession through basic research and application of chemistry in water purification and pollution control. Roshko was named for his contributions to vehicle aerodynamics, specifically to the knowledge of separated flows, turbulent wakes, and mixing layers.

Kerrebrock's election was for his contributions to the development of propulsion and energy conversion systems design and research, education, and national service. Mickley was elected for research on transpired turbulent boundary layers, and leadership in the industrial development of oxyhydrochlorination processes. Moore was recognized for geotechnical engineering work that contributed to knowledge of earth sciences.

Swerling was cited for his contributions to detection and estimation of random processes and their application to radar systems. Dhawan was recognized for leadership in aerospace research and education and achievement in management of space applications and development programs.

Election to the academy is the highest professional distinction that can be conferred on an engineer. The Caltech representatives are among 100 engineers in the United States who were honored this year by election to the academy.

Caltech in NAS limelight

Caltech faculty and alumni were in the limelight again this spring when the National Academy of Sciences announced its new members.

Ivan E. Sutherland, MS '60, Caltech's Fletcher Jones Professor of Computer Science, was elected to membership, as were three other alumni: Robert N. Hall, BS '42, PhD '48, physicist at General Electric Company's Corporate Research and Development Center in Schenectady, New York; Richard J. Reed, BS '45, professor of atmospheric sciences, University of Washington, Seattle; and George M. Whitesides, PhD '64, professor of chemistry, MIT.

Sutherland's election to the prestigious academy brings to 44 the number on the Caltech faculty who are members. A computer research scientist, Sutherland is developing new philosophies of computer design, programming, and use in order to cope with the rapidly changing nature of computer components. One of his early concepts was computer-drawn pictures in industry and education — that were used for everything from automobile design to simulating airplane landings for pilot training.

Schmidt honored

Maarten Schmidt, professor of astronomy and chairman of the Division of Physics, Mathematics and Astronomy at Caltech, is one of 15 scientists from nine countries who have been elected foreign associates of the National Academy of Sciences. Schmidt is a citizen of the Netherlands.

Although full membership in the Academy is accorded only to American citizens, foreign scientists who have done outstanding research in the United States are honored by election as foreign associates.

Shock waves to smog

Alumni absorb reports on research

Life on Mars: It's Us

The Viking Mission, despite its failure to find life on Mars, was a dazzling engineering and scientific achievement, Norman H. Horowitz, professor and chairman of the Division of Biology, told alumni as he explored its findings.

Horowitz described the five instruments on the Viking landers that searched for evidences of Martian life — the cameras, the gas chromatograph-mass spectrometer which analyzed soil for organic matter, and three instruments which performed metabolic measurements on the soil. He summarized the conclusions: "Even though some ambiguities remain, there is little doubt about the meaning of the observations of the landers," he said. "At least those areas on Mars examined by the two spacecraft are not habitats of life.

"The most surprising finding of the life-seeking experiments is the extraordinary chemical reactivity of the Martian soil: its oxidizing capacity, its lack of organic matter down to the level of several parts per billion, and its capacity to fix atmospheric carbon (presumably into organic molecules) at a still lower level. It seems that Mars has a photochemically activated surface that is maintained in a state far from chemical equilibrium, due to low temperature and the absence of water."

Although the Viking Mission failed to find life on Mars, it underscored our increasing capacity to explore space and it paved the way for future missions, Horowitz said. In this context he quoted Ray Bradbury who once remarked, "We have found life on Mars, and it is us."

Norman Horowitz

Nitrogen fixation

Research that may lead to more economical ways of meeting the world's demand for food and energy was described by John E. Bercaw, associate professor of chemistry.

Bercaw has synthesized two molecules containing either zirconium or titanium; these molecules are capable of converting molecular nitrogen into hydrazine, an important step in the fixation of nitrogen to ammonia.

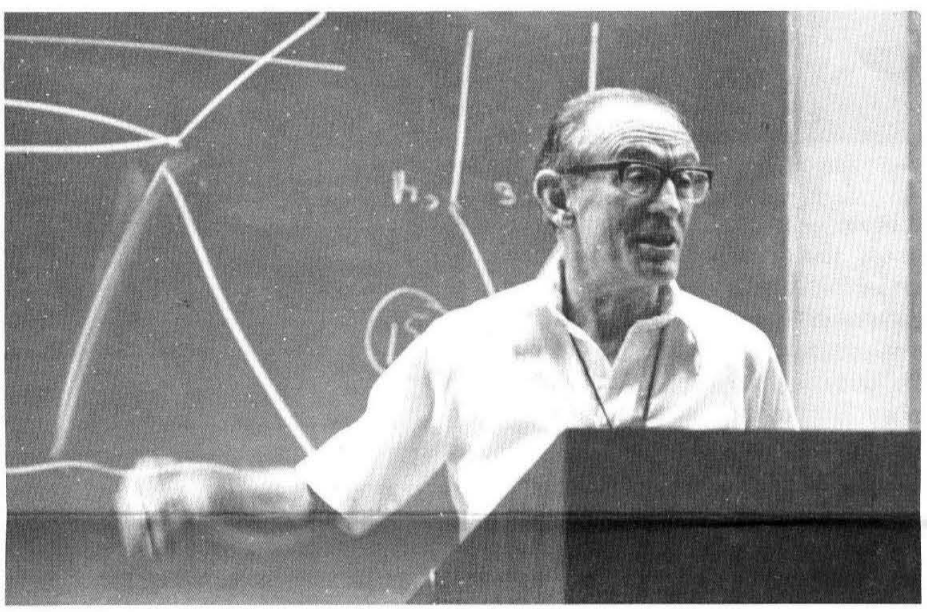
"Molecular nitrogen normally is unreactive, but a few smart plants know how to convert it to useful nutrients through the process known as nitrogen fixation," Bercaw explained. "Nitrogen fixation is one of the least understood processes in nature, but it is a fundamental step in the whole process of nutrition because it is essential for the creation of plant protein. Plant protein in turn is metabolized by animals to form animal protein."

There is an abundance of N^2 in our atmosphere but most plants are not able to use it directly, he explained. Synthetic ammonia fertilizers must be used instead.

"An understanding of the chemistry of nitrogen fixation could lead to more economical production of fertilizers, and help to solve food and energy needs," he said. But he explained that the process he has developed is not yet economically practical because titanium and zirconium complexes are still very difficult and costly to synthesize.

Shock waves

Those attending Hans Liepmann's Alumni Seminar Day talk on shock waves found out about the subject first hand because Liepmann used the laboratory apparatus to make the room reverberate with his topic.



Hans Liepmann discusses shock waves and how they are created.

After demonstrating with a water tank how shock waves are created by the release of energy, Liepmann unleashed a loud pop on his audience. He used a device called a shock tube that built up gas pressure behind a diaphragm that was subsequently ruptured. Shock waves of remarkable strength could be produced in the laboratory, Liepmann pointed out, to create an even more powerful shock wave that was funneled into a small transparent cone heating the gas inside to more than 50,000 degrees Kelvin, creating a bright flash of light. This wave was contained so that the audience heard only a muffled pop.

Liepmann, the Charles Lee Powell Professor of Fluid Mechanics and Thermodynamics, described how he and his colleagues are using shock waves in liquid helium to study the thermodynamic behavior of that material.

Is smog really necessary?

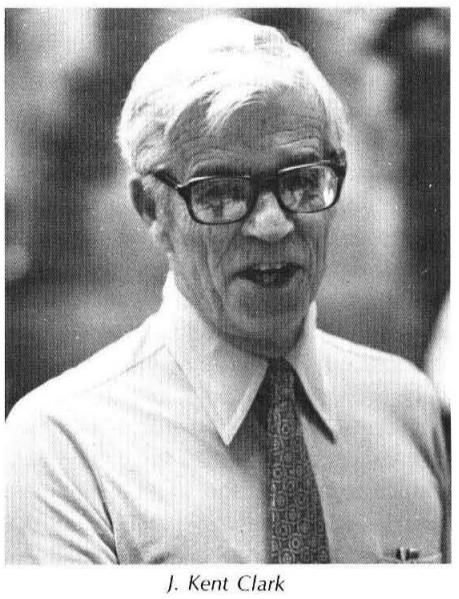
Automakers still have plenty of room in their attempts to reduce automobile pollution, said Francis Clauser, the Clark Blanchard Millikan Professor of Engineering, in his lecture, "Is All This Smog Necessary?" Clauser discussed research he has conducted that shows that it is possible to reduce by a thousandfold the unburned hydrocarbons produced by combustion engines. Such a reduction would allow adjustment of engines so that the amount of carbon monoxide they produce can be drastically altered.

The key to such a reduction, said Clauser, would be the use of engines in which the flame front of the burning fuel does not move in relation to the wall of the combustion chamber. In his research, Clauser developed an apparatus in which a metal surface could be moved in any speed or direction past a burning flame, or could be stationary. He found that a moving wall caused a quenching of the flame near it and that the quenching produced unburned hydrocarbons. But he found that if the wall is nearly stationary, quenching does not occur, with the result that all the fuel is burned.

Altering conventional gasoline engines to take advantage of this discovery will not be easy, Clauser warned. However, he said he has concluded that engines such as gas turbines, steam engines, and Stirling engines should be able to achieve emission levels far below the operating levels of today's gasoline engines.

Journey into the past

In the midst of writing a biography about the brilliant but eccentric seventeenth century Englishman, Goodwin Wharton, Caltech's J. Kent Clark, professor of English, traveled to Bath for insights into the city and its people as one would have found them between September 10 and October 8, 1687. On Alumni Seminar Day, Clark retraced this journey for his audience.



J. Kent Clark

The challenge for biographers, Clark told his listeners, is to reconstruct episodes in the lives of their subjects as accurately as possible. Clark's interests during his trip to Bath centered around a one-month romantic pursuit by Wharton of the queen of England, Mary Beatrice, wife of James II.

What did Bath look like in 1687? Who lived in the city? How did its inhabitants dress? Clark described his insights — and how he constructed word pictures depicting the city after a journey to modern Bath that involved long and absorbing searches through old records and maps.

Clark discussed his frustrations in attempting, unsuccessfully, to find the given name of a Mistress Gay, one of the leading ladies in the true-life scenario involving Wharton and the queen. And he shared his feelings of triumph when he discovered a schematic diagram of the fashionable Cross Bath where Wharton carried on his flirtation.

In a traveler's account of the times he found the queen's bathing outfit described. This yellow canvas gown with weights at the bottom complimented her modesty as she bathed in the presence of onlookers in the gallery — one of whom was the entranced but ultimately frustrated Wharton.

The rings around Uranus

The audience for Peter Goldreich's seminar on the rings of Saturn and Uranus got a taste of what it's like to be caught up in the excitement of scientific research. Goldreich, professor of planetary science and astronomy, described the recent discovery of three new rings around the planet Uranus. Their find brings to eight the total number of Uranian rings that astronomers have found.

Goldreich also announced that astronomers at Caltech and the Hale Observatories were attempting the very next week to obtain the first picture of Uranus's rings. He revealed that his colleagues were planning to search for rings around Neptune, and that the motions of the Uranian rings hinted that they might be under the influence of a heretofore undiscovered moon of Uranus.

The rings of Uranus were originally discovered in 1977 by several independent groups of astronomers, notably a Cornell University team headed by James Elliot, Goldreich said. Five rings were resolved in an original discovery that involved measuring how a star blinked on and off as it neared the planet and passed behind the rings. On April 10, 1978, Eric Persson measured another "occultation" and resolved three more rings. The observations were made at the Las Campanas Observatory in Chile, using the du Pont Telescope there.

In his seminar, Goldreich also described theories about the famous rings of Saturn. He said that competing theories exist about their composition — whether they are primarily ice or iron — and that astronomers are currently debating the size of the ring material and its thickness.

Harrison Schmitt

From the moon to Capitol Hill

by Winifred Veronda

Harrison H. (Jack) Schmitt (BS '57), after receiving his PhD degree from Harvard in 1964, decided that the most exciting thing he could do with his education as a geologist would be to get involved in the country's fledgling space program. This decision led to an assignment with Eugene Shoemaker, Caltech professor of geology, developing field geology techniques for the first men on the moon, and then to selection as an astronaut. In December 1972 Schmitt, after a flight aboard Apollo 17, became the first scientist to explore the lunar surface. Following the flight he was named chief of scientist-astronauts.

Deciding what to do for an encore when you've walked on the moon could prove challenging, but Schmitt had no difficulty focusing on a new career — in part, because he'd considered running for public office ever since he was in graduate school. After stints as a Sherman Fairchild Distinguished Scholar at Caltech and NASA assistant administrator for energy programs, he resigned from the space program in August 1975 to enter politics. In November 1976 he was elected a U. S. Senator from New Mexico.

Interviewed in his office in the Senate Building in Washington, D. C., Schmitt discusses such topics as what it's like to shift from astronaut to senator, how he feels about the future of the space program, and where the government's science dollar is going.

Was it hard to shift from the objective and analytical approach of the scientist to the advocacy role of an elected official?

My own transition was made easier because of my background as a geologist. I consider geology a science but also an art — because there are never enough equations to take care of all the variables that nature presents. So a geologist learns to adopt an advocacy demeanor because he's continually forming different interpretations than his colleagues for the same set of facts. In this sense, maybe geologists have to learn a little bit of politics right from the cradle. In my case, shifting to public office was eased because I worked with the public while I was still an astronaut. I often spoke to public groups about space exploration, and I became increasingly involved in discussions about other issues because people almost never confine themselves to the topics of the day. Just answering the question, "Was it worthwhile to spend 20 million dollars to go to the moon?" forced me to learn about a lot of other programs that the money might have supported, so that I could build a case — a technical one, at any rate — for the value of the space program. Of course, I still maintain that the real worth of the space program is in its impact in the human psyche, not in dollars, but most people expect a technical answer.

Are you regarded as a celebrity in Congress because you're one of a small handful of people who have visited another planetary body?

The only hint that I might be is when a senator asks me to talk with some of his constituents, usually young people who've come to visit, or maybe to go into his state and talk with people there about the moon. Of course, senators are much like astronauts; they think they're first among equals. They don't make many concessions to another person's uniqueness.

Occasionally in committee sessions I sense an awareness that I bring a different background to the deliberations. I detect some appreciation of my ability to understand the technical aspects of the issues we're considering.

For example, Senator Moynihan mentioned in a national television interview program that he feels extraordinarily uncomfortable when he votes differently than Jack Schmitt on energy policy, but so far, his discomfort hasn't changed his vote.

Harrison Schmitt

When did you decide to run for public office?

I made the basic decision in the early 1960's when I was in graduate school at Harvard. Then I filed the idea away in the back of my mind, but took care not to close off the option. A few years later when I was earning a reasonable income I began to save money so I could finance the start of a campaign.

My first overt step toward running for office came in 1975 when I decided not to run for Congress after I was asked to consider doing so. At this point I began to look seriously at the developing political situation in New Mexico, and I decided that 1976 would offer me a reasonable opportunity to run for the Senate.

What are your major goals as a senator?

In general I want to look for solutions to problems rather than treatment for symptoms. Listening to politicians who treat symptoms is one of the frustrations facing Americans today. I believe that our energy problems, inflation, the erosion of the dollar all have real solutions, and that we can find them.

What about our national science policy?

The administration doesn't really have a science policy. We're moving piecemeal in this area, if at all. I'm opposed to the regulation of science, but certainly we should define the federal government's role. I'm looking into this question as a member of the Commerce Committee's Subcommittee on Science, Technology, and Space.

In this and other committees, I'm involved in decisions about a new telecommunications policy, the disposal of nuclear waste, and how you manage international resources. Here we're using our successful management of the global satellite communications network [INTELSAT] as the starting point. INTELSTAT's success has led me to consider applying the same model to the exploitation of deep sea resources, the worldwide disposal of nuclear wastes, development of the antarctic, space exploration — and even the management of the Panama Canal.

What about your work in non-technological areas?

In other committees I'm working on a better and more affordable retirement security system, the efficient delivery of housing services to people who can't afford housing, and monetary export policy.

But my biggest job right now is on the Ethics Committee where I'm vice chairman of a non-partisan committee called the Select Committee on Ethics. Along with Adlai Stevenson I'm in charge of enforcing the professional ethics rules. And this is an impossible task. If professional ethics don't enforce themselves you can't enforce them — or at least you can only do so in a very limited way. Probably I'll eventually make a recommendation to the Senate based on a full disclosure of finances, travel, and gifts, rather than on an internal police system. Then the code will be self-enforcing because the public will have all the information it needs to judge the conduct of its senators.

How do you feel about the future of the space program?

I'm very optimistic. Man has proved he can live and work in space. There's no reason why he won't move further into space and on to other planets. A whole generation is alive that has grown up in an era of space exploration. These young people are excited about space-related careers. I'm confident that the parents of the first Martian colonists are living today.

To a casual observer, it looks as if interest in the space program peaked with the first manned moon landings and then diminished substantially.

The loss of interest occurred within the media, not the public. The media assumed that people were tired of watching astronauts work in space and so they began to shift the time to other subjects. They offered no live coverage when the crew of the third skylab mission returned, even though this crew stayed in space longer, by far, than any set of human beings up to that time. One could argue that the media evaded responsibility to history through this neglect.

The hazard in the media's indifference is its impact on federal budgeting. Unfortunately politicians often gauge their actions by what the press and television are interested in and not what the people are interested in.

Perhaps the media now regard space missions as routine aspects of our technological era.

But the missions aren't routine. Each one is different. Space shuttle missions bear no relationship to Apollo missions, for example. Of course the media's loss of interest is partly NASA's responsibility. NASA tended to think it couldn't do anything with public relations unless an astronaut was present as a spokesman. But the astronauts couldn't do everything and so many opportunities for exciting, newsworthy coverage of the space program were missed.

What about the willingness of the federal government to provide budget support for space exploration?

Congress has shown *its* willingness to support space programs; the block is at the level of the administration. The administration is holding funding at a half billion dollars below what Congress would approve. With NASA and its administrative structure already in existence, an additional half billion dollars would make a tremendous impact in what we could accomplish.

If not into space, where is the government's science dollar going?

Into defense, energy, the environment. This administration is in a holding pattern where technology is concerned. Obviously it has not developed a coherent policy for scientific research and innovation, nor for space. Maybe its leaders are still trying to get oriented, but they've taken a long time to do so. One spot that does look brighter than the others is in funding for university research. For this, Frank Press deserves a lot of credit.

We've heard considerable discussion about changes in the astronaut's life directions because of the impact of their experiences in space. How would you assess this impact in your own life?

To begin with, I believe these changes are more apparent than genuine; they're based on media treatment of astronauts' careers. Of course everyone who went to the moon found that the experience changed his outlook to some degree. But the effect was a maturing one, a reinforcement of goals, of what we believed up to that time, rather than a discontinuity. In every case where the press devoted considerable coverage to an individual who changed his direction after a moon mission — who became deeply involved in religion or the environment, for example — the roots of this interest already existed but had been subordinated to the business of being an astronaut. When I became a senator, I was doing something different from being part of the space program, but the change had nothing to do with going to the moon. I made the decision to run for political office many years ago.

Of course the experience was unique and extremely worthwhile — partly because we were all concentrating so intensely on a single objective. About 450,000 people in this country are responsible for the success of Apollo, and most of them feel that this was the most important thing they could have done with their lives. I'm one of those people. But I want the opportunity to go on to other things that are important . . . like my work as a U. S. Senator.

CALTECH NEWS

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More Seminar Day summaries

A geological history book

Hints of an intriguing pattern of earthquake recurrence in southern California over the past 1,500 years were described by Assistant Professor of Geology Kerry Sieh in his Alumni Seminar Day research seminar. Sieh's studies reveal that at least nine large earthquakes have struck the Palmdale region since the sixth century, A.D. and his findings may aid in understanding how the San Andreas fault will behave in the future.

Sieh explained that in conducting his research he explored a geologic "history book" along the San Andreas fault — a dried-out marsh in which evidence of ancient earthquake movements were preserved. Carbon-14 dating of the organic material in the layers revealed their age: from about 500 A.D. until the early 20th century. Shifting of the marsh layers revealed when they had been struck by earthquake movements.

His information brackets the dates of nine great earthquakes that struck the area over the last 1,500 years. Their approximate dates, plus or minus about 50 years, are 575 A.D., 665, 860, 965, 1190, 1245, 1470, 1745, and 1857. "The average recurrence rate of 160 years shows clearly that earthquake prediction research in southern California is extremely important because large earthquakes do recur often enough to warrant such efforts," Sieh said.

But he cautioned that the 160-year rate is only an average "recurrence interval" for the past 1,500 years. Some earthquakes were separated from one another by 50 to 150 years while others were separated by 200 to 250 years. In fact, Sieh noted, "The earthquakes appear to occur in pairs, with more than two centuries between each pair and about a century between the members of each pair. Although the pairing may be due to chance, this would seem to be an unlikely coincidence."

Is U.S. science declining?

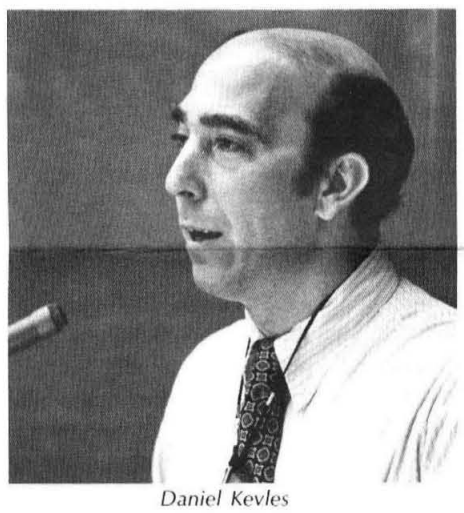
The apparent decline of science in the United States in the last decade is, in essential respects, not likely a decline at all, according to Daniel J. Kevles, Caltech professor of history and author of a recently published work about the American physicists' community.

Kevles told alumni that, to be sure, there has been a decrease in funding for research in academe and industry, and a reduction in the number of PhD's in the physical sciences. But paradoxically, these decreases do not appear to have led to a diminished quality in American science.

The resolution of the paradox lies in the fact that the large majority of advances in science are the work of a comparative fraction of the scientific community, according to Kevles. And the systems of recruitment and support in American science tend to give the greatest opportunities to the best people, on the whole.

"What counts in scientific manpower is not so much the total number of people as their quality," Kevles said. "The falloff in PhD's has probably occurred among the less able candidates."

Similarly, what counts in the funding is not so much the total dollar



Daniel Kevles

amount as how it is used. And Kevles reassured his audience that, on the whole, the distinguished schools of science and the best scientists still seem to be getting considerable support for research and training. It is the lower ranking departments of science that have suffered in recent years.

How the ear hears

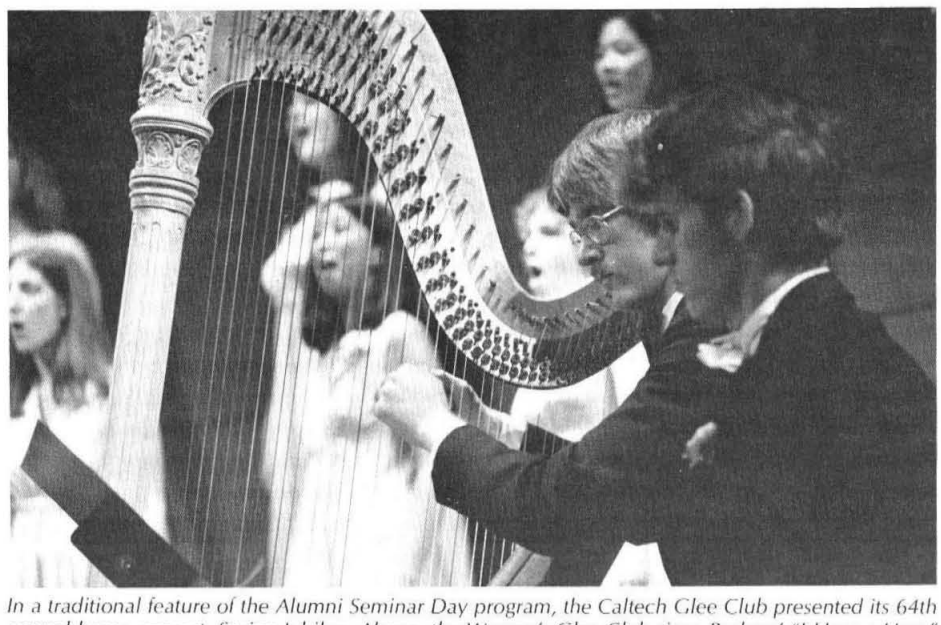
Tones from a device that can mimic sounds from musical instruments were played by George Zweig, professor of theoretical physics, in his Seminar Day discussion. The machine also allows its operator to create different sounds than those that any instrument can produce. The machine's repertoire — as demonstrated by Zweig — ranged from tones almost undistinguishable from those of violas and clarinets to a rendition of "Twinkle, Twinkle, Little Star," eerily resembling a fugitive composition from the "Star Trek" sound track.

Zweig explained that the device is the brainchild of Alan Danziger, BS '77, Timothy D. Ryan, BS '78, and Donald Lieberman, who is on leave from the Institute. It is enclosed in an 18-inch cube with a small attached keyboard. Zweig uses it in his laboratory to create custom-tailored sounds and to monitor the way the brain responds to them.

In his Seminar Day lecture, Zweig played the "music box" when he discussed the structure of sounds and how our understanding of the hearing process can be applied in practical ways. He described the anatomy and components of the auditory system and the functions of the outer, middle, and inner ear, and also explained how sounds excite the hearing mechanism and are identified by the brain.

Our understanding of the hearing process has made it possible to isolate only those tonal properties that can be detected by the human ear and to record them in a computer, Zweig explained. In this way a wave form can be simplified without altering its sound. The device that Zweig demonstrated can then produce a tone so close to that of the actual instrument that it is almost undistinguishable from the original one.

Glee Club's "Spring Jubilee"



In a traditional feature of the Alumni Seminar Day program, the Caltech Glee Club presented its 64th annual home concert, Spring Jubilee. Above, the Women's Glee Club sings Brahms' "I Hear a Harp" as 1977-78 ASCIT President Bert Wells (second from right) accompanies on the harp. Pianist Shawn Hall, a graduate student in mechanical engineering, is at right.

Computer speeds efforts to monitor earthquakes

A computer developed by a Caltech graduate student to watch over the Institute's extensive network of seismometers is allowing seismologists a faster, more precise look at southern California earthquake activity. The computer allows records of seismic events to be made available for study far more quickly than previous systems where they were measured by hand.

Carl Johnson, who created the system, says the computer has reduced the interval between the occurrence of a seismic event and its inclusion in a preliminary catalog from many months to two or three days. "This rapid availability is essential if seismologists are to analyze earthquake activity as it occurs," he explains.

The computer, dubbed the CEDAR System for "Caltech Earthquake Detection and Recording System," is the only one of its kind that is currently operating in this country. It monitors the Caltech/USGS network of 148 seismometers in southern California via phone lines, and it records data from the seismometers only when it detects an earthquake.

In the two years since it began operation, it has proved to be more thorough and precise in its data recording than previous methods. It detected about 20 percent more earthquakes than scientists spotted by visually scanning the wiggles on the data from seismic stations. Johnson is using the improved data to study patterns in the swarms of tiny tremors in California's Imperial Valley.

The CEDAR System makes it possible to locate earthquakes more accurately because its computer can determine the arrival time of seismic waves at any station to within .02 seconds. Persons reading film records from the network could only measure the arrival times of the waves to within .05 seconds. Seismologists use timing from several stations to pinpoint a tremor's location and can now pinpoint earthquake epicenters to within 50 to 100 meters.

Fulbright Alumni Association

Several Caltech graduates are eligible to become members of a new alumni association, and Caltech Professor of History Robert Rosenstone is asking them to get in touch with him. Rosenstone is helping the newly formed Fulbright Alumni Association (FAA) to compile a roster of names of all Americans who have participated in Fulbright programs. He explains that, until now, there has been no record of the more than 41,000 Americans who have received Fulbright grants.

Anyone who is, or was, a recipient of a Fulbright grant, or who knows the names of other recipients, is asked to contact Rosenstone in Caltech's Division of the Humanities and Social Sciences with the individual's name, host country, years of participation, and current address and affiliation. He emphasizes that submitting a name for the roster does not obligate a person to become affiliated with the FAA.

Wright receives Straub Award

Steven Jay Wright, PhD '77, has received the Lorenz G. Straub Award for his thesis, a fundamental hydraulics study of how sewage discharges diffuse into the ocean or how smokestack emissions diffuse.

Wright is the third Caltech graduate student in three years to win the prize. The Straub Award is given for the most outstanding thesis in hydraulic engineering or a closely related field submitted by entrants from throughout the United States and several foreign countries.

His thesis was entitled "Effects of Ambient Crossflows and Density Stratification on the Characteristic Behavior of Round, Turbulent, Buoyant Jets." His thesis supervisor was Norman H. Brooks, the James Irvine Professor of Environmental and Civil Engineering and director of the Environmental Quality Laboratory at Caltech. Wright is now assistant professor of civil engineering at the University of Michigan.

Surmounting the Shock of the Freshman Year

by Winifred Veronda

Caltech freshmen are a unique group. Brilliant and passionately interested in their fields, they often ranked at the top in their high school classes. There, they seldom earned less than A's in subjects they cared about and they generally achieved 4.0 averages without working very hard. Often they gained reputations among their classmates for being rather eccentrically brainy and sometimes they endured the frustrations of knowing their science and math better than their teachers. Some found conversations on dates a problem. (If you're genuinely enraptured by polynomial root approximation programs rather than rock stars, where do you find a high school date who shares your enthusiasm?)

As Caltech freshmen their situation changes drastically. No longer standouts, they become part of the group, struggling to get through first-term math and physics and learning that the phrase, "drinking from a firehose," means absorbing information dispensed by their professors, not guzzling water at a rapid rate. Memories of this adjustment (and proof of its consistency) caused one 65-year-old alumnus, now a Caltech faculty member, to remark, "Thank God I don't have to face it again."

Special rewards come along with the discomfort: learning about favorite subjects from professors who are world leaders in their fields, feeling close to a group of other young people who share the same interests, not having to listen to classmates asking naive scientific questions, and feeling free to talk about physics on a date — if one chooses.

But the first order of business is the transition. Some freshmen begin to feel apprehensive as soon as they're admitted. Others remain convinced that *their* intellects will carry them through the process without much strain, even after warnings from upperclassmen at Freshman Camp that Caltech will make demands much more strenuous than high school.

Too stubborn to quit

Eric Kaler, a senior majoring in chemical engineering, admits that he was one of the prematurely confident. Kaler, who last year received the Donald S. Clark Award for outstanding leadership and scholarship, says, "I expected Caltech to be harder than high school but I didn't expect it to be so *much* harder. At Freshman Camp I thought the counselors who told us how hard it would be were talking to the other guys. I just didn't believe I'd be in a class with so many people who were smarter than me, and in a field where I'd always been the best.

"Then I started going to lectures and they were way over my head. Within a week I was scared stiff I'd fail math and physics. But I never thought of quitting. I was too stubborn for that. I did a lot of growing up the first year when I realized how much I'd have to settle down if I wanted to make it."

Rebecca Hartsfield, a senior majoring in geology, experienced the same panic. "I thought Caltech would be tough," she says, "but it was worse than I expected. I failed my first physics quiz and then I became convinced I couldn't pass anything. I spent too much time worrying and not enough time sleeping. But after I passed my first-term courses I began to get my feet on the ground." Once she did so she also found time for activities: competing on the swim team, singing in the Glee Club, and serving as Page House vice president and secretary as well as on the ASCIT Public Affairs Committee.

"I believe anyone here who is willing to put in the effort can make it, but some students are horrified at spending two or three hours on a single physics problem," Becky says. "They don't understand that Caltech requires a different level of effort than high school where you could solve a problem in 15 minutes. It's hard for them to adjust to supplying their own motivation."

Lynn Hildemann, a sophomore majoring in biology, adds, "Most freshmen had it easy in high school. But at Caltech they face the possibility of failing a course. They begin to question their ability."

At Freshman Camp, counselors warn students that their freshman year will require a level of effort substantially exceeding that of high school.

In a few students, the first few weeks produce a different effect; they induce a state of euphoria. Mathematics major Bert Wells, 1977-78 ASCIT president, says of his own experience, "My freshman year was exciting. I had been frustrated in high school because some of the teachers didn't know their subjects very well. Sometimes I understood the material better than they did.

"My Caltech courses removed barriers to learning and fostered my excitement for science. I could finally learn about fields I'd always wanted to know about, from people who were authorities — among the best in the world. I was so excited that I asked for extra projects in addition to the homework. But after a couple of weeks I decided maybe this wasn't so wise."

Important in the adjustment for most students is a shift from learning by rote to solving problems by breaking them down into their essential components and understanding each element. This shift, according to several students, forced them to "learn to think in an entirely different way" — a process that doesn't always come easily.

The adjustment also often involves a reorientation in the goals that motivate studying. "In high school we were grade oriented," Hildemann says. "We studied for grades and often we liked courses just because we received high marks in them. But survival at Caltech means working in classes just because we want to learn. We discover our real interests and focus on the information we'll need for careers."

Doug Rountree, a senior majoring in applied physics, expresses the difference another way. "At Caltech you don't compete with people," he says. "You contend with a body of knowledge and you probe the limits of your ability to understand the world and the way it works."

Clarifying professional interests causes some students to reevaluate their reasons for coming to Caltech. "If you decided to major in science just because you got good grades in it in high school," Hildemann says, "you soon find out your mistake and you don't stay." Kaler adds, "The freshman year forces you to ask yourself whether you really want a scientific career. The teachers here don't hold your hands. They decide on the maximum you can take and they don't hesitate to administer it. This leads you to ask whether you really want to work so hard. If you don't, then you leave. If you are willing, then you discipline yourself to do the work that Caltech demands and you get eight years of education in four. When you graduate, you feel a tremendous sense of achievement."

Rountree, a three-year baseball letterman and junior and senior class treasurer, adds, "When you leave Caltech you think, 'There's no doubt that if I have enough time, I can solve almost any technical problem that has a solution'."

Lynn Hildemann agrees, "I've gained tremendous respect for my ability because I succeeded here. Knowing I could do the work means a lot to me."

Helping to compensate freshmen for the pain of adjusting is their pleasure in being with people who share their own interests and intelligence level. Many comment that they feel fully respected for the first time at Caltech for their intellect, their technological interests, and their capacity for hard work.

Says Becky Hartsfield, "I was something of a loner in high school but I feel close to students at Caltech because we have the same interests." Rountree adds, "It's pleasant to be with people who have the same abilities. Friendships develop more readily among people whose minds work the same way. I really like being with people as bright as the students here."

Practical benefits, in addition to emotional satisfactions, derive from living with people who share similar interests. "Your friends help you through your freshman year," Rountree says. "Students form study groups to help others who are having problems with a course. And when you're upset your roommate calms you down. He's generally feeling better than you are and he reassures you."

Kaler adds, "Just to live in the student houses with people who made it through their freshman year is helpful. They're living examples that it can be done.

"Seniors will spend hours explaining material to a group of freshman," he concludes. "Without their help, I don't believe I could have made it."

A jolt for parents, too

The jolt that freshman experience at Caltech is sometimes transmitted to their parents. Accustomed to seeing straight A's on their sons' and daughters' report cards, they are perplexed by their children's fears. "At Caltech you aren't expected to get grades of 90 on your quizzes," Hartsfield says, "but not everyone understands this — including parents."

"My parents knew that classes at Caltech would be a lot rougher than in high school," Hildemann agrees, "but even so, they had to adjust when I came home at the end of the first term and said, 'I'm sure I passed everything except for math and physics'." (She did pass, and went on to achieve a 3.8 grade point average — and also found time to compete on the swim team, manage the football team and sing in the Glee Club and the student musical).

Parents who do understand the transition can be of great help, the students agree. "Support from parents is essential," Rountree says. "I don't know how I could have made it without my family."

As the students become upperclassmen, they realize increasingly that success at Caltech brings substantial benefits in moves toward jobs or graduate school. Carol Thompson, a senior majoring in engineering, explains, "One of the best things about Caltech is the contacts you make. You do undergraduate research for professors who are world famous, and their recommendations go with you."

Students, after graduation, remember their struggles but increasingly they appreciate the benefits of their educations. Most come to echo the sentiments of Walter S. Baer, BS '59, a physicist with the Rand Corporation: "My Caltech education looks better every year. I knew at the time that I'd learned a great deal but only in retrospect did I realize how important those years really were. My education provided the base for all of my professional work. It gave me a set of problem-solving tools more important than any specific course I took or fact I learned . . . and a set of attitudes that encourages self-reliance, wanting to do a job well, and the desire to keep out in front."

Rewards like that are worth some discomfort.

Class of 1953 celebrates 25 years of alumni status

Timing the event to coincide with Alumni Seminar Day, members of the class of 1953 celebrated their 25th anniversary on the weekend of May 13. They launched festivities on Friday evening with campus tours, a social hour, and dinner in the Athenaeum, and on Saturday they met for lunch in Dabney Gardens and a social hour in Millikan Board Room, in addition to attending Seminar Day. Left—Before dinner on Friday, Ronald L. Richmond, MS '53, PhD '57, and Mary Richmond browse through a 1953-vintage Big T. Center—Dysart CoNine, BS '53, MS '54, left, talks with Rolf C. Hastrup, BS '53, MS '54, Eng '58, and Mrs. Hastrup. Right—Rolf Sabersky, BS '42, MS '43, PhD '49, right, chats with Gilbert B. Peppin, BS '53, and Mrs. Peppin. Sabersky is professor of mechanical engineering at Caltech.

Award to Liepmann

Hans W. Liepmann has been selected the 1978 recipient of the Monie A. Ferst Award for contributions to motivation and encouragement of research through education. The second recipient of the award since its inception, Liepmann is Caltech's Charles Lee Powell Professor of Fluid Mechanics and Thermodynamics and the director of its Graduate Aeronautical Laboratories. The award consists of a medal and a cash prize of $1,000.

Liepmann is internationally known for his work in fluid mechanics and aerodynamics. Through his own research and that of his students, he has exerted a distinct influence on the design of aircraft, rockets, and the development of modern fluid dynamics. The award is named for an engineer and businessman who actively supported scientific research on university campuses.

Gourmet fare

From Potage St. Germain to Amaretto mousse pie, Caltech students concocted an ambitious selection of gourmet dishes in the third annual Interhouse Cooking Contest co-sponsored by the Alumni Association and the Master of Student Houses Office. Teams from each undergraduate house prepared and served full-course menus to an increasingly satiated panel of judges from the faculty and administration. Above, Diane Wunderlich, resident associate in Dabney House, serves Ray Owen, vice president for student affairs and dean of students, a plate of Legumes a la Grecque and Coq au Vin as Master of Student Houses James Mayer looks on. Lloyd House won first prize of a microwave oven. Fleming House placed second, winning $250 worth of wine, and Page House, in third place, won $150 worth of kitchen equipment.

Feedback on Fansome

The antics of Aluvial Fansome, a resident of Fleming House who receives mail and bills but is never seen by his housemates, were chronicled in the April Caltech News *issue. This letter from Robert D. Parker, BS '67, sheds new light on Fansome's shadowy character.*

I enjoyed your article in which you described some of the antics of the eminent Mr. Fansome of Fleming House. However, I am afraid the present residents have given you some erroneous information.

To begin with, Fansome is a good deal older than 8. When I arrived at Fleming in the fall of 1963, all of the magazine subscriptions were addressed to him and the people who were seniors (class of '64) recalled that he had appeared before them. At that time he did not have such a good credit rating, and I recall repeated visits from collection agents who could never find him at home. The name Fansome was used regularly when reserving a table at Bob's; the manager must have thought there were about ten Fansome families in the neighborhood.

In the second place you've got his name spelled wrong! As I understand it, the name was invented by a geologist and is spelled Alluvial O. Fansome, the root being the geological term, "alluvial fan." The fear that someone would recognize the first word led to the abbreviation, "Al." I never learned what the "O" stood for.

ROBERT PARKER, PH.D.
FLEMING HOUSE CLASS OF 1967
HOUSE HISTORIAN

Robert Logan, BS '68, adds:

Al has been a Fleming House member for many years. The enclosed house list (the oldest I have) shows him there in 1967 but he was around when I arrived in 1964. From about 1965 to 1968 he was also listed in the Pasadena telephone book at 780 North El Molino where several other Flems and I lived.

Logan's list shows Fansome to be a member of the class of 1969 with a major in LSD. It depicts him as a "stud, jock, and everything else." This description suggests Fansome must have mellowed dramatically over the years if he has matured into the retiring and unobtrusive individual described in the April issue of Caltech News.

Coaches stress season's successes

Women's swimming
by Coach Ed Spencer

The Caltech women's swimming team completed a successful season despite its record of one win and seven losses. The team, consisting of five women, swam without two key members of last year's squad and still came within six points of defeating four rivals.

Sophomore Lynn Hildemann was voted by her teammates as winner of the Campbell Trophy for her outstanding performance. Hildemann was high-point winner as well as conference 1-meter and 3-meter diving champion.

Sophomore Sue Fuhs received the Most Improved Swimmer award and is co-captain for 1979 along with Lynn Hildemann. Sophomore Chris Bockenstette posted new school records in the 50 backstroke and Hildemann in the 100 backstroke.

Team Captain Rebecca Hartsfield, who competed on the men's team during her freshman and sophomore years, received a four-year letterman's award. Junior Pam Crane, sophomores Sue Fuhs and Shevaun Gilley, and freshman Grace Mah also made important contributions to the team's success.

Men's swimming
by Coach Ed Spencer

The Caltech men's swimming team ended the dual meet season on a winning note with a strong decision over the University of Redlands. The victory enabled Caltech to finish the season with a display of strength, after a season of struggles with SCIAC teams that have developed into NCAA Division 3 powerhouses. Caltech opened the season with a win over UC Riverside but then suffered seven straight losses before meeting Redlands in the season finale.

Junior John Reimer set new school records in the 1000 and 1650 freestyle, while sophomore Bill Power set records in the 200 breast and 400 individual medley events. The men's team awarded both Reimer and Power the Campbell Trophy for outstanding performance; Reimer was also elected the 1979 team captain.

Fencing
by Coach George Clovis

Caltech fencers have shown considerable talent this year and are improving rapidly. The number of Techers interested in fencing is growing, and an increase in numbers will lead to even greater team improvement.

Three men who have performed particularly well this season are Senior Ed Hamrick (11-17), Junior Richard (Tick) Morris (10-21), and Freshman Bruce Prickett (12-15). Prickett was the undefeated épée champion of the under-19-and-20 age groups in southern California. He went to the U. S. Junior Olympic Championships in Houston, Texas, where he advanced to the second elimination round before being narrowly eliminated.

Next year Hamrick, Morris, and Prickett plan to return, providing a solid nucleus around which to build, and several freshmen show promise of blooming into sound fencers. If so, we will be very respectable in competition and will enjoy a pleasant mixture of hard work and fun.