

CALTECH NEWS

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Brown assesses Caltech in the 70's

A university is a good barometer of change. Its constituents—students, faculty, and administration—represent a cross section of attitudes and backgrounds that not only contribute to academic change but also serve as indicators of change within the society as a whole. Like most other American universities, Caltech has experienced significant changes in recent years—the inauguration of a new president, selection of new division chairmen, revision of the curriculum, admission of the first undergraduate women, and the establishment of the Environmental Quality Laboratory. The number and rapidity of these changes have given rise to many questions from alumni who are concerned about where the Institute is today and where it is going in the coming decade. In response to this interest, Alumni President Bill Freed collected some of the most often asked questions and conducted this interview with President Harold Brown.

Alumni President Bill Freed interviews President Harold Brown

Freed:

What do you think are Caltech's greatest assets?

Brown:

Caltech's greatest assets are the quality of its faculty and students. This is practically a truism, so I should add that I think there are other factors that give us a better opportunity than almost anyone else to do the kinds of things we want to do here at Caltech. These include small size, a tradition of excellence, and—perhaps even more important—a tradition of cooperation across disciplinary boundaries and of mutual respect among the people of the Caltech community.

Freed:

We've had seven decades of academic excellence at Caltech. What will be the major academic challenges here in the ten years ahead?

Brown:

Of course, at least some of those seven decades have been spent in achieving excellence, with various disciplines evolving successively toward an outstanding faculty and research program and outstanding students as well. I think we can expect the same thing to happen in some of the new projects we undertake. None of them will develop overnight, and some may take longer to achieve than others. It will be a real challenge to maintain the preeminence that we have in a number of our areas of effort now because many other places have improved a great deal in the past two decades. The competition is much more severe. What we will have to do is turn our small size to advantage by letting it force us to abandon things that others can do as well—or almost as well—as we go on to other things that need to be done and which we can do better and earlier than others. In short, learning to change faster than we grow will be a very severe academic challenge.

For example, I would expect that biology, and particularly behavioral biology—the understanding of how other creatures behave and how man behaves—would be an important area for Caltech to develop. We already have considerable activity of this sort here with Professors Sperry, Benzer, Olds, and others. How to combine this with our work in information theory and with what we may build up in psychology is going to be an intellectual challenge to the participants.

The second area that seems almost certain to undergo growth (I hope in quality as well as in size) is social science, which I'll talk about a little later.

In engineering, clearly there is interest in working on complex systems and there



probably will be interaction between engineering and social science in this regard.

Each of our existing scientific disciplines has one or more new pathways that it can follow to considerable advantage; an understanding of planetary formation in our geology and planetary sciences division, chemical dynamics in our chemical and chemical engineering division, radio astronomy, and so forth. It is quite clear that we can't go all out on all of these at once, so we will have to make some difficult choices. That may be the biggest academic challenge of all during the next decade.

Freed:

One of today's most perplexing problems is the environment. What is the Institute's role now and what should be its role in the future in finding technological answers in this area?

Brown:

The Institute has a proud history in this area, beginning with the efforts of Professor Haagen-Smit over the past 20 years. During the past decade we have built up an environmental engineering science curriculum that has trained many students and has been accompanied by a

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L.A. earthquake keeps Caltech seismo lab busy

Although it's not much consolation to the millions of residents of the Los Angeles area who were shaken awake by the February 9 earthquake, Caltech seismologist Don Anderson says it was the most scientifically significant temblor we have ever had.

Anderson, who is the director of the Institute's Donnelley Seismological Laboratory, explains why: "First of all, it was an extremely important earthquake because it occurred right in the center of our seismic recording array. Because of that, we were able to record it much more precisely than others that have occurred at greater distances. So we're getting a lot of information about this one that we were unable to get for past earthquakes.

"Secondly—and this is related to the fact that we were so close—we were able to get a lot of geologists and portable instruments into the field very quickly." Anderson points out that an incredible amount has been learned about earthquakes just by studying them from great distances. So, he concludes, the closer you are the more you are likely to learn.

At the Donnelley Seismological Laboratory, the day of a major earthquake is always a busy one, and February 9 was no exception. "As soon as we felt the shaking and knew it was an earthquake, everyone started for the lab," Anderson says. "We were essentially fully staffed by 7 a.m.—an hour after the initial quake." The first people to arrive at the laboratory immediately started the process of locating the earthquake and trying to calculate its magnitude. Within the 15

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New laboratory tackles problems of environment

Caltech has set up a unique new Environmental Quality Laboratory (EQL) to look for answers to some of our most critical environmental questions—and then to actively pursue implementation of its findings.

The EQL is constructed on an interdisciplinary framework that brings engineers, natural scientists, and social scientists together with visiting scholars and representatives of government and industry to examine the practical problems of the environment.

The lab's aim is to suggest possible scientific solutions—including their social, political, and economic aspects—to government and industry.

Lester Lees, professor of environmental engineering science and aeronautics, is director of the new lab, and he intends to keep it informal, small, and flexible. "What we want to do least is grow," he says. "We expect our group won't have

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Brown's outlook for Caltech in the next decade

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great deal of valuable basic and applied research. In 1970 the Institute embarked on an additional activity, the Environmental Quality Laboratory, which takes a somewhat more programmatic approach, combining engineering analysis, social science expertise, and systems analysis to assist industrial organizations in making their own decisions and to help government legislative, executive, and regulatory agencies decide what the appropriate public ground rules and decisions should be.

What Caltech's role should be is an extremely difficult and complex question, involving everything from needed research to get technical answers, through technological systems designs and economic studies, to the basic questions of what constitutes the quality of life and how costs and advantages should be

possible to project support costs—and if we are to hold costs to an acceptable level, this is where it become important to apply strong pressures for austerity in providing support in the way of buildings and building maintenance, secretarial help, and business, purchasing, and financial services.

A careful analysis of past patterns has given us a chance to see where economies might be made. We have found that we can project and indeed control costs to some extent. Some of our sources of income are considerably less predictable. Endowment and tuition income can probably be projected for several years, but together these represent only between a quarter and a third of what we spend. Federal government contracts and grants are reasonably predictable for a year, but much less so for five years, and private gifts—which constitute about 15

own or in collaboration with other members of the faculty. It is clear that a number of activities the Institute is undertaking outside of social science will

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to make a contribution
to social science, I
think we ought to try."**

require collaborations with social scientists of ability, eminence, and imagination. These activities include the Environmental Quality Laboratory; the population and resources study currently being carried on under an AID contract by a group including Harrison Brown, Alan Sweezy, Ted Scudder, and Ned Munger; and a possible new combination of research activities flowing from work already being done at Caltech on various kinds of natural disasters—earthquakes (both seismology and earthquake engineering), fires, and tsunamis. This effort would require an understanding of the economics and psychology of such situations if the results are to be applicable to questions of public policy.

In addition to these activities in which social science is a vital element, the division of humanities and social sciences has prepared an application for support of a core program by the National Science Foundation and perhaps private donors as well. This program would bring together social scientists from various disciplines in the Caltech atmosphere to conduct analytical studies of policy relevance. They would make use of historical studies, social statistics, laboratory simulations, and computer simulations.

Many people doubt whether social science is rightly named. Certainly it is in primitive form compared to the natural sciences—perhaps largely because the questions with which it deals are so much more complicated and it is not obvious that they can be decomposed into simpler questions as has often happened in physical science. But the problems with which it tries to deal are not only real but pressing, and if Caltech has a chance to make a real contribution here, I think we ought to try. Implicit in all this is the thought that within the next few years there may be graduate programs here in the social sciences.

This is not likely to be so for the humanities. In this sense, I think that humanities activity at the Institute should be regarded as a way of enriching the atmosphere, not just for undergraduates but for everyone. Again, because of our size, we will have to be quite selective, and I think that we should place more emphasis on the performing arts, both by bringing prominent performers here and by giving our students (particularly our undergraduates, many of whom tend to be introverted and shy—a situation with which I sympathize because I was very much that way when I was in college, and haven't quite outgrown it yet) a chance to express themselves in what are known as the affective areas of art and music and poetry. It is foolish to think that you can force people to do this, or that you ought to force people to get into this kind of thing—but what you can do is offer the opportunity.

Freed:
The recent Carnegie Report listed a number of universities that are having financial difficulties. How is our financial status?

Brown:
There are activities, which we think

important, that we are not doing right now because the funds are not available. As a result of this austerity, the Institute, I would say, is now in fair financial condition, but future finances are quite precarious, because we can't predict the trend of government financing or private giving. Certainly, without a brighter future than we now see in terms of these two factors, it will be difficult, if not impossible, to do the new things we have talked about even if we cut back on some of the old ones.

The only reason the Institute is not now as badly off as some highly advertised cases is that during the period 1967 and 1968, when the rate of increase in government grants had already dropped rapidly, the Institute—instead of continuing to expand its faculty and student body as some other places did—began to cut back. There were actually fewer



shared among different segments of the population.

We envisage the Environmental Quality Laboratory as a small enterprise involving perhaps 15 or 20 people, divided between permanent and visiting or temporary personnel and including a number of Caltech professorial faculty. This requires that they concentrate on a very small number of critical problems. Professor Lester Lees, the director of EQL, and several other faculty members have succeeded in getting substantial financial support from private corporations and private foundations, and have applied for an NSF grant as well.

Freed:
It seems to many of us that some of the problems experienced by universities today have resulted from a lack of long-range planning. How does Caltech perform its planning function on such items as finances, curriculum, research, staff, and so on?

Brown:
During the past year or so Caltech has organized a thorough, though not overly elaborate, planning method involving a rolling five-year plan—which means it is updated and revised every year to cover the five years ahead. This begins with a statement of the academic goals of the various divisions, which are thoroughly discussed by the Institute Administrative Council. These statements include faculty inputs and decisions on such things as curriculum, what research the faculty would like to do, how many faculty can be added, and what funding might be forthcoming from federal or other sources. With projections of faculty and student population it also becomes

or 20 percent of our operating income, and a much larger fraction of additions to endowment and plant funds—are very difficult to predict. This is what makes it necessary to readjust the plan every year. In addition, we must try to make decisions over an intermediate programming period of two or three years. Budget decisions, which must be much more accurate, have to be made for the current and coming year.

Academic plans come from the divisions through the Provost, support plans involve the Vice President for Business and Finance and the Vice President for Institute Relations as well as the Director of Student Relations. The resulting planning documents, which are assembled by Dave Morrisroe in the Business Office and Hardy Martel in my own, then go through careful review at the top level of the Institute administration, and subsequently by a committee (and finally the whole) of the Board of Trustees.

Freed:
With Baxter Hall of the Humanities and Social Sciences near completion and plans for a new behavioral science building under way, what will be the role of the social sciences at Caltech? What will be the role of the humanities? Will there be more or less emphasis in fields such as literature, art, and music?

Brown:
Social science at Caltech is likely to be one of the areas of substantial growth and change. Hitherto it has existed principally in the undergraduate curriculum. No graduate degrees have been given, though a number of the faculty have carried out research either on their



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professorial faculty in 1970 than in 1968, and the student body had increased by only a few percent—so we didn't have to cut back very sharply this year and in our plans for next year, as other places have had to. On the other hand, our graduate student enrollment did decrease this year because of the federal government's sharp reduction in traineeships and fellowships. And during the past two years our operating budget has not been quite sufficient to do the necessary rehabilitation. We are in very uncertain times, and the next couple of years should tell us whether or not we will be able to do the great things we want to do, given the necessary support.

Freed:
What effect is the current government cutback in educational support having upon Caltech?

Brown:
The cutback in educational support has reflected itself principally in a decrease of about 40 graduate students during the last year. The government cutback in research support has been reflected in a slowdown in acquisition of junior faculty and postdoctoral fellows and in a complete elimination of new construction

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Faculty honors

National Medal of Science

A Caltech astronomer and a Caltech alumnus have been awarded the National Medal of Science by President Nixon. Allan R. Sandage, staff member of the Hale Observatories, was honored for "bringing the very limits of the universe within the reach of man's awareness and unraveling the evolution of stars and galaxies—their origins and ages, distances and destinies."

Sandage, whose research has concentrated on stellar evolution and the birth and death of stars, helped discover quasars—the mysterious power sources believed by some astronomers to be the most distant objects in the universe. He is currently making studies to determine the accuracy of the Hubble Constant, a formula that describes the rate at which the universe is expanding.

Saul Winstein, PhD '38, professor of chemistry at UCLA, was awarded the medal posthumously for his research on the mechanisms in organic chemical reactions. He had created and tested models for the complex motions and bonding interactions that must occur during reactions of complex molecules. A member of the faculty at UCLA for 28 years, Winstein died in November 1969.

The National Medal of Science is the highest award of the federal government for outstanding contributions to scientific and engineering development. Other Caltech recipients have been Theodore von Karman, professor of aeronautics and director of the Guggenheim Aeronautical Laboratory from 1930 to 1949; A. H. Sturtevant, Thomas Hunt Morgan Professor of Biology and a member of the Caltech faculty for 42 years; Wolfgang K. H. Panofsky, PhD '42, who is now professor of physics and director of the Stanford Linear Accelerator Center; and John R. Pierce, '33, MS '34, PhD '36, executive director of the Research Communications Division of Bell Telephone Laboratories.

Carver Mead

Carver A. Mead, professor of electrical engineering, has won the T. D. Callinan Award of the American Electrochemical Society's Dielectrics and Insulation Division. Mead is honored for his work in developing the theory of flow of electric current in dielectric materials (materials that do not readily conduct electricity) and for his work on dielectric thin films in microelectronics. One result of this basic research has been the development of microelectronic memory-storing devices in which tens of thousands of transistors are interconnected on a chip of silicon smaller than the head of a thumbtack. These electric charge-storage memories are just appearing on the market.

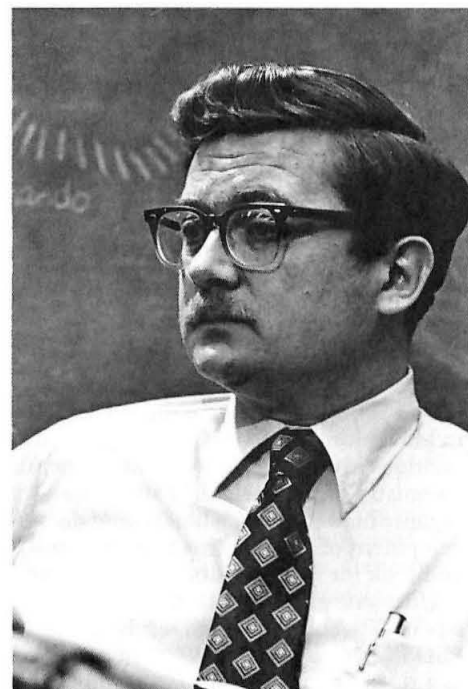
A member of the Caltech faculty since 1958, Mead graduated from Caltech in 1956, received his MS here in 1957 and his PhD in 1959.

Anatol Roshko

Anatol Roshko, professor of aeronautical engineering and applied science, is chairman of the new Universities Council on Wind Engineering Research. The organization was formed to promote research and disseminate knowledge that could save the U.S. some of the \$750 million a year in damage caused by high winds. A major outcome of a conference on Wind Loads on Structures held at Caltech in January, the council plans to organize similar technical conferences on progress in high winds research every two years. It will also provide advice to universities and government agencies upon request.



Throop Hall received new cracks, but no structural damage.



Don Anderson

Quake keeps seismo lab busy

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minutes it takes to make the appropriate readings and feed the information into the computer, three staff members had pinpointed the epicenter at 10 miles northeast of San Fernando. (The epicenter is the point of origin of an earthquake.) "It's important," Anderson says, "to get the location of the epicenter very quickly—not only for humanitarian reasons, but for purposes of getting our portable instruments out into the field (as close to the epicentral area as possible) so we can start locating the aftershock activity."

The next step that morning was to calculate the magnitude, but the earthquake was so near and so strong that the regular Wood-Anderson torsion seismom-

eter, which makes measurements of magnitude, was thrown off scale. This was to be expected because the instrument, which is basically designed to measure the magnitude of very small earthquakes at great distances, is very sensitive. Another instrument—unaffected by the shaking—was logging data on film, but rather than wait for it to be processed, the lab staff called the seismological laboratory at the University of California at Berkeley, which reported a magnitude of 6.6.

Meanwhile, telephone calls were pouring into the lab. "Whenever we have an earthquake of any size," Anderson says, "people start swamping the police and radio and television stations with calls. Then they start calling us." The lab's switchboard was jammed, not only with calls from worried private citizens but also with calls from public officials and the news services. Even though the lab is not really in the business of being a public service, a lot of its activities serve that function.

Anderson, along with Clarence Allen, professor of geology and geophysics, and Charles Richter, inventor of the Richter Scale and semi-retired Institute seismologist, spent most of the first three days after the quake just granting interviews for the purpose of dispensing information and, as Anderson says, "trying to keep

the public from being too scared."

While Anderson, Allen, and Richter satisfied the needs of newsmen, five other permanent staff members and some 10 graduate students carried on with the collection of data. Every student at the lab is fully trained in the techniques and problems of locating epicenters. The permanent staff members are fully qualified in every aspect of earthquake study, and Anderson points out, "These people did the work while Allen, Richter, and I acted as the front men."

In the week that followed the initial shock, more than 200 aftershocks of magnitude 3 or higher were recorded. Anderson explains that "most earthquakes are not just a single break, but rather a series of breaks. For instance, in the first five minutes after the first break there were about 10 large earthquakes."

The breaks that occur after the main shock are called aftershocks, unless another larger quake takes place. Then, the breaks that follow the larger activity become the aftershocks, and the ones preceding it are called foreshocks. The aftershocks of this quake will continue for several months with decreasing frequency and intensity, and other related activity, although not noticeable to the public, will continue to be recorded on the lab's instruments for years to come.

Systems concepts lecture series begins March 30

"Systems Concepts for the Private and Public Sectors"—a new seminar series that begins this month—will bring to campus a group of ten distinguished lecturers to speak on the theory and application of systems concepts. The motivating force behind the seminar is Ralph Miles (BS '55, MS '60, PhD '63), a member of the technical staff at JPL who sees a critical need for a systems approach in examining some of the troublesome problems of our society. Miles is on campus this year as visiting assistant professor of aeronautics and environmental engineering science. He is teaching a course in systems engineering for graduate and undergraduate students, and the new seminar will supplement his classwork for third term.

The series is sponsored by the divisions of biology, chemistry and chemical engineering, engineering, and humanities; the faculty committee on relations with industry; and the Industrial Relations Center. The ten public lectures will be given on consecutive Tuesday evenings between March 30 and June 1 in Ramo Hall in the new Baxter Hall of the Humanities. A subscription for the series is \$100, and enrollment is handled through the Industrial Relations Center.

Simon Ramo, PhD '36, the first speaker (March 30), will discuss "The Potential and Limitations of the Systems Approach." Ramo is vice chairman of the board and chairman of the executive committee of TRW Inc. and is a member of Caltech's board of trustees.



The quake shook 75,000 books off Millikan Library shelves.

DIVISION REPORTS

Biology

Norman H. Horowitz, professor of biology, has been appointed executive officer for the division of biology. Noted for his work in biochemical genetics, he is studying the water metabolism of *Neurospora crassa*, a reddish bread mold. As a space biologist, Horowitz was manager of the bioscience section at JPL until last August. Now a part-time consultant to JPL's Viking biology team, he is involved in bioexploration of the planet Mars; this includes investigation of the fundamental chemistry of pre-biological synthesis of organic matter on the planets, and development of instruments that will land and look for life on Mars.

Horowitz graduated from the University of Pittsburgh in 1936, received his PhD from Caltech in 1939, then stayed on as a research fellow until 1942, and a senior research fellow until 1946. He became associate professor of biology in 1947, and full professor in 1953.

Chemistry

Harry George Drickamer, professor of chemical engineering and physical chemistry at the University of Illinois, is the recipient of the fourth annual W. N. Lacey Lectureship in Chemical Engineering. On March 11 he spoke in Noyes Laboratory on "Electronic Transitions and Solid State Chemistry at High Pressure." Drickamer is well known for his contributions to chemical engineering, physical chemistry, and solid state physics. His experimental work has extended the pressure range for high pressure research by an order of magnitude and has made significant contributions to the understanding of the electronic structure of solids.

This series of lectures is named in honor of William Noble Lacey, Caltech professor of chemical engineering, emeritus, and a faculty member here for 55 years. It is made possible by the W. N. Lacey Fund, established by a number of Lacey's friends and former students, and brings to campus world-renowned experts currently active in chemical engineering or related disciplines.

Engineering

Engineers' Week, an annual event sponsored by the Institute for the Advancement of Engineering, was held this year from February 21 to February 28. It is designed to tell the public what engineers are doing for the benefit of society. At Caltech, members of the engineering and applied science division observed the occasion on February 23 with a public colloquium on "Everybody's Goal—A Smogless Car."

The meeting was organized by an Engineers' Week committee headed by Rolf Sabersky, professor of mechanical engineering. It featured talks by Mahlon Easterling, visiting professor of applied science from JPL, on "The 1970 Clean Air Car Race—Purpose and Results"; and Michael Lineberry (MS '68), graduate student in engineering science and captain of the 1970 Caltech car race team, on "Caltech's Entry in the Clean Air Car Race." Wally Rippel (BS '68), graduate student in chemical engineering and winner of the 1968 electric car race, discussed the future of electric cars, and Lester Lees, director of the Environmental Quality Laboratory and professor of environmental engineering and aeronautics, spoke about switching older cars to low pollution fuel.

Two Caltech men received awards in connection with Engineers' Week: Lee A. DuBridge, president emeritus of Caltech, was voted America's Honorary Engineer of the Year by the Orange County Council of Engineers. Jack McKee, professor of

environmental engineering received an Outstanding Engineering Merit Citation and designated as Fellow of the Institute for the Advancement of Engineering.

Geology

For the past five years the Division of Geological Sciences has increasingly focused teaching and research effort upon the study of the moon and the planets. The division's geochemists and geophysicists are now heavily involved in examining rocks and dust brought back from the moon and in studying the data relayed from the 1969 Mariner-Mars spacecraft. Last month division chairman Eugene M. Shoemaker announced that the division's name has been changed to reflect this emphasis. Now it's the Division of Geological and Planetary Sciences.

Five planetary scientists have been added to the full-time staff since 1966: Peter M. Goldreich, professor of planetary science and astronomy; Andrew P. Ingersoll, assistant professor of planetary science and staff member of the Hale Observatories; Duane O. Muhleman, associate professor of planetary science and staff member of the Owens Valley Radio Observatory; James A. Westphal, senior research fellow in planetary science and staff associate of the Hale Observatories; and Justin J. Rennison, senior research fellow in planetary sciences. Richard M. Goldstein, manager of the telecommunications research section at JPL, is a part-time visiting associate professor of planetary science. Bruce Murray, professor of planetary science since 1968, was Caltech's original faculty member in the field, coming here in 1960 as a research fellow in space science.

Room 151 of Arms Laboratory has been renamed the John Peter Buwalda Room in honor of the founder of the Division of Geological Sciences at Caltech and its first chairman—from 1926 until 1947. This room has been used for seminars, Geology Club meetings, and press conferences, and it was Buwalda's favorite lecture room. It is now refurbished, with projection and public address systems and a portrait of Buwalda painted by Ferdinand van Aken.

Dedication ceremonies and a reception were held on Sunday afternoon, February 14, with 45 people in attendance. C. Hewitt Dix, '27, professor of geophysics, spoke about the period during which the division was founded, while he was an undergraduate student; Richard Jahns, '35, PhD '43, a former Caltech faculty member and now dean and professor of geology at Stanford, reminisced about the division during the 1930's; and Leon Silver, PhD '55, professor of geology, recalled a field trip with Buwalda after the Arvin-Tehachapi earthquake in 1952.

Guest of honor, Mrs. Imra Buwalda, was presented with another portrait of her husband painted by Van Aken.

Mathematics

The department of mathematics has received a grant from the National Science Foundation to support summer research and independent study programs in mathematics for Caltech sophomores, juniors, and seniors during the summer of 1971. The Institute is supplementing the grant so that each student will receive a stipend of up to \$1,000 for a 12-week research program. Applications are being accepted until April 5. This is the second year that NSF grants have been given to undergraduate students in mathematics. Last year's recipients were Leonard Berman, Leonidas Guibas, Bruce Litlow, and Andrew Odlysko. The department expects to give stipends to six students this year.



Caltech in the 70's

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grants—which will probably limit our new building starts over the next five years to just two or three of the most vitally urgent requirements.

Freed:

One of Caltech's greatest strengths has been its small size. Will the Institute grow larger in enrollment, in faculty, or any other way?

Brown:

As I indicated, the Institute has actually decreased its professorial faculty size slightly since 1965. We would hope that this could be turned around and that the faculty could grow by 1½ or 2 percent per year over the next five years. Even if financial support is available at a rate higher than we now expect, it is doubtful that we would want to increase faculty size faster than at the rate of 3 percent a year.

Undergraduate student body enrollment at the freshman level is near the limit of the size that our facilities allow. Some would say that it is above the optimal size. We could increase our undergraduate enrollment only by having

"In nonacademic areas the question of what is right and what is wrong seems to have become more complicated."

the sizes of upper classes somewhat larger than they are now, through taking in more transfers or by reducing the attrition rate. It would be feasible to increase the graduate student body at the rate of a couple of percent per year, but only if funding of fellowships and traineeships by the federal government or some other source occurs, or if some changes are made in the way graduate tuition and support are financed. Even then, we have to think of the job market; it doesn't seem desirable to carry a large number of students through graduate degrees who then find themselves unable to get jobs. This hasn't happened here yet to a great extent. But it could happen soon, and this will also tend to place a limit on the size of the graduate student body, even at a place like Caltech where the quality of students is so high that one anticipates minimal difficulty in finding jobs.

Freed:

Undergraduate women were admitted to Caltech for the first time last fall. How are they doing academically and how are they adjusting to campus life?

Brown:

Freshmen are graded on a pass/fail basis, which makes detailed comparison difficult, but looking at the numbers of courses failed I find it hard to see any significant distinction between the performance of freshman men and women at Caltech during the past quarter, which is the only one they have yet completed. If I recall correctly, the freshman women undertook an average of a few less units per person but, because of a somewhat lower failure rate, received credit for more nearly the same number of units per person. With respect to adjustments to campus life, they appear to me to have adjusted well, and to have improved the adjustment of the male freshmen as well.

Freed:

There are currently 32 women undergraduates on the campus. How many will we ultimately have?

Brown:

I suppose that next year the novelty will have worn off and so we may not get as many qualified applicants, but I could be wrong. In any event, 10-15 percent of the undergraduate student body seems to be a reasonable estimate.

Freed:

When we were students here, one of the most important aspects of our education was the honor system. How is the system functioning today?



Brown:

The honor system and the implications of self-government which go with it still seem to function well today. Certainly, the undergraduate students are very proud of the honor system and of operating it themselves. They are particularly strongly committed to its successful operation in academic areas. In non-academic areas the question of what is right and what is wrong seems to have become more complicated (for them as for everyone else), but the honor system continues to provide them with standards that are clearer and better observed than those I see elsewhere.

Freed:

I understand that students have been serving on various faculty committees

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EDITORIAL STAFF

Co-editors: Laurie Spaulding and Jeff Zakaryan

Associate editors: Jacquelyn Hershey, Janet Lansburgh, Kathleen Marcum, and Kay Walker.

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Caltech

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dealing with planning and other areas.
How is the system working?

Brown:

I think the system is working remarkably well—which doesn't mean that the students are always very deeply in it. Perhaps that is indeed what works well about it. In an area where students have an interest, they show up at the committee meetings, make suggestions, argue well for them, and more often than not succeed in persuading the faculty. In areas where their interests are less strong, they have relatively little input and after a short time stop showing up at the meetings.

Freed:

We read a lot about the excellence of the Caltech faculty. Many alumni are curious about the quality of teaching at the undergraduate level. At the Institute how is this question met?

Brown:

Periodically, attempts are made to publish a summary of student critiques of faculty teaching. Some of these have been well done, some not so well done. There is now consideration of putting this on a more formal basis, which would probably help the students know what to expect and if properly done could also encourage the faculty to do more self-rating too. I consider the quality of teaching at the undergraduate level to be quite high at the Institute, although not

uniformly outstanding. I would also say that teaching ability and innovation in finding new and effective ways to teach—as rated by students, as well as by fellow faculty members—does play a part in the progression of a faculty member's career.

"I suppose the key words for a president are responsibility, authority, accountability and accessibility."

Freed:

The burdens on a university president must be great. How have you organized your office and staff to deal with the duties of the presidency?

Brown:

I have tried to avoid building up a large immediate staff, preferring instead to deal directly with the responsible administrative officials, with the division chairmen and faculty members, and with student body representatives and individual students. We do not need an additional echelon of administration at Caltech. My immediate office, aside from secretaries, consists of myself and Professor Martel. I have tried to delineate responsibilities in the administration and have specified a corresponding structure without increasing the number of people to do the jobs which everyone always knew existed here. Faculties and student bodies are not structured, and I don't think that a small place like Caltech ought to be any more highly structured

than is necessary to do the job. I suppose that the key words for a president are responsibility, authority, accountability—and accessibility.

Freed:

How, specifically, can the alumni help you in achieving your plans for the Institute?

Brown:

I hesitate to tell other people how best to carry out their responsibilities, but I will say something about what I think the responsibilities of the alumni are. First, they should know something about what is going on at Caltech, about our research activities, our teaching, our problems, and the nature of the people who are here. Second, they should act as messengers to the larger publics of Caltech through the press, civic organizations, the business community, and other educational institutions. Caltech is very well known in some places and among some groups, and not nearly so well known among others. Our Board of Trustees is numbered in the tens, and our administration and faculty in hundreds. Our alumni, though still small in number compared to many places, are more than ten thousand—spread throughout the country and the world and in all kinds of organizations, neighborhoods, and communities. We rely on you to get across Caltech's goals, its excellence, its problems, and its needs. It is from an understanding of Caltech—that you can maintain by reading our publications and visiting us when you can—that you can help us reach the public, and it is from your understanding and that of the public that our substantial need for financial support can be met.

Nominations for Alumni Board of Directors

The Board of Directors of the Alumni Association met as a nominating committee on January 26, 1971, in accordance with Section 5.01 of the bylaws. Six vacancies on the board, in addition to the positions of president, vice president, secretary, and treasurer, are to be filled. The present members of the board, with the years in which their terms expire, are:

Clifford C. Burton '40, 1972
Craig T. Elliott '58, 1971
William A. Freed '50, 1972
Raymond L. Heacock '51, 1973
Earl C. Hefner '51, 1972
William C. House '40, 1973
Robert V. Meghreblian '50, 1971
Reuben B. Moulton '57, 1972
Hubert M. O'Haver '29, 1973
Cornelius J. Pings '51, 1973
Charles A. Ray '61, 1971
Douglas G. Ritchie '57, 1971
Warren G. Schlinger '44, 1972
George E. Solomon '50, 1973
Arthur O. Spaulding '49, 1972
David B. Wilford '48, 1971

The following individuals have been nominated for the terms beginning at the close of the annual meeting in June 1971:

President—Reuben B. Moulton, BS57ME
1 year
Vice President—Arthur O. Spaulding
BS49Ge, MS58Ge 1 year
Secretary—Raymond L. Heacock, BS52EE,
3 years
Treasurer—George E. Solomon, MS50Ac,
PhD53Ac 1 year
Director—Stuart M. Butler, Jr., BS48CE
3 years
Director—Spicer V. Conant, BS64Ph
3 years
Director—P. Douglas Josephson, BS65Ph
3 years
Director—Wayne MacRostie, BS42CE
1 year
Director—Wayne T. McMurray, BS45ME
3 years
Director—Stanley T. Wolfberg, BS38ME
3 years

Section 5.01 of the bylaws provides that the membership may make additional

nominations for directors or officers by petition signed by at least 50 regular members in good standing, provided that the petition is received by the secretary not later than April 15. In accordance with Section 5.02 of the bylaws, if further nominations are not 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.

Statements about those nominated for directors are presented below.

—Arthur O. Spaulding, secretary



Butler



Conant

Stuart M. Butler Jr. got his BS in civil engineering in 1948 after six years of study at Caltech and military duty in Europe. Following graduation he moved to St. Louis to work in the construction industry. Subsequent assignments in San Francisco and Los Angeles led to his current position as vice president for administration for the William Simpson Construction Company, a division of the Dillingham Corporation. A member of the program committee for Alumni Seminar Day for the past three years, he was assistant general chairman in 1970 and is the general chairman for 1971. He lives in Pasadena with his wife and three children.

Spicer V. Conant, financial analyst with Beckman Instruments, Inc., received his BS in physics from Caltech in 1964. In 1969 he received an MBA in finance and

systems analysis from Stanford. He has worked for the American Machine and Foundry Company in the advanced research laboratory and the process equipment division, and was a management consultant with Fry Consultants in San Francisco. Before moving to southern California, he served briefly as secretary-treasurer of the San Francisco Chapter of the Alumni Association. He is a member of the American Finance Association and the Society for General Systems Research.

P. Douglas Josephson got his BS in physics from Caltech in 1965. After graduation, he joined the data processing division of the International Business Machines Corporation as a systems engineer. He has represented IBM at a number of aerospace firms in southern California, including the Hughes Aircraft Company, Aerojet-General Corporation, and the Lockheed Aircraft Company. He was the general chairman of the 1970 Alumni Seminar Day and is currently the chairman of the 1971 Homecoming Committee.

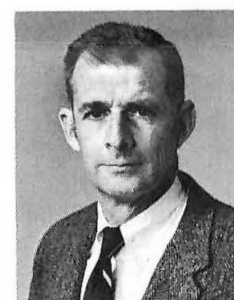
Wayne MacRostie received his BS in civil engineering from Caltech in 1942. He served in the Civil Engineer Corps, U.S. Naval Reserve, during World War II and then spent a year as a structural engineer with Spaulding, Rex and DeSwarte in Los Angeles. He has been on the staff of the California Department of Water



Josephson



MacRostie



McMurray



Wolfberg

Resources since 1947. He is now chief of the Interstate Planning Branch of the department, which cooperates with the 11 western states and the federal government in planning to meet the water requirements of the West—especially those of the Colorado River Basin.

Wayne T. McMurray graduated from Caltech with a BS in mechanical engineering in 1945, and got his MBA from USC in 1956. After leaving the Navy in 1946, he worked for C F Braun & Co for 13 years in Texas, Louisiana, and California. In 1958 he opened the west coast processing plant for Dynacolor Corporation. He entered the southern California construction industry in 1960 and is now vice president and co-owner of Weymouth Crowell Construction Company.

Stanley T. Wolfberg, management engineering consultant, got his BS in mechanical engineering from Caltech in 1938 and his MBA in 1940 from Stanford. He joined the U.S. Steel Corporation after graduating, then worked in retailing as general manager of a men's clothing chain. Since 1955 he has been a management consultant.

He is director and past president of the Los Angeles chapter of the American Institute of Industrial Engineers and was one of the first registered professional industrial engineers in California. He is the Alumni Association representative on the Caltech Athletic Council.

ALUMNI DIRECTORY SUPPLEMENT

A supplement to the 1969 Alumni Directory is ready for distribution. This supplement lists the names and addresses of those who received degrees in June 1969 and June 1970. Copies of this supplement have been sent automatically to Association members who received degrees in 1969 and 1970. Other Association members may secure a copy by filling in the form below and sending it to the Alumni Office, 204 Throop.

Please send the 1969-70 Supplement of the 1969 Directory to:

Name

Address

City..... State..... Zip.....

Expert dims hope for acceptable air quality before 1984

Air pollution issues received extra attention at Caltech when three experts on air pollution visited the campus in February to discuss governmental regulation, the F-310 fuel additive, and lead in gasoline.

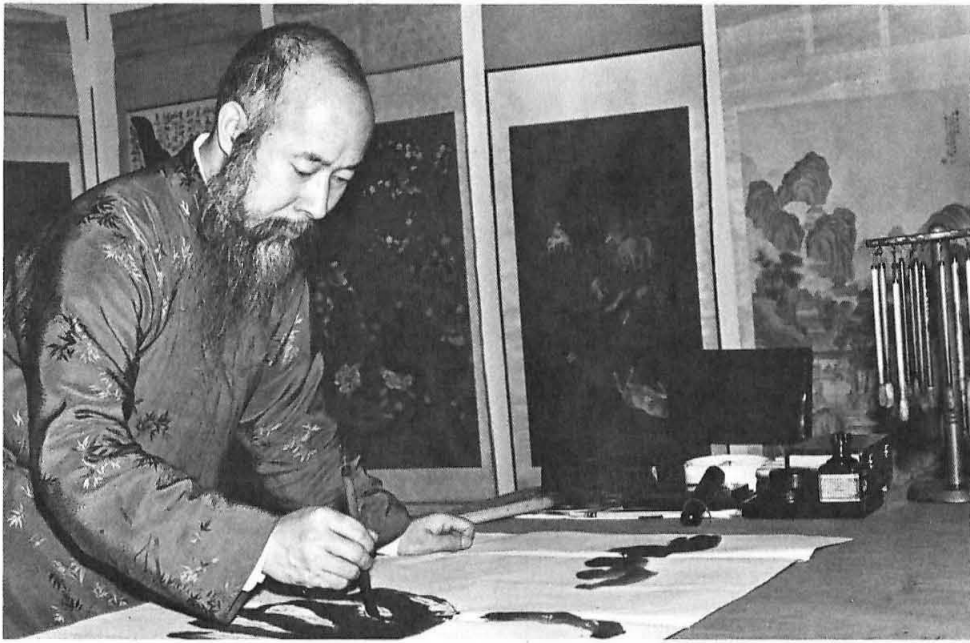
Robert L. Chass, air pollution control officer for the Los Angeles Air Pollution Control District, told an Environmental Engineering Science Seminar on February 17 that we should not expect acceptable air quality before 1984, even if present governmental regulations work as planned.

Chass blamed automobiles for the major share of air pollution in Los Angeles, and he charged that automobile manufacturers are continuing to turn out cars that don't meet emissions standards. He called for emissions tests for all new automobiles before they leave the factory. At present, the law calls for the testing of four prototypes for 50,000 miles, and in 1972, 25 per cent of the cars coming off production lines will have to be tested.

Two participants in the "Chemistry and Society" seminar series spoke about controversial chemistry in the petroleum industry. M. R. Barusch, who was closely associated with the development of Standard Oil Corporation's F-310 fuel additive at the Chevron Research Company, defended the additive as the ultimate detergent for automobile engines and as a significant contributor to cleaner auto exhausts. He cited the results of a careful test of 297 automobiles at Pasadena's Rose Bowl. Data showed that F-310 cut emissions of hydrocarbons by an average of 13.9 per cent.

"For the foreseeable future, gasoline driven engines will be the primary source of automotive power," Barusch told the February 11 seminar meeting. "But we would welcome another form of energy that would be pollution-free. We are in the energy business."

The following week, on February 17, Morton Z. Fainman, chairman of the Southern California Chapter of the American Chemical Society, discussed lead in gasolines. He praised Caltech's Clair Patterson, senior research fellow in geochemistry, who has done work on the environmental effect of trace lead from automobile exhausts, and he advocated research and regulatory leadership from the federal government in removing lead from gasoline.



A lesson on China

Caltech's Chinese Student Association, the largest foreign group on campus, started in late January doing something about this community's lack of knowledge about China. Led by the president of the association, Wei-Tou Ni, the 96 members held a series of events that began on January 28 with a showing of Chinese painting and calligraphy in Dabney Lounge; Chinese artist, I-Chen Wu (above) demonstrated the techniques of calligraphy. "China Night," a festival of music, dancing, and opera (below), was presented on February 13, and a symposium on contemporary Chinese society and China in international relations on February 25-26 concluded the program. Not everyone who participated has converted his calendar to the year of the Boar, but a large number of people learned a great deal about China.



Placement Assistance To Caltech Alumni

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

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

This service is provided to alumni by the Institute. A fee or charge is not involved. If you wish to avail yourself of this service, fill in and mail the following form to:

Caltech Placement Service
California Institute of Technology
Pasadena, California 91109

Please send me: (Check one)

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

Name

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

Address.....

.....

Morton Jacobs new president of The Associates

W. Morton Jacobs, Caltech alumnus and president of the Southern California Gas Company, is the new president of The Associates of the California Institute of Technology. He succeeds John R. McMillan who has held that office since January 1968.

Jacobs graduated from Caltech with honors in mechanical engineering in 1928 and joined Collins-Western Corporation of Los Angeles as a design engineer. He has been with the gas company since 1930, working in industrial service engineering, general sales, advertising, public relations, and general management. Jacobs was first named a director of the company in 1950. He became president and director in 1967 and has been president, chief executive officer, and a director since 1968.

A past president of both the Pacific Coast Gas Association and the American Gas Association, Inc., Jacobs was president of the Caltech Alumni Association in 1947.

Another Caltech alumnus, Wilson

EQL

Continued from page 1

more than 12 or 14 members, plus a few graduate students."

The senior staff of the lab currently consists of seven members. In addition to Lees, three faculty members divide their time between the laboratory and their academic work—Burton Klein, professor of economics; James Morgan, professor of environmental engineering science; and John List, assistant professor of environmental engineering science. Mahlon Easterling, space communications and information engineer at JPL; and Guy Pauker, a political scientist and senior staff member at RAND Corporation, also work at the lab in addition to their other jobs. Kenneth Heitner, a research engineer who received his PhD from Caltech in 1969, is EQL's first full-time staff member.

Lees hopes that the group will eventually expand to include another economist, an ecologist, a cultural anthropologist, a social psychologist, and a young lawyer interested in the legal implications of pollution control. He would also like to see three or four graduate students involved in EQL's work every year. They will carry out projects in the laboratory that are useful there and also applicable to master's and doctor's thesis research. "These students should have considerable impact on industry and government over the next 10 to 20 years," Lees points out. "In fact, they might well be our most important product."

The EQL's first graduate student, John Trijonis, who is a PhD candidate in environmental engineering science, is assembling data on pollution control costs related to the internal combustion engine, relating pollutant levels to emissions, and evaluating the damage costs of pollutants in the Los Angeles area.

The EQL staff is now working on studies in two critical areas: the impact of energy use on the California environment, and the economic aspects of air pollution control in the Los Angeles Basin.

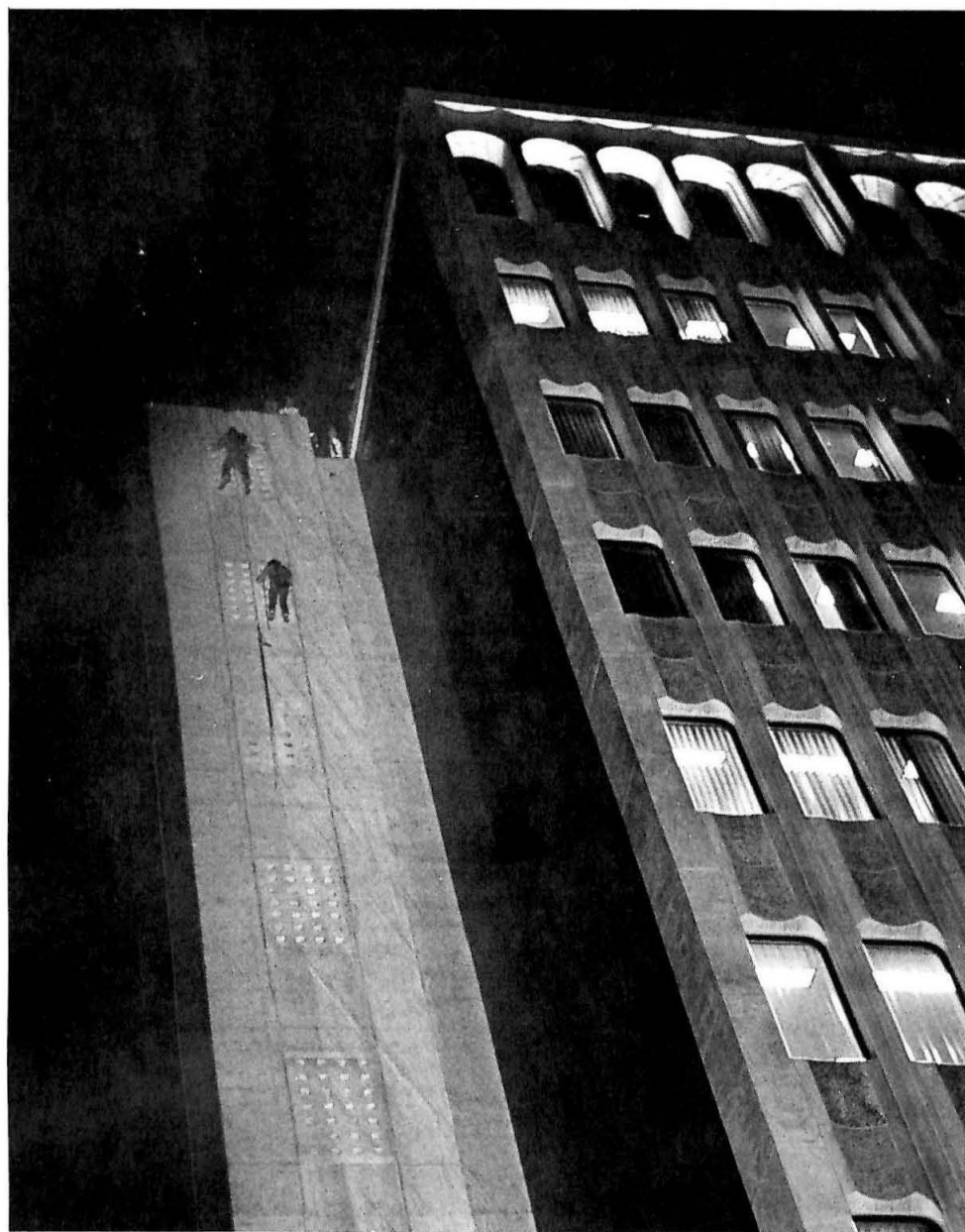
The lab is determined to maintain its independence and objectivity as it deals with the many-faceted questions concerning the environment. An effort is also being made to establish a free-flowing exchange of ideas with industry, government, and conservation organizations.



W. Morton Jacobs

Bradley Jr., '50, was elected treasurer of The Associates. He is president of Endevco Corporation of Pasadena, president of the electronics division of Becton,

Dickinson and Company, and a newly elected member of the board of directors of the First Western Bank.



Millikan climbing

Two Caltech undergraduates found a new way to get to the top of Millikan Library last February 5. Beginning at 7:00 p.m., Dwight Carey and Bob Durst, members of the Caltech Alpine Club, used grappling hooks and a ten-foot rope to scale the south face of the ten-story building. When asked, some three hours and forty minutes later, why they had climbed Millikan, they replied: "Because it was there."

Calendar of events

Friday, Mar. 12, 8:30 p.m. Beckman
MUCH ADO ABOUT NOTHING by William Shakespeare. Performed by the National Shakespeare Company of New York. \$5.50-4.50-3.50.

Saturday, Mar. 13, 11:00 a.m. & 1:00 p.m.
The Caltech Band in a tribute to THE CIRCUS—music from the Big Top presented with traditional circus acts. \$1.25—children; \$1.75—adults. Beckman.

Sunday, Mar. 14, 8:15 p.m. Dabney
The VALLEY STRING QUARTET in a program of music by Schubert, Jenssen, and Brahms. Free.

Sunday, Mar. 21, 8:15 p.m. Dabney
The YOUNG ARTIST PIANO QUARTET in a program of music by Mozart, Handel-Halvorsen, and Brahms. Free.

Sunday, Mar. 28, 3:30 p.m. Beckman
COLEMAN AUDITIONS WINNERS CONCERT. \$2—general admission; \$.50—Caltech students.

Monday, Apr. 5, 8:30 p.m. Beckman
THE CIRCULATION HARVEY COULDN'T SEE, by Wallace G. Frasher Jr., MD, Senior Research Fellow in Engineering Science, Caltech, and associate professor of physiology at the USC School of Medicine; and Harold Wayland, Caltech professor of engineering science. Caltech Lecture Series. Free.

Monday, Apr. 12, 8:30 p.m. Beckman
THE CONTRIBUTION OF A PRO-

GRESSIVE MYOPIA TO THE RISE OF IMPRESSIONISM: VISUAL PROBLEMS IN THE HISTORY OF ART, By Cary Lu, division of biology. Caltech Lecture Series. Free.

Monday, Apr. 19, 8:30 p.m. Beckman
THE COMMUNICATIONS GAP IN SCIENCE, by R. G. Bergman, assistant professor of chemistry. Caltech Lecture Series. Free.

Alumni!

Plan now to attend

the 34th annual

ALUMNI SEMINAR DAY

SATURDAY, MAY 15

Guest speaker at

the general session

will be Lee A. DuBridge,
president emeritus

Caltech keeps its promise

The end of the year is ordinarily a time when colleges and universities deluge alumni with requests for contributions and subtle reminders of the benefits of generosity. But December 1970 came and went, and 3,500 of Caltech's alumni were not solicited. Of course, Caltech still needs money, but it is keeping a promise that was made over three years ago.

The 3,500 are alumni who have participated so far in a development program that was initiated in 1967. At that time the Institute promised that those who made contributions would not be solicited again for five years. "It was hoped," says J. Benjamin Earl, '44, chairman of the Alumni Development Committee, "that most alumni would make a pledge and pay it over the five years, and many did so. Others made a one-time gift. Regardless of the size of these contributions or how they were paid, no appeals will be sent to

the alumni who made them until late '72."

Alumni who have not made a contribution are contacted on a regular basis. In November a letter was sent to over 7,300 of them, and by February 1 an additional 81 had made donations of \$7,467. During the same period, alumni who had already given once made supplementary gifts amounting to nearly \$40,000.

One alumnus, who made his original pledge in 1967, sent another \$100 in December, explaining: "I have not been asked to contribute for three years. Consequently, I feel, with all sorts of noble thoughts, that it is time to give again."

A gift of \$62.56 was received from a 1970 alumnus along with a note that read: "I am glad to be able to send this check for Caltech's use. It may not seem like much, but it is 10 percent of my year's pay. The Army doesn't pay a PFC much. Thanks for a great four years."

PERSONALS

1926

JAMES M. CARTER has been elected a Fellow of the American Institute of Chemists. The purpose of the Institute is to develop the professional and economic status of chemists and chemical engineers. Carter has been a consultant since he retired from Aerojet-General Corporation in 1968.

1927

C. KENYON WELLS retired December 31 as general manager and chief engineer of the Long Beach Water Department. He had been with the department 42 years. Attending a dinner in his honor on January 8 were three Caltech classmates: WILLIAM M. AULTMAN, chairman of the board of James M. Montgomery, Inc., Consulting Engineers, of Pasadena; ALAN E. CAPON, general manager of the Public Service Department in Burbank; and ROLLAND A. PHILLEO, who recently retired as a technician from TRW Systems in Palos Verdes.

1930

TOM G. BERNHARDI has retired as manager of the production engineering department of Whiting Corporation in Illinois. He has moved to Apple Valley, Calif.

1932

L. S. KENNISON, PhD, left the department of mathematics at Brooklyn College of the City University of New York to become chairman of the mathematics department at Southeastern Massachusetts University in North Dartmouth.

RICHARD N. THOMAS, formerly an engineer with Boeing in Huntsville, Ala., is now a second-year student in the school of theology at The University of the South in Sewanee, Tenn.

1939

CALVIN A. GONGWER, MS, who presented a paper on fluid mechanics at Caltech in 1938, recently repeated the paper for members of the American Society of Mechanical Engineers to show that the principles involved with his work had not changed. Gongwer is manager of the oceanics division of Aerojet General.

1940

PRESTON C. TORREY is a meteorologist for American Airlines at the Los Angeles International Airport.

1942

CARL SAVIT, MS '43, is the new chairman of the Interdepartmental Committee for Atmospheric Sciences (ICAS). The appointment was made by Edward E. David Jr., Science Adviser to the President and chairman of the Federal Council for Science and Technology, of which ICAS is a subgroup. Previously vice president for research and development of Western Geophysical Company of Houston, Savit has been with the

Office of Science and Technology in Washington, D.C., since June 1970.

1943

ARTHUR H. GARDNER, MS '47, formerly with Standard Oil Company in Bakersfield, has been named assistant to the president of the Bahamas Oil Refining Company in Freeport, Bahamas.

J. EARL THOMAS JR., PhD, is now a consultant for Warnecke Electronics in Des Plaines, Ill. He was vice president of the Carman Sapphire Co. in Canoga Park.

1945

DONAL B. DUNCAN, PhD '51, will head a new information system group for the Friden division of the Singer Company. The new group will undertake expanded operating responsibilities in the retail fields of automation, office equipment, and data processing. Duncan has also been named president of the Friden division.

1947

JARVIS L. SCHWENNESEN, MS, has resigned as deputy chief engineer at McDonnell Douglas' Sacramento Test Center to become associate director of the office of energy systems for Douglas United Nuclear, Inc., in Richland, Wash.

1948

CHARLES C. B. MOODY has been appointed an assistant manager for Hydril Company in Houston.

1950

PHILIP H. CLOSMANN, MS, formerly associated with Shell Development in Houston, is now with Bataafse Internationale Petroleum at The Hague.

1953

H. LESTER VINCENT has left the Shell Chemical Corporation in Los Angeles for a position as supervisor for the Perl Pillow Company in Houston.

1954

GEORGE R. JAFFRAY JR., formerly head of the mathematics and science department at San Jose Christian School, is now an editor for Associated Publishers and Authors in Byron Center, Mich.

MARVIN A. LeGETTE JR., MS, has become national sales manager for Ampex Corporation in Redwood City, Calif.

1956

HOWARD C. BERG, who has been at Harvard University as an assistant professor, is now associate professor of molecular, cellular, and developmental biology at the University of Colorado in Boulder.

ARTHUR H. BLAIR, MS, Lt. Col. in the U.S. Army, is associate professor of English at the

Continued on page 8

PERSONALS

Continued from page 7

United States Military Academy at West Point.

DAVID B. BROOKS, MS, formerly chief of the Division of Mineral Economics of the U.S. Bureau of Mines, is now head of economics research for the Department of Energy, Mines and Resources, Mineral Resources Branch, of the Canadian government in Ottawa.

JOHN C. VARADY II is now a senior biostatistician for Syntex Research in Palo Alto. He was director of computer services for the University of Cincinnati.

1957

LARRY G. WHITLOW sends the following: "After 14 years with General Electric, in various positions within their computer operations, I am now with Honeywell Information Systems, Inc., as a result of the merger of computer operations of General Electric and Honeywell. I have assumed the position of market manager within the Southern Operation of HIS, and as such will be responsible for technical marketing and support in the South."

1958

RICHARD I. TANAKA, PhD, has been elected a trustee of the International Federation for Information Processing (IFIP), a 32-nation federation concerned with computers and information processing. He is currently president of the American Federation of Information Processing Societies and vice president of California Computer Products, Inc., in Anaheim.

1960

HARRY DYM, MS, formerly an assistant professor of mathematics at the City College of New York, is now a senior scientist at the Weizmann Institute of Science in Rehovot, Israel.

1961

DONALD CRONIN, MS, PhD '66, has been appointed associate professor of mechanical engineering at the University of Missouri in Rolla. He was a member of the technical staff at TRW Systems.

ALEXANDER F. H. GOETZ, MS '62, PhD '67, formerly a member of the technical staff for Bellcomm, Inc., is now a staff member in JPL's planetology section.

ROBERT L. HEATH has left Brookhaven Medical Laboratories in Upton, N.Y., to work as associate editor for Chemical Abstracts Service in Columbus, Ohio.

WALTER R. HOLMQUIST, PhD '66, formerly a research fellow at Harvard, has joined the space sciences laboratory at the University of California at Berkeley as a research biochemist.

ALBERT W. MERRILL, MS '62, received his PhD in electrical engineering from USC in February. He is now a member of the technological staff in communications at Aerospace Corporation in El Segundo.

PAUL PURDOM JR., MS '62, PhD '66, has become a member of the technical staff of the Bell Telephone Laboratories in Naperville, Ill. He was formerly an assistant professor at the University of Wisconsin in Madison.

JOHN L. STROMBERG, who has been an economist with the RAND Corporation in Berkeley, is now a student at Emerson College in Pixton, Forest Row, Sussex, England.

1962

DAVID B. BENSON, MS '63, PhD '68, formerly a member of the faculty at the University of North Carolina, is now an assistant professor of computer science at Washington State University at Pullman.

PETER L. METCALF has completed his graduate work in chemical engineering at Cornell University and is working as a research engineer at the DuPont Experimental Station in Wilmington, Del.

DAVID L. SELLIN joined the faculty of West Virginia State College at Institute, W. Va., as assistant professor of physics.

ROBERT J. TAIT, MS '66, received a PhD from the University of California at San Diego and is now an assistant professor of oceanography at the University of Hawaii.

1963

HARRY E. KELLER, a former postdoctoral fellow at Colorado State University, has become an assistant professor of chemistry at Northeastern University in Boston.

LARRY E. RUFF, who was an assistant professor of economics at U.C. San Diego, has joined the United States Treasury Department as an economist.

1964

FRED W. DORR JR. is an assistant professor of computer science at Stanford University; he was a mathematician at Los Alamos Scientific Laboratory.

ROBERT R. GILMAN, who lives in the Gunbarrel Meadows apartments on Williams

Fork Trail in Boulder, Colo., is a systems analyst for the University of Colorado.

TOM C. LUBENSKY completed graduate work at Harvard University and is now a research associate in the physics department at Brown University in Providence, R.I.

ALAN O. RAMO, MS, formerly a senior analyst with the United Geophysical Corporation in Houston, now works for the Aero Service Corporation in Philadelphia as a geophysicist.

MASON L. WILSON, who received his PhD in electrical engineering at USC in June 1970, has joined IBM's manufacturing research division in San Jose.

1965

JAMES F. EDER JR. is doing field work in anthropology in the Philippines as a graduate student at the University of California at Santa Barbara.

MANUEL A. HUERTA has been appointed associate research scientist at the Courant Institute of Mathematical Sciences at New York University.

GORDON E. KELLER, PhD, formerly at the University of Minnesota, is now an assistant professor of mathematics at the University of Virginia in Charlottesville.

HAROLD D. MOELLER has joined Essa Mathematics and Systems in Florham Park, N.J., as a senior analyst. He was a marketing analyst for the Humble Oil and Refining Company in Houston.

TERRY R. SIMPSON, who received his PhD from MIT last year, is a member of the technical staff at Atomics International in Canoga Park, Calif.

OLIVER L. WEAVER completed graduate work at Duke University and is a member of the physics faculty at Kansas State University in Manhattan.

1966

CLEMENT G. CHASE has received a National Science Foundation postdoctoral fellowship to work in the department of geodesy and geophysics at the University of Cambridge in England.

WILLIAM D. HARRISON, PhD, who has been a research fellow at Caltech, is now a senior research associate in geophysics-atmospheric science at the University of Washington in Seattle.

MILTON E. TESKE JR., MS, is a Goddard postdoctoral fellow in the gas dynamics laboratory at Princeton University's Forrestal campus.

1967

PETER CROSS has spent three years in Nepal in the Peace Corps as a coordinator for a science-teaching enrichment program that is revising and implementing new courses in the high school curriculum. On November 21 he married a South Pasadena girl, Kumiko Kazahaya, in Katmandu, Nepal. Cross will be in the Peace Corps for another year and a half.

JOHN B. FOSTER, formerly a graduate student at the University of California, is teaching at the Valley of the Sun School in Phoenix.

1969

MICHAEL J. GEORGE, PhD, has recently joined the staff of the Los Alamos Scientific Laboratory in New Mexico. He will work with the explosives testing division.

KENNETH S. KAMM was married to Marga Hirsch on September 6 in Bethesda, Maryland. They will live in Madison, where both are graduate students at the University of Wisconsin.

1970

WILLIAM G. BRADLEY JR. married Annice Thompson on June 20. He is now attending Princeton University.

RICHARD R. BURTON was married to Katherine Krase in June. He is now doing graduate work at the University of California at Irvine.

ALUMNI ASSOCIATION OFFICERS AND DIRECTORS

PRESIDENT William A. Freed '50	SECRETARY Arthur O. Spaulding '49
VICE PRESIDENT Reuben B. Moulton '57	TREASURER Robert V. Meghreblian '50
Clifford C. Burton '40 Craig T. Elliott '58 Raymond L. Heacock '52 Earle C. Hefner '51 William C. House '40 Mike O'Haver '29	Cornelius J. Pings '51 Charles A. Ray '61 Douglas G. Ritchie '57 Warren G. Schlinger '44 George E. Solomon '50 David B. Wilford '48
Secretary Emeritus: Donald S. Clark '29	Treasurer Emeritus: John R. Fee '51
EXECUTIVE DIRECTOR James B. Black	

ALUMNI CHAPTER OFFICERS

NEW YORK CHAPTER President	S. Kendall Gold '42 California Texas Oil Corp. 380 Madison Ave. New York, New York 10017
Vice President	Rodman Jenkins '50 400 East 57th Street New York, New York 10022
Secretary-Treasurer	Harry J. Moore Jr. '48 IBM Corp. Route 22, Armonk, New York 10504
BOSTON CHAPTER President	John C. Russ '62 3A Edward Road, Woburn, Mass. 01801
Secretary-Treasurer	Duane Marshall '53 205 5/E Walden St., Cambridge, Mass. 02140
WASHINGTON, D.C., CHAPTER President	Willard M. Hanger '43 4720 Sedgwick St., N.W., Washington, D.C. 20016
Vice President	Bernard B. Watson '35 Research Analysis Corporation, McLean, Va. 22101
Secretary-Treasurer	John T. Cookson Jr. '66 1225 Noyes Drive, Silver Spring, Md. 20910
CHICAGO CHAPTER President	Robert J. Kieckhefer '45 222 Oak Knoll Rd., Barrington, Ill. 60010
Vice President	Walfred E. Swanson '36 1415 Fairway Dr., Lake Forest, Ill. 60045
Secretary-Treasurer	Howard E. Jensen '46 225 Ridge Ave., Winnetka, Ill. 60093
SAN FRANCISCO CHAPTER President	Harrison W. Sigworth '44 10 Casa Vieja, Orinda, Calif. 94563
Vice President	Curt D. Schulze '56 1329 Terrace Drive, Millbrae, Calif. 94030
Secretary-Treasurer	Thomas M. Menzies '65 2990 Cowper St., Palo Alto, Calif. 94306
Meetings: Engineers' Club, 16th floor, Hong Kong Bank Bldg., San Francisco. Informal luncheons every Thursday at 11:45 A.M. Contact Mr. Sigworth, 434-7700, Ext. 2918, on Thursday morning for reservations.	
SACRAMENTO CHAPTER President	William D. Pyle '49 3920 Dunster Way, Sacramento, Calif. 95825
Vice President	Dudley E. Bennett '47 4124 Zephyr Way, Sacramento, Calif. 95821
Secretary-Treasurer	Harris K. Mauzy '30 2551 Carson Way, Sacramento, Calif. 95821
Meetings: University Club, 1319 "K" St. Luncheon first Friday of each month at noon. Visiting alumni cordially invited—no reservation.	
SAN JOAQUIN-MOJAVE CHAPTER President	Ed Joujon-Roche '28 2700 Loma Alta, Bakersfield, Calif. 93306
Secretary-Treasurer	William F. Edmondson '52 1831 Truxton, Bakersfield, Calif. 93306
SAN DIEGO CHAPTER President	David B. Wilford '48 6581 Avenida Wilfredo, La Jolla, Calif. 92037

Obituaries

1926

BRUCE MILLS in September 1970. He had been vice president and general manager of Rancho Sespe in Fillmore, Calif.

HAROLD F. RICHARDS, MS '35, on December 19, 1970. He was employed by Caltech from 1942 to 1960 in connection with the Co-op Wind Tunnel. In 1960 he joined JPL and, at the time of his death, was supervisor of the Servo and Control Engineering Group of the Deep Space Tracking Antenna division. He is survived by his wife, Pauline; two daughters; and a son.

1933

LOUIS A. PIPES, MS '34, PhD '36, on January 17. Professor of engineering at UCLA since 1947, he was the author of textbooks in the field of applied mathematics. He leaves his wife, Johanna, and a son, Robert.

1938

HARRISON M. LAVENDER JR., MS '39, on November 16. He worked for the Chevron Research Company in Richmond, Calif.



Interhouse Sing

This quartet from Ruddock House, composed of Bill Derrick, Kelly Beatty, Wes Munsil, and Dave Wellman, won first-place honors in the foursome category of this year's Interhouse Sing. The annual event was held on February 19 in Beckman Auditorium.