

CALTECH NEWS

Acid fog: more lethal than acid rain?

Acid fog may cause damage more serious than that produced by acid rain, according to six Caltech environmental engineers. The scientists performed the first detailed study of the composition of fog water in polluted areas, and found it to be a concentrated solution of chemicals acid enough to corrode metal, damage vegetation, and perhaps threaten human health. Previous studies have shown acid rain to be about 100 times less acidic than the fog.

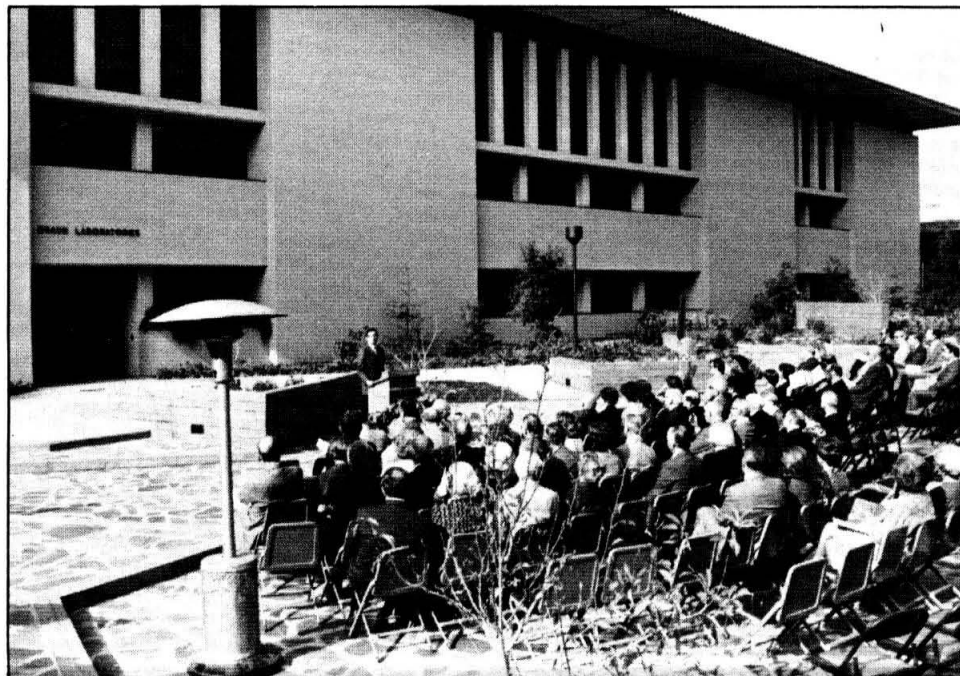
In a recent report in *Science*, the environmental engineers reported on measures of the pH and chemical composition of fog from three sites in Los Angeles and Bakersfield. They found the fog to be laden with high concentrations of pollutants such as sulfates, nitrates, ammonia, lead, copper, nickel, iron, manganese, and organic chemicals.

The fog water samples possessed pH readings from 2.2 to 4.0, meaning that they were highly acidic. (The pH scale is a logarithmic measure of acidity and alkalinity. A pH of 7 is neutral; higher than 7 is alkaline; lower than 7 is acidic. The pH of natural rainwater, due to the acidity of dissolved carbon dioxide, is about 5.6.)

(In December, the researchers measured the most acidic fog ever recorded in southern California: the fog, in Corona del Mar, reached a pH level of 1.69 — about as acidic as a toilet bowl cleaner and three times more acidic than a lime.)

Researchers collaborating on the work are graduate student Jed M. Waldman, staff engineer J. William Munger, graduate student Daniel J. Jacob, Associate Professor of Environmental Engineering Science Richard C. Flagan, Professor of Environmental Engineering Science James J. Morgan, and Associate Professor of Environmental Engineering Science Michael R. Hoffmann.

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Guests at dedication of the Braun Laboratories hear Harry Gray describe some research goals for the new building.

Caltech formally welcomes the Braun Laboratories to campus

The Caltech community formally welcomed a major new biological research facility — the Braun Laboratories in Memory of Carl F and Winifred H Braun — in dedication ceremonies on December 13.

Caltech President Marvin L. Goldberger greeted guests in Braun Court beside the building and introduced speakers: Harry B. Gray, chairman of the Division of Chemistry and Chemical Engineering; Leroy E. Hood, chairman of the Division of Biology; and John G. Braun, vice chairman of the Board of Trustees of Caltech.

The \$15-million, four-level, tile-roofed building will house some 180 researchers and support staff in the

Divisions of Biology and of Chemistry and Chemical Engineering. Eight research groups in the laboratory — four each from biology and chemistry — will carry out research in molecular biology, immunology, and cell-surface chemistry.

The building is the main facility for Caltech's Cancer Center — directed by Leroy E. Hood, the Ethel Wilson Bowles and Robert Bowles Professor of Biology. The 85,000-square-foot structure, on the northwest corner of the campus on Wilson Avenue at San Pasqual, is connected to Church Laboratory by a pedestrian tunnel on the basement level.

In their work, the scientists will use newly developed biotechnologies of recombinant DNA, monoclonal antibodies, and microchemical instrumentation. The new building will include a number of advanced resources to aid these techniques, including a microchemical facility, a computer facility, cell-sorting instrumentation, and animal facilities.

Studies in the Braun Laboratories could lead to important insights into cancer, arthritis, infections, and autoimmune disease, President Goldberger told guests.

"We expect research efforts in the Braun Laboratories to do what universities do best — long-term studies," Goldberger said. "In this case, we're talking about investigations of the fundamental structure and mechanisms of life itself."

"Caltech is fortunate. We have some of the finest faculty and research personnel in the country and even in the world. We also have some of the very best students. And we are loyally supported by many dedicated people who assist us in our decision to play a major part in contributing to the recent dramatic progress in immunology and cell biology."

Goldberger noted that the building is the largest biological facility on campus. He pointed out that Braun Court, where dedication was held, has already been used extensively for divisional events and student plays.

The Laboratories were made possible by a gift from the Carl F Braun Trust. Braun, a mechanical engineer, founded and headed C F Braun & Co, one of the world's leading engineering and construction companies.

In 1926, the Brauns were charter members of The Caltech Associates. In 1961, the Braun Trust presented Caltech with funds to construct Braun House, a graduate student residence, and in 1973 the family endowed the Carl F Braun Chair in Engineering.

Carl Braun was a member of the Caltech Board of Trustees, and from 1937 until his death in 1954, a director of The Associates. Mrs Braun, active in Caltech and community service activities, died in 1980. The

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Air pollution aggravates acid fog

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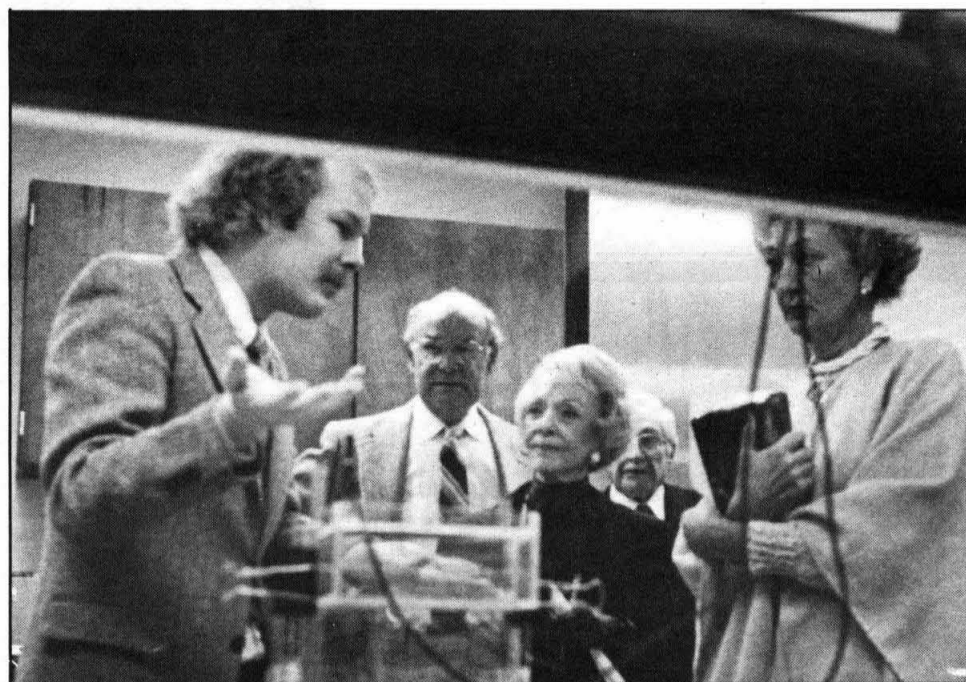
The sites used in the study included a residential area in Pasadena; a Los Angeles site near the Los Angeles Airport, a major freeway, two power plants and an oil refinery; and a Bakersfield site in an agricultural region surrounded by secondary oil recovery operations.

The scientists gathered the fog samples using a rotating arm collector consisting of a steel tube with slots milled into it. The collector is spun at high speeds and fog droplets are captured in the slots. Centrifugal force then slings them outward into sample bottles at either end of the tube. The droplets gathered in this way are 10 to 20 millionths of a meter in diameter, some 100 times smaller than raindrops.

Analysis of the samples revealed that the fog was consistently acidic, and that the pH dropped precipitously during periods of heavy air pollution. This means that the fog droplets may condense on smog particles, creating concentrated solutions in which sulfur and nitric acids are produced from sulfate and nitrate pollutants. As the fog evaporates under the sun's heat, the acidity of the droplets increases, and when it finally disappears, smog particles are released back into the air, producing severe smog conditions.

The fact that fog forms close to the ground may explain why it is so much more acidic than cloud or rain water, said the scientists. In one set of experiments, the Caltech scientists and a team from Meteorology Research, Inc., of Altadena, simultaneously sampled fog and cloud water at the same site. The Caltech scientists found the pH of the fog to be 2.8 while MRI measurements of the top of the cloud bank at 600 meters registered 3.6.

Preliminary evidence suggests that acid fogs are a general phenomenon and have produced damage in other places. For example, the "killer fogs" that have periodically plagued London may owe much of their damage to their acidity.



David S. Middlemas, graduate student in chemistry, leads guests at the Braun Laboratories dedication on a tour of one of the research labs. Middlemas is a member of the research group of Michael A. Raftery, professor of chemical biology. Guests are, from left: Caltech Trustee Dr. Lawrence Williams, Mrs. John G. Braun, Dr. Emrys Ross, Mrs. Nathaniel Paschall.

Caltech honors donors to Braun Laboratories

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Braun's son, John G. Braun, has been a member of the Board of Trustees since 1959.

The following donors also contributed generously to support the building: Chandis Securities Company,

Mrs. Norman Chandler,

the Coca-Cola Company, the James Irvine Foundation, David Keaton, Miss Tracy Keaton, the Ambrose Monell Foundation, Mrs. Nathaniel Paschall, the Times-Mirror Foundation, and the Weingart Foundation.

Alumni Fund telephone program begins February 28

Caltech's Alumni Fund telephone program will get under way on February 28 as Caltech graduates call classmates throughout the country, seeking their support for the Institute.

Most of the calls will emanate from the Alumni House, where a bank of 16 newly installed telephones will be in use, along with seven existing phones. Calls also will be made from Varco International in Orange, Intel Corporation in Santa Clara, and General Dynamics in San Diego, and Dames & Moore in San Francisco. Phone nights are being planned for the San Fernando Valley, West Los Angeles, New York City, and Washington, D.C.

Andrew B. Campbell (BS '46) and Ira Simon (BS '81) are coordinating the phone program in Orange

County. Barry R. Lieberman (BS '68) is responsible for Santa Clara, and Charles M. Davis (BS '45, MS '46) for San Diego.

Calls will be made on these dates, according to Harry J. Moore, Jr. (BS '48), National Alumni Fund chairman: from the Alumni House — February 28; March 8, 16, 24, and 28; and April 5, 20, and 28; from Varco — April 6 and 21; from Intel, March 14 and April 26; and from General Dynamics, March 9 and April 12, and from Dames & Moore, March 15 and April 25. Other dates are being arranged.

"We will be reaching out to alumni where they live or work," said Moore. He added that much of the success of the second phase of the Alumni Fund will depend on the volunteers who help with the telephone program.

Caltech alumni who would like to help in the program are invited to call the Alumni Fund office: 213-356-6286.

Caltech tops its record for private gifts: \$22.8 million

Caltech has set a record high for private gifts — \$22.8 million for the fiscal year ending September 30. This figure represents an increase of 16 percent over last year's level of gifts from corporations, foundations, and individuals.

In making the announcement, Caltech President Marvin L. Goldberger said that "this level of giving is a tremendous encouragement to us — as a public recognition of the importance of science and technology, and as an expression of confidence in Caltech."

Another record was broken when the alumni fund-raising effort resulted in a record 43 percent participation by alumni. The successful fund-raising year was characterized by a heavy involvement of volunteers, both alumni and friends of the Institute.

Notable gifts and pledges this year included the R. Stanton Avery Professorship of Distinguished Service, established by R. Stanton Avery, chairman of Caltech's Board of Trustees; a million dollar grant for a Fund for Special Programs provided by the Weingart Foundation of Los Angeles; a million dollar bequest from the estate of Josephine Halsell; and pledges from the System Development Foundation totaling over \$2 million for research on the physics of computation and neural networks.

A major grant was also made by the Rockwell International Corporation for research in engineering, and another by the Corporation for Public Broadcasting/The Annenberg School of Communications for the production of an educational TV program on physics called "The Mechanical Universe."

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Sandra Loh is a senior majoring in physics. In her talk on Parents' Day, she explains what it is like to be a Caltech freshman.

By Sandra Loh

Ladies and gentlemen, welcome to Caltech. You've heard lots of facts and statistics about the campus, but no doubt you're still in the dark as to what your son or daughter is actually experiencing here, and I would like to give you some of the inside scoop. I guarantee no statistics — or at least, if a few creep in, I promise you that I've made them up.

I hope you didn't make the mistake of checking by unannounced at your son or daughter's room at 9 this morning for a quick hello. My freshman year, my parents came by briefly before the day's events began. Not only was I sound asleep, but I was lying fully clothed on the rug, face down in a physics book, and there were two young men in the corner, faces down on physics books bearing the same title.

We had been pulling an "all-nighter," which is not as exciting as it sounds. It means you stay up all night to finish an assignment. One of the first things you have to realize about all-nighters, which can be defined as "borrowing from tomorrow to pay for yesterday, today," is that often they don't actually last all night. One's gilded carriage of knowledge turns into a pumpkin at approximately 5:42 a.m., and it's curtains for Schrödinger's Equation.

Often ignored is the fact that Caltech students realize not only their intellectual limits, but their physical ones as well. Long-distance runners speak of "hitting the wall" when they reach the point of exhaustion. Chances are that when your son or daughter was living at home and competing with "average" students in high school, exhaustion was never much of an issue. You made sure your children got their share of leafy green vegetables and were in bed by 4 a.m. at the latest.

But here, there is a probability that last Thursday your daughter or

Sandra Loh bares the truth about Caltech freshmen



son was trying to finish a math assignment at 3 a.m. and gave it up at 4 to ingest doughnuts, followed by pepperoni pizza with extra cheese at 5, followed by one hour of troubled, unexpected sleep at 6, followed by great confusion at 11. (At 11:30 comes lunch.)

The truth is that many freshmen, trying to get too much work done too soon, run out of hours to sleep. They realize there is no solution for the sleep problem, and they interpret fatigue as hunger. This may help you to understand why, over Christmas vacation, you may be requested to let a piece or two of your freshman's clothing out at the waist a little — "just to be safe."

A matter of great concern to parents is the fear, often expressed by a son or daughter, of **FAILING EVERYTHING**. Hardened upper-classmen have seen their share of 30 and 40 percents, but freshmen tend to be much more melodramatic about those things. Your freshman probably expended much time on Interhouse, and then felt guilty and annoyed because the math problems due the next morning weren't the snap that math problems used to be. When you phoned to see how things were going, you were told flatly that your freshman is **FAILING EVERYTHING!**

Don't panic. Your son or daughter is trying to transfer frustration to you. Discovering how hard science can be, while simultaneously discovering how much fun rowdy dorm life is, is dreadful for a freshman. It's comforting to have parents feel alarm because one is failing — and it's hard for parents *not* to feel alarm when paying \$10,000 in tuition and housing.

If your son or daughter reports getting two out of five on a quiz, don't panic; those two problems were real doozies. Caltech is a tough place, and that's why some rational person put freshmen on a pass-fail basis. Professors here really want to see every freshman pass everything (they know they'll get them on grades as sophomores and juniors). A student has to actively miss classes and not attempt homework to fail; just the fact that your freshman is anxiously listing every score earned all term indicates a level of effort that should assure solid "passes" in almost everything.

If your freshman *should* fail a class, it's not time to climb the Transamerica building and end it all; students who fail are in the best of company. Some of the nicest people you meet on campus have at least failed a frosh humanities course. And the administration here has a fair amount of wisdom and tolerance; they know the students here can be incomparably brilliant and therefore often incomparably flaky.

Caltech students tend to be overly self-critical, and one of the most important lessons for students to learn on the campus is to reward themselves for something as small as half of a problem well done. Over the summer I met a tenured professor in high-energy physics from Princeton University who spent eight years at Caltech — four as an undergradu-

ate, four as a graduate student. Reminiscing, he said, "The first thing I learned when I got to Caltech was that I wasn't as smart as I thought I was. The second thing I learned was harder to accept: I wasn't as dumb as I thought, either."

His words express a common experience because one of the greatest struggles for students here is to believe in themselves. If you ask your freshmen how they're doing, the response may suggest confusion: "I got a C+ on my chemistry midterm, but I learned more in those five weeks than ever before in my life. Does that mean I'm doing well?"

Enough of schoolwork. It's important to keep in mind that your freshman will be living at Caltech between the ages of approximately 18 and 22. A lot of things — many of them unscientific — are supposed to happen to human beings during those years. It's your job to help make sure your son or daughter grows into someone other human beings will want to live with. The most brilliant mind will shrivel up and go to waste if not relaxed when necessary. Your freshmen will get lots of tries at understanding Maxwell's Equations, but when will they be 18 again?

Chances are, your son or daughter will experience enough woe as a freshman to fuel hours of potential depression. One of the tricks of surviving Caltech is to turn those hours when they can't deal with one more problem on boundary conditions into hours spent in some emotionally rewarding, culturally enriching, or at least physically tiring activity. I'm a physics/literature double major, and have played volleyball for four years; I also have a work/study job improvising on the piano for a modern dance class.

What I'm telling you is that you will never need to worry that your son or daughter won't learn enough science here. But do make sure that they experience non-scientific things as well. Caltech has teams in football, basketball, water polo, men's and women's soccer, swimming, volleyball, and cross country. For the more eclectic, there is fencing, karate, cricket, and modern dance. For the cultured, there is drama, glee club,

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James Michener's novels (*Hawaii*, *The Source*, *Centennial*) have generally encompassed time frames ranging from hundreds to millions of years — and their actions have taken place in exotic settings throughout the world. In his most recent novel, Michener deals with a time frame of only 40 years — but on activities focused billions of miles beyond the earth's surface into outer space.

Called *Space*, the novel is based on the activities of NASA from 1944 through the 40 years that follow, and Caltech comes in for its share of mentions. For those who may not read the book, we're reprinting this excerpt:

A committee reviewed the entire personnel of the new agency and winnowed the possible candidates into two groups. The first were those younger men who had already demonstrated outstanding intellectual capabilities in getting their master's degrees in various good engineering schools and who could be relied upon to handle the advanced work for a doctorate. High on this list was Stanley Mott: B.S., Georgia Tech; M.S., Louisiana State, IQ 159, lifetime grade average, 3.89.

"We've talked with the men at Cal Tech," the older man in charge of the Program Doctor Rush informed Mott when the latter came to Washington, "and they tell us that their program normally takes three years."

"Beyond the master's!" Mott gasped.

"This is the top school in the nation, maybe the world. They don't throw doctorates around."

"I don't want to drop out for three years. In that time we could be on Saturn."

"That's what we said. We showed them your record. The nine research papers you've already done — on the upper atmosphere, ablation, bringing a blunt-nosed body back through the friction belt — satisfied them that you're well beyond the average doctorate level right now."



"Did they listen?" Desperately Mott wanted to spend a year at Cal Tech, for in his advanced work at Langley and Wallops Island, and especially during his studies of ablation in California, he had seen that much of the really powerful thinking being done in these intriguing fields stemmed from this small, tight, distinguished center of learning in Pasadena. To share this high intellect, to stand beside these brilliant men as they wrestled with the arcane new concepts, would be a privilege, and he would undergo any hardship or embarrassment to get such an assignment. He would even plead for a chance.

"The difficulty is," the personnel man said, "that what we want you to specialize in is the most arduous field they have, celestial mechanics, what holds the universe together and makes it run." He stopped to allow this startling assignment to sink in, but as soon as he heard the phrase celestial mechanics Mott's heart skipped a series of beats . . . To be

allowed to grapple with those secrets! To be one of the handful who comprehended the structure of a galaxy or the behavior of atoms at the outer edges of space!

"I'd volunteer to spend the three years for that," he said quietly.

"Maybe there's no need."

"Oh, but I'd like to try!"

"We've had substantial discussions with them and they're willing to make a concession . . . If you work hard and are able to maintain the level of studies you've already done with us . . ."

"I will." He was a learned man, one of the best in his field, 41 years old, but he was pleading like a Boy Scout who wanted to attend summer camp. "I can work, you know."

"They say that perhaps you can handle the material in two years."

. . . Rachel was enchanted by the news that her husband was going to get his doctorate; she had often felt that he was far more learned than most men who had the degree, but her brief time at NACA had demonstrated how even a good man could find himself at a disadvantage because he lacked a doctorate. The two boys were delighted at the prospect of living in California and studied maps to see how far Cal Tech was from the beach. They were not disappointed . . .

Rachel's mother . . . when she heard of her son-in-law's implied promotion told the social leaders of her city:

"Rachel tells me that NASA realized it needed some of its own men to be trained in celestial mechanics . . . what holds the Sun in place, and wouldn't we be in a fix if it lost its place and dragged us around the universe in its fiery tail?"

"Well, it's a relief to me, I can tell you. I mean Stanley, not the Sun. It's not pleasant to have to admit you have a son-in-law who went to Georgia and Louisiana. But I do wish he was taking his doctorate at a school of real distinction, like Harvard or MIT. Who ever heard of Cal Tech?"

Sandra Loh on Caltech freshmen

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instrumental ensembles, Baxter Art Gallery, piano instrumentation, and top-quality events in Beckman Auditorium. As far as humanities goes, you can take some excellent liberal arts courses at Caltech.

In closing, I want to make a warm mention of an institution of which I am a member, The Caltech Y. The Y is a non-profit, on-campus institution that exists solely to enrich the students' lives. The Caltech Y sponsors programs at little or no cost to the students — decompression, evening concerts, guitar workshops, backpacking, skiing and sailing trips, speakers on stress, sexuality, theology, politics and dreams, and things like body relaxation and whale watching.

We also have more mundane but quite useful things like a used book exchange, a lost and found, a Xerox machine, and rentable camping gear. Literally anything a student could need can be had at the Y — and if the Y doesn't have it, the folks at the Y are happy to find it for you.

Finally, I wish parents of Caltech freshmen good luck in the next four years, for you will need it. Though Caltech is undoubtedly challenging, strenuous, and uncompromising in quality, if you make it through, the rewards are great. Thank you.

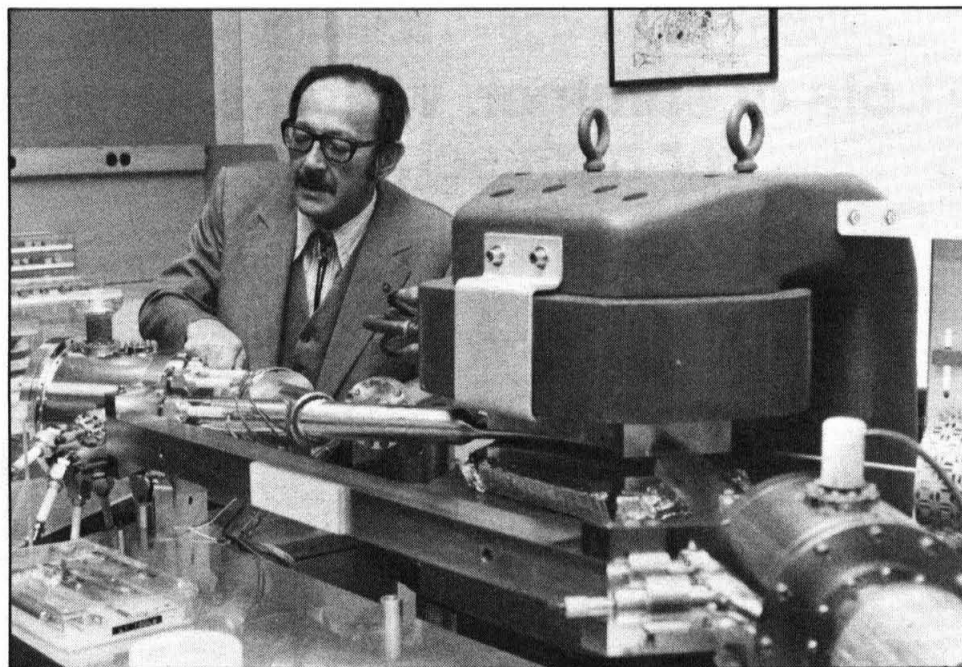
A decade ago last December the last precious sample of dusty gray-brown stone was lifted from the sun-blasted surface of the moon. On December 11, 1972, the Apollo 17 lunar module *Challenger* had been expertly piloted to a landing at Taurus-Littrow by Commander Eugene A. Cernan and by the first and only scientist-astronaut to visit the moon — Harrison H. Schmitt (BS '57). Schmitt and Cernan gathered 243 pounds of lunar rock on their 76-hour stay, bringing the lunar harvest from the Apollo program to slightly over 845 pounds.

Since then, scientists around the world have picked their way painstakingly through those samples, subjecting tiny particles of the material to an enormous range of chemical and physical tests. Among the most notable of these analyses have been those by researchers at Caltech's famed Lunatic Asylum, led by MacArthur Professor of Geology and Geophysics Gerald J. Wasserburg.

By subjecting carefully chosen grains of lunar rock to isotopic analyses using specially constructed mass spectrometers, Wasserburg and his colleagues have revealed much about the age and early history of the moon. For instance, they first showed the moon to be about as old as the earth, 4.5 billion years. They did this by precisely measuring the decay products of such radioactive elements as rubidium, uranium, and samarium.

Although the moon rocks do not contain diamonds or gems, they have proved as beautiful as the most exotic gem collection to the scientists studying them. Their many facets have told researchers a myriad fascinating stories, including:

- how the moon's crust and interior formed and chemically differentiated from an immense ocean of magma,
- how the moon formed from material depleted of water and other volatile elements,
- how its surface was splattered by an intense bombardment by meteorites 3.9 billion years ago,
- how volcanic lava flows spread thin layers of molten rock across the lunar plains for only a short period, terminating 3 billion years ago.



In the Lunatic Asylum on campus, Gerald J. Wasserburg uses a mass spectrometer to "count" the atoms in a sample of lunar rock. After preparation, the sample is placed into the spectrometer and heated to 2,800 degrees Fahrenheit in a vacuum to evaporate the atoms and convert them into ions. These in turn are converted into ion beams which are recorded as computer signals. The ultimate goal — after a process that may take an entire day — is to define the age.

The last moon rock

by Dennis Meredith

Besides their considerable scientific value, the moon rocks served to bring together researchers from a variety of disciplines. Caltech geochemist Dimitri Papanastassiou, a pioneer along with Wasserburg in the Lunatic Asylum work, explains: "Basically the lunar samples served as a focus for research for people in many different disciplines, including planetary geophysics, geochemistry, isotope specialization, geologists and many others. The net result of this collaboration was bigger than what would have happened if these people were working by themselves."

"This communication has remained and a great many of these relationships are continuing now in meteorite research. These studies are yielding insight into the very early formation of the solar system, and they're much more inclusive than if individual disciplines were attacking the problem."

And finally, said Papanastassiou, the techniques used in analyzing lunar samples have been applied directly to studies of the earth's evolution and the study of oceanography.

"A number of laboratories, including ours, are now using measurements of samarium and neodymium isotopes in terrestrial rocks to study the earth," he says. "These measurement techniques were first developed

a half-dozen years ago as part of the research in lunar samples. Now, they have revitalized studies of the course of terrestrial crustal evolution for the last 3.8 billion years and how the mantle of the earth has evolved. Work with neodymium in the last two or three years by Wasserburg and graduate student Donald Piegras has led to a method that can distinguish between waters from the Atlantic and Pacific Oceans by using isotope measurements. Thus, we can now study the evolution and mixing of the oceans in a precise way, using stable isotopes."

Perhaps one of the most remarkable tributes to the moon rocks — or more aptly to the scientists who study them — is that even after a decade of analysis, the lunar samples are still revealing information about the earth's closest companion. New techniques and new ideas are continually refreshing the effort to study lunar samples. Chemical separation methods and isotope analysis by mass spectrometry have steadily evolved, enabling scientists to study more subtle isotopic differences.

But despite the promise of further information, the rate of discoveries from lunar sample analysis has slowed, even at the Lunatic Asylum. The reasons for the slowing offer a good lesson in the vagaries of science. Papanastassiou describes the difficulties in one particular area, that of finding evidence for the first one-

half billion years of the moon's evolution: "We sit down and work with samples that are the most complicated rocks in the collection, and try to identify specific clasts (inclusions) whose petrologic and chemical characteristics have the biggest chance of taking us back to the moon's early history."

"After that, there's the really detailed work of clast extraction, crystal extraction and mineral separations, and the isotopic analysis that will tell, in fact, whether the material we are working with is old — whether it's really preserved in a reasonably pristine condition so that the isotopic relationships can be really interpreted in a straightforward way to yield needed age information."

"We may find that, although our sample may have been nice and pristine some time ago, it has since been so bashed or remelted that we cannot recognize its earliest beginnings. The analysis becomes much harder the farther back we try to go in the moon's history. The preserved samples are much smaller and harder to analyze."

"Nevertheless, our analytical techniques have improved, so the problems which require sample analysis on a micro-scale are doable, and they are going to be done. The problem is always to determine when such projects are going to be phased in, and when the right person will become available who has both the desire and the technical skills to do them." And ironically, says Papanastassiou, even though the moon rocks were obtained in a massive effort, and even though valuable scientific insights are still locked within them, funds for their analysis have seriously eroded. This shriveling of support affects more than just salaries and equipment budgets, says Papanastassiou. It also dampens the spirit of the research effort.

"When levels of support are reduced it's hard to find students who will become interested in these problems," he says. "Most students are reasonably conservative in their choice of research topics, certainly more conservative than their professors. This is partly because they're in their formative years, and they expect the scientific area they enter to be reasonably well supported, to have lots of excitement, and maybe even to last a few years after graduation. So, the prospect of working in what might appear as a slightly mature area of science such as lunar sample analysis does present a problem to students."

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Caltech's challenge to scientific illiteracy: Lots of summer, winter science for high schoolers

By Winifred Veronda

Paul Lee, a high school senior, is auditing freshman math, physics, and chemistry, and Computer Science 112, at Caltech — in addition to taking four courses at Arcadia High School. "I'm treated just like a regular student," he says of the Caltech classes. "I do all the homework assignments and take all the tests." He has applied for admission to Caltech next year and hopes, through placement tests, to be given advanced standing.

Lee wants to major in mathematics and computer science, and earn a PhD. Eventually he would like to become a professor, "perhaps at Caltech."

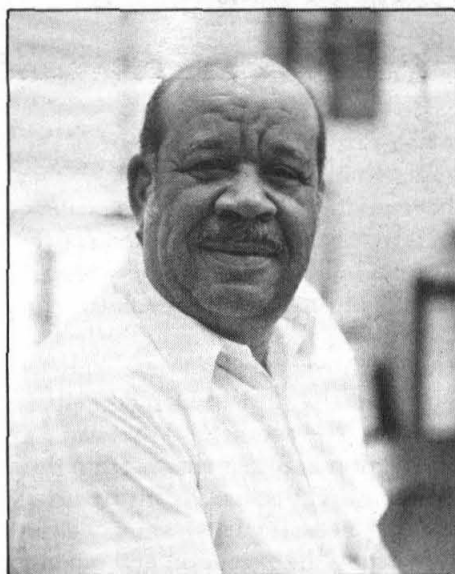
Lee is bright and highly motivated, but there is more than this behind his success. He enrolled in the sixth grade in Caltech's Secondary School Science Project, and took courses consistently during both the winter and the seven-week summer program — covering algebra, astronomy, physics, chemistry, and advanced geometry, among others. Last year he tutored a Saturday high school course in computer science, and this year he is teaching a course in physics.

Not all participants in Caltech's programs for high school students have achieved such distinction, but Lee Browne believes the classes are making their contribution to lessening scientific illiteracy in our country. Browne, who is director of secondary school relations and special student programs, came to Caltech in 1969 and, under his leadership, the courses have grown to enroll nearly 400 students. Most of them are from southern California, but young people arrive for the summer program from all over the country.

Given the state of science education in the United States, an enrollment of 400 is at least a contribution toward making a bad situation better. "We are at our worst level in modern times where science education is



Byron Gutierrez tutors a computer science class, part of Caltech's Saturday program for high school students.



Lee Browne heads Caltech's Secondary School Science Project.

concerned," Browne says. To back up his point, he notes that the Cal State Long Beach department of education — known for its quality — has provided one certified high school physics teacher during the last five years. "Graduates in physics," he observes, "are going into industry where they can make \$7,000 a year more than they can make in education."

Continuing to stress his point, Browne points out that there are 16,000 school districts in the country but only 16,000 certified mathematics

teachers, 12,000 certified chemistry teachers, and 10,000 certified physics teachers. "Forty-three percent of our states indicate a shortage of math and physics teachers — and the percentage is worse in schools with minority students predominating," he says.

To lure promising young people into science and math, Caltech, under Browne's direction, offers three programs. A Saturday series of courses during the academic year gives students in junior high and high school general background in 25 different subjects — from electronics to medical science to physics/trigonometry to human-powered vehicle design. No credit for the work is given.

"The Saturday program," says Browne, "is 40 percent exploration, 50 percent enrichment, and 10 percent remediation. We try to get seventh, eighth, and ninth graders to explore science and math by taking one course a year. The tenth, eleventh, and twelfth graders are established. They come to do heavy stuff — physics, calculus, trigonometry, applied chemistry."

The program accommodates everyone who applies. "But," says Browne, "students quickly learn that if they're not into working hard at science and math, this isn't a place to hang out."

The summer program runs six hours a day, four days a week for seven weeks. Taught by Caltech students, it immerses its participants in rigorous work in such core subjects as chemistry, physics, and physics/calculus. Students do a

week's worth of classwork per day, and are expected to complete at least three hours' homework, seven days a week.

"Students who earn A's or B's are recommended to their high school for 10 units of credit," Browne says. "We advise the ones who get C's to negotiate with their schools about credit."

Browne also runs a monthly science lecture series on Wednesday afternoons during the academic year for secondary students and teachers.

James Roberts, a high school senior living in Palos Verdes Estates, has been taking courses in both the summer and winter programs for two years, driving an hour each way to reach the campus.

"The classes have given me an enormous background," he says. "One of the courses (physics/calculus) wouldn't have been available to me until late in college. I'm enrolled in a physics course at my high school this year and I'm virtually co-teaching it; the students come to me all the time for help with their problems."

"The classes at Caltech have opened my eyes to how much scientific knowledge there is," he adds, "and what it takes to make it in the big time. The average high school science student has no idea of what it's like out there."

"The summer program is an incredible experience," he continues. "It demands heart and soul — but it can be very uplifting. What would I say to a student thinking about enrolling? I'd say, 'First make sure that you're committed to science and mathematics. If you are committed, you'll find out. And if you still want to keep going after you've completed the program, then you'll know you're in the right field.'"

Bryon Gutierrez, a senior at Kennedy High School in Granada Hills, came to Caltech for a summer program in pre-engineering in the ninth

grade. He earned an A, and stayed to take two winter and three more summer classes. This year he is tutoring a course in computer science and he plans to major in pre-medicine. He has applied to Caltech, but may enroll at Cal State Northridge and transfer later; his father's job is threatened because of recessionary cutbacks in his profession.

"In high school, the teachers expect you to *learn* the material," he says, "but here they expect you to *know* it. When I was in the ninth grade, my science teacher at Caltech made me feel like a college student, and I liked that."

Lee, Gutierrez, and Roberts are typical of the high school students who enroll in the secondary school program, do well, and go on to apply for admission to Caltech. "Last year," says Browne, "about 15 from the program applied to Caltech. Eight or nine of them are here now. This is about par for the course."

Browne visits some 200 high schools each year, explaining Caltech and its programs and attempting to lure students into science and math. The problem of scientific illiteracy among young people in the country is always on his mind. "The problem is not a function of race," he says. "You can get the same stupid answers to a science question in Brentwood that you'll get in Watts."

"We talk of the haves and have nots," he adds. "What I don't want to see are 'knows' and 'know-nots.'"

And, at least among those 400 high school students on the Caltech campus, "know-nots" are turning into "knows."

Eugene Shoemaker awarded Day Medal

Eugene M. Shoemaker (BS '47, MS '48), professor of geology and planetary science, who is with the U.S. Geological Survey as a member of the professional staff, has received the Arthur L. Day Medal, one of the highest awards of the Geological Society of America, for "very special distinction in contributions to research in geology."

The day the cake exploded

December 13, 1982, will be remembered in the history of Caltech's Athenaeum as The Day The Cake Exploded. The day of infamy that would end with angry Caltech officials and a frosting-spattered room began when a crew of filmmakers from Johnny Carson Productions set up to film in the Athenaeum main lounge. The comedian was doing a television special on practical jokes, and of course no such program

(Chip) Smith, Jr. (BS '70) came down from San Francisco to participate, and Harry B. (the Horse) Gray, chairman of the Division of Chemistry and Chemical Engineering, gave the faculty perspective.

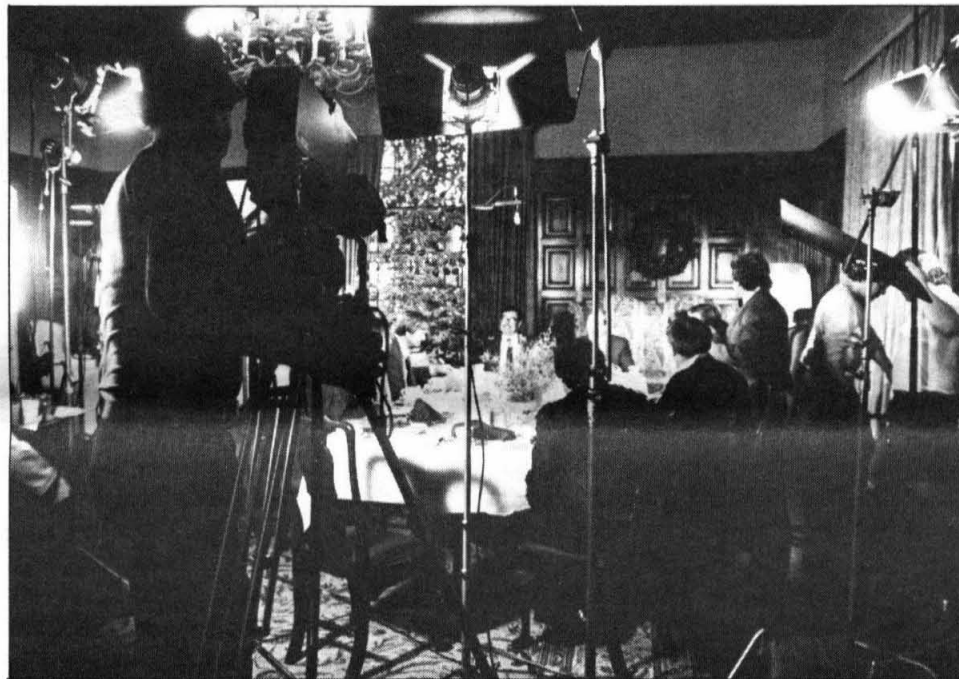
But unknown to the Techers and the Athenaeum management, the Carson crew had decided to turn the tables by playing a prank, in the form of a cake rigged with small explosive charges. When presented to

the luncheon guests had arrived. Rugs, furniture, floor, and ceiling were splattered with sticky confectionary, which the Athenaeum staff had to clean.

Undaunted, the NBC crew tried again after the luncheon with a second cake, this time outside. Their faces grew even redder when this cake failed to explode at all.

Carson Productions will be charged for all cleaning costs, plus facilities rental, but the duel is far from over. Observers say the Caltech students left the Athenaeum that day with a gleam in their eyes, talking of revenge on the Carson staff.

In any case, the television special is set to air in the spring.



Carson Productions films a discussion on Caltech pranks.

Parsons-Gates receives its first inhabitants

Administrative personnel now housed in the third floor of Millikan Library — including President Marvin L. Goldberger and his staff — will pack their belongings in mid-March and move to the second floor of the newly renovated Parsons-Gates Hall of Administration. Then, for the first time since the earthquake-damaged building was evacuated in 1971, the campus's now oldest (1917) edifice will have a permanent population.

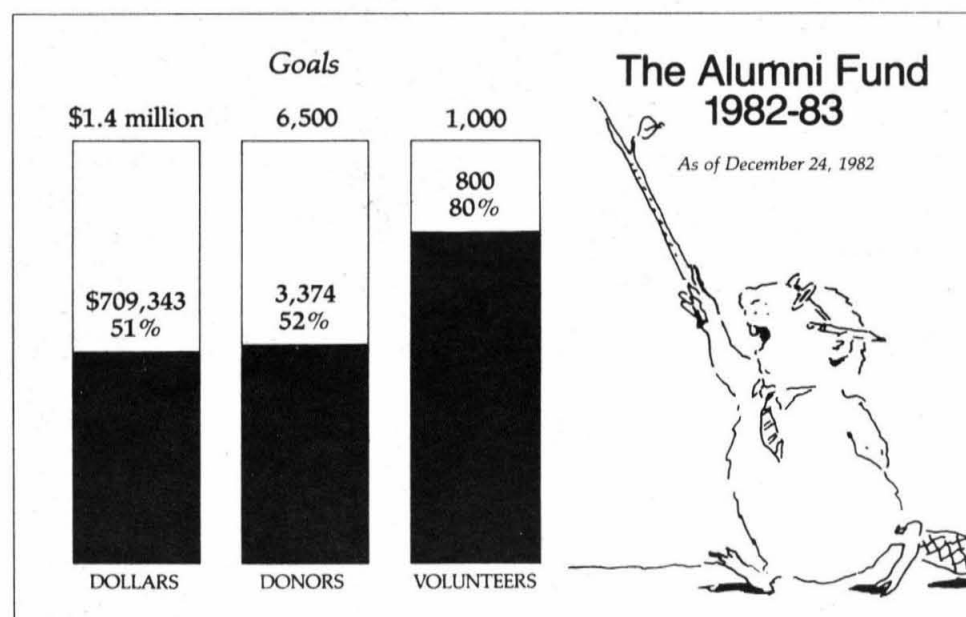
The administrative personnel moving in March will be followed during the spring and summer by the gradual migration of student services personnel from Dabney Hall to the ground and first floors of Parsons-Gates.

would be complete without a segment on the brilliant pranksters at Caltech.

So the Caltech News Bureau was asked to round up students, faculty, and alumni for a luncheon at which they would talk about Caltech's history of pranksterism. Adrian C.

the group as a token of appreciation, the cake was supposed to erupt in their faces.

It was a foolish plan considering the havoc it would wreak in the Athenaeum main lounge, but it went even further awry when the cake exploded prematurely, before any of



"Caltech voices" reach the Soviet Union and the Rudins find a new home

By Winifred Veronda

"Our Voices Were Heard," read the invitation to a reception at the home of Caltech Professor Aron Kuppermann for Berta and Yakov Rudin — Jewish residents of the Soviet Union who for five years were denied the right to emigrate from the Soviet Union.

The invitation came from the Soviet Jewry Support Group at Caltech's Hillel Foundation, and it represented the fruition of five years of effort in behalf of the parents of Leonid Rudin, a Caltech graduate student in computer science. During those years, members of the support group, their friends, colleagues, and family members, sent some 400 letters to persons in the Soviet Union, petitioning for the Rudins' freedom.

The letters were part of a worldwide effort in behalf of the

The worldwide effort on behalf of the Rudins called forth more than a thousand letters.

Rudins that called forth more than a thousand letters — including ones from such public figures as Caltech President Marvin L. Goldberger, entrepreneur Armand Hammer, and Congressman Robert Dornan.

The journey that eventually brought all four members of the Rudin family together in the United States began with the decision of Lenny Rudin and his brother, Sergey, to petition for exit visas to leave Russia. Graduates of universities in the Soviet Union, they were blocked, as Jews, from opportunities to go on to graduate school or to work in jobs equal to their training.

Their applications to emigrate brought the usual response in such situations: They were fired. But the Rudin brothers were lucky. The political climate was right for ges-

tures of generosity, and after six months, they were permitted to leave the country. Both arrived in Boston where they had friends, and they enrolled in graduate studies — Lenny at the University of Massachusetts and Sergey at Brandeis University.

Lenny studied English in a special summer program at Harvard, dipping deep into a large Slavic languages department section in the Harvard library and reading books by Solzhenitzsyn and other writers to whom he had not had access in the Soviet Union. He saw Solzhenitzsyn in person when the author delivered his famous lecture on the Harvard campus.

"I love the United States," Lenny says, "... the freedom! Here, for the first time, I could feel myself to be a normal human being, and not an untouchable because I am Jewish."

Lenny came to study at Caltech while his brother remained on the East Coast in a PhD program in physics at Brandeis University. Lenny had heard of Caltech in Russia. He had seen Feynman's *Lectures in Physics*, translated into Russian, and he knew of Caltech's reputation as a "world science center."

When Lenny and Sergey applied to come to the United States, they hoped their parents would soon be able to follow. But internal policies on emigration tightened, and Berta and Yakov Rudin were consistently denied requests to leave. Meanwhile, both were fired from professional positions of long duration — Berta as a medical doctor and Yakov as a marine engineer.

But losing their professional status and incomes was only the beginning of difficulties for the senior Rudins. Mrs. Rudin, who suffers from a serious heart condition, was denied access to medical care at the hospital where she had worked, and was put on mock trial in front of 200 of her former co-workers, accused of being "the mother of two enemies of the state."

Now without jobs, the Rudins were in violation of a rule that citizens of the Soviet Union *must* work or be deemed "parasites of the state,"

and as "parasites," they were subject to regular harassment from Soviet officials. Consequences could have been banishment from their home in Odessa to a small town, or to Siberia, or even imprisonment, according to Lenny Rudin.

After periodic visits from officials, Mrs. Rudin would carefully search their apartment, concerned about the



Lenny Rudin has been reunited with his parents after a six-year separation — thanks to a massive letter-writing campaign that originated at Caltech.

practice, sometimes used in cases such as theirs, of planting subversive material and returning later to "find" it.

Perhaps even more painful than the harassment was the isolation inflicted on the Rudins for their decision to emigrate. Friends and relatives avoided them for fear of reprisals, their landlord threatened to evict them, and the Rudins found themselves virtually alone. For a time, Mrs. Rudin was bedridden.

Their sons wrote regularly, but an estimated five out of six letters were waylaid. The Rudins spent their time studying English and coping with continuing demands for documentation to support their requests for departure.

Potential emigrants from the Soviet Union must collect several documents, including permission of parents — no matter what one's age. Yakov Rudin would have needed "permission" of his 90-year-old mother; she died before his emigration.

Approval from one's employer and landlord, and paper from one's republic, are necessary — as are (for

refuseniks) immigration invitations from Israel or the United States. Each refusal necessitated additional documents. The Rudins had acquired six immigration invitations by the time they were permitted to leave, including an official invitation from the U.S. government.

Meanwhile, in the United States, the support group at Caltech continued to write letters, some individuals writing as many as 100. Lenny Rudin attributes much of the eventual success of the group to the "tireless work" of research associate John Zipkins. The members contacted colleagues at Caltech, and letters went to the Soviet Union from President Goldberger, faculty members, postdoctoral fellows, and students. Because Caltech is an international community, letters went to Russia from family members in several foreign countries.

The group became skilled in the techniques of conducting such a letter-writing campaign. They wrote

The group wrote not only to top officials but to middle- and lower-level individuals including persons with no direct connection to the Rudin's situation. Party members at these levels are not supposed to know about the refuseniks.

not only to top officials, but to middle and lower-level individuals in the bureaucracy, including persons with no direct connection to the Rudins' situation. "We would have written the director of the local shoe store," says Lenny, "but we didn't have his address." Party members at these levels are not supposed to know anything about the refusenik's situation, and the KGB prefers to keep it that way, according to specialists in the field.

They also wrote to public figures who function officially as good-will emissaries for Russia, and who, in a controlled society, may have limited insight into the plight of people like the Rudins.

They learned that the use of duplicating machines is controlled in the Soviet Union, and that, to a Soviet

bureaucrat, a Xeroxed copy looks more official and impressive than in the U.S. They perceived that, in Russia, policies require that letters from outside the country — particularly when typewritten or duplicated — must be translated and read. "In Russia," says Lenny, "there is no junk mail."

Perhaps the absence of junk mail in the Soviet Union is why the senior Rudins are now in the United States. Lenny Rudin reasons that it may have been easier — and less expensive — for the Soviets to allow his parents to leave than to continue to monitor and translate a deluge of letters. He says that his father, when informed that permission to leave had been granted, was shown a file containing perhaps a thousand letters, and was told that they were the reason why the departure would be permitted.

After years of waiting, emigration permission for the Rudins came abruptly last July when they were given seven days' notice to leave the country. Initially they were told they would be given plane tickets to Vienna, but at the last minute they were informed they would go by train. They stood during most of the journey, which took them from Odessa through Moscow to Czechoslovakia and Vienna, and finally to Rome. There Mrs. Rudin was hospitalized more than a week before flying to the United States.

Finally, in September, they were reunited with their sons in Los Angeles. Here they were welcomed into the community of friends who had worked so hard to make their arrival a reality. Said Mrs. Rudin at the reception, "I feel as if I have always lived here."

Meanwhile, the Soviet Jewry Support Group continues its efforts on behalf of other Russian Jews, forging ahead with campaigns in behalf of Boris Chernobilski and Gannady Khassin. Rabbi Michael Perelmuter, advisor to Hillel, underscores the value of their efforts. He says, "An attitude exists that the Iron Curtain is too tight [for Americans] to do anything [about refuseniks]. This attitude can be paralyzing." The experience of the Rudin family seems to prove that — when this paralysis is broken — concerned citizens here can do a great deal, indeed.

How two great oceans mix

In the storm-tossed Drake Passage between South America and Antarctica, two great oceans come together. In this region, named after its discoverer, Sir Francis Drake, the waters of the Atlantic and Pacific are sucked into the great Antarctic Circumpolar Current, a clockwise swirl of water that circles the continent of Antarctica. Until now, scientists have had no quantitative way of determining how their waters mix when the oceans come together.

But now, two Caltech scientists, Donald J. Piepgras and Gerald J. Wasserburg, have developed a method of obtaining an isotopic signature that distinguishes Atlantic from Pacific ocean water. In a recent article in *Science*, they describe the application of their technique to the discovery of how the two oceans merge. (Piepgras is a graduate student; Wasserburg is the John D. MacArthur Professor of Geology and Geophysics.)

Their study is based on their discovery in 1979 that the waters of the Atlantic and Pacific are distinctly different in measures of the ratios of two isotopes of the element neodymium — those with atomic weights of 143 and 144. (Isotopes are elements with the same chemical properties, but slightly differing weights because of a difference in the number of neutrons in their nuclei.)

The key to the difference between the two oceans lies in the different kinds of terrain through which their feedwaters flow. Ancient continental terrains are characterized by lower abundances of neodymium-143 than are younger volcanic terrains, such as those surrounding the Pacific.

In general, since some 70 percent of the world's continental drainage flows into the Atlantic, its waters extract material from older geological formations than do the waters of the Pacific. Thus, the ratio of neodymium-143 to neodymium-144 is lower in Atlantic than in Pacific waters.

Using an isotopic signature to distinguish between waters from the

Atlantic and Pacific Oceans supports previous findings by two Caltech scientists — Tsaihua Chow (now at Scripps Institution of Oceanography) and Clair Patterson (senior research associate). These scientists studied the ratio of lead-206 to lead-204 in marine sediments, and found that lead in Atlantic waters reflects an older continental source than lead in the Pacific.

But industrial lead contamination in the last century has made the use of lead isotopes somewhat ineffective as a tracer to distinguish between the waters of the two oceans.

Normally, ocean mixing might be expected to homogenize the neodymium in the two bodies of water. But the Caltech geochemists found that neodymium stays in ocean waters only a short time before settling onto the bottom. The neodymium in the water is constantly being replenished by runoff from the continents.

To apply their technique to the waters of the Drake Passage, Piepgras embarked in the fall of 1980 on a cruise with the research vessel *Atlantis II*, which is operated by the Woods Hole Oceanographic Institution. He collected samples from four spots within the Drake Passage and the southeast Pacific. To extend their data base, the scientists also used samples collected in the central Pacific by UC Santa Cruz scientist Kenneth Bruland.

Then they measured the isotopic composition of the samples using a mass spectrometer, which separates elements according to their atomic weights. The analysis was done at Caltech's Lunatic Asylum, well known for its studies of lunar samples.

"Because of the eastward transport through the Drake Passage, we expected to find Pacific signatures in the neodymium isotopic composition of water flowing through this region," wrote the scientists.

But instead, Piepgras and Wasserburg found the Drake Passage samples to have neodymium ratios indicating that about 70 percent of the water in the Antarctic Circumpolar Current originated in the Atlantic Ocean. Thus, the scientists concluded that the giant whirlpool acts mainly to draw water from the Atlantic, which it then spreads to other ocean basins and recirculates back into the Atlantic.

The scientists calculated that the overall rate of exchange between the Pacific Ocean and southern oceans was as much as 33 million cubic meters per second. At this rate, it would take at least 800 years for the two oceans to completely exchange.

The last moon rock

Continued from page 5

However, Papanastassiou and his colleagues are hoping for a continuing lunar study program, with funding for studying already gathered lunar samples, as well as for launching new probes. These new unmanned missions might include lunar polar orbiters and sample-return missions from the poles and the far side of the moon. They would all produce surprises, if the past is any guide, says Papanastassiou.

"Every Apollo mission had its own little surprise. Besides the local geology that prompted a landing site to be chosen, each site had some material that was thrown in from some distance, so that inferences could be made about a much wider area of the moon." On Apollo 11, which landed in a low-lying mare, astronauts found a few fragments of anorthositic materials from which geologists inferred that there was an ancient anorthosite or a plagioclase-rich crust on the moon. In later landings, this was found to be correct.

"On Apollo 12, the astronauts returned this unique rock that was very rich in radioactive elements and from which, along with the samples from Apollo 11, we inferred that there was an early differentiation of the moon which resulted in the formation of crustal materials very rich in all the incompatible elements, elements like potassium, uranium, rubidium, and others, that could be used for dating. This inference was strongly substantiated by samples from the Apollo 14 landing site."

"On Apollo 15, there were some green glass balls found that were particularly magnesium-rich and which appear to be materials that originate from deep inside the mantle of the moon. On Apollo 17, there was a lot of excitement about the orange glass spherules that were found. The material when first seen was thought to be very young material from recent volcanic eruptions, but it turned out to be 3½ billion years old. Yet its lead isotopes had characteristics that were totally different from anything else on the moon."

Eventually, lunar researchers hope to see permanent, manned bases on the moon, which would allow, along with a huge number of research and development efforts, extensive long-term lunar studies. Perhaps then such major questions as the moon's origin — Was it formed independently, captured, or torn from earth? — could be answered.

But until then, the decade-old cargo of moon rocks will have to be ingeniously analyzed for the tantalizing hints it contains.

Two decades ago, Engineering & Science ran an article, commemorating the construction of three new student houses, about the original four houses and their characteristics. We liked the idea, and asked Julian West, editor of the California Tech, to provide alumni with a student's-eye view of the seven undergraduate houses in their current state of evolution. West, a member of Ruddock, has graciously agreed to take all the flak.

By Julian West

The houses are in many ways the center of student life on campus. House rivalries extend from athletic

Dabney

Twenty years ago, Darbs had a reputation for being gentlemen. Perhaps this is because this was only the beginning of the sixties, and Darbs had not discovered a more uninhibited lifestyle. Today, they are anything but gentlemen. This is not to say that they aren't polite; it's simply that they have no cultivated social behavior. Dabney is far and away the most laid-back and relaxed of the houses, and is relatively careful not to impose any of its feelings on its house members or the outside world. Not a generally popular house at rotation, Dabney attracts a particular species of Techer who seems to belong there.

Fleming

The Flems are the obnoxious ones. Flems wear red shirts with white F's on them, and they look down on the

rest of humanity. They function as a single organism, and that organism is determined to win.

This view of Fleming is prevalent, and in some ways accurate, if a little unkind. Whether they want it that way or not, Flems are members of a house apart, since theirs is the only one that other houses are united in despising. In reality, most Flems are

tionally wins the Discobolus and Interhouse trophies. Unfortunately, there is not a whole lot more to say about the Page boys. Fleming hates them, but only because they beat the Flems in a lot of sports. There really isn't much to like or dislike about Page House. Page has a few house traditions, like the Greased Frosh races and the ride at Interhouse, but



Page House pulls together to offer Interhouse patrons a boat ride down a jungle stream.

A guide to the student houses

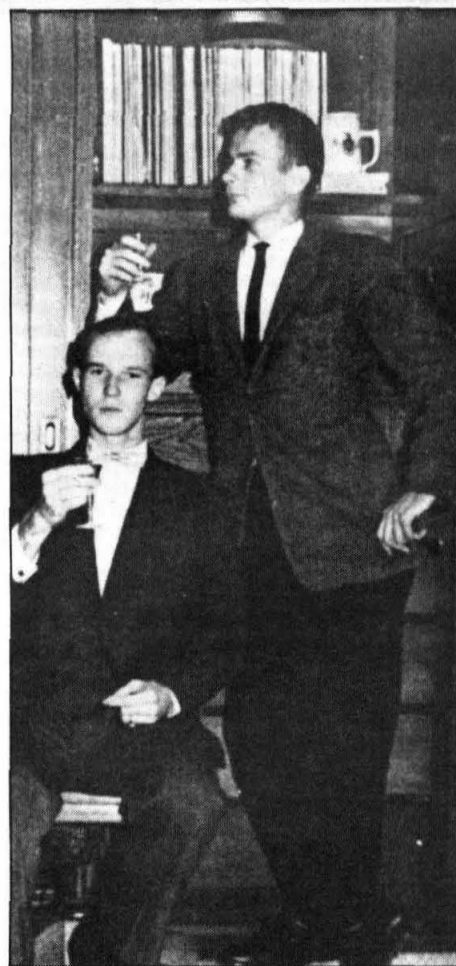
Ricketts Rowdies, Rudds, Big Reds . . . California Tech editor Julian West casts a sardonic eye on all of them.

competitions to the annual Interhouse party to showering wars and shouting contests. Most of it is taken in good fun, although occasionally house allegiances are so strong that tempers begin to flare.

Each house maintains a separate identity, but the stereotypes associated with a house are not always as accurate as they appear. Nevertheless, houses can be characterized, and I shall attempt to do so here.

Blacker

In some ways, Blacker is a bad house to start with, because there really isn't a lot to say about it. Attempts to classify Moles have included calling them trolls/workaholics, tunnelers, and lockpicks, but none of these descriptions really captures the spirit of the house. Now, as in 1960, Blacker is a house of non-conformity. It provides an environment unique in its lack of social pressures. Nevertheless, it maintains a group identity and spirit within its loose framework.



In 1959, Darbs were known on campus as gentlemen.

perfectly reasonable, and it is only when a group of troublemakers gets together that the perceived Fleming mentality takes over.

For all their unpopularity, their persistence pays off. Big Red trades off with Page to dominate campus athletics, and the unified front provides healthy support for house members. Fleming is one house never accused of lacking a spirit and identity. In some ways, Flems are superior.

Lloyd

Lloyd, on the other hand, is a house that has been accused of lacking an identity. Other houses have been hard put to pin a label on Lloyd, and attempts by the Lloydies to find one for themselves have ranged from "the house of spazmoids" to "wizards and compunerds" to the perennial "Lloyd sucks." Lloydies have had trouble finding a group identity partly because the house has been wracked over the past several years by internal dissent. Today, most of the problems lie below the surface, but the house is still divided into separate groups with little interaction.

Lloyd is at peace, however, and is still as good a place as ever to sit and have a conversation on almost any topic imaginable.

Page

The House of White Horses and Railroads is the dominant force in campus athletics. This house tradi-

these appear to be simply things to do rather than manifestations of house spirit as a whole.

Despite their athletic superiority, the Page boys are sportsmen. And, although they are competitive, they are much more easy going about house rivalries than are the Flems.

Ricketts

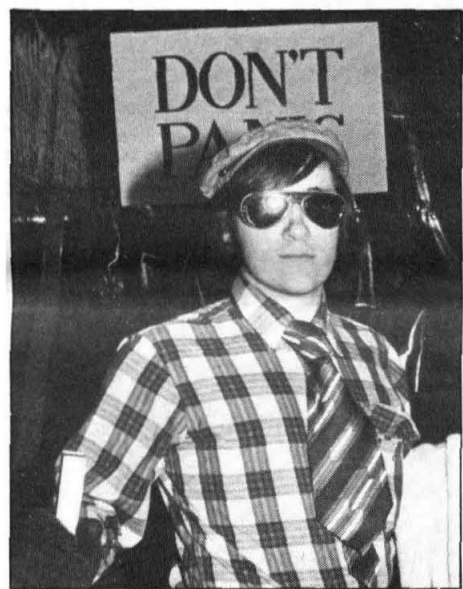
This is a strange house. Some people can't stand Ricketts, while others like it a lot. These reactions can, for the most part, be attributed to the house's fundamental characteristic, one that has remained virtually unchanged for 40 years: rowdiness. While nearly every other house seems to have either a dearth or a super-abundance of house spirit, Ricketts oscillates year to year, and sometimes day to day, between apathy and bloody screaming and

obnoxious hilarity. There is no deliberate pressure put on any member of the house to conform in any way, and likewise, nearly any sort of behavior is tolerated in the house. There is some peer pressure from the environment, however.

Many people see the Scurves as merely a bunch of drunken, obnoxious boors, but the truth is that there are many more reasonable people in the house than the other variety, although one sometimes wonders. In any case, there are an awful lot of Scurves and Ghosts (grad-turkeys and other alumni) around the house, making it an interesting place to live.

Ruddock

In some ways, Ruddock is an emergent house. But then, it's been that way for years. Ruddock is the third power in athletics, but always far behind Page and Fleming. The



This hitchhiker from Lloyd House, Paul Stankus, is on his way to the Restaurant at the End of the Universe. Location: Interhouse.

Rudds have more active house spirit, geared at getting out and doing things together, than do most of the other houses. This is an accomplishment for the largest of the seven houses, because achieving a common sense of purpose for more than 100 people is no mean feat. If only the Rudds would decide what they wanted to do once they got together, they would begin to go somewhere. Until then, Ruddock will remain a house of untapped potential.

1931

"Southern California inevitably has become the world's most suitable and famous center for astronomical studies, and similarly is becoming well known for researches into mathematics, physics, chemistry, geology, and biology, according to a vision projected by Robert A. Millikan before the California Institute Associates," reports the Pasadena *Star-News* on January 31. Millikan tells The Associates that the ten new buildings planned to begin construction within a few months have already been financed: three astrophysics, two geology, and one biology unit; the Athenaeum and three dormitories.

"Having been roundly scored by no less an authority than Hugo Kirchhofer (a well-known song leader) for lack of singing ability, the student body at Caltech is looking for a song worth singing," according to the *Star-News* on February 24. "The existing school song cannot be pepped up enough for the day when — as some people believe — the school contributes the 'West' to the East-West annual football classic at the Rose Bowl. The student body is offering a \$75 prize for the best lyric for which a 'well-known composer' will fit a tune for nothing," relates the *Star-News*.

One submission (in part):
We are the dirty engineers
The engineers that have no fears
But after all, we're proud to be an Engineer of CIT.
Old Noah built a mighty ark,
Laid the keel in Tournament Park.
Didn't know how to make it steer

[The Way It Was]

So had to call it an engineer.

It surely was a glorious day

We brought our books and came to stay.

But multiply that job by eight

Upon the day we graduate.

Caltech will erect 18 buildings in ten years; seven are under construction, and two more will start in two months, William B. Munro, a member of the executive council, announces, according to the *Star-News* on September 7. Munro says that the student body will be limited to 160 new students a year; the total undergraduate body to 500. Munro notes that no student is admitted except by rigid examination, and that Caltech is the only college west of the Mississippi River to enforce this provision.

1951

The Chemical Science Division of the USSR Academy of Sciences attacks the theory of chemical bonds developed by Linus Pauling as "pseudo-scientific," "vicious," and "an example of 'world outlooks hostile to the Marxist view,'" according to a Caltech News Bureau release. Four Soviet chemists who championed the theory are censured by more than 400 Russian scientific workers in a recent conference, according to a *Pravda* article translated and released in this country by the *Current Digest of the Soviet Press*.

Caltech leads all technological institutions in the nation in production of scientists and "occupies a class by itself," according to a survey sponsored by the Carnegie Corporation and reported in *Scientific Ameri-*

can. The five-year survey on the origins of American scientists was conducted by two members of the faculty of Wesleyan University in Middletown, Connecticut; the index by which they gauged performance was the number of men who were graduated from college between age 24 and 34 who were listed as PhD's in the 1944 edition of *American Men of Science*.

A Caltech professor casts a scientific eye on the Tournament of Roses crowd estimates and comes to the conclusion that it can't be, notes the *Star-News*. Estimates range from 1,500,000 to 1,750,000. Mathematician Albert Tyler asserts, "Just to have a million people at the parade, it would be necessary to have 40 rows of people on each side, all the way along the parade route."

Five civic groups file a formal protest with Caltech, charging that operations of the Jet Propulsion Laboratory are devaluing property, and urging that the lab be moved out of the urban area, according to the *Independent* on April 1. Administrator Val Larson estimates that moving the lab would cost between 30 and 40 million dollars and that by relocating in an isolated area, it would lose between 50 and 70 percent of its present personnel.

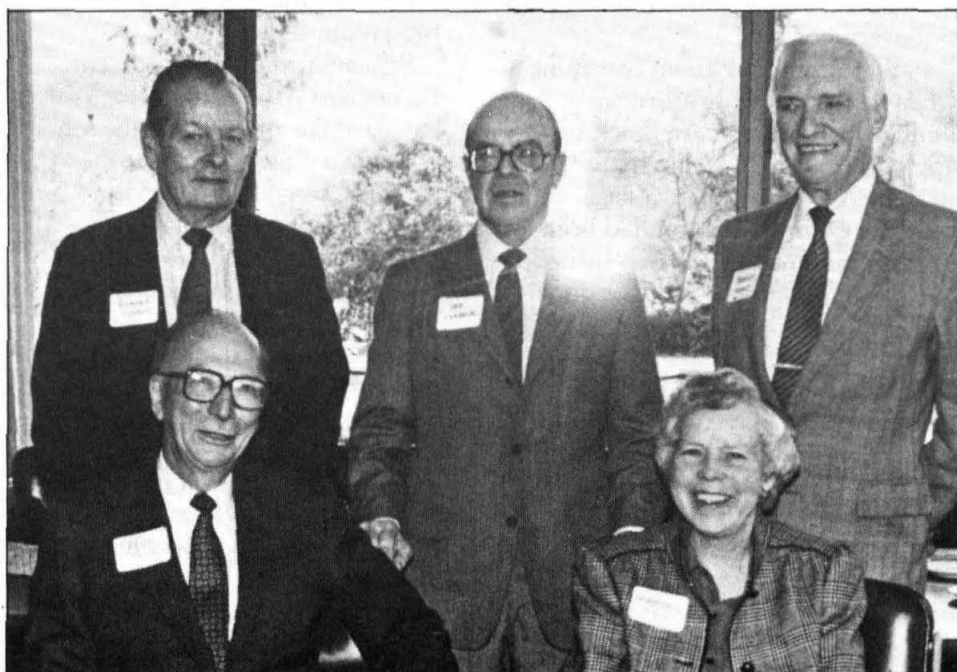
1971

In a survey of graduate schools of 130 U.S. universities, the ACE ranks Caltech first in the nation in effectiveness of graduate educational programs in astronomy, geology, physics, and developmental biology.

The new \$1.6 million Earle M. Jorgensen Laboratory of Information Science is dedicated on one of the warmest September 13's in Pasadena history — 109 degrees.

The Independent Study Program, thoroughly debated for three years, finds its way into the Caltech catalog as a new academic option. The program is designed to take maximum advantage of the intelligence and curiosity of Caltech students by allowing them to combine existing courses with self-scheduled studies to meet personal educational goals, according to the October *Engineering & Science*.

New Associates Executive Committee



New members of The Caltech Associates' Executive Committee: Standing — Richard L. Hayman (EX '36), secretary; Robert L. Zurbach, president; and Charles F. Thomas (BS '35), vice president. Seated: Ralph W. Jones (BS '38), treasurer; and Berneice Anglea, vice president.

Just in case you missed it

By Scott Ostler

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While UCLA and USC were battling before 95,763 fans and a TV audience in the zillions Saturday afternoon, another college football classic was taking place a few miles across town.

In their traditional season-ending Beer Bowl, the California Institute of Technology's battling Beavers were defeating the Valley Nomads, a semipro club, 21-7.

One reserve linebacker is a 46-year-old Caltech professor with a PhD in biology.

The school dropped football for one year (1975) when only 12 students tried out, but now as many as 40 hopefuls turn out each spring. Everyone plays.

Winning is not exactly a school tradition. Last year's team had the first winning season at Caltech in 51 years.

Football, however, is a school tradition. The season just completed was Caltech's 89th.

It was the third Caltech season for head Coach Boyd Church Linton Parker III. His friends call him Lin.

patient, I don't get mad and scream and yell."

Parker has five assistants, including a former Stanford class valedictorian, a real estate appraiser and a professor of Asian studies at USC.

There are two PhD's on the squad — the 46-year-old linebacker and a 27-year-old chemistry professor (since it is a club team, faculty and grad students are allowed to play). And when Parker sits down for coffee in the school cafeteria, he might find himself chatting with one of the faculty's nine Nobel Prize winners.

Yet Parker is not intellectually intimidated. He considers himself as

It's a low-budget football program ("If we can save a couple dollars by leaving the stripe off the side of the football pants, we'll do it"), but Parker and his staff scout opponents and study game films. They run well-organized, though necessarily short, practices. They take the sport seriously, but keep it in perspective.

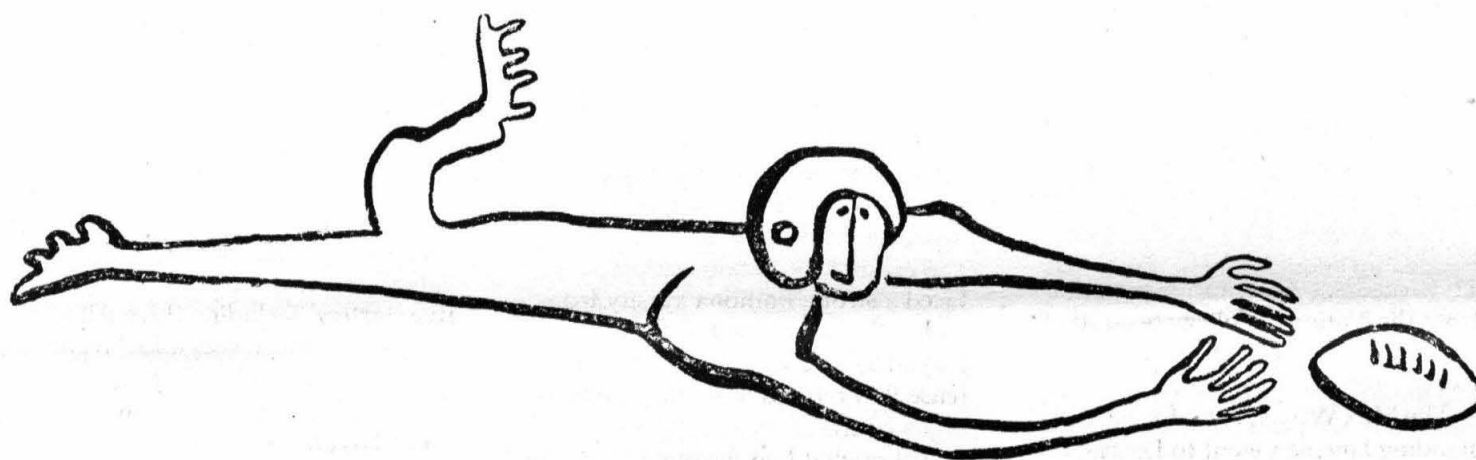
"We're here for the students," Parker says. "They're not here for us, to earn money for the program or the school. As long as there is student interest, we'll have a football team."

Bearcat Parker loves his job.

"You're dealing with great kids," he says. "You walk into the huddle, all the kids have IQs between 120 and 160, and you call the wrong formation, two guards and a tackle will correct you before the quarterback can."

"The kids who turn out for football here really have their lives organized, to be able to study as much as they have to and play football. When they enter industry, big business, government, they're going to be the leaders of the nation, you can just see that."

One way or another, the battling Beavers will be heard from.



Because admission was free and so was the beer, pop and candy, the Beer Bowl drew upwards of 270 spectators, more than double Caltech's average crowd.

The folks on hand saw their boys complete a successful 4-4-1 season. Considering the obstacles to winning football at Caltech, 4-4-1 is one of the most impressive records in college football. [Ed. note: the actual record was 3-4-1.]

Consider, for instance:

Nobody ever got an athletic scholarship to Caltech. Students are admitted on the basis of their brilliance in mathematics or science.

The majority of the players never played football, even pee wee football, before coming to Caltech. One of the starting guards, for instance, is a freshman who was involved last year in the football program at Taft High — as a statistician.

His players often call him Bearcat, a nickname he brought with him from his prior coaching jobs at high schools in Antelope Valley, Boron, Kingman (Arizona) and Bullhead City.

Bearcat Parker knew he wasn't invited to Pasadena to build a dynasty. He knew that the football team wasn't in a conference; didn't even play under NCAA sanction. For several years the Beavers have been a club team.

Parker found out about recruiting when he persuaded his former Bullhead City star quarterback to apply to Caltech. The lad had a straight-A average, high college entrance exam scores and had been a four-sport standout. Caltech turned him down because he had not done enough outside science projects. He is now a physics major at Arizona.

"I came here with my eyes open," Parker says. "I played semipro football for nine seasons and we played Caltech, so I knew what kind of program they had. I'm relaxed and

competent in his specialty as they in theirs.

"I don't give an inch to (Terry) Donahue or (John) Robinson," he says. "If we were to sit down, draw Xs and Os, make decisions and halftime adjustments, I feel I'm as good a coach as any of them."

He certainly faces challenges unknown to the Donahues and Robinsons. Parker had a 6-6, 238-pound tackle this year. He also had a 5-11, 140-pound center.

Scheduling can be a problem. Parker and Athletic Director Warren Emery make and remake the schedule as they go along. Last year the La Verne University JVs had to cancel due to a shortage of players, after trying unsuccessfully to borrow seven linemen from another college. This year the Tijuana Tech Greyhounds canceled due to financial problems. One year the Greyhound bus broke down on the way to Pasadena.

This season Caltech played five semipro teams, two small college JV teams, an Air Force base team and the Mexicali Tech Spartans, in Mexicali.

Plans fell through for games against the El Toro Marines and a team from the Tehachapi Youth Prison.

Winter sports warm in memories of coaches, players

Cross Country

The Caltech men's and women's cross country teams enjoyed a successful campaign in 1982. The Orange and White raced to third place in the SCIAC men's division and fifth place in the women's. Two weeks later, Caltech surprised all by taking fourth place in the NAIA District 3 championship, both in the men's and women's divisions. This was the highest finish ever for a Caltech cross country team.

Starting slowly and then rapidly progressing, the men's team ended with a record of 5 wins and 4 losses overall, and a 3 and 3 dual meet record in the SCIAC. The women's team was forced to forfeit several races due to circumstances beyond its control — including a storm that prevented five of the runners from departing from Catalina Island, and

leaving the team with less than the mandatory five runners. Thus the dual meet record was 2 and 6 overall, and 1 and 5 in the SCIAC.

Sophomore Jennifer Haase and senior Karen Close led the women. Three newcomers instrumental in the team's fortunes were freshmen Marit Jentoft-Nilsen, Diane Creveling, and Joy Watanabe.

Super-seniors Vince Cammarata and Karl Clausing led the men. Cammarata was the number one runner in all but two races. The highlight of the season was his performance in the SCIAC championship when he took sixth place, only five seconds behind the front runner from Occidental. Clausing finished only 29 seconds behind Cammarata for 11th place; another 39 seconds back found Steve Stahl in 16th.

Two weeks later, at the NAIA district meet, Clausing and Cammarata led the team to a fourth-place finish, turning in the second and fourth fastest times ever for Caltech athletes on that course. Clausing's eighth place individual finish qualified him for the national championship at Kenosha, Wisconsin. A family emergency took Cammarata out of the area; otherwise "he undoubtedly would have qualified too," according to Coach Leroy Neal. Cammarata still ran a personal best time, and the fourth fastest ever for a Caltech runner, to take 11th place.

Jennifer Haase was honored as the outstanding women's team runner at the awards dinner at the Alumni House. Vince Cammarata was voted the Barthel Award as the men's outstanding runner, as well as being recognized for his school record on the home course and as most improved runner.

Football

The 1982 football season ended on a positive note. With back-to-back victories over Edwards Air Force Base and the San Fernando Valley Nomads, the "Battling Beavers"

capped a successful year. Coach Lin Parker highlighted the season by taking his Tech footballers into Mexico and emerging with a 44-18 win in the International Friendship Bowl. The host school, University of Baja California, in Mexicali, treated the team to a victory feast of carne asada following the contest. Included in the season's contests was a 14-14 tie with the Valley Stars to give Caltech a 3-4-1 record.

Of the 36 men who began Caltech's 89th season, 31 celebrated its conclusion with a barbecue dinner at the Alumni House. Winning football awards were four-year lettermen Scott Bloom and John Humphrey. Co-captains David Brinza and John Humphrey were awarded plaques for their leadership. Newcomers Tom DiChristina and Rick Roberts were selected as the 1982 Rookie of the Year and Best First-Year Player, respectively.

Junior Tim Magee was named the Most Improved Player while Pat Harrison won the Coaches Award and Daren Casey was awarded the "Battling Beaver" trophy as the most spirited Techer. Vincent Riley, who led the nation in interceptions with 11, earned All-American recognition from the National Collegiate Football Association, and the Best Defender trophy from his teammates.

The Max West Trophy for Outstanding Lineman went to Daren Casey, and the Irv Noren Trophy for Outstanding Back was given to Scott Bloom. The coveted Wheaton Trophy was awarded to David Brinza.

Elsewhere in the SCIAC, La Verne and Whittier shared the conference championship with identical 4-1 records.

Soccer

After a slow start, the Caltech soccer team came on strong, winning three and tying one of the last five games. The team's overall record was 5-8-3.

In conference play, Tech defeated La Verne and Occidental and was defeated by Claremont, Pomona, Redlands, and Whittier. An undefeated Claremont won the conference. Claremont beat Caltech 2-1

after breaking a 1-1 tie with less than ten minutes left to play. Doug Shors played a brilliant game in goal against La Verne when he had a shut-out.

Peter Orr was voted Most Valuable Player, and was selected second team All-Conference. John Krehbiel was named team captain for next season.

Volleyball

The 1982 Caltech volleyball season was the culmination of four years of hard work, sincere determination, and a genuine desire to win. It was the team's most successful season in four years of existence. With nine players returning to the squad this year, experience was an invaluable contributor to a 10-5 win-loss record.

Throughout the past four years, one of the goals of Caltech volleyball has been to beat Occidental College. The team never quite managed it — not until this year. A combination of ace serves, perfect passing, strategically placed hits, and intense concentration resulted in a victory, as Caltech won the match in two straight games by scores of 15-6 and 15-12. Later in the season, Caltech faced a strong Pomona varsity team, and, although losing the match, played a fantastic game with a defense that refused to let the ball land on its court.

Although it had the opportunity to compete against some varsity squads, the team continued in club competition. The efforts and determination of 12 women combined in a strong contingent, as Sue Fuhs, Sandra Loh, and Lynmarie Thompson returned for their fourth year as starters, each of them carrying different responsibilities. Fuhs quarterbacked the team's multiple offense as setter-hitter while Sandra was stable and effective as a middle hitter and center back defensive player. Thompson was a mainstay on defense, playing the power angle position.

Other defensive specialists included Eliza Sutton, Julie Kornfield, and newcomers Leslie Lippard and Nancy Liu.

Graduate student Ann Rosenthal returned after an injury and was effective as a strong hitter and excellent defensive passer. Sophomore Chris Tiller started as a setter-hitter and provided the team with its most effective floating serve. Graduate student Lynn Hildemann returned to Caltech volleyball as a left-handed hitter while Lucy France and Sue Hunts completed the squad.

The conference varsity results this year left La Verne University as champion with Occidental placing second. This was the first time in three years that the two teams had not shared a co-championship.

Water polo

The water polo team completed another impressive year, finishing fourth in the SCIAC conference with a 9-13 record. Coach Clint Dodd reports, "The Tech team did extremely well considering that eight of our losses were to opponents on the national coach's poll of Top 20 Teams." Out of the 25 young men who participated in water polo this year, only one player had any previous experience before coming to Caltech.

Led by senior Chris McKinnon and captain Bill Polson and outstanding goalie Reed Burkhart, the Techers rallied from early season losses to Loyola (11-10) and UC Riverside (4-3 in overtime) to post a five-game winning streak. Aiding these victories were Brent Stuart, Bjorn Matthias, Dave Huff, Jim Labrenz, and Steve Chin. These players, along with a newcomer to water polo, Bob Golden, made up the core of starters. Wins included a 10-5 victory over a tough alumni team and a 9-8 upset over Whittier, when three Caltech goals were scored in the final two minutes of the game.

Hurt by the graduation last year of five starters, including three All-Americans, much was asked from Eric Grannan, Dave Watkins, Paul Graven, goalie Stan Berman, and Steve Loyola.

The last part of the season was a roller coaster ride of fabulous victories and miserable defeats. Victories included a 14-13 overtime revenge over Loyola and a 19-9 washing of Redlands. Narrow two- and three-goal losses to Whittier and Pomona-Pitzer ended the team's chance to move up in the final standings.

Post-season SCIAC honors went to Chris McKinnon, first team; goalie Reed Burkhart, second team; and Bill Polson, honorable mention. This year the Coach's Cup Trophy was presented to Chris McKinnon and the Most Improved Trophy went to Brent Stuart.

His premature obituary brought some surprises

Mike O'Haver and Mark Twain could have shared interesting insights if they had been contemporaries. Both lived to verify that the reports of their deaths had been greatly exaggerated.

O'Haver dropped into the *Caltech News* office recently on a project to make Industrial Relations Center programs better known to alumni, and he reminisced about the time, in 1969, when *Caltech News* published his obituary. Twain is not around to comment, but O'Haver terms his own premature death notice "one of the most wonderful and interesting experiences of my life."

O'Haver had just retired as sales manager for the Southern California Gas Company, and he informed the Alumni Association of his change in status. But the notice crept into the obituary file, and ended up in the death notices for the June issue.

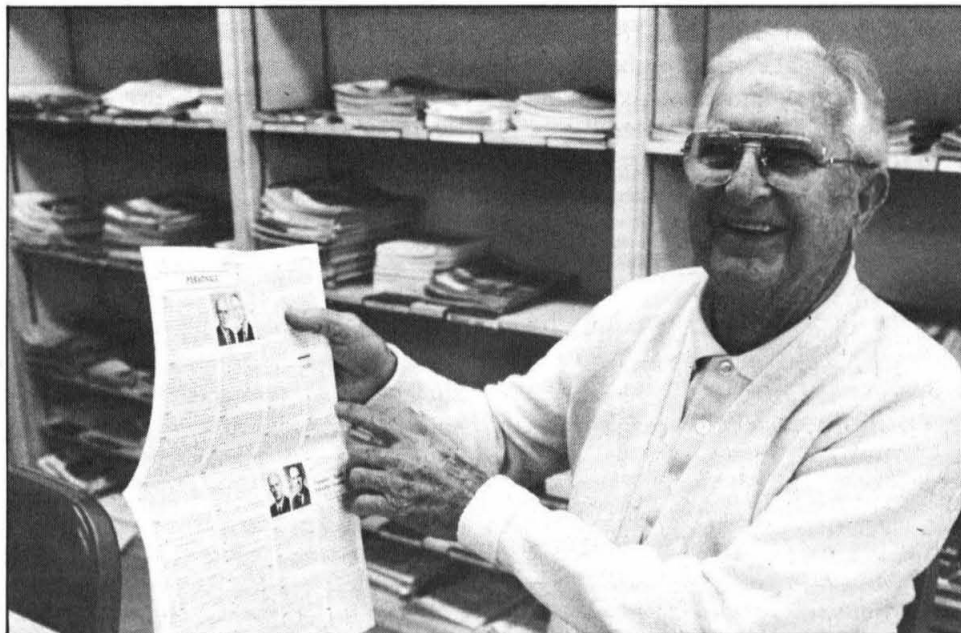
The error was detected just before the issue was mailed, and Alumni Association Director James B. Black called to warn O'Haver of what might lie in store. Soon the telephone calls began to come in.

O'Haver's youngest son responded to some of them by informing callers that "Mike's still around . . . he changed his mind!" Subsequently, O'Haver became known as "the man who decided not to go." His appearance at an Alumni Association meeting shortly afterward caused quite a stir.

One call, taken by O'Haver, came from a friend in the Northwest who asked to speak to the widow, saying, "I was a good friend of Mike's for years and I'd just like to talk about it."

"Al, are you sitting down?" responded O'Haver. "If you're not, you'd better be. It was all a mistake, and you're *talking* to Mike." His friend began to cry.

"I learned how many friends I had," said O'Haver. "It's hard for most men in the United States to express their feelings. We're reluctant to voice affection, and we generally



Mike O'Haver points out his obituary notice, which ran in *Caltech News* in 1969.

communicate friendship through kidding and insults, not compliments. I would have been sorry to miss the expressions of affection that only came because friends thought I was dead."

O'Haver's death notice led to more stringent safeguards on information leading to notices in the obituary column. But O'Haver suggests that an occasional mistake might not be a bad idea — to give other alumni the opportunity to reap tributes of affection from friends while still around to enjoy them.

Chairmen named for class reunion gifts

Several classes holding reunions in the spring are planning to make gifts to the Institute, and have appointed chairmen to coordinate fund-raising efforts.

Trent R. Dames (BS '33, MS '34) heads a committee to seek gifts for the class of 1933, which plans an unrestricted gift of \$75,000 for the Institute. Edward P. Fleisher (BS '43) is gift committee chairman for the class of 1943, with a goal of \$70,000 in unrestricted funds. Richard L. Van

Kirk (BS '58) is spearheading efforts of the class of 1958 for \$30,000 in unrestricted funds, and Max J. Kay (BS '73) and Jan Waluk (BS '73) are co-chairmen for the class of 1973 gift committee.

Alumni Activities

March 24-31 — Hawaii Volcanoes Expedition with Robert Sharp and Dan Dzurisin.

March 4 and 11 — Annual wine tasting programs, Caltech Athenaeum.

May 21 — Alumni Seminar Day, and 25-year reunion for the class of 1958, Caltech campus.

June 4 — 50-year reunion, class of 1933.

June 19-26 — Yellowstone and Grand Tetons Expedition with Lee Silver and Robert Sharp.

Expeditions planned to Mt. St. Helens

Mt. St. Helens will be the destination for two groups of alumni during August and September. Robert P. Sharp (the Sharp Professor of Geology, Emeritus) will be the guide on both.

A two-day trip for alumni in the Oregon and Washington areas is planned August 20 and 21, with flights over the volcano scheduled for either August 19 or August 22.

A four-day trip is scheduled September 22-25 for alumni from out of the area. Alumni will spend the first two days in the Columbia River Gorge and the Hood River Valley and the last two days — September 24-25 — in the Mt. St. Helens area.

Letters:

Dear Editor:

In addition to being ranked number one *officially* in physics, chemistry, and geoscience, it is universally admitted by all professional astronomers (who were not surveyed by the report discussed in your December issue) that Caltech has *the best* program in astrophysics in the world.

DIMITRI MIHALAS (PhD '64)

Dear *Caltech News* Editor:

I have given the December 1982 issue of your excellent *Caltech News* the study it deserves and I notice that on page 11, Myron Polycove (BS '42) and Clifford Truesdell (BS '41, MS '42) are wearing togas and wrist watches in the Greek or Roman comedy "Curculio." I suppose that the ancient Greeks or Romans had analog wrist watches but not digital.

As for karate at Caltech, I have long thought that judo should be encouraged at Tech. Unlike karate, which involves a form of shadow-boxing, judo is competitive. One throws his opponent in a tournament or gets thrown. Judo does not make a great time demand and one can develop his or her own skill at his own pace. One-and-a-half-hour practices twice a week are enough.

NAOMI KASHIWABARA (BS '49)

Obituaries

1923

LAURANCE G. SOUTH on October 8. He was retired as a self-employed contractor and had been living in Laguna Beach, California, with his wife, Gertrude, since 1959. He was active in the Emerald Bay Volunteer Fire Department, during later years as secretary-treasurer. Also surviving him are two daughters, eight grandchildren, and four great grandchildren.

1924

FRANK LOVERING. He was retired as chief of operations for Shell Oil Company in Midland, Texas.

1926

STUART L. SEYMOUR on October 13. The owner of S. L. Seymour, Contractor, Inc., in Covina, California, he had lived since 1939 in San Marino with his wife, Edwarda, who survives him. He also leaves a daughter, a son, and four grandchildren. Donations can be sent to the Stuart Lewis Seymour Memorial Fund, Office of Memorial Gifts, Caltech.

1935

KURT R. OSMAN, Ex, in April 1982. He was retired as a consultant in aerospace and had been living in Santa Monica, California.

1936

ARTHUR A. SIMPKINSON in May 1982. He was a retired building inspector with the city of Los Angeles.

1938

WALDON R. RHOADS in June 1982. He was retired as public relations consultant in his Escondido, California, firm, W. R. Rhoads & Associates. His wife survives him.

1939

JOHN R. GRIFFITHS in June 1982. He was a consulting geologist with his own firm in Pasadena.

1942

ROBERT F. HALL in summer of 1982. He retired as a member of the technical staff in Autonetics at Rockwell International in Anaheim, California.

1946

JOHN McCURDY, MS, in August 1982. Retired from the United States Air Force, he had also retired from his subsequent position as assistant manager, staff research, for ARO Inc. in Tullahoma, Tennessee.

1948

LAWRENCE DAHM in September, of an apparent heart attack. He was a rancher in Brawley, California, and had been active assisting youth organizations. Surviving him are his wife, Joan, three sons, and five daughters.

1949

MURRAY S. BORNSTEIN, MS, in June 1982 of coronary heart disease. He was project manager with Parsons Brinckerhoff/Tudor in Atlanta, Georgia. He is survived by his wife, Manuela, and two sons.

WILLIAM J. RAMSEY, PhD '53, in October. A chemist with Lawrence Livermore Laboratory, he was a "founding father" of the plutonium facility there and was highly regarded during his 29 years with the Laboratory. He is survived by his wife, Carolyn, and two sons.

1951

EDWIN E. PYATT in June 1982. He was professor of environmental engineering science at the University of Florida in Gainesville.

1969

RICHARD K. FRANZ in July 1982. He was a systems engineer with EDS in Dallas, Texas. His wife survives him.

Personals

1929

JAMES W. DUNHAM, retired coastal engineering consultant, has won ASCE's 1982 Moffatt & Nichol Harbor and Coastal Engineering Award. Dunham lives in Los Alamitos, California.

1935

WILLIAM G. COX writes, "I shall be retiring the end of this month (September) after more than 46 years of service with the General Electric Company . . . the last twenty involving international business development and including business trips to many foreign countries. We will stay in Kentucky for awhile, adjusting to a slower pace and developing plans for the next thirty to forty years."

1939

MELVIN LEVET, MS '40, has retired from Standard Oil of California, Chevron, as manager of staff services, after 35 years of service. His travels have taken him to Egypt, the Holy Land, Germany, Scotland, Canada, and the South Pacific — so far.

1940

RAYMOND CLINTON reports, "I am in my second year of a three-year term in the elective office of president (i.e., mayor) of our small community here in Green Valley, Arizona. The job does take a big piece out of my retirement time, but I do enjoy it very much."

1942

JOHN W. MILES, MS '43, PhD '44, professor of applied mechanics and geophysics and vice chancellor of academic affairs at the University of California, San Diego, is the 1982 recipient of the American Society of Mechanical Engineers' Timoshenko Medal. The prestigious award was given for "outstanding contributions to a wide range of areas of fluid dynamics, particularly to supersonic aerodynamics and panel flutter, oceanography and geophysical fluid dynamics, generation of water waves by wind, stability of heterogeneous shear flows and solitary wave interactions."

1944

JOSEPH M. PHELPS, MS '47, retired chairman of Phelps/ABC Civil Engineers, writes that he is busy developing a 20-acre ranch in Temecula, California, and expects to show a farm profit in the year 2024, at which time, he says, he will be 100.

1947

EDWARD FLANDERS, retired Army colonel, now living at Lake Tahoe in Zephyr Cove, Nevada, informs us that he has Parkinson's disease and "would enjoy a correspondence with any of my peers so afflicted."

1950

DWIGHT SCHROEDER, MS '63, vice president of engineering at Boyle Engineering in Newport Beach, California, received the 1982 Engineer of the Year Award from the Orange County branch of the ASCE.

1953

HENRY R. JEX, MS, in his 24th year at Systems Technology Inc., Hawthorne, California, where he is principal research engineer, was awarded the 1981 Franklin V. Taylor Award in Engineering Psychology from the American Psychological Association. Jex, who is the first engineer to win the award in its 20-year history, was honored for his work in measuring mental workload.

1959

WILLIAM R. GRAHAM, who is with R & D Associates in Marina del Rey, California, received a Presidential appoint-

ment as chairman of the Government General Advisory Committee on Arms Control and Disarmament, and was confirmed by the U.S. Senate to this position in September 1982.

1961

ALEXANDER F. H. GOETZ, MS '62, PhD '67, writes, "Married Rosa Cyrus of Hehlen, West Germany, in August. Still senior research scientist and manager of geological applications research at JPL. In addition will become professor-in-residence at dept. of earth and space sciences, UCLA, in January to teach and research remote sensing for non-renewable resources."

1963

ALAN LIPPERT, MS, engineer and support consultant at IBM in White Plains, New York, reports, "My wife, Margaret, and I had a baby girl on February 25, 1982. We named her Jocelyn."

1964

LUC O. BAUER, MS, PhD '68, reports that in January 1981, along with Dr. Jean A. Hoerni, he founded Telmos Inc., a semiconductor company with headquarters in Sunnyvale, California.

RICHARD R. BURGESS, professor of oncology at the University of Wisconsin, has received the 1982 Pfizer Award for Outstanding Contributions in Enzyme Chemistry from the biological division of the American Chemical Society.

1965

JOHN H. BEAMER sends this update: "I received my PhD in chemical engineering at Stanford in 1970 and taught chemical engineering at Clarkson College for two years. Received my MD degree from the U. of Miami in 1974 and completed my residency in psychiatry in 1977 and currently practice psychiatry in Potsdam, New York. I have a son, Matt, 11, a daughter, Jennifer, 10.

1966

DOUGLAS W. GAGE, a physicist with the Naval Ocean Systems Center in San Diego, writes, "Adam Frederick Gage (first child) was born May 8, 1982. Mother (and father) and child all having a great time."

1969

DALE PAYNTER writes, "My wife, Patti Pjerrou, and I would like to announce the birth of our second daughter, Erin Elizabeth, born August 5, 1982. Our first daughter, Kristen Emily, is 2½ years old. I am currently a project manager for the space and communications group at Hughes Aircraft Company in El Segundo, California."

1970

THOMAS R. DAVIS reports, "After graduating from Stanford with a PhD in mathematics in 1980, I worked as a research associate in EE at Stanford for two years and have just joined a start-up company named Silicon Graphics Inc. in Mountain View, California."

1971

WILSON WONG, MS, engineer and scientist specialist with McDonnell Douglas Astronautics in Huntington Beach, California, writes, "Two bits of very good news in 1982. We got Solar 1, world's largest solar thermal electrical power plant, into operation in April. It achieved electrical output power of ten megawatts in October. On September 25, 1982, I married Karen Ann Berg. We met on a sailing trip to Catalina on Memorial Day 1981."

1973

THOMAS GREENLEE, MS, PhD '78, reports that he is an associate professor of physics at Bethel College in Arden Hills, Minnesota, and that he and his wife are expecting a child in February.

GARY W. ZIEVE writes, "In the fall I started as an assistant professor in the medical school at Stony Brook. After all this work it is only the start of the second period."

1974

ERIK HORSLEY reports that he is doing well with his new business, Computer Craft Corporation, which he started in 1981 in Seattle.

ROBERT STANDLEY writes, "Since getting my PhD in physics from Univ. of Illinois in May 1980, I have been working in the corporate research division of Standard Oil Co. (Indiana) in the Chicago area. Greetings to PGR denizens everywhere."

1975

WILLIAM SHARMAN reports, "After finishing business school I've settled in Tucson and am working for Hughes in the Phoenix Missile Program office. It's a far cry from Harvard Square but I love it here and will finally stay put for a few years before heading back to the West Coast."

1976

SHAWN HALL, MS, PhD '81, research staff member at IBM in Yorktown Heights, New York, reports that on September 4, 1982, he married Jennifer Ann Moro, a friend from high school, in a ceremony at Princeton University Chapel.

1977

JOHN L. GUSTAFSON and his wife, formerly Denise Hayward, received their respective degrees in the same ceremony at Iowa State University: John his PhD in applied mathematics and Denise her BS in materials science engineering. John now works as a senior applications specialist for Floating Point Systems in Portland, Oregon.

CHRIS E. JENSEN and Linda A. Taylan report the birth of a baby girl, Heather Victoria, on September 26, 1982, in Salinas, California, where Chris works for J. M. Electric Co.

1978

JAMES B. McBEATH reports, "After spending a very enjoyable and worthwhile year in Heidelberg, West Germany, earning a Master of International Management (M.I.M.) at Schiller International University, I am back in the States and working for Technical Magic, Inc., in my little one-man Santa Clara branch office (sometimes referred to as the Santa Clara 'twig office'). My fiancée, Michelle Dicklich, who I met two years ago while touring Europe, is a first year student at the University of Santa Clara Law School. We are engaged to marry in January."

CALTECH NEWS

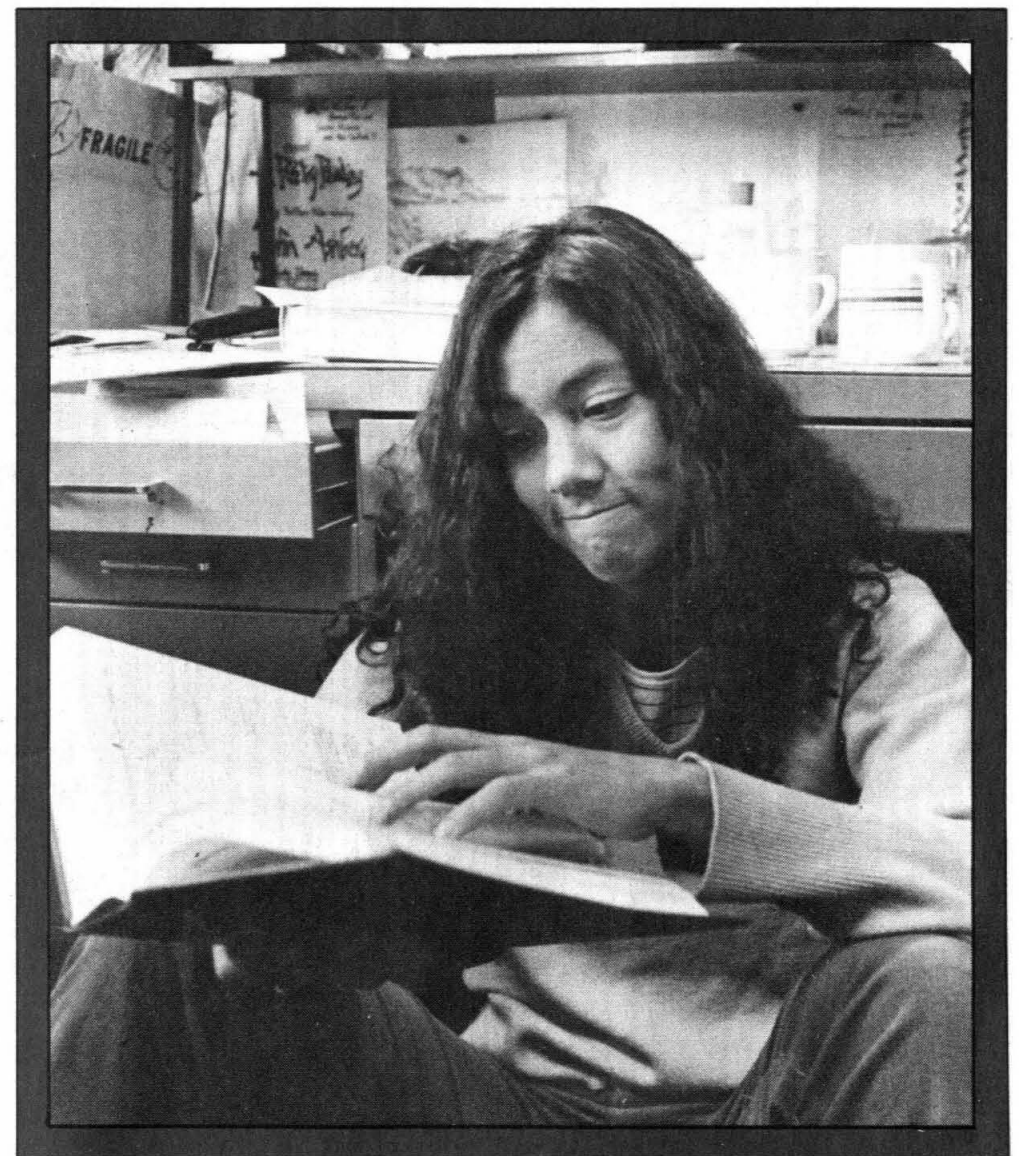


Research programs in the new Carl F and Winifred H Braun Laboratories focus on molecular biology, cell surface chemistry, and immunology.

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Senior Sandra Loh demonstrates an all-nighter.

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