Vol. 16, No. 2, April 1982

CALTECH NEWS

## Maintain support for planetary probes, Ingersoll urges U.S.

Dangerous consequences for science, technology, and education will result from currently proposed reductions for planetary exploration, according to a Caltech space scientist.

Speaking at a conference of the American Association for the Advancement of Science in Washington, D.C., Andrew P. Ingersoll asserted that the excitement of planetary exploration has drawn countless young people into science and engineering, has contributed to U.S. leadership in technology, and perhaps has even helped to defuse international tensions. Ingersoll, professor of planetary science at Caltech, is a member of the team of scientists managing the recent Voyager rendezvous with Jupiter and Saturn.

"By postponing or eliminating planetary probes, the administration is closing the last great frontier," he said. "Such frontiers are a part of this country's history, and they have served to motivate all sorts of change and to inspire young people. I wouldn't be so concerned if I could see alternative scientific frontiers as popular and exciting, but there simply aren't any."

Among the projects canceled in budget reductions have been the U.S. portion of the International Solar-Polar Mission and the Venus Orbiting Imaging Radar mission. Also omitted from NASA's proposed budget for fiscal year 1983 was a probe to Halley's Comet, and funds for the research and analysis of data from current planetary missions were severely cut. In addition, said Ingersoll, numerous other future missions may never leave the drawing boards — among them, a Mercury orbiter, a lunar polar orbiter, a Mars sample return mission, a Saturn orbiter, and a probe to the outer planets.

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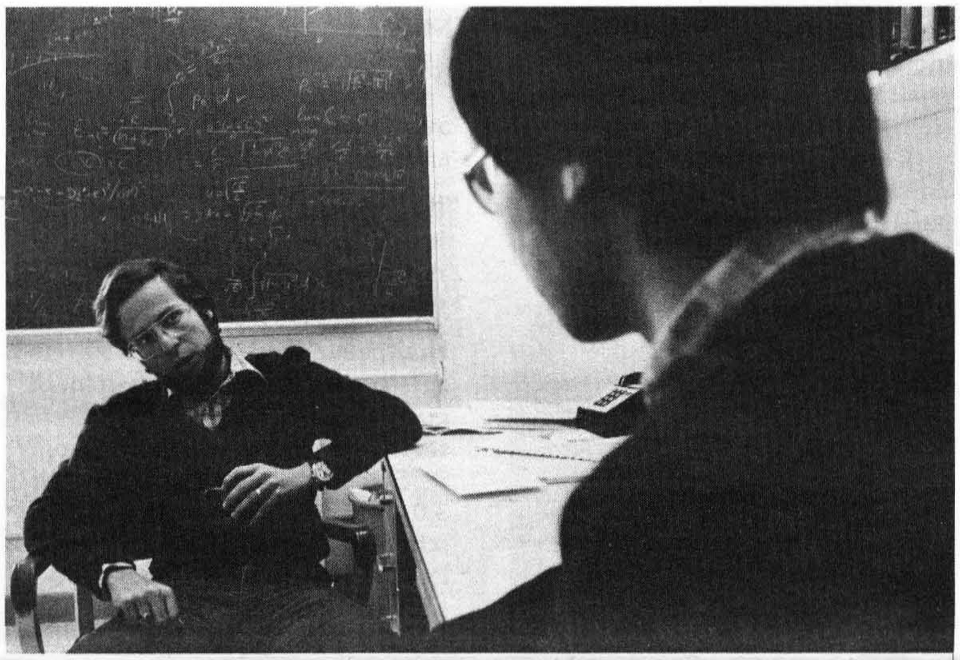


*Steve Koonin advises Ken Chow, a junior majoring in physics, on graduate school admission.*

## Getting into graduate school: How Caltech students measure up

*By Winifred Veronda*

Caltech's rigorous academic standards are well known — particularly to members of its student body. And concern about their effect on grade-point averages ("If I went to UCLA, I'd have a 4.0 — easy.") is frequently articulated.

This concern may be pervasive, particularly at exam time, but it is not well founded, according to people at Caltech and other universities who review applications for admission to graduate programs. This is because Caltech's reputation has gone before and because those demanding standards translate into high GRE scores, strong letters of recommendation, and generally some independent research.

"Where a student did his undergraduate work has a lot to do with his chances of being admitted here," says Karlene Dickey, associate dean of graduate studies and research at Stanford. "The more rigorous the school, the better the chances for admission. A BS degree from Caltech can represent a tremendous jump forward on the list of applicants under consideration."

"We look at the whole picture: letters, GRE scores, GPA's" says Sheldon Glashow, Harvard professor of physics and chairman of the department's Graduate Admissions Committee. "GPA's are only one factor. I remember an applicant from a state university with a perfect GPA — but his GRE's told the truth about his ability. We know what a Caltech degree means, and what its faculty recommendations mean. The best graduate schools are well aware of Caltech, and these schools are where your people go."

"The GPA is only part of the total admission equation," agrees Kenneth Raymond, UC Berkeley. (Raymond is vice chairman of the Department of Chemistry with responsibility for admission to PhD programs in inorganic chemistry.) "We readily recognize that an application from Caltech isn't the same as an application from Podunk U. and we take this into consideration when we evaluate GPA's."

Francis S. Buffington, who is in charge of graduate admission to six engineering options at the Institute, concurs. "When people like me examine applications for graduate study," he says, "we're concerned primarily with faculty recommendations. We look at the students' academic records to make sure they have the proper background, and then at their grades in the more important subjects. We don't pay that much attention to their grades in courses that aren't important for the graduate program." (Buffington is associate professor of materials science.)

Richard Marrus (professor of physics at UC Berkeley and chairman of the admissions committee for departmental graduate programs), says that "people here are well aware of Caltech's rigorous regime. The school a student has been attending is very important when it comes to admission to our program."

Horace Smith, who heads an admissions committee for the graduate electrical engineering program at MIT, agrees. "Each year we have about 1,600 applications for 130 places," he says. "And most of the applicants are well qualified. We turn down 500 people a year who could go anywhere and do well. Quibbling over a few points on a GPA is irrelevant. All of this means that we're looking for qualities that make a particular applicant stand out from the herd.

"What Caltech students should be worrying about is how to make the most of their educations, how to make themselves stand out. They should look for opportunities to demonstrate their experimental or theoretical skills in the laboratory."

Smith adds that his department scrutinizes the academic load a student has carried, and that a minimum load with all A's is less desirable than a heavier load with fewer A's. "We're interested," says Smith, "in students who are trying to expand their knowledge because they really care about the material."

*Please turn the page*

Back on the Caltech campus, faculty members will tell you they knew it was so. "Our top students can get in anywhere," says James J. Morgan, vice president for student affairs, acting dean of graduate studies, and professor of environmental engineering science", and many students with 3.0 averages are admitted to fine schools because they've done research and because Caltech faculty members will testify that they're talented and hard-working researchers.

"The opportunity to do research is one of the things about the Institute that makes a tremendous difference — and this brings up an area where some Caltech students make a tragic mistake. They graduate with pretty good grades but are known to no one on the faculty. By missing these contacts, they've lost one of the best opportunities that Caltech offers."

The impact of recommendations from Caltech faculty members is not to be underestimated, Morgan stresses. He recalls one instance when a faculty member wrote a colleague at Harvard about a student whose GPA was less than stupendous: "If you don't take this person, you'll be making a big mistake."

The student was admitted, earned his PhD in four years, and went on to an impressive academic position. "He was brilliant," says Morgan, "but he simply wouldn't study unless he was interested in the material. It took a particular kind of insight to recognize his abilities. If he had gone to a large institution, he would have been lost."

A similar instance is recalled by John E. Bercaw, professor of chemistry and chairman of the Curriculum and Undergraduate Study Committee. A student who did very well initially and then fell apart his senior year because of romantic problems barely graduated. Phone calls from faculty members got him into graduate school where he did very well.

"Students in our division are very successful in being admitted to graduate school," says Bercaw. "Most schools know we have demanding standards, and they tend to take this into perspective. Sometimes I find it surprising that our weaker students get into as good schools as they do. The admissions committees must be taking the Caltech degree into consideration."

John F. Benton, professor of history and adviser to a number of students in the humanities, says he is not aware of anyone graduating in the humanities and wanting to do advanced work who has not gotten into a good graduate school. "Their Caltech backgrounds make our students seem interesting and unusual," he says. "They stand out."

Steven E. Koonin, professor of theoretical physics and chairman of the Physics Undergraduate Committee, stresses that "quality physics departments look at each application individually. They know Caltech's reputation and weigh it when decisions are made.

"Contrary to what some people think," he adds, "getting into graduate school isn't just a matter of grades. A student may fall into the middle of the heap *here*, where grades are concerned, but come out well ahead on GRE scores. I've taught physics at Caltech to classes with both graduates and undergraduates enrolled, and our undergraduates often do better than graduate students who took their training at other universities; they've had better preparation.

Koonin adds that, paradoxically, physics students with GPA's of 3.0 or below may fare better at a private university than at a large state institution. At the latter, applicants who are below a certain level may automatically be eliminated without an evaluation of their overall qualifications. George Rossman (associate professor of mineralogy and frequent adviser to undergraduates) offers the same observation about students graduating in geology. "If there's going to be a problem," he says, "it will be at a state university, not at a prestigious private institution."

Throughout the country, students applying to medical school face particularly intense competition, and applicants from Caltech are no exception. But the advisers to applicants from Caltech, James Hudspeth and Marlene Coleman, say that Caltech students do well in this talent lottery. (Hudspeth is associate professor and executive officer for biology; Dr. Marlene Coleman is a staff member with Young Health Center.)

"Our students with 4.0 to 4.2 averages are routinely admitted to any school where they apply," says Hudspeth. "Students with 3.5 averages and up are admitted to a lot of good quality schools — generally seven out of ten to which they apply.

**"If there's going to be a problem, it will be at a state university and not at a prestigious private institution."**

"Students with averages between 3.0 and 3.5 can also get into medical school, but have to set their sights lower. Below 3.0, the situation becomes more probabilistic, although many of these students will be admitted to local institutions." (Two years ago, 11 out of 12 students who applied to medical school were admitted; no statistics for this year are available.)

Medical schools are looking for keen intellectual ability — which all Caltech students can offer — and they also are looking for personality characteristics that may not be as consistently strong in applicants from the Institute.

"If our own applicants have a deficiency, it's in breadth of life experience," Hudspeth says. "Some of them have been too sheltered; they haven't acquired enough personal strength in a variety of situations.

"Medical students must care about other people and also have the emotional capacity to survive the rigors of medical school — and of a medical career. If physicians can't acquire enough detachment, they burn out. All medical school applicants are moved up in the standings if they've demonstrated not only strong research skills, but also success in hospital employment, or in working with people in a volunteer capacity."

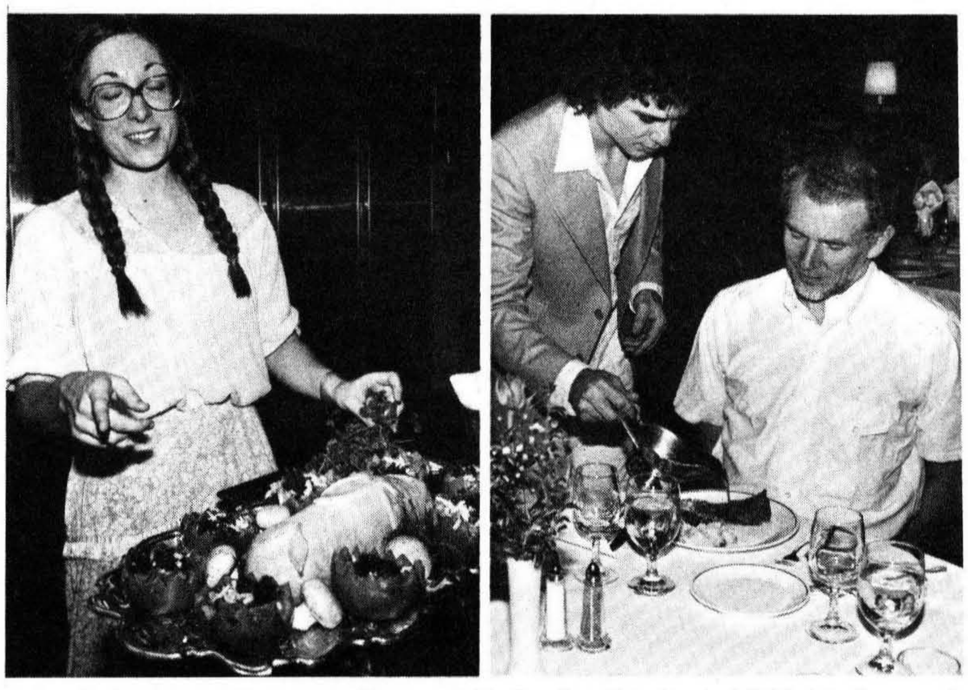
It is with this in mind that Hudspeth and Coleman encourage their advisees to work on their personal development and to get involved in jobs or volunteer activities that bring them into contact with people in a helping capacity. "I tell them to get out into the world and to do more than play Dungeons and Dragons," Hudspeth says.

Coleman agrees that medical schools are increasingly looking at students with respect to maturity and breadth of life experience, and that this may be an area to which Caltech will increasingly need to address itself.

To help, she, Hudspeth, and Sally Asmundson (director of the Office of Placement and Career Planning Services) are working with medical school applicants on improving their interview skills. "Many of our students aren't used to selling themselves," she says.

A paradox concerning medical school admission: The top medical schools, according to Hudspeth and Coleman (like the top graduate departments in other fields) give the most time to evaluating applications. By contrast, large state universities may do extensive preliminary screening and thus cut out a student with a lower GPA but good qualifications in other areas. This person might end up being admitted to a prestigious private school, but not to a state university.

In evaluating the whole graduate school situation, Morgan observes that many Caltech students labor under a misconception concerning what would happen to their GPA's if they transferred to another univer-



*Eating six opulent multi-course meals, one right after the other, is a tasteful but taxing way to spend a Saturday afternoon. But the seven judges of the interhouse cooking contest — all of them members of the Caltech community — didn't seem to mind. They began eating at 1 p.m. and finished at 6 p.m., maintaining their enthusiasm to the end. Above left: In the Athenaeum kitchen, Carlotta Paulsen of Dabney House admires her beef Wellington. Right: Louis Godbout of Ruddock House serves Dwain Fullerton, vice president for Institute relations. Lloyd House won first prize, a trophy and microwave oven, for mussel soup, lobster thermidor, asparagus Polonaise, creamed cucumbers, and Charlotte Malakoff aux fraises. The contest was sponsored by the Master of Student Houses' Office.*

sity. "It's a mistake to think that a 3.0 at Caltech would translate into a 4.0 somewhere else," he says.

"What sometimes happens is that a person comes to Caltech and doesn't work. He transfers out and starts getting A's because he begins working. Then he comes back to visit and says to his former classmates, "Look at me. I'm going to University X and getting all A's." What he doesn't realize is that getting all A's at University X won't automatically get him into Harvard, unless he's done something exceptional."

Bercaw echoes this sentiment: "College is going to be a lot harder than high school, no matter where you go. In high school you can get A's without trying. In college, this isn't possible, no matter whether you go to Caltech or State U."

David B. Wales (dean of students and professor of mathematics) sums up this way: "Any student with the interest in going to graduate school — and the ability to do so — will fare better by going to Caltech. An exceptional student will emerge with a GPA of 3.6 or above, will know faculty members here, will have done independent research, and will be able to choose his graduate destination. A student a cut or so below this can get into a less prestigious graduate school because of the opportunities here to do research and to know faculty members who will give recommendations. At a bigger school these opportunities simply wouldn't have been available."

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EDITORIAL STAFF
*Executive Editor:* Winifred Veronda
*Staff associates:* Phyllis Brewster, Diane Davis, and Kay Walker
*Photographer:* Chris Tschoegl

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# Smog over Titan:
## A hazy issue intrigues planetary scientists

Smog pollution in the earth's atmosphere may represent a serious problem — but nothing compared to the one on Titan. Saturn's largest moon, Titan, has a photochemical smog "problem" that would tax the patience and ingenuity of any environmentalist, provided that one could exist on that distant frozen body.

Yuk L. Yung, assistant professor of planetary science at the California Institute of Technology, and his associates, Caltech research fellows Mark Allen, Ed Gardner, and Joseph Pinto (now at Harvard), have been analyzing the processes at work in the atmosphere of Titan, using theories based on ground-based observations and those relayed to earth by the Voyager probes. They reported on their findings at the American Association for the Advancement of Science annual meeting in Washington, D.C., as part of a symposium on "The Weather of Other Planets."

Part of their work centers on the several layers of dark haze in the upper atmosphere of Titan. Planetary scientists had predicted the existence of such a dark haze for about 10 years. It was confirmed by Voyager.

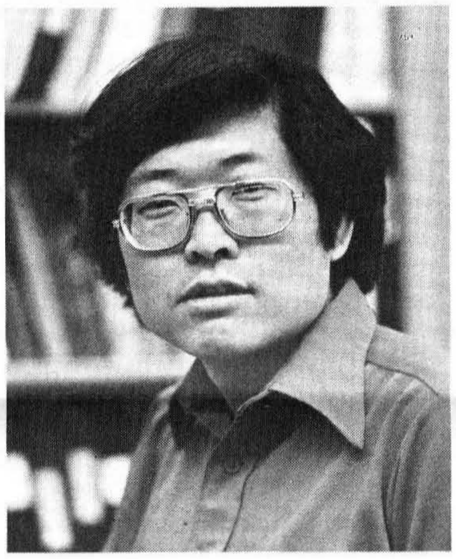
"As far as we know," says Yung, "Titan is the only body in the solar system covered by a dark cloud layer. The earth has water clouds, Jupiter has clouds of ammonia, and Venus has clouds of sulfuric acid. But all of these cloud covers are light in color."

Because it possesses an atmosphere, Titan resembles a planet more than a typical moon. Less than half the size of the earth, it has a radius of 2,560 kilometers, compared with the earth's 6,400-kilometer radius, and a 1,700-kilometer radius for the moon.

Titan's density is only 1.9 grams/CM$^3$, compared with a 5.5-gram/CM$^3$ density for the earth. (CM$^3$ stands for cubic centimeters; there are 453.6 grams in one pound.) This is because the earth consists mainly of heavy refractory material (rock and iron) while Titan, like an icy snowball, is composed primarily of methane ice mixed with a little rock. Titan is 890 million miles from the sun and therefore receives only about one percent of our sunlight.

The organic compounds that create Titan's black smog cover are formed through the photochemical destruction of methane and nitrogen in Titan's atmosphere. Methane is composed of four parts hydrogen to one part carbon. As the methane is converted into more complex organic molecules (hydrogen cyanide, propane, ethylene, methylactylene, cyanogen, etc.), the lightweight hydrogen escapes from Titan's atmosphere and is lost from the satellite forever.

The heavy hydrocarbons and other organic molecules that are the end



*Yuk Yung*

products of the process eventually rain down on the surface as a tar-like residue of carbon and carbon-nitrogen polymers. Planetary scientists speculate that the planet's surface could be covered with an organic residue about a kilometer thick.

Both ground-based observations and data from Voyager have shown that there is about 10 times as much nitrogen in Titan's atmosphere as on the earth. The satellite's major atmospheric components are: nitrogen, 82 percent; methane, 6 percent; argon, 12 percent, and hydrogen, 0.2 percent.

Titan's large proportion of atmospheric nitrogen is fairly stable, says Yung, because the satellite's atmosphere is so cold. The upper atmosphere is about 170 degrees Kelvin, or about 190 degrees below freezing on the Fahrenheit scale, compared with 300 degrees Kelvin, or 80 degrees Fahrenheit on the suface of the earth. Nitrogen is slowly escaping from Titan's atmosphere, but the loss is not catastrophic. Titan may have lost 50 percent of its nitrogen over geological time, Yung says.

But if Titan is continually losing its methane, how does it perpetually renew its supply and keep its atmosphere alive? Yung explains that Titan draws on its own icy body for replenishment. By an ongoing evaporation process, methane frost is peeled off the planet's surface to create a new supply of atmospheric methane. In this way, the atmosphere is continuously recharged and a bit of the satellite's mass is lost in the process.

Thus, unlike our own moon, which long ago lost its atmosphere, Titan possesses within its system a dynamic process for atmospheric renewal.

The hydrogen that is lost to Titan by the destruction of methane does not go far, according to Yung. The Voyager spacecraft was able to detect hydrogen leaving Titan's upper atmosphere and flowing into a doughnut-shaped torus that circulates around Saturn.

In studying the atmosphere of Titan, the scientists have been interested in learning whether it is possible, starting with only nitrogen and methane, to create all of the complicated compounds that exist in the satellite's atmosphere today. This question is particularly interesting because scientists believe that by studying what is happening in Titan's atmosphere, it may be possible to gain insight into how complex organic molecules were formed in the primitive atmosphere of the earth. These organic compounds are the same ones that are needed to initiate life via photochemical action.

"We don't find these compounds being produced in the earth's atmosphere today," says Yung. "They stopped being created here many billions of years ago. Over this period of time, our own atmosphere has gone through an extensive evolution, and most of its early constituents have been lost. Today, the chemistry in the earth's atmosphere is dominated by gases of biological origin. In the atmosphere of Titan, we may be seeing a snapshot of what the earth's atmosphere was like a few billions of years ago."

The more it is possible to learn about the processes occurring in any one planetary atmosphere, Yung notes, the more accurately scientists can develop theoretical models for the atmospheres of planets in general.

## Ingersoll presses for continuing planetary exploration

*Continued from page 1*

"These proposed future missions would yield insights every bit as valuable as previous probes," said Ingersoll. "The first studies of Mercury, Venus, Mars, Jupiter, and Saturn have been essentially reconnaissance missions, and now we must begin the work of exploration." He cited the high public interest in the Voyager mission as an example of the lure of planetary exploration.

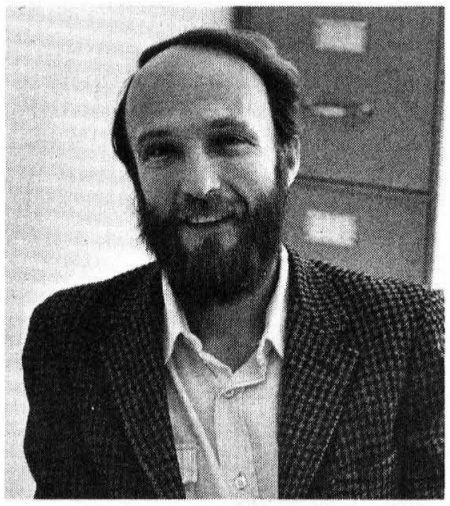
"One of the surprises for us in planetary exploration was the popular excitement over Voyager. We knew there had been interest in Venus and Mars because they were earth's neighbors. We might colonize them, and we could learn about earth by studying them because they're like the earth in some respects.

"But then Voyager reached Jupiter and Saturn, and we found all these phenomena that were utterly bizarre, and people were just as interested in the results. It showed us that there was a huge public reservoir of curiosity for its own sake." Ingersoll said this helped him to understand how planetary exploration has drawn young people to science. "This aspect of planetary science may not be the sort of role that inspires great lobbying efforts, because it can't be quantified, and it affects people who can't even vote yet," he said. "But for the sake of our future, we'd better not ignore it.

"It has been argued that space science should not be funded as long as social programs are wanting, but I don't believe that. Everyone agrees that the most effective government funding yields the most social return for each dollar. By that criterion, planetary exploration is incredibly effective.

"Planetary exploration is something terrifically exciting that brings young people into technical fields, filling a reservoir of technical talent. Much of our economy, as well as our federal budget, is devoted to developing technology, from electronics to agriculture. So anything we can do to keep youth pouring into technological fields is a good investment."

Ingersoll continued by remarking that "planetary exploration helps us address fundamental problems concerning the earth. In my field of atmospheric science, these problems include the origin and evolution of atmospheres, thermal balance, climate change, and weather. For example, we can learn about long-lived weather features by observing Jupiter and Saturn. The exotic phenomena on these planets have given meteorologists better insights into weather on the earth.



*Andrew Ingersoll*

"Of course, I don't believe that planetary research is as relevant to solving immediate problems in the earth's weather as is direct study of the earth. But the planets do raise fundamental questions about atmospheric science that can ultimately provide powerful insights.

"For one thing, meteorologists on earth are searching for permanent flow structures that produce long-term weather changes. So far, they haven't been very successful. But on Jupiter and Saturn, there are storms that have lasted for centuries, and these may help us understand the earth's more subtle weather patterns.

"Planetary exploration has also stimulated new technology," Ingersoll said. "For example, it has spurred scientists, technologists, and high-technology companies to solve the problems of building planetary probes. The resulting knowledge can be applied to communications satellites, earth observation, military purposes, and indirectly to related fields such as computer design.

"Without space science, our computer technology would have developed more slowly. We are still ahead of such countries as Japan, partly because space science spurred computer development.

"It is significant that the Japanese and Europeans are increasing their involvement in space science as the U.S. shows signs of pulling back."

Ingersoll also sees some international political effects of planetary exploration. "During the 1960s and 1970s, the U.S. and the Soviet Union competed in several peaceful areas, and among them was space exploration. I wouldn't go so far as to say that this competition kept us out of military competition with the Soviet Union, but it is interesting that the last two decades were a time of relatively lower international tension between the superpowers."

The planetary missions currently under way represent the bare minimum required to keep together the teams of scientists and engineers that have been formed for planetary exploration, Ingersoll said.

"I know a number of people at JPL who are leaving for jobs in industry," he said. "They can easily go into higher paying jobs in aerospace, so the change doesn't represent any great personal tragedy for them. But I believe that disbanding these teams is a great tragedy for the country.

"The current administration is taking an extremely shortsighted view in its cost-benefit analyses of planetary exploration. By neglecting the question of how we're going to keep our country ahead technologically over the next decades, the administration has come to the wrong conclusion."

## Fred Shair named AIChE chairman-elect

Fredrick H. Shair, professor of chemical engineering, has been named chairman-elect of the Southern California Section of the American Institute of Chemical Engineers.

At Caltech, Shair has been active in research involving the atmospheric transport and dispersion of substances associated with safety and environmental problems. A member of the Institute faculty since 1965, he is known as an outstanding educator as well as a fine researcher. In 1975, for excellence in engineering instruction, he was given a Western Electric Fund Award from the Pacific Southwest Section of the American Society for Engineering Education.

## $375,000 NCI grant helps to fund Braun Laboratories

Caltech has received a $375,000 grant from the National Cancer Institute to help in completing the 56,000-square-foot Braun Laboratories in Memory of Carl F and Winifred H Braun. The grant will help to fund three research modules of the building now under construction on the campus; the modules contain about 14,000 square feet of laboratory and office space.

The Braun Laboratories will house Caltech's Medical Sciences Program, a major effort to bridge the gap between basic and applied cancer research. The new NCI grant will augment an earlier NCI grant of $1,871,000, awarded to Caltech in 1978 to support the new building. Other funds for the $14.5 million complex have come from private sources.

The NCI funds will make it possible to complete the three modules to which they will be applied. Two modules of the eight-module building will still be unfunded.

## Millikan mall transformed, thanks to anonymous gift

A gift from an anonymous donor is making it possible to transform the Millikan mall (between Wilson Avenue and the library) into a park-like area with small garden spots and patios.

The first step in the transformation was the transplanting on the mall during late February of five 30- to 40-foot coast live oaks. The rest of the work will take place over the summer and early fall.

One phase of the development will involve building up the ground about six inches to meet the level of the walkways of Mudd, Arms, and Kerckhoff laboratories. Matching tile will be extended out to the mall at certain points to form patios, separated from the lawn and concrete sections by shrubs, rose beds, and low walls. Eight jacaranda trees will form a grove at the west end of the mall.

The anonymous donor also gave funds making it possible to relandscape Winnett plaza and the Athenaeum grounds.

# "Reds" taps knowledge of Caltech historian

*By Phyllis Brewster*

Fascination with the life of John Reed brought together actor Warren Beatty — whose film *Reds* is currently competing for Oscars — and Caltech Professor of History Robert Rosenstone — whose 1975 biography of Reed, *Romantic Revolutionary,* came out in paperback in December 1981 and is already in its third printing.

It all began in 1970 when Rosenstone was well along with the research on his book. He had just spent a 1969 sabbatical in the archives at Harvard, Reed's alma mater, when he heard that Beatty was thinking about making a film about Reed. Rosenstone wrote him a letter.

Two years later he got an answer — a phone call. Beatty wanted to talk about Reed, and right away! An hour later historian and actor were deep into their first of many conversations about the American journalist who took part in, and wrote about, the Russian Revolution of 1917-1920. Beatty shared his ideas for the movie; Rosenstone shared his knowledge of the man and the historical times in which he lived. In 1979, before the shooting began, Beatty signed Rosenstone on as historical consultant for the film.

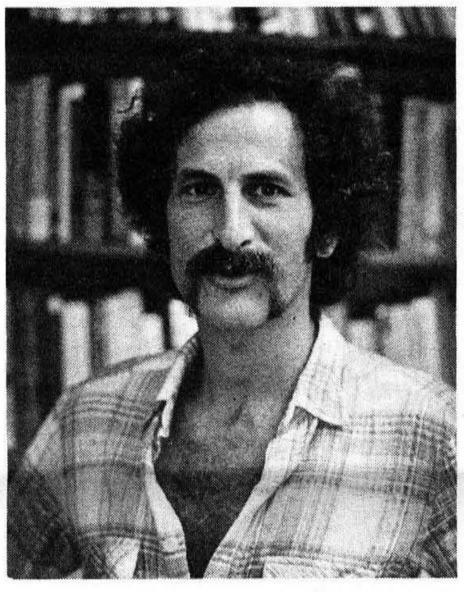
"I probably contributed more in those seven years of conversations than after the filming began," Rosenstone says. Nevertheless, during the months that followed, the Caltech professor read the screenplay several times, pointing out the historical inaccuracies and interpretations and making suggestions for changes. When the shooting began he was consulted — often by phone — about details of people, places and times.

But in spite of the long collaboration between Rosenstone and Beatty, the Reed of *Reds* is not the Reed of *Romantic Revolutionary.* So different are they, in fact, that Rosenstone has been deluged with requests to lecture, write, and just talk about "the real Reed," sometimes under the academic title, "*Reds* as History."

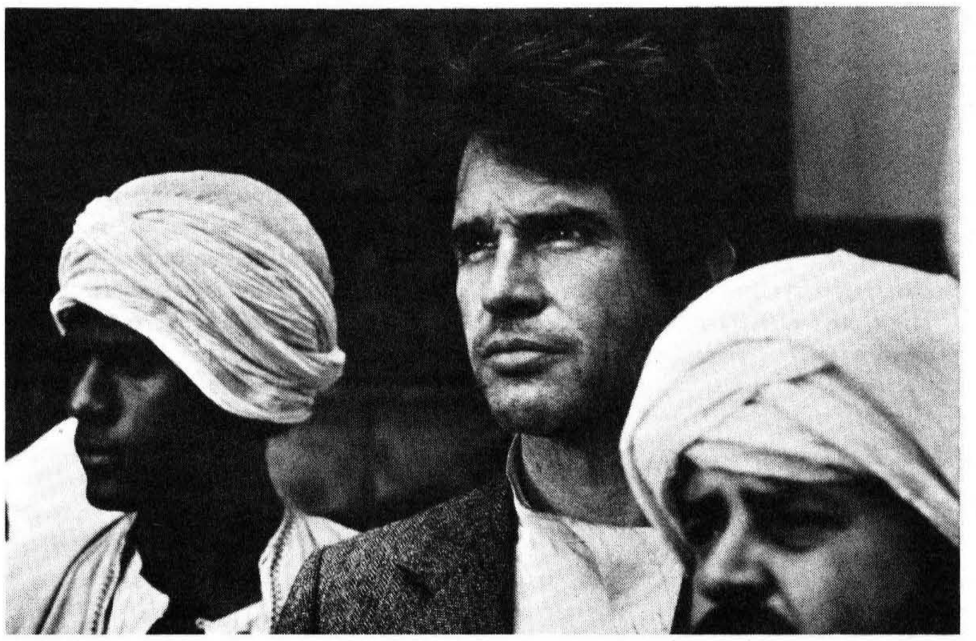
Beatty and Rosenstone themselves have a number of parallels. About the same age, they share historical-political experiences, as well as their deep admiration for the "neglected" left-wing hero. Both men played minor roles in political-social movements of their own times. Their different interpretations of Reed stem not from differences between themselves, but from the divergent demands and strictures of their different biographical forms — literature and film.

"Historians have one goal," says Rosenstone, "and that is to reconstruct the past as exactly as possible. Filmmakers, on the other hand, have two goals. One is to make money; the other is to entertain.

"Historians may interpret, but they don't change fact. Filmmakers are willing to alter fact if it makes the story more dramatic."



*Robert Rosenstone*



*Warren Beatty as the Romantic Revolutionary, John Reed, in the movie,* Reds.

In some instances Beatty did care about historical detail. For example he was very concerned about knowing the exact number of delegates attending the 1919 Socialist Party convention in Chicago — a statistic that was adhered to in the film.

On the other hand, Beatty knew his audience. And, where history detracted from theater, theater won. The film called for Reed's wife, Louise Bryant, to stow away aboard a ship bound for Finland and then to ski across the border into Russia, while in fact, Rosenstone points out, Louise had traveled openly by ship, with Hearst press credentials, and she went from Finland to Russia in August.

However, the basic difference between the Reed of the film and the Reed of the book has little to do with that kind of detail. It concerns the interpretation, or lack of it, of Reed as a human being — with the development of his ideas, his motivations, his temperament, his relationships.

"*Reds*' Reed is charming, sweet, winsome. On occasion he is even somewhat of a buffoon," says Rosenstone. The real Reed, according to his biographer, *was* often charming, but he was also brilliant, egocentric, intense, and sometimes a showoff.

Why the different interpretations?

Rosenstone calls *Reds* an "audacious undertaking in the history of American film." It is the first Hollywood movie to have a Communist as its hero, the first to deal with the radical politics of this country during the first two decades of the century, and "certainly the first to have an all-American couple bed down to the stirring strains of the 'Internationale.' " Beatty had to take out some kind of insurance to protect his investment. That was to insure that Reed would be loved.

"Warren used a kind-of 'Archie Bunker' approach to achieve this," Rosenstone says. A bigot, Bunker is accepted by audiences because he is lovable. They just don't believe he is a bigot. Reed, as a Communist, is treated the same way.

To further insure the film's success Beatty focused on the love story of Reed and Louise. In doing so, the director consistently inflated *her* historic importance in order to show them as equal as companions and lovers, Rosenstone says. In fact, Louise played a much smaller role in Reed's overall life than the film suggests.

For example, the movie implies that *he* was more miserable without her than *she* without him. This was simply not so. The film also shows Louise helping Reed with his writing. In 1917 Reed was probably the best and highest paid journalist in the country, while Louise had never published anything significant. She was certainly too inexperienced a writer to help him with his work.

In spite of the inconsistencies and omissions in *Reds,* Rosenstone calls it "a courageous movie to have made at this time." At a showing of the film that he arranged for the December (1981) meeting of the American Historical Association in Los Angeles, many in the audience of historians enjoyed the movie very much.

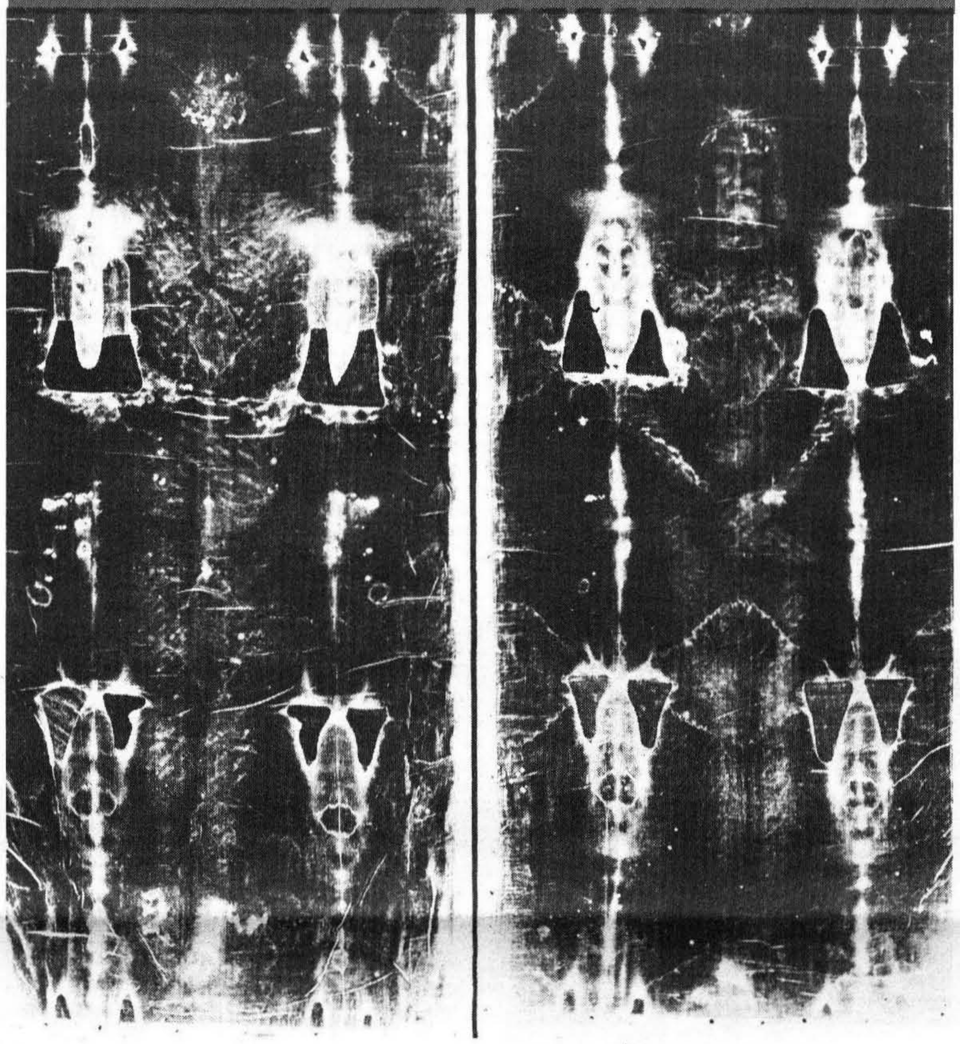
Rosenstone never had any illusions about the importance of his role as historical consultant. "My professional integrity lies with the acceptance of my biography of Reed by a jury of my peers — other historians and scholars," he says.

But he did have one disappointment. "Beatty politely, but firmly, refused my generous offer to play the role of Trotsky in the film," he says.

In Rosenstone's opinion, Trotsky had the best single line of the revolution. Thundering at the opponents of Bolshevism as they leave a mass meeting at the Smolny Institute, he calls after them, "Let them go. They are just so much refuse which will be swept into the garbage heap of history!"

Denied his dramatic moment, the Caltech historian has returned to his research and writing — this time about American missionaries, scientists, artists, and businessmen in 19th-century Japan. He does *not* expect a movie to come out of it.

# The Shroud of Turin
## technology probes a tantalizing puzzle



*Enhancement in the Image Processing Laboratory at JPL is used to bring out details in photographs of the front and back of the Shroud of Turin.*

*By Winifred Veronda*

An enigma that challenges technology's most sophisticated tests — and a mystery that grips the imaginations of believers — this is the Shroud of Turin. The 14-foot strip of ivory-colored cloth could be the burial cloth of Christ, or the product of an incredibly ingenious hoax. A more fascinating challenge for specialists in computer image enhancement (or any lovers of puzzles and mystery stories) could scarcely be imagined.

The challenge is the reason why Jean Lorre and Donald Lynn at JPL, along with their co-workers Sue Lavoie and Charles Avis, have devoted many free hours to analyzing data from tests of the object.

Like most people outside of Italy, Lynn and Lorre had never heard of the shroud before 1975. That year John Jackson of the U.S. Air Force asked them to use their skills in computer image enhancement to bring out details in photographs of the cloth.

Once exposed to its baffling aspects, they were hooked, and in 1978 they became part of the newly formed Shroud of Turin Research Project. This group is made up of some 30 specialists from throughout the country — among them physicists, chemists, pathologists, photographic and textile experts, linguists, and scholars of biblical and art history. Catholics, Protestants, agnostics, and Jews are represented.

In 1978, after the shroud had been on display for public viewing, the research team was given permission to test it. They went to Turin, Italy, with 72 crates holding five tons of equipment, and worked around the clock for five days, subjecting the shroud to every non-destructive test that they felt would yield useful information.

Because the team is composed of volunteers whose participation in the project is limited to a spare time effort, the work has proceeded slowly. But one thing is certain, according to Lynn: The shroud continues to raise new and perplexing questions, even as old ones are answered.

"This is what makes the project so neat," he observes. "In the beginning you're very skeptical about something like this, and you expect it to fall apart. But it doesn't, and the more you learn about it, the more fascinating it becomes."

The cloth's history can be traced back to its first recorded display in Lirey, France, in the mid-14th century. It has been the property of the House of Savoy since the early 16th century and has been housed at the Cathedral of San Giovanni Battista in Turin since 1578. It bears scars from a fire in Chambery, France, in 1532. Its earlier history can only be theorized, as British writer Ian Wilson has done. Wilson postulates a history — via circumstantial evidence — all the way back to Jerusalem via Paris and Constantinople.

The shroud itself is a 14-foot by 3-foot strip of linen cloth that bears a lifelike image of a lean, unclothed bearded man with long hair. "We aren't aware of any other burial cloth bearing such an imprint," says Lynn, "but we would welcome any information about such articles."

Research indicates that the hand-spun fibers and herringbone-twill weave of the cloth are compatible with ancient Middle Eastern textile technology. Its width and the number of weft threads suggest that it was expensive. Specks of pollen from the shroud include a number from plants of Palestine and southern Turkey. (Critics note that pollen travels long distances and that the shroud has been exhibited out-of-doors in the past.)

This full-body image, anatomically correct, is that of a crucifixion victim who has been heavily scourged, according to the pathologists. The body appears to be that of a 30-year-old man. The face shows evidence of swelling from blows but appears remarkably serene. The image on the cloth is 5 feet 11 inches, but when the cloth drape is taken into account, the body required to produce the image would be about 5 feet 9 or 5 feet 10 inches, and would weigh 150 to 160 pounds.

There are dark crimson stains — "bloodstains" — on the head, the arms, the back, and the feet. A large bloodstain appears on the side, at about the area of the fifth or sixth rib, recalling the thrust of the centurian's spear. "Scourge marks" pepper the body and resemble those that would be created by wounds from a flagrum — a multi-thonged Roman whip tipped with metal or bone.

The color of the "bloodstains" appears to be contradictory — old blood turns black with age; these stains are more crimson. This contradiction might be attributable to the chemistry involved in the treatment of the linen, as described by Pliny. However, there is no evidence of such chemicals on the cloth. Another anomaly is the complete absence on the cloth of any living mold or mildew.

Nail marks in the wrists were validated in 1968 when archaeologists found, in a Jewish cemetery, the first-discovered skeleton of a person who is known to have been crucified. The skeleton bore possible nail marks in the wrist area, as opposed to the hands where they have traditionally been depicted in the paintings of the crucifixion. Head wound marks on the shroud suggest a cap of thorns, not the traditional circlet — intriguing to specialists in burial customs.

The body image, a faint, reddish brown impression, fades into the background on close examination. But photographic examination reveals details that are not readily observed visually.

One of these came to light in 1898 when the initial photographs of the relic were processed. When the photographer, Secundo Pia, examined his plate glass *negative* as it emerged from the developing bath, he realized that he was viewing a clear positive image with highlights and shadows like those that are observed in a normal photograph — an image much more lifelike and realistic than that which appears on the shroud itself. How, many observers have wondered, could a medieval artist have produced a negative image hundreds of years before the invention of photography, and why would he have chosen to do so?

Another enigma is found in the fibers carrying the stain that forms the body image. The stain is found only on the top fibrils of the thread segments, and penetrates only a few microns into the fibrils. Each stained fibril appears to be the same shade; the darker areas appear to be the result of a larger number of stained fibrils. Tests of the shroud have revealed no evidence that the color entered the fibers as a gas or liquid, and no trace of pigment.

"We're convinced," says Lynn, "that the image we're seeing wasn't created by adding a pigment or other material to the cloth. The image is the result of a chemical change, dehydrated oxidation, of the fibers themselves. Several tests back up this conclusion."

Another perplexing aspect of the image was suggested by Paul Vignon in the early 1900s as he studied early photographs of the shroud. He observed that the intensity of each part of the image appears to vary in proportion to the distance of that part of the body from a covering sheet, with the darkest portions closest.

In 1976, John Jackson tested this hypothesis by examining pictures of the shroud with a VP-Image Analyzer, which converted image intensity to vertical relief. He found that the shroud contains three-dimensional information — not a feature of ordinary photographs or paintings.

In 1977, as scientists discussed the state of research on the shroud, they concluded that their biggest problem was lack of good data. They requested that a series of prescribed tests be performed on the relic. When it was put on public display in 1978, they were given permission for five days of non-destructive analysis.

When the public exposition ended, the specialists — working in the Royal Palace in Turin, along with scientists from Italy, Switzerland, and Belgium — began their examination. They anchored the shroud to a rotating frame of their own design, and they worked around the clock.

The scientists measured variations in the way the image, the "blood," and the background emitted, fluoresced, or reflected energy across a wide range of the electromagnetic spectrum. They probed details of the shroud's makeup in infrared, visible, and ultraviolet light at various frequencies.

They photographed and x-rayed every inch of the linen in detail at various resolutions. They examined it visually and took photomacrographs. They captured bits of fiber, dust, pollen, and other particles for analysis. Then they returned to their laboratories and began processing their data, and the shroud was returned to its nest of cases behind glass windows and iron bars.

Thus far, the work has yielded an abundance of new information — some of it conflicting and much of it raising new questions as old ones are illumined. None of the results indicate that the shroud is a man-made artifact, or invalidate its possible authenticity.

The technologists continue to be at a loss as to what mechanism produced the image. According to Lynn, "We feel that we have definitely identified the mechanism for recording the image on the cloth as dehydrated oxidation, but we still don't have a satisfactory mechanism for transporting the image to the cloth.

"All we know is that the mechanism acted parallel to the axis of symmetry in such a way as to preserve geometric integrity and provide a fairly good resolution.

"The body image doesn't have characteristics of a high-temperature scorch," he says. "It's more like accelerated aging on a low-temperature scorch. And there's none of the distortion that one would expect from a contact process."

Meanwhile, scientists testing the few crystals found on fibrils from blood stains say they have definitely identified the presence of human blood. Unfortunately, the limited number of samples available make it impossible to state at this time that all of the blood stains on the shroud are made up of human blood. And the samples are too minute to permit a blood typing.

A major factor in determining the shroud's authenticity is its age. The research group has petitioned the Archbishop of Turin to permit segments to be age-dated, and indications are that he is in favor of these tests and may permit them after he is satisfied concerning accuracy, sample contamination, amount of material required, and so on. No information is available, however, as to when these tests might be performed.

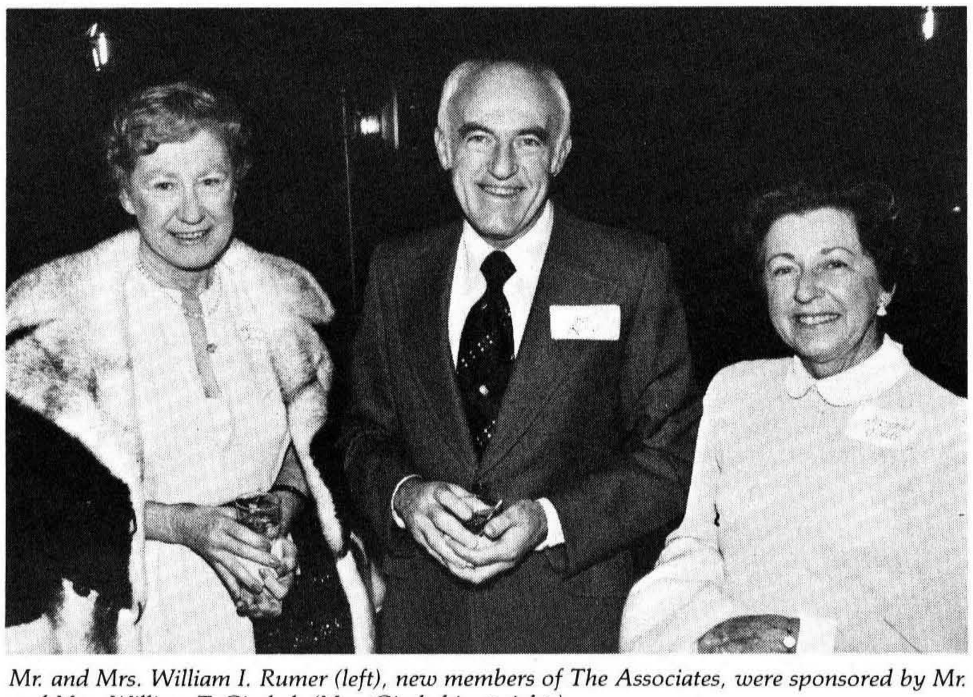
Lynn stresses that with the information that is now available, it isn't possible to prove that the shroud actually *is* the burial shroud of Jesus of Nazareth. "What we might be able to prove," he says, "is that it *isn't* his shroud, and if we fail to do *this*, then the possibility that it is, increases."

If the shroud *is* a human-made creation, Lynn wants to stress that it was no casual product of an afternoon's work. Rather it is a magnificent effort representing countless hours of painstaking planning, research and implementation — an effort that encoded uncannily correct data about anatomy and crucifixion.

Pressed for explanations that are not readily available, the research group is eager for input and suggestions. Lynn hopes readers who can share historical and archaeological insights, or technological information, will contact him or another group member. In the meantime, research continues on one of the most improbable and intriguing technological puzzles of the century.

## The Associates honor new members

*Mary Heiskell (left) became the youngest member of The Associates at the group's New Member Dinner in the Athenaeum. With her are her parents and sponsors, Dr. and Mrs. Charles Heiskell. The Associates honored 63 new members at the dinner where Roger Noll (chairman of the Division of the Humanities and Social Sciences) spoke on market solutions to control air pollution.*



*Mr. and Mrs. William I. Rumer (left), new members of The Associates, were sponsored by Mr. and Mrs. William T. Gimbel. (Mrs. Gimbel is at right.)*

## Annual meeting notice

NOTICE IS HEREBY GIVEN that pursuant to the bylaws of the Alumni Association, California Institute of Technology, the annual meeting of the members thereof will be held Thursday, June 17, at 6 p.m. in the Athenaeum, 551 South Hill Avenue, Pasadena, for the purpose of receiving results of the election of officers and directors and for the purpose of transacting any and all business that may come before such meeting of the members.

Philip L. Reynolds, BS '58, MS '59, President

Carole L. Hamilton, PhD '63, Treasurer

Donald P. Wilkinson, BS '48, Secretary

# Faculty-Student Conference focuses on undergraduate education

*By Phyllis Brewster*

The day's events went virtually without a hitch. Almost exactly at 9 a.m. Dean of Students David Wales, chairman of the morning session, welcomed the 115 faculty, students, and staff assembled for the 1982 Faculty-Student Conference in JPL's Von Kármán Auditorium. And almost precisely at 5 p.m. Vice President for Student Affairs James J. Morgan, chairman of the afternoon session, adjourned the gathering with a summary and an invitation to all to retire to the Athenaeum for what was billed as a "reception."

The eight hours between welcome and adjournment were packed with presentations, reports, opinions, (lunch), suggestions, discussion, debate, and rebuttal. Formal recommendations there were not, for, as Morgan remarked at the opening of the afternoon session, "our purpose here is to gather data and opinions, not to write policy."

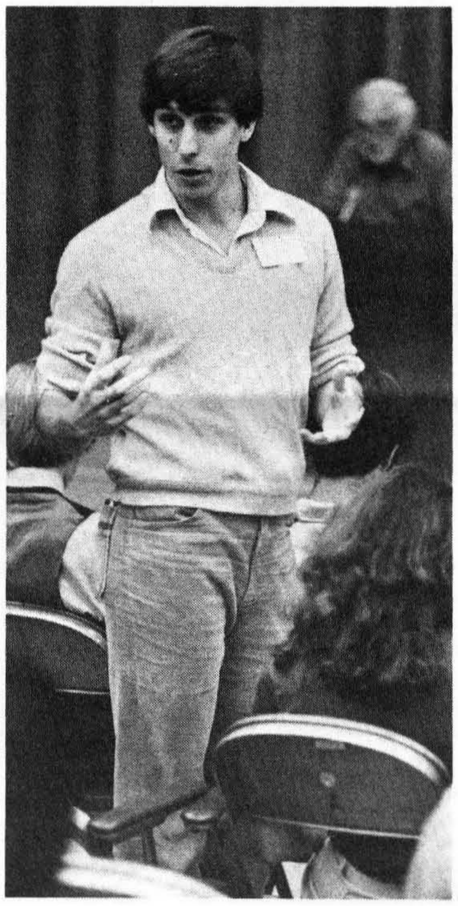
The announced theme of the conference was Improving the Quality of Education. ASCIT Vice President Ed Lambert expressed the theme in another way when he said, "What we actually discussed here was improving the quality of communication."

Indeed, in each of the six major topics on the agenda — Core Courses and Curriculum; Humanities and Social Sciences; Feedback, Advisers, and TAs; the Honor System; Student Body Size; Health and Athletic Facilities; and Undergraduate Research — the recurring plea was for more and better exchange of ideas, feedback, discussion, interaction.

Absent from this conference were the intensity and bitterness that marked the faculty-student conference in 1980. (Present were a few participants of that event — notably ex-ASCIT president Ray Beausoleil, currently working at JPL.) This year goodwill and hopefulness were much more in evidence.

Considerable research and preparation had been done by teams of students and faculty. A 100-page sheaf of papers delivered to each participant two days before the conference contained background information and proposals put together by the teams, who began meeting in January to research their topics. Chief among the material was a Student Attitude Survey conducted by ASCIT. Survey response came from about 50 percent of on-campus undergraduates and "a small number" from off campus, and the resulting statistics were referred to often in the proceedings.

Each of the six session topics was assigned an hour's time slot. A panel of students and faculty made presentations, and then the topic was open for discussion — and other bursts of opinion — from the audience. More hands were raised for recognition than there was time to accommodate speakers, but Wales and Morgan did a judicious job of balancing input and keeping conversations moving.



*Bruce Behymer expresses a student viewpoint at the conference.*

The issues of greatest urgency — judging from the liveliness of the debate and the length of the exchanges they drew — were: the need for a basic computer programming instruction, the need for courses to improve writing skills, the need to strengthen the Honor System by communicating to graduate students and new faculty the importance of the Honor System to the quality of life on campus, the need for better and more immediate feedback (about the quality of teaching, class material, and labs) between faculty and students and between advisers and advisees, and the need to expand the ombudsman system that currently operates only in chemistry and biology.

Strong desires were expressed for more variety in the humanities — specifically philosophy, psychology, and foreign languages; for more *undergraduate* TAs in classes and labs, and for more opportunities in undergraduate research. Student tribute was paid to both the SURF (Summer Undergraduate Research Fellowships) program and to ongoing academic-year research, and a plea was made by some for endowment for the program.

Less urgent, but of obvious interest, were the exchanges about student body size (no more than the 830 recommended by a recent Institute study?), advisers signing preregistraton cards (make it optional), more affordable off-campus housing, a new athletic facility, and the desire for the health center to be open on weekends. Suggestions for improving the TQFR (Teaching Quality Feedback Reports) called for having it come out sooner and for getting response from a larger percentage of class members. (Some faculty decried what was called the "public humiliation" concept of the TQFR, and called for a more "positive" approach.)

The issue that in 1980 had drawn fire — core courses — this time drew praise for substantial improvements that have been made since then. It was agreed that core courses are better organized and have more carefully selected instructors, but that some few still need bettering. (Math 2 and Chem 1 fall into that category, some students felt.) Physics got praise, as did Professor David Goodstein, the chief architect of revisions in that area.

In return, Goodstein proclaimed that "teaching Physics 1 the past three years has been the most enjoyable experience of my 15 years at Caltech." (Chemistry Professor John Bercaw said he is aware that "improvement is still needed in Chem 1 and 3a," and announced that "we are working on it.")

Another off-the-cuff discussion was launched when President Marvin Goldberger asked for response to the idea of a new housing unit for a 50-50 mix of undergrads and graduate students. One undergraduate said, "We would lose our sense of community," but all others speaking out were enthusiastic about the possible integration.

As the discussions wound down, Morgan reminded the tiring participants that "to debate is easier than to effect change — and doesn't take as long," and Lambert pronounced that he was "very encouraged about what was done here today." To the faculty, he made this challenge: "Your function is not to destroy minds but to teach students how great science and engineering is."

*Provost John Roberts voices an opinion.*

To the students he said, "You are responsible for your own lives. You can effect change. There have been some real changes since the last conference. But apathy and indifference take their toll. Don't let this happen here."

And with that, the congregation departed for the Athenaeum to celebrate the promise of change and to imbibe another dimension of Caltech life.

## AAAS welcomes five on Caltech faculty as Fellows

Five Caltech faculty members have been elected Fellows of the American Association for the Advancement of Science: John D. Baldeschwieler, professor of chemistry; Jesse L. Beauchamp, professor of chemistry; Donald E. Coles, professor of aeronautics; Leverett Davis, Jr., professor of theoretical physics, emeritus; and Herbert B. Keller, professor and executive officer for applied mathematics.

AAAS members are elected as Fellows when their efforts to advance science or its applications are deemed "scientifically or socially distinguished."

## Financial aid worries carried to Washington by Caltech students

Two Caltech students — Tim Brazy and Al Lin — joined thousands of college and university students from throughout the country who traveled to Washington, D.C., on March 1 to participate in the second National Student Lobby Day. The event was organized by Peter Peyser, Democrat, a member of the U.S. House of Representatives from New York, to bring the concerns of students about financial aid cutbacks to the attention of governmental leaders.

Senior Brazy, president of ASCIT, and graduate student Al Lin, president of the Graduate Student Council, talked with congressmen and senators from California and from their home states, and joined with other students for a meeting at the day's end. They pronounced the reception on the part of elected officials as "good."

## ASCIT president's goal: more involved students

ASCIT President Tim Brazy was taught when he was growing up that a person who has something important to say should say it, and Brazy would like to see more Caltech students act on this axiom.

"I've talked with people at quite a few other universities," he says, "and it would be hard to find a faculty and administration more responsive to students than at Caltech. I wish more of the students here would take advantage of the opportunities they have to make changes."

Brazy was elected ASCIT president in February for the second time, after resigning from office last September when a serious back injury forced him to drop out of school for several months. Returning in winter quarter, he was reelected — and was soon participating in a project he helped to plan last spring. This was the second faculty-student conference, held at JPL in February.

The conference, said Brazy a few days before the event, would provide him with his priorities as president. "All of the students want the conference to be a tremendous success," he said. "Afterward, it's up to us to get the faculty and students working together on ideas for changes that are suggested at the conference. The process of change at Caltech is slow. Some results of the last conference are just now taking effect."

A graduate of Shorewood High School in Milwaukee, Brazy first learned of Caltech when he was working as a high school student in the chemistry laboratory of E. A. Hill III (PhD '61), a faculty member at the University of Wisconsin. His contact with Hill was followed by a personal interview with Fredrick H. Shair, professor of chemical engineering, and that clinched his decision to come to the Institute.

A Page House member, he was active, before his accident, in football and track, and he has been a student representative on the Financial Aid Committee and a member of the Caltech Y Executive Committee. He is majoring in economics and plans to go on to graduate school to study economics or public policy.

Before his accident, his hobbies were exercising — especially running and lifting weights. But recently he has been devoting much time to another avocation: He does a lot of reading, mainly political history. He's glad that he's now permitted to swim, because "you can only do so much reading."

In talking about the first faculty-student conference, Brazy says he believes it filled an important role by helping faculty and students understand each other's viewpoints, and that it "provided the final push for some changes.

*Tim Brazy*

"It improved communications, and created an atmosphere where the administration, faculty, and students could work together better toward goals that were important to all of them," he said.

"Students generally are pleased with efforts to improve the core curriculum — and the curriculum in general. Some of these changes happened because the conference showed the faculty that the students were deeply concerned about academic quality, and willing to work for specific changes that they felt were important."

Some of the improvements, Brazy feels, are better coordination in the core curriculum between math and physics courses, and improvements in mechanisms for communicating with faculty members about problems in teaching clarity or course content.

To make changes, faculty members need the support and insight that a faculty-student conference can provide, Brazy said, and they also need suggestions on an ongoing basis. It is in this area where he feels students need to be more active in making themselves heard. "Apathy is prevalent among students at Caltech," he said. "Over and over, at meeting after meeting, the same students are doing all the talking."

As president, he wants to try and change this by getting more students involved in campus life. How to accomplish this objective? "By contacting people in person," he said. "By talking and arguing and cajoling."

Another way to increase communication between faculty and students is by the Teaching Quality Feedback Report, and Brazy wants to improve it this year by increasing the number of students who take the time to fill out the form. Having students complete the TQFR at exam time rather than at home might be one way to increase participation, he notes.

Brazy is glad he decided to come to Caltech, and he wishes more students would take advantage of what it offers. "Caltech is a place unto itself," he said. "A lot of this has to do with the Honor System. Students here are competing more with their own standards for themselves than with one another. People learn together, and most everyone is willing to try and help someone else, even though we're all busy.

"Then too, because it's small, Caltech is flexible. Changes can be made, red tape can be circumvented."

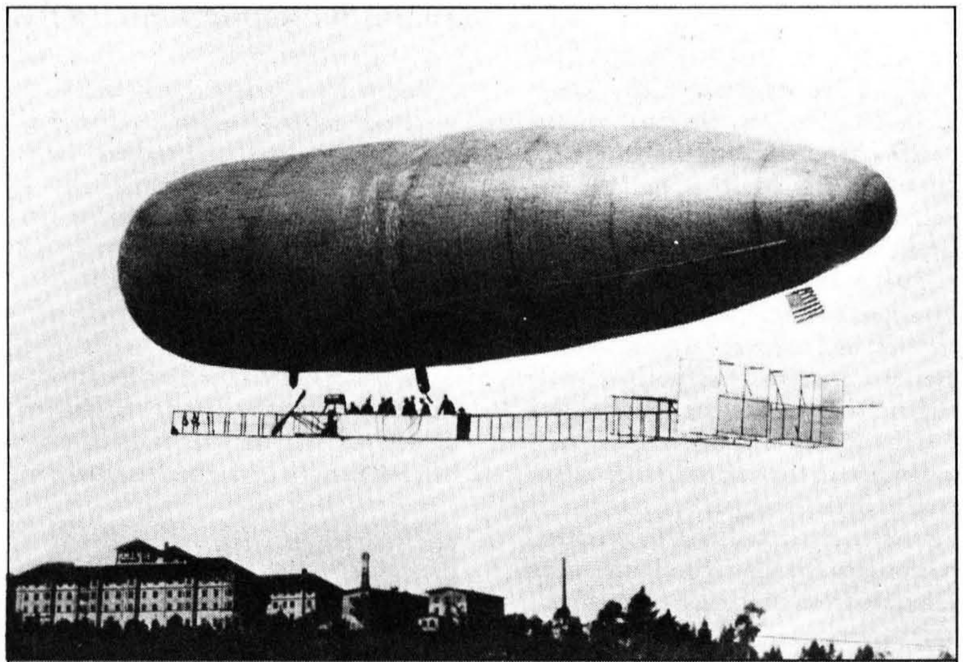
More changes would be in the offing after the second faculty-student conference, Brazy noted, and he and the ASCIT Board would be ready to help make them a reality.

## Brockes awarded McKnight grant

Jeremy P. Brockes, associate professor of biology at Caltech, is one of 14 research scientists throughout the country to be awarded a McKnight Foundation Neuroscience Development Award for advanced research. The award supports research focusing on the basic mechanisms of memory and on memory-affecting disorders.

Over a three-year period, Brocke's $100,000 award will help to fund his research project, "The Distribution of Sodium Channels in Neuronal Membranes."

*Roy Knabenshue's steerable balloon soars in Pasadena skies above the Raymond Hotel. (Photo courtesy of the Pasadena Historical Society.)*



# Firsts in our field

*By Diane Davis*

Nobel prizes and scientific breakthroughs are the stuff of Caltech history. But across California Boulevard, history took off in another direction. There, bronze and granite plaques tell of landmark events that took place on the campus "south forty."

Tournament Park, which once included the area devoted to today's softball and soccer field, was years away from being a part of Caltech when the first "Rose Bowl" game was played there in 1902. The Tournament of Roses Association had purchased the land a year earlier, after it had served as the site for post-parade events — running and bicycle races, polo matches, and tugs-of-war. Tournament officials thought that pitting the University of Michigan, the "point-a-minute team" with a 501-0 season record, against the best in the west, Stanford, would create a contest worthy of a New Year's celebration.

Both teams accepted the invitation and met on tournament grounds on a hot, dusty afternoon. The 1,000 bleacher seats were not enough for the crowds that arrived, and 8,500 fans all but broke down the fences, after creating the biggest traffic jam that Pasadena had seen. The game went on into the dark of night and resulted in yet another victory for Michigan, 49-0. The pre-game stampede concerned the officials and the next year activities were again confined to picnic-style events.

1904 saw the initiation of an event famous in its own right. The book *Ben Hur* was a best-seller at the time, and the chariot races it inspired became the focus of each year's post-parade festivities for almost a decade. (The first year's race was supplemented by an automobile race. The winner drove the course in an average of 4 mph and won a pair of ladies' gloves for his efforts.)

The 1905 chariot race was a little *too* thrilling. Horses ran wild, and driver Ed Off barely escaped with his life. He tried to finish the ordeal in grand style with a bow to Rose Queen Hallie Woods, but collapsed on the spot. (He revived, and went on to head the Association.)

In 1915 that dangerous sport came to an end. In the opinion of Tournament directors, not only were the races perilous, but they provided nothing newsworthy to tout elsewhere in the country.

Thus football returned in 1916 and by that time the chariot races had drawn an audience large enough to warrant the building of stands for 25,000. Six years later the crowd had reached almost twice that number and it became obvious that a much larger stadium was needed. Work was begun on the Rose Bowl and in 1923 the New Year's competition moved across town.

Meanwhile, aeronautics history had been made on the once-a-year gridiron. In 1904 Roy Knabenshue first displayed his dirigible to southern California. Earlier that year he had become the first person to successfully fly such a contraption as he demonstrated the *California Arrow*, a steerable balloon, at the St. Louis Exposition. The balloon's owner, Thomas Baldwin, who had won $25,000 in St. Louis for Knabenshue's derring-do, asked Roy to go barnstorming over the country to promote the sport, and they were off. The pair headed for southern California when fall approached, and at Tournament Park they demonstrated the aircraft for Pasadenans.

Knabenshue returned to Pasadena several times, and settled there in 1913. That year and the next he conducted balloon rides for $25 per 20-minute ride from his hangar on Marengo Street.

Knabenshue was on hand in 1911 when Tournament Park became the landing strip for an aviation "first" that captivated the nation. On November 5 Calbraith (Cal) Perry Rodgers became the first person to fly from coast to coast, taking 49 days to navigate from Sheepshead Bay, New York, to Pasadena. Rodgers had responded to an offer by William Randolph Hearst to award $50,000 to the first person to make the coast-to-coast trip in under 30 days.

*Calbraith (Cal) Perry Rodgers before one of the many laps in his historic coast-to-coast flight. (Pasadena Historical Society photo.)*

The flight, which took an actual air time of 3 days, 10 hours, and 4 minutes, was accomplished at the expense of 16 crashes along the way. The craft had to be completely rebuilt four times, and some parts required eight replacements. At one point, the engine blew up at 4,000 feet and Rodgers took six miles to spiral to earth.

Repairs and parts were provided from a train accompanying him (and whose track provided one of his two means of navigation. The other was a string tied to a strut so that he could tell which way was up when caught in dense fog.) The train belonged to his sponsor, the Armour meat packing company, who agreed to pay him $5 per mile in return for advertising their new drink, Vin Fiz, by means of dropping leaflets and appropriately decorating his plane.

That craft, built for him by the Wright brothers (who had also given him his entire 90 minutes of flying lessons), was composed of bamboo, cloth, and wire. Its two wooden pusher-propellors were activated by bicycle chains, and the landing gear was four bicycle wheels mounted behind a pair of skis. The *Vin Fiz* now hangs in the Smithsonian.

Lookouts on Mt. Wilson used special telephone lines to herald Rodgers's approach to Pasadena. He was welcomed by 10,000 "out-of-their-minds-with-joy" spectators (according to a reporter on the scene) who were treated to a few aerial tricks before the aviator touched down on the target sheet that had been spread on the field.

According to one report, one of his first acts was to consume the bottle of Vin Fiz that providentially had been strapped to the one strut that made the entire trip. He also took the microphone that had been set up and reported his accomplishment to the Associated Press.

The next day Rodgers described his reception in the L.A. *Examiner:* "This was a happy reception I got in Pasadena; I was taken aback when those lovely women presented me with the flowers, and if I had any egotism it must have shown when I was being driven about the track in that motor car with the American flag wrapped around me." He added, "I think that this flight of mine has proven that the flying machine has come to stay and that it is only a matter of time until the flying machine has reached its highest point of efficiency. Personally, I prefer a buzz wagon with a good driver."

Rodgers went on to touch the shores of the Pacific at Long Beach, but there, six months later, he was killed in the crash that ensued when a seagull flew into the controls of his plane. Memorial services were held at Tournament Park.

Caltech turf also had a brush with world fame. On what is now Paddock Field, Charles Paddock, "the world's fastest human," set six world records in June 1921, the year after he won the Olympic gold medal in the 100-meter event in Antwerp. The Pasadena sprinter, who won a record number of points at the 1920, 1924, and 1928 Olympic competitions and who, at one time, held 94 world records for short distance running, is remembered by a plaque that lists records established from 90 yards (8.8 seconds) to 200 yards (19.0 seconds).

Tournament Park has also provided space for, among other things, float-building, early movie locations, circus grounds, stables for the city's work horses, and spring training for the Chicago Cubs.

Since Caltech acquired the land in 1949, things have been a bit quieter. However, some moderately persistent sleuthing around the area will result in the discovery of etched reminders that bring to life the illustrious stories played out on those fields.

*The first New Year's game receives honor on the north wall of the swimming pool. Charles Paddock is remembered at the northeast end of the track. The memorial plaque for Rodgers, Knabenshue, and chariot drivers, among others, stands in the picnic area.*

## THE WAY IT WAS

### 1907

The *Pasadena News* reports in May that "pretty girl graduates of this year's domestic science class at Throop Institute, under the direction of Miss Grace Dutton, have commenced giving their series of graduation dinners which are always a feature of the closing month of school, and are looked forward to both by the pupils and their friends with a great deal of interest.

"The dinners are given with all the elaborateness of a social function and are as perfect in every detail as the dainty young cooks can make them, for they are part of the final examinations. They invite their most favored friends to these dinners, thus making them delightful social affairs. The weekend was marked by a beautifully appointed red-rose dinner given by Miss Grace Fordyce . . . ."

### 1928

"FOOLPROOF WORLD CAN'T CRUMBLE, MILLIKAN SAYS," proclaims the *Los Angeles Times* on September 3. "SCIENTIST AVERS HE HEARS BIRTH CRY OF ATOMS TO PROVE IRON MADE IN INTERSTELLAR SPACE. Prediction that evidence of the daily creation of iron in interstellar space is almost within reach of scientific demonstration was made tonight by Dr. Robert A. Millikan . . . this and other evidences of elemental creation in progress in interstellar space were linked by Dr. Millikan with the assertion that nature made the world 'fool proof' so that the earth is not likely, as some scientists have suggested, to disintegrate in future time through atomic splitting upon a gigantic scale."

"GIANT TELESCOPE OF IMMENSE RANGE TO DWARF ALL OTHERS," reports the *New York Times*. "Announcement was made by the California Institute of Technology that funds have been provided for the erection and maintenance of a great telescope of the reflector type, with a mirror 200 inches in diameter, planned to surpass by from five to ten times the power of the present largest astronomical instrument in the world, the 100-inch Hooker Telescope on Mt. Wilson near Pasadena, and for construction of an astrophysical laboratory to supplement the work of the telescope . . . ."

"TELESCOPE OF POWER TENFOLD GREATER THAN ANY EXTANT TO BARE SECRETS OF UNIVERSE," comments the *Los Angeles Times.* "Standing on the threshold of a vast uncharted space to be penetrated by the 200-inch telescope, the scientific world is frankly a tiptoe with excitement . . . Men who ordinarily deal exclusively with uninspiring mathematical problems and cold concrete facts find themselves engaging in imaginative flights. What, they are asking themselves, will the giant new telescope of the California Institute of Technology reveal?"

### 1960

"Caltech's 52-man Glee Club, which seems to be making a career of collecting honors, collected the biggest last month when it was invited to provide music for the colorful closing ceremonies of the 1960 Olympic Games at Squaw Valley," recounts March *Engineering & Science* magazine.

In its October issue, *Engineering & Science* assigns a member of the class of 1962, Roger Noll, to report on the caliber of the freshman class. (Noll, BS '62, left reporting to become an economist and chairman of the Institute's Division of the Humanities and Social Sciences.) ". . . Caltech's newest class," reports Noll after Freshman Camp, "is different from its predecessors. Even on a Caltech scale it is not very athletic, contrary to advance notices. While there are a few experienced athletes in the class, including an all-conference basketball player from California's Desert League, the overall athletic ability of the group, as displayed at camp, was not particularly notable. And no other class has ever been beaten *quite* so decisively by the faculty in a softball game.

". . . Undoubtedly, this class is still by far the most intelligent freshman class in the world, but this year the freshmen don't seem to be as sharp as their immediate predecessors, or to possess as high a degree of quick wittedness as has been common in the past . . . ."

But what the freshmen may lack in quick wittedness, they make up in charm: "This is one of the most socially adept classes Caltech has ever had. They seem to know the difference between being friendly and obnoxious, between enthusiasm and naive effervescence. The class is full of the strong, silent type — the freshman who is always there when you want him, but never there when you don't."

For the new freshmen, there would be new houses. October *Engineering & Science* announces that "a multiple ceremony took place on the Caltech campus on October 3 when the Chandler Dining Hall and three new student houses were dedicated, and ground was broken for four graduate houses . . . ." The undergraduate houses: Ruddock, Page, and Lloyd; the graduate houses: Braun, Keck, Marks, and Mosher-Jorgensen.

## LETTERS

Dear Editor:

Diane Davis reviews Caltech's football record in the December 1981 *Caltech News.* I was a "snake" during my years at Tech and I saw only a few of the football contests she writes about.

One game that I remember was Tech versus Loyola in the fall of 1938. It was played in Gilmore Stadium, which stood on Beverly Boulevard, near where the Los Angeles CBS building stands today, before school started.

Fox Stanton's brave little band was no match for Loyola, which had as yet not deemphasized and where football players and not students played football.

During the game a burly, Goliath-like Loyola back sprang free from the line of scrimmage and headed for the Tech goal line. Only safety 5'3" Yoshinao Nakada, class of '40, who weighed 135 pounds after one of Ma Wheeler's more filling meals in Ricketts House, stood between him and the goal line. Scorning Yash, the Loyola back came straight on. It reminded one of a puppy facing a locomotive. Yash neither flinched nor fouled and brought the Loyola man down with a crashing, head-on tackle. Everyone cheered. Lloyd Goodmanson, head yell leader, was not needed.

I meet Yash now and then, usually at funerals of mutual friends. Each time I recount to him of his great defensive play in the Loyola game. He responds modestly. (Yash has retired and plays much tennis.)

He told me a sequel.

The same situation arose, according to Yash, when Tech played Pasadena Junior College (now PCC) for the Pasadena city championship in the Rose Bowl in 1938.

A PJC back sprang free and again only little Yash stood between the ball-carrier and six points for PJC. Yash made his move. The back swiveled his hip and Yash flew to the ground clutching nothing.

The PJC back was Jackie Robinson, who set a record with his 104-yard touchdown run.

Naomi Kashiwabara, BS '49

# Caltech teams tenacious in winter sports contests

## Basketball team determined in battling opponents

The Caltech basketball team opened practice on October 15 with only two returning varsity players — senior Phil Patten and junior Bob Golden. Three integral players from last year's team decided not to play this year. But the real tragedy of the season occurred when senior guard Glen Sigler died in a motorcycle accident on his way back to school.

Caltech opened the season with a thrilling overtime victory over Pacific Coast Baptist College, 56-55. Two weeks later, however, the varsity lost to alumni for the first time in five years, 48-38. Following the game, an alumnus told second-year coach Mike Poizner, "It's going to be a long season, Coach." A seven-point loss to Life Bible College demonstrated the accuracy of this statement; last year's team defeated Life by 38 points.

Caltech returned from the Christmas break with resounding defeats to Claremont (80-31) and Pomona College (84-17). The Beavers looked rusty and were easy prey for their stronger and quicker opponents.

In true Caltech tradition, the Beavers were determined not to be slaughtered as if they didn't belong on the same court with their adversaries. Tech came back with fine efforts against Redlands, Los Angeles Baptist, Whittier, and Occidental. The Beavers played Occidental evenly to 19-19 with only six minutes remaining in the first half, and lost grudgingly, 71-54. Even more outstanding was the 32-32 halftime deadlock with Claremont, when another overconfident team went to the locker room at halftime, looking embarrassed. Next Caltech faced Pomona College at home and lost 63-41, after trailing by only six points at halftime. Both individually and as a team, the players showed vast improvement during the season. Sophomore Stewart Peebles ranked as one of the league's leading rebounders, and Bob Golden consistently led the team in scoring. Phil Patten proved to be among the most able point guards in the league. Fine contributions were also made by the scoring of Chris Kyriakakis, and the hustle and determination of Howard Kong, Tom Heer, and Chris Cotterel. Armand Capote played well when healthy, and Wen-Teh Chang filled in admirably.

## Fencing program grows in strength

This year, Caltech's fencing program continued to grow. Five years ago, only five or six people were in the program; now, there are more than 25. This year, for the first time in many years, Caltech re-entered the Intercollegiate Fencing Conference of Southern California. This gave Tech two matches against each of seven other schools: Cal States Fullerton, Long Beach, Northridge, and San Diego; UC San Diego, UC Santa Barbara, and Cal Poly Pomona. The final record: eight wins and six losses for the men, and two wins and 12 losses for the women.

The men entered the season with more experience than the women, and therefore they experienced more success. The épée team finished fourth in the conference.

Outstanding team members were Bruce Prickett, who was manager, assistant coach for saber, and team organizer, and Scott Prahl and Maclen Marvit, who led the foil team. All three earned individual placements in the top ten. Prickett and Prahl were fifth in their respective events, and Marvit was sixth.

Next season, fencing faces a rebuilding program because Prickett, Prahl, Brian Kenney, Michael Thien, C. J. Beegle, and Lisa Penninger will graduate. However, the "youngsters" in the program received a lot of good experience this year and should be ready to go full tilt next year.

## Men's swim team finishes fourth in SCIAC

The men's swim team moved up a notch in the SCIAC championship meet, finishing ahead of Whittier and Redlands. The dual-meet season ended with a three-three record, as wins were recorded over Cal States Los Angeles, Redlands, and Whittier.

The Beavers were led by two outstanding swimmers, juniors Chris McKinnon and Bjorn Matthias, but lacked the depth to be strong contenders in the conference. McKinnon won the 200 and 400 individual medleys and the 200-yard breaststroke in the conference meet. His time of 4:18.27 in the 400 individual medley established a new conference-meet record. McKinnon qualified for two events in the NCAA Division 3 nationals to be held in late March at Lexington, Virginia. Matthias has done an excellent job in the distance events and is approaching the school record for the 500-yard freestyle.

In the shorter events, senior Kurt Bachmann and junior Bill Polson led the way. Freshman Dave Watkins contributed points in the middle distance freestyle and butterfly events, while other distance swimmers were senior Joe Garvey and junior Scott Michaels.

Junior Brent Stuart carried the load in the backstroke while seniors Russ Barnes and freshmen Uwe Hollerbach and Paul Graven were the breaststrokers. Two divers, senior Lee Laroco and junior Rusty Schweickart, scored valuable points all season. With a majority of the conference meet point winners returning, the men's team should improve next year on its fourth-place finish.

Claremont-Harvey Mudd replaced Occidental as men's champion this year, and Pomona-Pitzer edged Oxy out of second place.

## Women's swim team hurt by graduation, injuries

The women's swim team fell to last place in the SCIAC conference but still managed a win over Cal State Los Angeles in dual meet action. Hurt by graduation and injuries, the Techers nevertheless contributed some excellent races and efforts.

Cathy Kirschvink, a senior, destroyed her own school record in the 50 breaststroke with a time of 35.53, and dropped her 100 individual medley to an excellent 1:12.64 in dual meet competition. Cathy showed herself to be one of the top women swimmers in the conference. And although she was a victim of a shoulder injury, junior Loren Alving recovered in time to swim a 1:01.28 in the 100-yard freestyle at the conference meet, scoring needed points.

Diving duties fell to freshman Faye Flam and sophomore all-around athlete Clare Waterson. Juniors Gloria Badilla, Faan Tone Liu, and Lynne Adler led in distance events. Backstrokers included senior Margaret Short and junior Charlotte Clark. Junior Noemi de la Puente gave the needed speed and enthusiasm in the sprints.

Coach Dodd relates, "All in all, not a bad year. Everyone did an excellent job, and in the final score we were only 29 and 32 points away from Whittier and Redlands in the championship meet." Pomona-Pitzer was the final winner and is picked to win the women's NCAA Division III meet.

## Wrestling team rebuilds, regains momentum

Caltech's 1982 wrestling team slipped a notch or two from its preseason predicted finish. Head Coach Lin Parker and Assistant Coach Jim Woodhead (PhD '66) saw a once-promising team, and their high hopes, disintegrate as injury, church missions, and several leaves of absence took no less than seven 1981 lettermen to other activities.

A salvage operation began to shore up the once-proud team, as three freshmen and two juniors picked up the Beaver banner this year. The wrestling team began anew, learning wrestling from the ground up. All took pride in small accomplishments, and in every step toward improving their individual wrestling skills.

Emerging as the 1982 leader was 1980 SCIAC second-place finisher John Humphrey. Clearly the top competitor this season, Humphrey, from Savannah, Georgia, placed third at the conference tournament. These efforts garnered this Caltech junior the Thomas W. Latham Award for ability-attitude-improvement--performance. Humphrey was also elected the team's captain.

Charles Strauss earned points for Tech by placing fourth in the unlimited weight class at the Twelfth Annual Caltech Wrestling Tournament. Strauss was also chosen to receive the Outstanding First Year Wrestler award. (Strauss and Humphrey shared the fulback position on Coach Parker's football team.) Other bright spots were created by freshmen Lewis Aronson, Don Buchholz, and Steve Penn.

As the Tech wrestlers move on toward next season, the return to competition of SCIAC champions Bob Shoemaker and Mike Ammon, along with returning 1982 lettermen, forecast a bright future.

Claremont-Mudd dominated both the dual matches and the conference tournament to win the SCIAC championship, followed by Pomona-Pitzer, Whittier, La Verne, and Caltech, in that order.

## Caltech alumni call from five locations in telephone program

The next telephone voice you hear may be that of a fellow Caltech alumnus who is working for the Alumni Fund telephone program. During March, April, and May, calls are going out to graduates throughout the country from five West Coast locations: Sears in Alhambra, Varco International in Orange, Intel Corporation in Santa Clara, Merrill Lynch in Oakland, and General Dynamics in San Diego.

Volunteers are participating in this program to seek Alumni Fund support, according to David L. Hanna (BS '52), the national Alumni Fund chairman.

Charles H. McDougall (BS '47), an executive with Sears, has made that company's telephone system available for the eighth consecutive year. Gordon B. Weir (BS '40, MS '41), Harold B. Crockett (MS '40), and Jeff Williamson (BS '48, MS '49, Eng '55), are heading the Alhambra telephone effort.

In the San Francisco area, Barry R. Lieberman (BS '68) has opened the telephone system of Intel Corporation to the Alumni Fund, and Harrison W. Sigworth (BS '44), that of Merrill Lynch. Donald L. Cleveland (BS '34) and Weldon H. Jackson (BS '54) are coordinating the San Francisco Bay area telephone program.

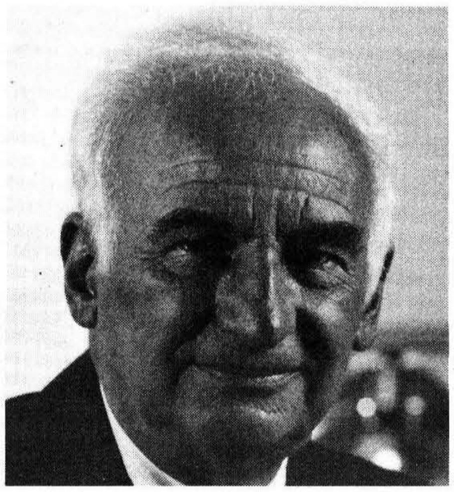
Andrew B. Campbell (BS '46) and Lee Carleton (BS '33) head the South Coast telephone effort — the first involving calls from a central Orange County location. This year, alumni will make calls from Varco on two evenings. Charles M. Davis (BS '45, MS '46) is serving as host for the San Diego group.

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

## Simon Ramo: Seminar Day keynote speaker

Simon Ramo, director of TRW and chairman of the board of TRW--Fujitsu Company, will give the keynote address at Alumni Seminar Day on Saturday, May 15. Ramo, who is visiting associate in engineering and visiting professor of management science at Caltech, will talk on "What's Wrong with the Technological Society — and How to Fix it."

Thirteen research seminars in the sciences, humanities, social sciences, and engineering will be featured on the program. The speakers include: Norman Brooks, the James Irvine Professor of Environmental and Civil



*Simon Ramo*

Engineering and director of the Environmental Quality Laboratory; Paul Dimotakis, associate professor of aeronautics and applied physics; Ronald Drever, professor of physics; John Hopfield, the Roscoe G. Dickinson Professor of Chemistry and Biology; Barclay Kamb, professor of geology and geophysics and chairman of the Division of Geological and Planetary Sciences.

Joseph Kirschvink, assistant professor of geobiology; Elias Lazarides, associate professor of biology; Jerome McGann, the Doris and Henry Dreyfuss Professor of the Humanities; Roger Noll, Institute Professor of Social Sciences and chairman of the Division of the Humanities and Social Sciences; Thomas Phillips, professor of physics and associate director of Owens Valley Radio Observatory; Fredric Raichlen, professor of civil engineering; Jean-Paul Revel, the Albert Billings Ruddock Professor of Biology; and Geoff Robillard, assistant laboratory director for energy and technology applications at JPL.

## Class reunion schedule announced

Alumni who graduated 50 years ago — and at five-year intervals since that time — are invited to the campus this spring for class reunions. The Half-Century Club will welcome inductees from the class of 1932 when new members are honored at a 12:30 p.m. luncheon on June 4 at the Huntington-Sheraton Hotel.

Later in the day, the class will return to the Alumni House for a reception and buffet supper. Wives or guests, and alumni from earlier classes, are invited.

Most of the other class reunions will follow a traditional format, with campus tours at 4 p.m. followed by social hours at the Alumni House or Athenaeum, and dinner in the Athenaeum. Reunion dates are: June 4 — classes of 1932, 1937, 1942, and 1962; June 5 — 1947, 1952, 1967; June 12 — 1972, 1977. The class of 1957 will hold its reunion on May 14.

## New Alumni Association Board members nominated

The Board of Directors of the Alumni Association met as a nominating committee on January 26, 1982, in accordance with Section 5.01 of the bylaws. Four vacancies on the board, in addition to the positions of president, vice president, secretary, and treasurer, are to be filled. The current members on the board, with the years in which their terms expire, are:

*Francis H. Clauser, BS '34, MS '35, PhD '37 — 1982*
*Thomas V. Davis, BS '38, MS '47, Eng '48 — 1982*
*David E. Groce, BS '58, PhD '63 — 1983*
*Carl W. Hamilton, BS '62 — 1983*
*Carole L. Hamilton, PhD '63 — 1983*
*David L. Hanna, BS '52 — 1982*
*Frances E. Janssen, BS '75, MS '77 — 1982*
*Arne Kalm, BS '56, MS '57 — 1985*
*William J. Karzas, BS '49, PhD '55 — 1984*
*Herbert A. Lassen, BS '43, MS '47, PhD '51 — 1983*
*Richard G. Lipes, PhD '69 — 1984*
*Philip M. Neches, BS '73, MS '77 — 1984*
*Philip L. Reynolds, BS '58, MS '59 — 1983*
*J. Robert Shreck, BS '34 — 1982*
*Donald L. Smith, BS '71, MS '72 — 1983*
*Neil J. Stefanides, BS '53, MS '54 — 1984*
*Gregory P. Stone, BS '75, MS '74 — 1984*
*Samuel N. Vodopia, BS '54 — 1984*
*Donald P. Wilkinson, BS '48 — 1983*
*James W. Workman, BS '57, MS '58 — 1982*

The following individuals have been nominated for terms beginning at the close of the annual meeting in June 1982:

*President: William J. Karzas, BS '49, PhD '55 — 1 year*
*Vice President: Arne Kalm, BS '56, MS '57 — 1 year*
*Treasurer: Carole L. Hamilton, PhD '63 — 1 year*
*Secretary: Donald P. Wilkinson, BS '48 — 1 year*

Directors:
*Robert B. Leighton, BS '41, MS '44, PhD '47 — 3 years*
*Lee W. Ralston, BS '27 — 3 years*
*Sidney Schafer, MS '36 — 1 year*
*Paul H. Winter, BS '44 — 3 years*

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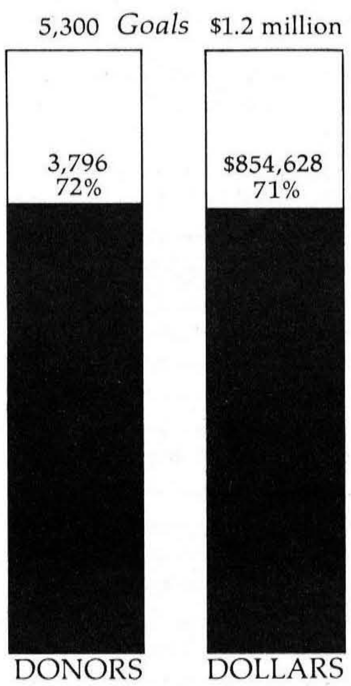
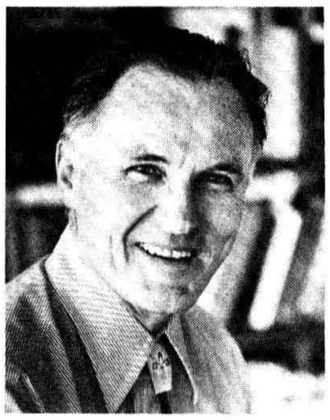
## The Alumni Fund 1981-82

*As of February 19, 1982 (time elapsed, 63%)*




Section 5.01 of the bylaws provides that members may make additional nominations for directors or officers by a petition signed by at least 50 regular members in good standing, providing the petition is received by the secretary no later than April 15. In accordance with section 5.02 of the bylaws, if no additional nominations are received by April 15, the secretary casts the unanimous vote of all regular members of the Association for the election of the candidates nominated by the board. Otherwise a letter ballot is required.

Below are the biographical summaries of those nominated for directors.



*Robert Leighton*

Robert B. Leighton (BS '41, MS '44, PhD '47) is professor of physics in the Division of Physics, Mathematics and Astronomy at Caltech. He has done research on cosmic rays, solar physics, the planets, infrared astronomy, and millimeter-wave astronomy. Leighton participated in television picture experiments on the spacecrafts Mariners 4, 6, 7, and 9. Among the instruments he has developed are Doppler-shift and Zeeman-effect cameras.

With Gerry Neugebauer of Caltech, he designed and built an inexpensive infrared telescope that was used to survey the sky for objects having copious radiation in the infrared spectrum near 2.2 microns wavelength.

Over several years, Leighton has designed and built four radio-type telescopes for studying millimeter-wave and submillimeter-wave radiations from astronomical objects. Three of these telescopes are located at Caltech's Owens Valley Radio Observatory near Big Pine, California, and are used mainly for millimeter-wave interferometric studies. The fourth will be installed on Mauna Kea, Hawaii, for far-infrared and submillimeter wave studies.

Leighton became a research fellow at Caltech in 1947 and advanced to full professorship in 1959. During World War II he was engaged in rocketry research at Caltech. He is a member of the American Physical Society, Sigma Xi, the American Astronomical Society, the American Association of Arts and Sciences, and the National Academy of Sciences.

*Lee Ralston*

Lee W. Ralston (BS '27) joined Standard Oil of California after graduating from Caltech but shifted to a career in education after ten years, completing his MA and EdD degrees at UCLA. He retired as director of vocational education for the Office of the Los Angeles County Superintendent of Schools.

Ralston has had experience in both national and international assignments and has been a visiting professor in education programs throughout the United States. He is past president of the Trade and Industrial Division of the American Vocational Association and the American Technical Education Association. He has been named to the National Hall of Fame for Vocational Education and to the California Hall of Fame for Vocational Education.

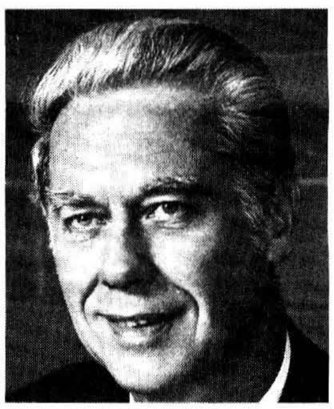
As chairman of the Sigma Alpha Pi alumni, he was responsible for raising funds for the Sigma Alpha Pi room at the Alumni House, and he is a life member of the Alumni Association.

*Sidney Schafer*

Sidney Schafer earned his BA degree from the University of Wisconsin in 1930 and his MS degree in geology from Caltech in 1936. He worked for the British South Africa Company, prospecting for gold and other minerals in Northern Rhodesia, and he was employed by Texaco, Tidewater Oil Company, and Pan American Production Company as a geophysicist.

In 1945, Schafer opened a geophysical and geological consulting office in Houston. Today he heads Sidney Schafer and Associates, a professional corporation engaged in geophysical and geological consulting, oil and gas exploration, and production and publishing. He is a member of the American Association of Petroleum Geologists.

Schafer is a member of The Caltech Associates. He worked as a volunteer for the Science for Mankind development campaign and in 1972, when the Alumni Fund was re-established, he became a volunteer. He was the area chairman for Houston and has been a regional chairman since 1979.



*Paul Winter*

Paul H. Winter (BS '44) is a consulting structural engineer providing design services for new buildings and consultation and analysis of existing structures. After graduating from Caltech he served in WW II in the Pacific theater as an officer in the Naval Civil Engineer Corps, and after the war he returned to USC for an MS degree in structural engineering.

Afterward he represented UNESCO in Afghanistan for two years, served as an officer of two large architectural-engineering firms in the U.S. and overseas, and established his own consulting firm.

Winter has been active in professional organizations, serving on the board of several engineering societies, and is a Fellow of the American Society of Civil Engineers and a Fellow of the Institute for the Advancement of Engineering. He has been a member of the Alumni Seminar Day Committee for four years and is a life member of the Alumni Association.

# Obituaries

**1922**

A. P. G. STEFFES, Ex, in March 1981 in Los Angeles after a long illness. He had been an attorney with Hurley & Grassini in North Hollywood.

**1923**

GEORGE I. HICKEY, SR., on November 11. He was valuation assistant with Southern California Edison in Los Angeles before his retirement in 1965. He is survived by his wife, who writes, "He loved Caltech and thought that science benefited greatly from the teachings given students at your institution."

LLOYD A. WALLING on December 7. Before his retirement in 1968, Walling was with the Pacific Fire Rating Bureau in Los Angeles. During his years at Caltech he was instrumental in incorporating the Sigma Alpha Pi fraternity and arranging for the purchase of its house on South Mentor Avenue, which provided housing for members for almost a decade before undergraduate housing became available on campus. Walling leaves his wife, Beatrice, two sons, and five grandchildren.

**1931**

HARRY A. KIRKPATRICK, PhD, on January 5. While he was earning his undergraduate degree at Occidental College, he was recognized for outstanding performance in many areas of athletics. At Caltech he did research under Jesse DuMond to document the component parts of the atom, and the spectrometer they devised for that work is on display at the Smithsonian Institution. Kirkpatrick then taught at the University of Hawaii for four years, and returned to Occidental as a physics professor until 1941, when he joined the MIT radar group. He again returned to Occidental from 1945 until his retirement in 1957, but continued to do research under Navy and Air Force grants at Caltech, USC, and the University of Wisconsin. Retiring permanently in 1967, he had been living in Fallbrook, California.

**1933**

PAUL H. KEMMER, MS, on May 28, 1981. He had retired from the Air Force with the rank of colonel and had been living in Prescott, Arizona.

**1934**

VICE ADMIRAL A. B. VOSSELLER, MS, on November 27 in Palm Beach, Florida. After his graduation from the Naval Academy in 1924, he had a long and distinguished military career. In charge of a seaplane squadron searching for Nazi submarines at the start of World War II, he later commanded the escort carrier *Bogue* and its task group, which was credited with sinking 13 U-boats. After the war, Vosseller was commanding officer of the Naval Air Station at Patuxent River, Maryland, of the carrier *Coral Sea*, and of Carrier Division 18. In 1955 he assumed command of the 11th and 12th Naval Districts in San Diego.

When he retired from the Navy in 1956, he became senior military adviser to the director of development planning at Lockheed Aircraft, and later vice president of its operations abroad. Vosseller is survived by his wife, Julia, two sons, two stepchildren, and six grandchildren.

**1935**
HANS MARTIN ANTZ, MS on November 13. He had retired in 1974 from his position as manufacturing director of Astra Werke in Hamburg, Germany.

**1936**
CHARLES B. JORDAN, MS, '37, on October 31, 1980. He had retired from a position on the technical staff at JPL and had been living in Pasadena.

**1940**
FRANK D. OLNEY on November 8. Following his graduation from Caltech, he was an engineer for General Electric in Schenectady, New York, for 11 years, then joined Hughes Aircraft in Culver City, California. As an electrical engineer with Hughes he helped build the Surveyor spacecraft. Upon retirement, he and his wife, Jean, moved to Laguna Beach, where he did research and writing on science and the humanities. Olney was a member of the South Coast Literacy Council, teaching English as a Second Language for nine years, and of the National Affiliation for Literacy Advance. In addition to his wife, he is survived by two sons.

**1974**
GERTRUDE FILA, MS, on January 6, 1980, of cancer. She had been a mathematics instructor at Stillwater Middle School in Stillwater, Oklahoma. Though she received her Caltech degree in 1974, she did her academic work here in 1945, when women could not formally register. The faculty reviewed her course work in aeronautics almost thirty years later and recommended her for the degree. Her husband survives her.

# Personals

**1918**
FRANK CAPRA, veteran film maker, was presented with the American Film Institute's Life Achievement Award on March 4. The annual awards goes to "an individual whose talent has in a fundamental way advanced the film-making art . . . and whose work has stood the test of time." That work includes *It's a Wonderful Life, Lost Horizon,* and Oscar-winning *It Happened One Night.*

**1935**
J. HAROLD WAYLAND, MS, PhD '37, professor of engineering science, emeritus, at Caltech, has received an Alexander von Humboldt Senior Scientist Award and will spend six months doing research at the Institute of Physiology at the University of Heidelburg.

**1937**
ROLAND A. BUDENHOLZER, MS, PhD '39, has received the Distinguished Alumni Award in Engineering for 1981 from New Mexico State University in Las Cruces. Budenholzer is Rettaliata Professor Emeritus and chairman of the American Power Conference at Illinois Institute of Technology.

**1939**
HERMAN ENGLANDER writes from La Mesa, California, "I work with intellectually gifted students and would like to share experiences with others (parents, teachers, etc.) who also do so."

**1948**
N. JOHN BECK, MS, and WELKO E. GASICH, Eng, have been elected to the Society of Automotive Engineers (SAE) Fellow grade of membership. Beck, who is president of BKM, Inc., in Chula Vista, California, and SAE's 1982 president-elect, was cited for outstanding research contributions in internal combustion engines. Gasich, senior vice president of advanced projects with Northrop Corporation in Los Angeles, was chosen for outstanding contributions in aeronautics in the design and development of the first operational supersonic jet trainer, the T-38, and the F-5 jet fighter airplane.

WARREN D. HARRISON reports from North Hollywood, California, that he is alive and well and owns a mechanical engineering consulting firm.

**1949**
DONALD W. PETERSON reports, "In 1980 I received the assignment of scientist-in-charge of the U.S. Geological Survey's project for the study and monitoring of Mount St. Helens. This involved moving from California to Vancouver, Washington."

**1953**
THOMAS T. TAYLOR, MS, PhD '58, writes, "In 1977 I became seriously disabled by a stroke. Not able to continue teaching and other duties at Loyola Marymount University, I was — in 1980 — granted the title of emeritus professor of physics."

LAWRENCE WALLCAVE, PhD, informs us that he has retired as research professor of environmental chemistry at the University of Nebraska Medical Center and is now living in Santa Rosa, California, where he is associated with Calsec Consultants, Inc., of Berkeley.

**1954**
BENJAMIN M. ROSEN sends the following: "I left the investment banking firm of Morgan Stanley & Company as vice president and electronics analyst two years ago to form my own firm. New York-based Rosen Research, Inc., publishes The Rosen Electronics Letter, which analyzes market, product, and technology trends for industry executives and the financial community. We also conduct annual forums on the semiconductor and personal computer industries. With recent staff additions, more products in other technology areas are in the offing. More recently, I ventured into a new adventure — venture capital — with L. J. Sevin as my partner. We raised $25 million from U.S. and European financial institutions, corporations, and individuals to invest in new high-technology companies, with a heavy emphasis on funding those at the start-up stage."

**1955**
A. DALE KAISER, PhD, professor of biochemistry at Stanford's School of Medicine, has been named the sixth recipient of Scripps Clinic and Research Foundation's Waterford Biomedical Science Award. He is recognized for his role in establishing the foundation on which much of the field of molecular genetics was built.

**1956**
G. LOUIS FLETCHER, general manager and chief engineer for the San Bernardino Valley Municipal Water District, has been named co-winner of the 1981 J. James R. Croes Medal, the national award for outstanding achievement by an engineer in the field of technical research and writing. The American Society of Civil Engineers presented the award for Fletcher's article on mortar lining of steel pipelines.

**1964**
A. H. (STEEN) GRAY, JR., PhD, writes that he is vice president of Signal Technology, Inc., in Santa Barbara, California, and received his MBA from Pepperdine in December 1981.

**1966**
JOHN R. ADAMS, an attorney with Taylor, Miller, Magner, and Sprowl in Chicago, announces that he and his wife, Cynthia, welcomed a baby girl, Alison Marie, on September 23.

SUSANN NOVALIS, MS, reports, "After eight years of teaching mathematics at San Francisco State University, I've been appointed associate dean of the School of Science."

**1967**
A. WINSOR BROWN, JR., MS, writes, "I've started doing a regular column for a trade newspaper (Software News) on the Pascal programming language. I'd be interested in hearing from anyone using Pascal in serious applications work. I've also put together and presented to over 500 attendees a professional development seminar, 'Introduction to Pascal.' It was done under the auspices of IEEE Computer Society, but I can do it for other groups. You can contact me at 15332 Fieldston Lane, Huntington Beach, CA 92647, or by phone at Point 4 Data Corporation, 714-754-4114."

BENJAMIN G. COOPER, assistant professor of mathematics at Augsburg College in Minneapolis, reports, "In recent years, my wife and I have both been tenured at our respective academic institutions (hers is the University of Minnesota, where she is professor of law), and we are enjoying our first child, Timothy, born June 20, 1981."

**1969**
KATHLEEN E. ABBOTT, MS, writes from Portland, Oregon, "There seems to be no end of things a person can do with a degree in aero. In 12 years I have worked for one aerospace company, one engineering construction company, two pulp paper mills, one general consultant, and now am the instrument engineer at a nuclear power plant."

**1971**
WILLIAM B. UPHOLT, PhD, assistant professor in pediatrics at the University of Chicago, announces the birth of a daughter, Gretchen Morrison, on November 4.

**1972**
GEORGE A. RAPPOLT writes from Athol, Massachusetts, "On November 4 I passed my doctoral orals (in psychology) and on November 11, my second child, a daughter, Pélé Alethea Tara Rappolt, was born. Now I'm job hunting."

YORKMAN LOWE, Ex '72, writes, "I'd just like to report that I received the MS degree in industrial engineering from San Jose State University in December 1981, and now will go on to more *relevant* studies such as piano, photography, and social dancing. I'm employed by Fairchild Test Systems, San Jose, as an engineering change coordinator, and particularly enjoy collecting cartoons and historic photos."

PAUL S. ZYGIELBAUM, MS '73, has joined Hewlett-Packard's Signal Analysis Division in Santa Rosa, California. In January 1981 he and his wife welcomed their third child, Joshua Michael.

**1974**
GENE GINDI reports that he is an assistant professor in the department of electrical and computer engineering at Clarkson College in Potsdam, New York, and is working in optical signal processing and medical imaging.

EDWARD B. PONTIUS writes, "My wife and I have moved to Honolulu, where I'm finishing my residency in psychiatry."

**1975**
KARL RUDNICK, PhD, and his wife, Jill Cooper, report the birth of their daughter, Elizabeth, on January 27. Rudnick is a mathematician at Aerospace in El Segundo, California.

**1976**
CHANNON P. PRICE II sends this update: "In June I received my PhD in astrophysics from UC Santa Barbara. In July, Marsha Hancock and I were married. This September I began my present position as a post-doctoral fellow at McMaster University in (Ontario) Canada, where I am continuing to do research in neutron stars."

**1977**
JOHN B. ERNEST, a chemical engineer at JPL, married Susan I. Medina on August 15, 1981. The Ernests live in Alhambra, California.

LARRY PAULSON sends the following: "I have just completed my PhD in computer science from Stanford and will spend the next few years with the Computer Laboratory of Cambridge University, in England (the real Cambridge). The beer and new wave clubs may compensate for the lack of tortillas." (Ed. note: Canned tortillas were seen at Fortnum and Masons in London in 1978.)

FREDERICH SOLOMON reports that he received his PhD in mathematics from UCLA in 1981.

**1978**
ANTONY BAKKE, PhD, is assistant professor of research medicine at the USC medical school and director of the flow cytometry lab in the rheumatology section.

**1979**
SAI-WAI FU, MS '80, a components engineer with Intel in Aloha, Oregon, announces his marriage to BEATRICE LEE (BS '80) in June 1981.

Caltech faculty, staff, and alumni traditionally get involved — along with students — in the annual spring musical. This year, a production of *South Pacific* featured a bit player who stole the show. Richard Feynman (the Richard Chace Tolman Professor of Theoretical Physics) appeared as a native chieftain on Bali Hai and brought rousing cheers as he played the tweti, a Tahitian drum. For the performance, Feynman took pains to master a few lines in Tahitian.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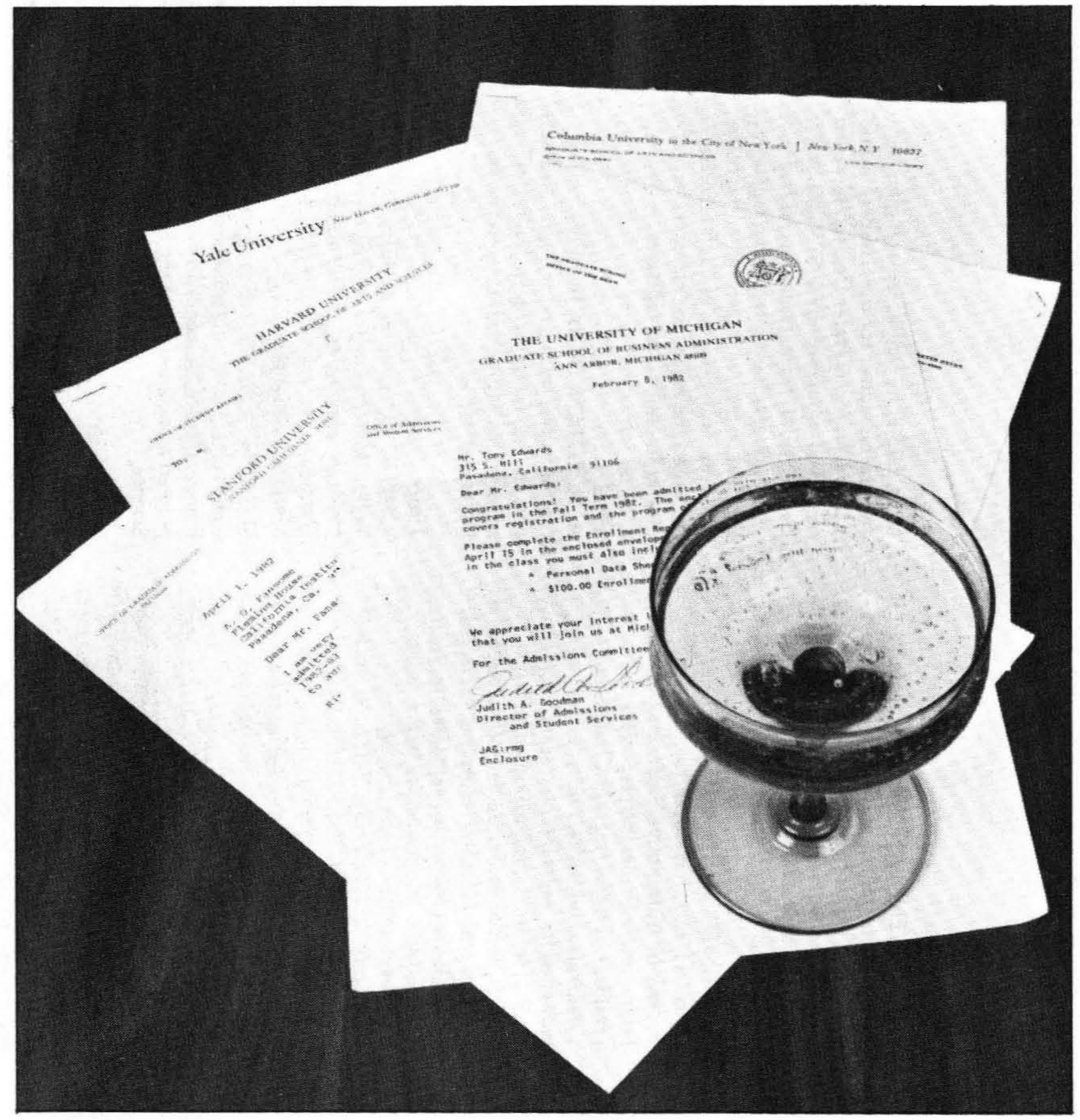


Admission to graduate school: Cause for celebration. See page 1.

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