

CALTECH



NEWS

PUBLISHED FOR ALUMNI AND FRIENDS OF THE CALIFORNIA INSTITUTE OF TECHNOLOGY

VOLUME 3 · NUMBER 1 · FEBRUARY 1969 · PASADENA, CALIFORNIA



Speaking about the role of universities and students in modern American society, John Gardner addresses a large campus crowd on the afternoon of the day he received the Millikan Award. He deplored the universities' lack of involvement with their communities on an action level and suggested that they organize their own "urban task forces" to circumvent their traditional stances of separateness from their local communities.

Now Students Giving Grants

Caltech's student research project on air pollution has had an offspring: a separate organization designated as the Research Center. Based at Caltech, it includes students from the University of Southern California and Immaculate Heart College. The Ford Foundation recently contributed \$8,500 toward its organization, and the Center also received \$1,000 each from ASCIT and a fund administered by the Master of Student Houses.

Jim Beck, an electrical engineering sophomore and one of the leaders in last summer's smog project, is the Center director. He says its goal is to provide support to student groups wanting to conduct studies that would make their educational experience more profitable. Funds up to \$500 are available to projects approved by Center management.

The first Center-based project is already under way, supported by an added \$32,700 grant from the Ford Foundation. Twenty students from 13 predominantly black southern colleges will soon arrive on campus for six months of study and work in the Center. The 20 were recruited by a team of three Caltech students and a coed from Immaculate Heart College during a November trip through the South.

Under terms of the grant these students may choose their own research. One has already indicated that he will work on an English composition text.

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First Annual Millikan Award to Gardner

"To think clearly about social change, we must first dispose of the notion that it is a process that alters a tranquil status quo. Today there is no tranquility left to alter," said John W. Gardner on the occasion of his acceptance of the first Robert A. Millikan Award on November 21. Speaking to more than 800 guests at the Ambassador Hotel in Los Angeles, the chairman of the National Urban Coalition and former Secretary of Health, Education, and Welfare pointed out that the status quo is the victim of revolutions in science and technology, transportation, communication, industry, agriculture, education, demography, and medicine.

Dr. Gardner warned that society's in-

stitutions, perhaps the embodiment of the status quo, are isolated by the swift pace of these revolutions at a time when they most need to be adaptable.

"It isn't enough," he declared, "just to change institutions. As an institution builder man has a notable gift for making the same mistake over and over."

Ignoring the flaws in human nature, such as prejudice, greed, and lust for power, is one source of such repeated mistakes, he added. Another is failure to recognize that all social institutions tend to rigidify.

As a first step toward a sound philosophy of institutional redesign, Gardner urged the breaking of our habit of concentrating on routine repair activities.

"At this critical time in our history, we can less and less afford to limit ourselves to routine repair of breakdowns in our institutions. More and more, we must undertake the imaginative redesign of institutions."

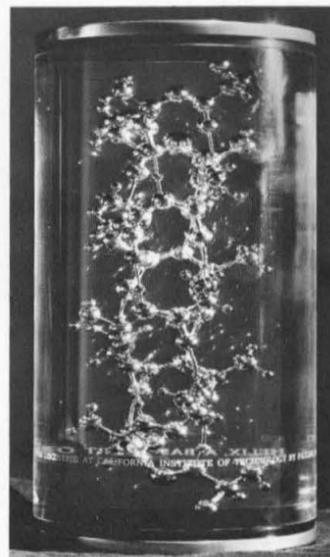
One of the universally neglected aspects of the problem, he said, is the decay of human institutions. As they grow increasingly resistant to criticism, their critics grow increasingly hostile. And the stage is set for violent collision.

In all of history no people has seriously attempted to take into account the aging of institutions and to provide for their continuous renewal, he noted, and asked why we should not be the first to do so.

"The individual is the ultimate source

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The Robert A. Millikan Award, in memory of the physicist and Nobel laureate who headed Caltech for over 25 years, will be given annually to "an individual, not directly connected with Caltech, who has made great contributions to the national welfare through the use or encouragement of scientific, engineering, or other scholarly pursuits." The award consists of a citation, an honorarium of \$5,000, and a specially designed model of the α -helix, representing Caltech research. The α -helix is one of the most widespread and important structural elements in the protein molecule—the molecule so essential to life. Its structure was first proposed at Caltech in 1951 by Linus Pauling and Robert Corey.



Institute Wants More Black, Brown Students

The scarcity of black and Mexican-American students in Caltech classrooms has concerned faculty, administration, and students for some time. The problem is frustrating because relatively few individuals among these groups are qualifying for college-level work in science and engineering.

However, there have been discussions in the Caltech community of possible ways to identify and strengthen, academically, those who have the potential to do advanced work. Thought has been given to summer tutoring programs for borderline students, and also to the possibility of a year's transitional program similar to those being tried at Yale and some other eastern colleges. Such a program would teach science and engineering subjects to minority students to qualify them for admission to college. It would be hoped that some would choose Caltech.

A faculty ad hoc committee of 14 is now studying these courses of action and

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Eugene Shoemaker

New Geology Chairman

Eugene M. Shoemaker has arrived on campus to take over as chairman of Caltech's division of geological sciences. Shoemaker, who heads the geological field investigations of the Apollo lunar landing program, succeeds Clarence Allen, professor of geology and geophysics, who has served as acting chairman of the division (and before that, interim director of the seismo lab) and who will now devote full time to teaching and research. Shoemaker's appointment was announced a year ago and became effective on January 1 of this year.

He had been serving in Flagstaff as chief scientist of the US Geological Survey's Center of Astrogeology, which he organized in 1965. He also set up the USGS Branch of Astrogeology in 1961 and served as its chief until 1965.

In 1963 Shoemaker organized the Manned Space Sciences Division of NASA and established the USGS Observatory at Flagstaff for the study of the geology of the moon and planets.

He was a scientist on the television picture experiment on the series of Ranger spacecraft that photographed the moon, and was principal investigator of the Surveyor spacecraft moon television experiment.

Earlier in his active career he explored for uranium deposits and salt structures in Colorado and Utah and later studied the geochemistry, volcanology, and geologic structures of the Colorado plateau country.

In 1957 he began studying the mechanism of meteorite impact processes. He was co-discoverer of a high-pressure form of silica—coesite—in natural materials, and he established a lunar geological time scale and methods of geological mapping on the moon.

Shoemaker was born in Los Angeles. He obtained two degrees in geology at Caltech, a BS in 1947 and an MS in 1948, and his PhD at Princeton in 1960. □

TRUSTEE NEWS

John O'Melveny, a member of Caltech's board of trustees and on its executive committee since 1940, was elected an honorary trustee in November. During his 28 years on the board he served on the finance committee, as chairman of the nominating committee, as a vice chairman, and as general counsel through the firm of O'Melveny and Myers, of which he is the senior partner.

Mr. O'Melveny's service to Caltech has been a continuation of the tradition begun by his father, Henry O'Melveny, who was a member of the board of trustees from 1921 to 1941. He has been a member of the Associates of the California Institute of Technology since 1935 and since 1947 has been a Contributing Life Member.

Lloyd L. Austin, 64, chairman of the

board of Security Pacific National Bank, died on December 30 in Arizona. He had been a Caltech trustee since 1963. He was a native of Leadville, Colo., and attended USC and the University of Arizona, where he majored in business administration and English.

Austin was active in banking organizations, corporations, and civic affairs. He served as chairman of the Los Angeles chapter of the American National Red Cross and as a director and past president of Childrens Hospital.

In addition he was a trustee of Occidental College, director of the Friends of Huntington Library, and a Founding Friend of Harvey Mudd College.

He held honorary degrees of Doctor of Laws from USC and the University of Arizona.

He had served as director and past president of the Automobile Club of

CALTECH NEWS

Vol. 3, No. 1 February 1969

Issued monthly except in August and September. Published by the California Institute of Technology and the Alumni Association, 1201 East California Blvd., Pasadena, California 91109.

Second class postage paid at Pasadena, California.

Editor: Bruce Abell, '62

Associate Editor: Janet Lansburgh

Photographer: James McClanahan

Southern California, director and vice president of the Los Angeles Music Center Operating Co., director of the Southern California Visitors Council and of the California State Chamber of Commerce, and as a trustee of the Menninger Foundation.

Austin was appointed to the Auditing Committee of the board of trustees of the Institute in 1965 and became its chairman in 1967. □



(Above) In the Athenaeum on Jan. 12 a crush of faculty and friends gives Lee DuBridge three robust "hip-hip-hurrays" at a last reception in his honor. (Below) Earlier, Trustee Chairman Arnold Beckman pays tribute to the departing president as the DuBridges admire a gift from the trustees.

HAIL AND FAREWELL

Lee DuBridge officially departed Caltech on January 15, leaving Provost Robert Bacher as Acting President until February 15, when Harold Brown takes office. Incoming President Brown arrived in Pasadena with his wife and two daughters at the end of January; his formal, gala inauguration is tentatively scheduled to take place this spring.

DuBridge's last few weeks before becoming President Nixon's science advisor were filled with tying up loose ends and saying his goodbyes to the Institute he led for 22 years.

The biggest farewell occurred on January 12, when some 500 faculty, staff, students, alumni, trustees, and friends met for speeches and presentations in Beckman Auditorium, then repaired to the Athenaeum for a reception. The retiring president was lauded by Trustee Chairman Arnold Beckman, Provost Bacher,

Faculty Chairman Norman Davidson, Alumni Association President Don Davidson, and ASCIT President Joe Rhodes. J. Kent Clark, professor of English, assembled one of his musical *tours de force*, the trustees presented DuBridge with an engraved silver tray, and the faculty gave the DuBridges a painting for their new home.

Just a few months ago DuBridge was anticipating retirement at the end of this school year; now he has a job that—by his own admission—has already turned out to be tougher than he thought it would be.

But much of his task will be to make and present a better case for basic research to Congress and the nation. And, as his friends at Caltech know, there are few men anywhere who can make as convincing a case for scientific research as Lee DuBridge. □



Caltech Creates a Superdean and Names New Undergraduate Deans

Lyman Bonner, associate in chemistry and assistant to the president, is Caltech's first Director of Student Relations. He has prime responsibility for coordinating the efforts of the student deans, the Master of Student Houses, the Director of Admissions, and other officers responsible for student-related affairs and activities. He'll report regularly to the president on the operations of his office, and will be asked at times to report to the trustees

on student problems and activities.

Robert Huttenback, professor of history and Master of Student Houses, will become Dean of Students in September of 1969. He replaces Paul Eaton, who retires after 17 years in that position.

Working with Huttenback will be David Wood, professor of materials science and currently acting Associate Dean of Students. Wood becomes Associate Dean of Students in July. □

Lyman Bonner

Lyman Bonner's new position was established to provide, at long last, a "home" for the various separate functions that affect student affairs. Bonner will be a spokesman for them—as well as for the students—to the administration and trustees. Predominantly academic concerns will, of course, remain the responsibility of the faculty.

Bonner stresses that he will be con-

cerned with the affairs of *all* students—graduate and undergraduate, men and women. He is, in fact, currently formulating the administrative plan whereby women undergraduates will eventually be admitted to Caltech.

One of his immediate concerns is to find a new Master of Student Houses to replace Robert Huttenback, who will become Dean of Students. Bonner will select from among several candidates to be recommended by a faculty committee.

Bonner expects to take an active role

Robert Huttenback

Robert Huttenback, during his 11 years of keeping watch over the four—and then seven—student houses, has become a "quasi-dean" because of the active part he has taken in promoting and guiding extracurricular interests through his office. He became a strong advocate of on-campus professional psychological counseling for students (finally instituted in 1961) soon after he became Master of Student Houses. He persuaded the Institute to set up a Master's Fund, out of which he paid for such diverse things as libraries and pictures for the student houses, speed-reading courses, sensitivity training, art classes, partial reimbursement for theatre and concert tickets, and subsidized student dinners in faculty homes.

He has also contended that the student houses are not adequate for today's needs and has continually prodded the Institute to make them more suitable. In 1967 he

sent seven students on a tour of other colleges to help them evaluate possible changes in housing arrangements here.

Huttenback considered that his job as Master included those actions he believed to be in the students' interest. Actually, his only formal responsibility was to see that non-fiscal matters were taken care of and that various rules of conduct were complied with.

As Dean he now must take on certain traditional duties—those of academic counseling and general interaction with the student community. Those, he says, he will do, operating as well as he can within the existing system. But in addition he intends to "agitate constantly for desirable and necessary changes."

His primary goal is to improve undergraduate life, and he expects to continue to be active in nonacademic areas, talking to students about all of their problems, continuing to provide informal educational opportunities, integrating graduate and undergrad activities, and improving counseling for upperclassmen.



Bonner

in helping determine and review policies of such student "services" as the graduate and undergraduate houses and dining halls. He has no intention, he says, of becoming involved in business operations, but wants to assure that the services are responsive to the needs—both physical and emotional—of the users.

A Caltech alumnus (PhD '35) and brother of biologist James Bonner, he returned to the Institute in 1965 after

He's sorry the Dean's offices are somewhat removed from normal student thoroughfares. Since 1960 he has been conveniently located—when not in his academic office in Dabney Hall—in the Master's office just off the Olive Walk between the old and new student houses. He's used to students dropping in to talk, or to meeting them as they walk to and from their houses. So, he says, if he feels too removed from accustomed contacts in his new office, he may set up a "branch office" at a table on the Olive Walk.

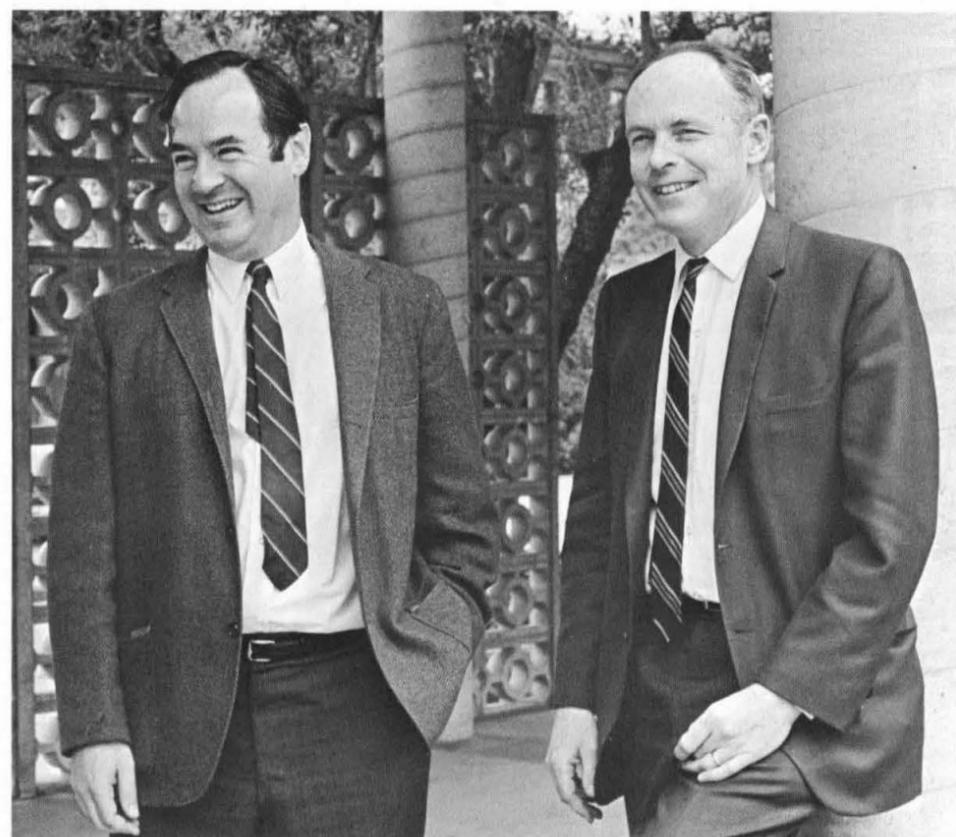
In his new job Huttenback intends to grapple, alongside the students, with the "three major problems confronting undergraduate education today: involvement, relevance, and disenchantment. There's a student revolution going on, and it's damn good. We at Caltech not only want to join it—we want to lead it."

In the time Huttenback has been Master of Student Houses he has become a well-known historian of British imperialism, publishing four books and numer-

ous articles. He also found time to captain a Caltech cricket team for years and to coach an often-winning soccer team composed of graduate students, faculty, and other players ineligible for the intercollegiate team. (He was first introduced to Caltech in 1952 when, as a graduate student at UCLA, he coached Caltech's varsity soccer team, which won three consecutive championships under his leadership.)

At age 40, the former UCLA soccer player is tapering off his athletics a little but is going more strongly all the time in his research and teaching. He insists he won't let his academic work suffer when he becomes Dean. "It's important," he thinks, "especially at Caltech, for an academic officer to continue study and to be respected for academic endeavors."

This year he'll take his wife, Freda, and infant daughter to England (March through August) to study immigration policies; he'll spend the same period the following year on similar studies in Australia. □



Huttenback

Wood

David Wood

David S. Wood, newly appointed Associate Dean of Students, may be famous in Caltech annals as the man who introduced girls to freshman camp. That much-acclaimed act last September grew out of his involvement with the student smog project, which showed how much impact just a few women can have on a male campus.

Wood, incidentally, is chairman of the faculty committee advising the smog project. He, Lyman Bonner, and George Canetta (Caltech's administrator for sponsored research) also meet regularly with leaders of the new Research Center to decide fiscal matters.

Wood, professor of materials science, was once a Caltech student himself. He got his BS in mechanical engineering in 1941, and until 1944 was a member of a National Defense Research Council project at Caltech. In 1944-45 he was at Los Alamos doing mechanical design development work for the atomic bomb. It was there that he met and married his wife, Connie. He received his PhD at

Caltech in 1949 and has been on the faculty since that time.

Since 1960 he has been on the freshman admissions committee. In 1968 he took over some of the duties handled by Dean of Freshmen Foster Strong, who retired from that job in June of last year. Recommending Wood's permanent appointment, Lee DuBridgely told the Board of Trustees that "he has done a splendid job in the Dean's office and has won the confidence of faculty, students, and administration."

One of the programs he hopes to implement in his new job is computer processing of all student records; eventually he hopes to have an input/output console right in the registrar's office.

Other areas of his special concern are further improvements in freshman camp and students' day, and more successful social activities for students. He will also continue some of the campus activities that have brought him personal pleasure. Both Woods are charter members of J. Kent Clark's campus-renowned stock company (Musical Skits For All Occasions) and active participants in the campus playreading group. □

Gardner: Society's Problem Is Not To Find Better Values But To Be True To Those It Now Professes

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of social renewal. It follows that the self-renewing society will be one that fosters creative, free, and self-renewing individuals." But, he pointed out, all modern societies seem to be moving toward the beehive model in which the total system perfects itself as the individual is steadily dwarfed.

Gardner then listed attributes of a society capable of resisting this trend, of fostering creative individuals, and of renewing itself.

The first attribute is pluralism, he said, but the logic of modern, large-scale organization tends to squeeze it out.

Release of individual potential is another characteristic of a society that develops to the fullest its human resources.

Internal communication is also part of a self-renewing society. Such communication, he emphasized, must be more than a flow of messages; it must be a means of conflict resolution.

Gardner urged that society provide for dissent, for the emergence of alternatives to official doctrine or widely accepted assumptions.

He declared that there is nothing more healthy, nothing more healing, than for men to participate directly in the reshaping of their institutions, and he emphasized that this should be done at the local level. He also sees the need to develop further the service idea inherent in the Peace Corps and VISTA.

In the matter of leadership, which is another attribute of a free society, Gardner feels that we are in poor shape. "The specialization of modern society channels executive and analytical talent into professional and specialist areas and away from leadership. A free society does not

need leaders to tell it what to do, but it urgently needs them to symbolize its values, to clarify choices, to help sift priorities, and to keep hope alive."

Conflict is a part of life, he observed, and a society capable of renewal will have developed effective means of conflict resolution. A great deal has been learned about this in the last 15 or 20 years—far more than has ever been applied.

He also noted that a society capable of renewal must have such deeply rooted values as freedom, justice, equality of opportunity, the worth and dignity of the individual. The problem of this society is not to find better values but to be faithful to those it now professes.

The last attribute of Gardner's self-renewing society is morale. Speaking of our present loss of confidence he said, "It is my belief that this is traceable to the severity of internal conflicts, the failure of leadership, the incapacity of society to solve obvious and grave problems, to a visible disparity between the values we profess and the practices we tolerate. The return of confidence does not depend on achieving our goals at once. It does depend on seeing light at the end of the tunnel."

Gardner called upon each individual to take responsibility for improving himself, his community, and the nation.

"I am not proposing new duties; I am calling you back to old duties. Remember the Preamble to the Constitution? 'We, the people of the United States . . .' Not we the public officials of the United States. Not we the certified experts in public administration. Not we who have time to think about these things when we're not busy running our businesses or practicing our professions. Just we, the people.

"We have elected a new President. No matter how gifted he may prove to be, he cannot save us from ourselves. He cannot function effectively unless we are actively and intelligently at work on our own problems. No matter how accomplished our public servants are," Gardner concluded, "the inner mystery of democracy will always involve that old and good idea: 'We, the people.'"

Others taking part in the program that evening were John R. McMillan, '31, president of the Caltech Associates; Arnold O. Beckman, chairman of Caltech's board of trustees; President Lee DuBridge; and three relatives of Robert Millikan—sister Mrs. Mabel Millikan Brown, niece Mrs. Charles A. Mosher, and grandson Dr. Michael Millikan. □



ROLLING IN THE AISLES. A lunar rover makes its way to the front of Beckman Auditorium during Caltech biologist (and chief, JPL's bioscience section) Norman Horowitz's discussion on November 25 of "The Biological Exploration of Mars." The device, agile as a mountain goat but not as smart, was designed to map the lunar surface; a Mars mission would require a more sophisticated version. Life on Mars? Horowitz says the answer may be only a few years away. □

Research Center Encourages Innovative Education

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book with special relevance to black students. Another wants to develop tutoring techniques geared especially to black students.

The Ford Foundation and the Research Center believe there is much to be gained by all the students involved in learning about how to organize projects, train personnel, and raise funds.

Another project underwritten by Center funds is headed by Mike Garet, a senior mathematics major at Caltech. Garet and a small group of Caltech mathematics students are experimenting with teaching techniques at a Los Angeles high school where over 70 percent of the students are Mexican-American. Garet reports that the math teachers there are highly enthusiastic about having Caltech students involved.

"The dropout rate is so high in a school like this," Garet says, "that many of the teachers are frustrated—they have to admit the present system doesn't work. Ours is definitely a research endeavor. We're not trying to provide a service, because we don't know the right answers either.

"Fresh ideas are vitally important. These kids need friends, too, who are interested in them. A lot of students in these classes don't have anybody to go to just to talk." □

Garet thinks that instead of trying to help them with something they have already failed at, this experimental teaching must start them working on things they haven't had.

"We hope that, if we do it in such a way that we interest them, they'll find that they need some of the old concepts such as addition, subtraction, and multiplication. Then they'll have more motivation to learn them."

A similar math project is being run by other Caltech students in a Pasadena elementary school, and other students are developing a high school program—similar to the math program—in chemistry. □

Northrop & Fluor Pledge Substantial Contributions

Two major gifts to Caltech's development campaign were made in December. Both provided unrestricted support, which Caltech will use for endowment of faculty salaries, construction of new facilities, and operation of the campus.

The Fluor Corporation, a major engineering firm with headquarters in Los Angeles, pledged \$100,000. Northrop Corporation, a leader in the aerospace industry, pledged \$130,000. □

1968, a Caltech High For Private Gifts—\$15 Million

The fiscal year ended June 30, 1968, was the most successful in Caltech history for voluntary (non-contractual) private gifts. The \$15,194,069 (which includes cash received only—not pledges) eclipsed the fiscal 1960 amount—the previous high—by more than \$2.5 million.

The table below shows both sources and destinations of all private gifts received in the period. It is compiled from an annual survey conducted by the Council for Financial Aid to Higher Education and by the American Alumni Council.

	Unrestricted	Student Aid	Division Support (Engineering, Biology, etc.)	TOTAL SUPPORT FOR CURRENT OPERATIONS	Endowment (Unrestricted)	Endowment (Restricted—Aid, Research, Divisions)	Facilities, Equipment	Life Income Trusts	TOTAL SUPPORT FOR CAPITAL PURPOSES	TOTAL SUPPORT FOR ALL PURPOSES
Corporations, business concerns	\$1,455,130	\$104,290	\$ 546,650	\$2,106,070	—	\$ 120,600	\$ 317,374	—	\$ 437,974	\$ 2,544,044
Alumni	304,546	—	30,322	334,868	\$ 129,165	23,277	454,875	\$319,280	926,597	1,261,465
Other individuals (trustees, parents, and other friends)	749,585	9,801	40,254	799,640	1,286,713	861,540	4,262,457	406,678	6,817,388	7,617,028
Foundations	73,500	94,718	1,470,817	1,639,035	—	3,000	50,000	—	53,000	1,692,035
Societies and organizations (Associates and other groups)	192,718	24,520	99,688	316,926	—	2,500	58,980	—	61,480	378,406
	<u>\$2,775,479</u>	<u>\$233,329</u>	<u>\$2,187,731</u>	<u>\$5,196,539</u>	<u>\$1,415,878</u>	<u>\$1,010,917</u>	<u>\$5,143,686</u>	<u>\$725,958</u>	<u>\$8,296,439</u>	<u>\$15,194,069</u>

FACULTY HONORS

Murray Gell-Mann, Robert A. Millikan Professor of Theoretical Physics, received the \$10,000 Research Corporation Award at a dinner in New York City on January 23. The Research Corporation each year honors a scientist chosen by a distinguished panel of scientists for making notable contributions to knowledge.

At the dinner an additional award of \$10,000 was presented to Caltech and accepted by Carl D. Anderson, chairman of the division of physics, mathematics and astronomy. The matching sum recognizes an institution's contributions to the awardee's accomplishments.

Gell-Mann was cited for his contributions to the understanding of elementary particles, including his prediction of the existence of the Omega minus particle. This particle was subsequently detected by the proton accelerator at Brookhaven National Laboratory. Its prediction and discovery have been called the crucial test of a theory that could mark a turning point in particle physics.

The Research Corporation is a non-profit institution for bringing inventions into public use and directing the rewards to support of scientific research. Gell-Mann is the 36th man to receive the award since it was first given in 1925. It has been awarded annually since 1947; in that year it was won by Lee DuBridge.

W. Barclay Kamb, Caltech professor of geology and geophysics, is the recipient of the Mineralogical Society of America Award for 1968, which recognizes outstanding contributions to mineralogy. Kamb's research centers on the study of glacier flow and the crystal structure of various high-pressure forms of ice.

William N. Lacey, emeritus professor of chemical engineering and retired Dean of Graduate Studies and of the Faculty, has received a Founders Award from the American Institute of Chemical Engineers. The award, created by the Institute in 1958, recognizes outstanding contributions to the field of chemical engineering. Lacey retired in 1962 after 46 years at Caltech.

Hans Liepmann, Caltech professor of aeronautics, has been awarded the Ludwig Prandtl Ring, the highest distinction

of the Deutsche Gesellschaft für Luftund Raumfahrt, the German society for aeronautics and astronautics. The Prandtl Ring is given for distinguished and original scientific or technical work in engineering or aeronautics. Liepmann is an authority on shock waves, plasmas, and the flow of rarified gases. He and his colleagues have made significant contributions to aircraft and rocket design. The first winner of the Ludwig Prandtl Ring was the late Theodore von Karman, Caltech aerodynamicist who was one of the founders of the Jet Propulsion Laboratory.

Linus Pauling, Caltech research associate in chemistry, is the 18th recipient of Dickinson College's Priestley Memorial Award. The award is named for Joseph Priestley, discoverer of oxygen, and consists of \$1,000 and a portrait medalion of Priestley. Dickinson, which owns one of the largest collections of Priestley memorabilia in America, created the award in 1952 to recognize modern scientists for research, discovery, or other production benefiting mankind.

The oldest science prize in America, the Rumford Premium of the American Academy of Arts and Sciences, has been awarded to Maarten Schmidt, Caltech professor of astronomy and staff member of the Mount Wilson and Palomar Observatories. Schmidt was honored "for his discoveries in the spectra of quasi-stellar objects." □

Brune Succeeds Richter As Head of Seismo Net

James N. Brune, a geophysicist who specializes in the study of earthquakes, has been appointed supervisor of Caltech's network of seismological stations in southern California. He replaces Charles F. Richter, who supervised the operation for more than 21 years. Richter, author of the scale of earthquake magnitude bearing his name, will continue his research on global seismicity.

The network consists of 19 stations, six of which are connected to the laboratory in Pasadena by microwave relay systems, giving instantaneous information on earthquakes. An array of six drums in Pasadena records earth movements at the six stations simultaneously and shows the progress of earthquake waves as they reach each station.

The network is used in studies of seismicity and earthquake mechanisms, the structure of the earth's interior and crust, the forces that deform the earth, the problems of distinguishing earthquakes from underground nuclear explosions, and the seismic hazard in California.

Attendants at the 19 stations change records daily and send the collected data in every week for analysis at Pasadena. Accurate arrival times and amplitudes of earthquake waves are measured for all 19 stations; then locations and magnitudes of earthquakes are determined.

The seismological station system was founded in 1927 as a joint venture of Caltech and the Carnegie Institution of Washington, under supervision of the late Harry Wood. By 1929 six seismological stations had been established, and in 1937 the network began operation solely under Caltech. □



RICHARD JAHNS, '35, PhD '42, former Caltech geologist and now Dean of Stanford's Earth Sciences School, talks to acting division chairman Clarence Allen before giving the first annual John P. Buwalda Lecture on November 18. The lectures in honor of the founder and chairman until 1947 of Caltech's geology division were funded by a bequest from and gifts in memory of the late Lenora Reno, longtime secretary to Buwalda. □

CINE Award to Caltech

Caltech's film "The Universe From Palomar"—depicting the birth and building of the famous 200-inch Hale telescope—has won a CINE Golden Eagle award for excellence from the Council on International Nontheatrical Events. Only three films were chosen for science awards in CINE's 1968 competition.

The color film, produced by Rose Blyth Kemp, Caltech's director of television, radio, and film affairs, was made in cooperation with National Educational Television, New York City. Mrs. Kemp went to Washington, D.C., recently to receive the 1968 award certificate.

It cost Caltech \$10,000 to put the film together, but almost all of that has since been earned back from sales and rentals. More than 40 copies of the movie have been sold to schools and other organizations, and rentals are booked up through at least next May. The film sells for \$200 per copy, and rental is \$20 for the first showing, \$4 for each additional. □

Development Development; Hanak Takes Director's Reins

Edward P. Hanak has been made Caltech's Director of Development and assumes responsibility for the Institute's development program. He succeeds Curzon Fager, who resigned to become a vice president of California Institute of the Arts.

Hanak has been Director of Foundation Relations at Caltech for two years (and continues that work for the present), maintaining close contact with the foundations that support higher education. He joined Caltech in 1966 as Associate Director of Corporate Relations.

A native of Ohio and a graduate of Ohio University, Hanak worked with the Greater Cleveland Growth Board, an arm of the Cleveland Chamber of Commerce, before coming to Caltech. He helped develop the Growth Board, which was formed to attract industry to Cleveland. □

Jean Weigle 1901-1968

Jean-Jacques Weigle, Caltech research associate in biology, died of a heart attack on December 28 at the age of 67.

He began his career as a physicist, and was head of the physics department at the University of Geneva (his native city) for 17 years. In 1946, after suffering his first heart attack, he resigned his position and became a research associate in biology at Caltech, where he had an equally brilliant career.

A memorial service for Weigle was held in Dabney Hall on January 10; a number of his friends are establishing the Jean Weigle Memorial Fund for the purpose of bringing scientists of outstanding talent to the biology division. □



Gell-Mann



Kamb



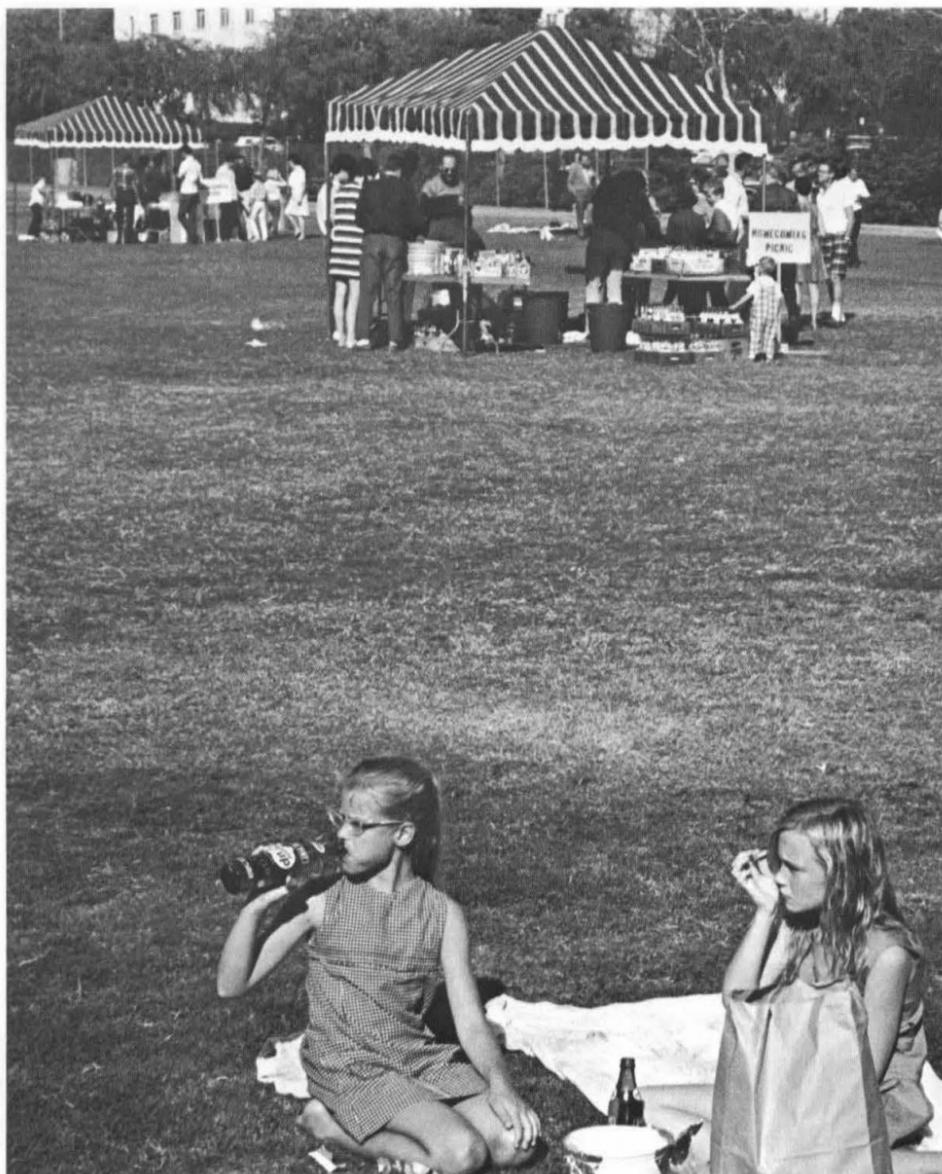
Schmidt



Liepmann



LADIES FIRST, but the gentlemen followed. For an added attraction, this year's Mudeos was formal (for about 30 seconds). Tuxedos for the special event, courtesy of Dedrick's; gowns from a thrift shop; girls from PCC. The 1968 winners: Freshmen. □



CALTECH HAS REPORTEDLY been having homecoming football games for years; this year the students finally remembered to tell the alumni, who turned out in staggering numbers for the event on Nov. 9. A picnic (above) drew about 500 alumni, wives, and children. The Alumni Association furnished beer and soft drinks; Mother Nature presented a beautiful, warm day; and Caltech's brave band of football players—led by "college back of the week," senior Tom Burton, number 12 (left), and triumphant coach Tom Gutman (below)—provided their best game (and only win) in four years. The day ended with those almost forgotten traditions of tearing down the goalposts (left, middle) and a bonfire (left, bottom) at the busy corner of Lake and California. □



Photo by John Bean, '72



Photo by John Bean, '72

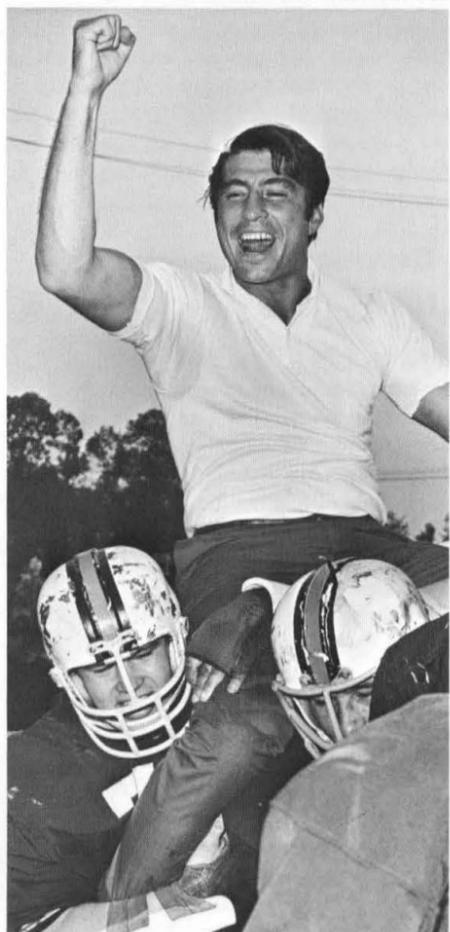


Photo by Herb Shoebridge, Pasadena Star-News



REP. ED REINECKE, '50 (right), is introduced at a Washington news conference on Jan. 8 by Robert Finch, now Secretary of Health, Education, and Welfare, whom Reinecke succeeded as Lt. Governor of California. The Caltech engineering alumnus, a Republican who was just elected to a third term in Congress representing southern California's 27th District, was appointed by Governor Reagan to fill out the final two years of Finch's term. (Wide World Photo) □

Winter Sports Roundup: Swimmers Splashing To Another Great Season

Wrestling

Top man on Caltech's wrestling squad is a remarkable 191-pound junior, Alan Beagle, who is undefeated in dual competition throughout his college career. His record is now 31 wins, no losses. The team has dual meet wins over Pasadena College, PCC, Los Angeles CC, and UC Riverside.

Record as of Jan. 27: 4 wins, 3 losses.

Swimming

The graduation last year of All-American swimmer Henry DeWitt couldn't help but hurt this year's swimming team, but the pain has been eased considerably by the appearance of freshman Steve Sheffield. He has already broken DeWitt's Caltech record of 11:40.0 in the 1,000-yard freestyle by a whopping 38 seconds with a time of 11:02.0. He also claimed DeWitt's 200-yard butterfly record with a new time of 2:11.0, six seconds faster than the old Caltech mark.

Caltech's early season victories include wins over both Cal State Los Angeles and San Fernando Valley State in a tri-meet, and a surprising first place (and two records) in the SCIAC Relays on January 18.

Coach Lawlor Reck predicts at least a second-place finish in conference action behind Claremont-Harvey Mudd, even though *Swimming World* magazine picked Caltech for fifth place in the SCIAC. Obviously, *Swimming World* hadn't met Steve Sheffield when they made their predictions.

Record as of Jan. 27: 4 wins, 2 losses.

Fencing

The fencing team, after a slow beginning, is improving. The team, led by two seniors and three freshmen, has one win over UC Riverside.

Foil record as of Jan. 27: 0 wins, 7 losses.

Epee record as of Jan. 27: 1 win, 5 losses.

Basketball

The season is now about half over, and the Beavers, with new coach Hudson Scott and assistant coach Jim Pearson, '67 (two-time captain of the team as an undergrad), have gotten off to a weak start. However the team is young (led by one senior, three juniors, and three sophomores) and is improving. Leading scorer is junior Bruce Ault.

Record as of Jan. 27: 2 wins, 13 losses. □

Minority Admissions: "We Ought To Do More"

Continued from page 1

others that might culminate in more minority students coming to the campus. Norman Davidson, professor of chemistry and chairman of the faculty, has appointed Edward E. Zukoski, professor of jet propulsion, to head it. Davidson has instructed the group to provide detailed documentation and a feasibility analysis of any action recommended, and detailed directions for implementing any plans suggested.

Peter Miller, director of admissions, sums up the majority feeling that "we ought to and want to do something more than we have done."

Miller says that, right now, a black student with certain qualification problems would probably be admitted where a white student with the same problems would not.

"However," he adds, "any plans we put into operation will not mean lower-

ing the quality of our courses. It isn't our wish to turn out anyone who is second rate. At the same time, we recognize the social necessity for helping the bright black and Mexican-American students further their education."

There is enough scholarship money, Miller says, to help support more minority students. He reflects the belief of many faculty and administration members and students that there must be more active recruiting of the black and Mexican-American minorities, and the admissions office pays special attention to communication with high schools having large minority groups. It is also working with the National Scholarship and Service for Negro Students, and is in touch with the National Merit Scholarship Corporation for leads on black students showing science and engineering aptitude in their National Achievement Tests. □

COMING CALTECH EVENTS

Sunday, Feb. 9, 3:30 p.m., Beckman
NEW YORK PRO MUSICA. A program of vocal and instrumental works. Medieval and Renaissance music. Coleman Chamber Concert. \$4-3-2.

Monday, Feb. 10, 8:30 p.m., Beckman
SCIENCE, TECHNOLOGY, AND ECONOMIC DEVELOPMENT. Harrison Brown. Caltech Lecture Series. Free.

Wednesday, Feb. 12, 8:30 p.m. Beckman
1968 NOBEL PRIZEWINNER for medicine and physiology, H. G. Khorana. Buchman Memorial Lecture. Free.

Friday, Feb. 14, 8:30 p.m. Beckman
KIPNIS MIME THEATRE from Israel. Company of five. \$5-4-3.

Saturday, Feb. 15, 8:00 p.m. Beckman
L.S.B. LEAKEY of Olduvai Gorge fame, speaking on "The Latest Evidence of Man's Evolution in Africa." Free, but tickets are required.

Monday, Feb. 17, 8:30 p.m. Beckman
GENES, SEX, AND DEVELOPMENT. Edward B. Lewis. Caltech Lecture Series. Free.

Tuesday, Feb. 23, 8:15 p.m. Dabney
VALLEY STRING QUARTET. Music by Barber, Russotto, Mozart, Prokofieff. Free.

Monday, Feb. 24, 8:30 p.m. Beckman
NEW APPROACHES TO RADIO ASTRONOMY. Marshall Cohen. Caltech Lecture Series. Free.

Friday, Feb. 28, 8:30 p.m. Beckman
WORLD-RENOWNED VIOLINIST ISAAC STERN. \$7-5-4.

Sunday, March 2, 8:15 p.m. Dabney
BORSCHEL WOODWIND TRIO. Music by Bach, Mozart, Francaix, Milhaud, and Villa-Lobos. Free.

Monday, March 3, 8:30 p.m. Beckman
THE METROAMERICAN: THE NEW AMERICAN OF THE 1960's. First of three Haynes Foundation Lectures by Eric F. Goldman. "The Hidden Prelude." Free.



THE KIPNIS MIME THEATRE from Israel performs in Beckman Auditorium on Friday, Feb. 14. □

Wednesday, March 5, 3:00 p.m. Dabney
THE HONORABLE ELDON GRIF-FITHS, MP, will discuss the changing relationship between the U.S. and Europe. Free.

Thursday, March 6, 8:30 p.m. Beckman
THE REVOLUTIONIST IN A MERCEDES-BENZ. Eric F. Goldman. Second Haynes Lecture. Free.

Friday, March 7, 8:30 p.m. Beckman
PHEDRE, a tragedy in five acts by Racine, in French. Performed by the Productions d'Aujourd'hui in association with La Comedie de Bourges, directed by Roland Monod. \$4-3-2.

Wednesday, Mar. 12, 8:30 p.m. Beckman
NEW STANCES, OLD PROBLEMS. Eric F. Goldman. Third Haynes Lecture. Free.

Friday, March 14, 8:30 p.m. Beckman
FIRST CHAMBER DANCE QUARTET of New York in a program of contemporary classical ballet. \$5-4-3.

Sunday, March 16, 3:30 p.m. Beckman
SMETANA QUARTET from Prague will perform Mozart (K.458), Janacek (Quartet No. 2), and Beethoven (Op. 132). Coleman Chamber Concert. \$4-3-2. □

ALUMNI CALENDAR

March 7, 14, 8:00 p.m. Athenaeum
ANNUAL WINE TASTING.

March 27, San Diego
ALUMNI DINNER. Caltech Glee Club will sing. Speakers to be announced.

April 12, Swiss Park, Duarte.
BARN DANCE.

May 10, all day, campus.
ANNUAL ALUMNI SEMINAR.

June 11.
ASSOCIATION ANNUAL DINNER MEETING.

Advance notice only. Details of each event—including ticket information—will be mailed by the Alumni Association. □



NO MATTER HOW FAR OUT he is, an alumnus never need be out of touch with Caltech. Witness Frank Borman, MS '57, commander of the Apollo 8 spacecraft. John Bolton, an Australian astronomer working at Palomar Observatory, made this remarkable triple exposure (2-minute exposures, 5 minutes apart) of Apollo 8 with the 48-inch Schmidt telescope on the night of December 23, just hours before moon orbit was achieved. The spacecraft, visible in two of the three exposures, was about 200,000 miles from Throop Hall at the time. □

Alumni Begin a Series of Local Dinner Meetings

Two regional dinner meetings sponsored by Caltech's Alumni Association attracted more than 100 people in October and November. The meetings are the first in a series to be held, in time, in most areas in which a significant number of alumni live.

On October 14 in New York 66 people at the Delmonico Hotel heard Lee DuBridge talk about the Institute, students, smog project, electric car race, and problems in fundings for science. He was followed by Jesse Greenstein, professor of astrophysics, who explained some important new equipment developments in his field. Representing the Alumni Association were New York chapter president Fred Wood, '57, Association president Don Davidson, '38, and executive director Jim Black.

Detroit, an area without an alumni chapter, had a surprisingly large turnout of 45 people, headed by dinner chairman Cy Minkler, '28. As in New York, Lee DuBridge told the alumni about current activities at the Institute, and was joined by Harrison Brown, professor of geochemistry and of science and government, who spoke about "Science, Technology, and Developing Nations." Also present were Association past president (and head of Caltech's Industrial Associates) Dick Schuster, '46, and Black. □

New Alumni Books

The Story of Science in America, L. Sprague de Camp, '30, and Catherine de Camp. Scribner, N.Y., 1967. \$4.95.

The Structural Basis of Antibody Specificity. David Pressman, '37, PhD '40, and Allan L. Grossberg, '42, MS '44. Benjamin, N.Y., 1968. \$16.75.

The Primary Structure of Proteins. Principles and practices for the determination of amino acid sequence. Walter A. Schroeder, PhD '43. Harper & Row, N.Y., 1968. Paper \$5.95. Modern Perspectives in Biology.

Galactic Astronomy, Dimitri Mihalas, MS '60, PhD '64, with the collaboration of Paul McRae Routly. W. H. Freeman and Company, San Francisco, 1968. \$10.

Current Algebras and Applications to Particle Physics, Stephen L. Adler and Roger F. Dashen, PhD '64. Benjamin, N.Y., 1968. \$12.50, paper \$5.95. □

Membership in the Caltech Alumni Association (\$10 a year) brings:

- ▶ *Engineering and Science* magazine nine times a year
- ▶ Alumni Directory, to be issued this year.
- ▶ Athenaeum membership privilege

ARTICLES IN THE JANUARY ENGINEERING AND SCIENCE MAGAZINE

- ▶ *Engineering for Earthquakes*, by George Housner. A Caltech engineer looks at the prospects for building-in protection against earthquake damage in seismic regions.
- ▶ *Lorentz Microscopy: A New Dimension*. A new use of the electron microscope allows detailed observation of the magnetic structure of ferromagnetic materials.
- ▶ *New Scope in Blood Flow Studies*.
- ▶ *George S. Hammond—Dynamic Chemist*. When the explosion in chemical dynamics comes, George Hammond will meet the change with some ideas of his own.
- ▶ *Jean-Jacques Weigle 1901-1968*. A tribute by Max Delbrück and Robert Edgar.

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.....

.....

PERSONALS

1932

JOHN A. LEERMAKERS, PhD, a vice president of Eastman Kodak Company and director of Kodak Research Laboratories, Rochester, N.Y., has been elected to honorary fellowship in the Royal Photographic Society of Great Britain. Leermakers, author of 25 technical papers and holder of 16 patents, was honored for his contributions to photographic science.

PATRICK B. LYONS is the new general manager of the Western Electric Company plant in Oklahoma City. He was formerly director of engineering at the company's Columbus, Ohio, plant. Lyons joined Western Electric in 1942 as a field engineer in San Francisco.

1940

ROBERT WAYMAN writes that he is vice president of advanced transmission engineering, Borg-Warner Corporation; he has been transferred to the Transmission Products Group in the Detroit area.

1942

ROBERT J. CLARK, MS '43, vice president for special market development with North American Rockwell Corp.'s aerospace and systems group, has been elected president of the North American Aviation International marketing subsidiary.

1946

THEODORE H. DEHNKE was recently named section supervisor in The Dow Chemical Company's process engineering in Midland, Mich. A Dow employee since 1946, Dehnke returned to Midland earlier this year as head of the inorganic and hydrocarbons process section after five years with the company's international operations.

PHILIP E. JENSON, manager, exploitation engineering in Shell Development Company's research center in Houston, has been named production manager for the Shell Oil Company's Denver exploration and production area. Jenson joined Shell in 1946 as a junior exploitation engineer in Ventura, Calif.

FREMONT E. REICHWEIN, a captain in the U.S. Navy, recently took command of the USS Norton Sound, the Navy's weapon system test and evaluation ship, based at Port Hueneme, Calif. The ship is currently testing a new point defense missile system and will test a new Navy five-inch gun in 1969. Reichwein was formerly Fleet Ordnance Officer on the staff of the Commander in Chief, U.S. Pacific Fleet.

1948

JUSTIN BLOOM has been appointed staff assistant to the chairman of the Atomic Energy Commission in Washington, D.C. Formerly assistant director for licensing and regulations in the AEC's division of nuclear materials safeguards, Bloom has served on the AEC staff almost continuously since 1956. His new position will involve a wide range of administrative and technical matters relating to the review and analysis of programs and policies.

ALLEN T. PUDER, MS '49, has joined Electro-Optical Systems Inc. in Pasadena



McConnell, '51



Fuller, '52

in the new position of marketing manager, illuminations. Puder was formerly a consultant to the Kollmorgen Corp., Northampton, Mass.; prior to that he was vice president and operations manager for the Hughes Electronics Co. in Los Angeles.

1951

ROBERT G. ADLER completed requirements for a PhD in chemistry at the University of California at Riverside this summer and is now assistant professor of chemistry at Bethel College in North Newton, Kan.

BARRIE H. BIELER, MS '52, is a senior research ceramist in the Walnut Creek, Calif., research laboratory of the Western Division of The Dow Chemical Co. He is also assistant professor of geology and chairman of the department of general sciences at John F. Kennedy University at Martinez, Calif., a small private college offering evening classes.

HARDEN McCONNELL, PhD, professor of chemistry at Stanford University, is the recipient of the 1968 Harrison Howe Award, presented by the Rochester Section of the American Chemical Society in recognition of outstanding contributions in chemistry. McConnell, who served on the Caltech faculty from 1956 to 1964, is a member of the National Academy of Sciences and the American Academy of Arts and Sciences. Many of McConnell's original contributions involve the application of electron and nuclear magnetic resonance to the solution of fundamental problems in theoretical chemistry, chemical kinetics, radiation chemistry, solid state physics, and molecular biology.

Navy photo



Fuhs, '55



Rothe, '58

1952

PAUL D. ARTHUR, PhD, professor of aerospace engineering and engineering science and mechanics at the University of Florida—GENESYS, in Port Canaveral, was recently named Engineer of the Year by the Indian River Chapter of the Florida Engineering Society. Arthur, who has been with the University since 1965, was formerly at USC and UCLA and has taught in the Fulbright program at the University of Naples, Italy; at the University of Cairo, Egypt; at Delft Institute of Technology, Holland; and at the University of Baghdad, Iraq.

RICHARD R. DICKINSON, former assistant to the vice president of supply and distribution, Texaco, Inc., in New York, has been transferred to London, England, as general manager of supply and distribution, Texaco, Ltd. The Dickinsons will make their home in Virginia Water, just west of London and a few miles from Windsor Castle.

RICHARD H. FULLER has been appointed director of research for Sperry Rand Corporation's UNIVAC Federal Systems Division, St. Paul, Minn. He was formerly director of advanced technology for the Librascope Group of General Precision in Glendale, Calif.

JOSEPH L. O'BRIEN, PhD, is a new research supervisor, plastic films, for Rohm and Haas Company, Philadelphia.

1953

ROBERT L. BIXLER, PhD '57, has been named acting business manager for many



Ellett, '58



Dixon, '68

of The Dow Chemical Company's organic intermediate products. Bixler, who joined Dow in 1957, has been serving as manager of development chemicals sales.

JAMES A. HENDRICKSON, PhD '57, was married last November in Osaka, Japan, to Miss Doris Lyons of Los Angeles. He is a senior research engineer with Science Engineering Associates, San Marino, Calif.

CARL A. ROUSE, MS, PhD '56, has joined the staff of Gulf General Atomic, Inc., San Diego, Calif. He was previously with the Naval Research Laboratories in Washington, D.C., working on a program to determine the helium abundance in the solar photosphere. Rouse was elected in September to fellowship in the American Physical Society.

GEORGE W. SUTTON, MS, PhD '55, on the staff of Avco Everett Research Laboratory, Everett, Mass., has been elected a fellow of the American Institute of Aeronautics and Astronautics. Sutton joined the laboratory in 1965 and is currently chairman of the Aerophysics Committee there.

1955

ALLEN E. FUHS, MS, PhD '58, professor of aeronautics and chairman of the department of aeronautics at the Naval Postgraduate School, Monterey, Calif., has become chief scientist of the Air Force Aero-Propulsion Laboratory at Wright-Patterson Air Force Base, Dayton, Ohio. Fuhs joined the faculty at the Postgraduate School in 1966 and has been chairman of the aeronautics department since 1967.

1957

FRANKLIN P. DIXON, MS, PhD '60, has resigned as director, advanced manned spacecraft, NASA Headquarters, Washington, D.C., to accept a position with International Telephone and Telegraph as product line manager, military electronics and space, located at ITT Europe headquarters in Brussels.

1958

NORMAN T. ELLETT has been promoted to the position of managing principal with Fry Consultants Incorporated, international management counsel. He is associated with Fry's production and general management services.

ROBERT E. ROTHE, MS, was recently appointed senior research physicist at The Dow Chemical Company's Rocky Flats plant near Boulder, Colo., where he has been since 1964. The Rocky Flats plant is operated by Dow for the U.S. Atomic Energy Commission.

1959

JAMES E. MERCEREAU, PhD, Caltech research associate in physics, was awarded an honorary degree of DSc by Pomona College, Claremont, Calif., at their Founders Day Convocation in October.

1960

WILLIAM K. DAVIS, president of Ward/Davis Associates, Pasadena, will become president and chief executive officer of the combined company that will result when Ward/Davis merges with the Glassco Instrument Company (Robert Glassco, '40), also of Pasadena. The merger has been agreed to in principle and awaits approval by shareholders of Glassco and appropriate regulatory agencies.

1968

JEFFREY A. BURKE, MS, has completed Officer Training School and been commissioned a second lieutenant in the U.S. Air Force. He has been assigned to Ft. George G. Meade, Md., as an electrical engineer.

CHARLES J. DIXON, MS, a second lieutenant in the U.S. Air Force, has been assigned to Griffiss AFB, N.Y.

ROBERT E. STARRETT is in the Peace Corps, teaching physics in a public high school in the central Philippines. He became a PCV in July and will complete his service in September 1970.

W. STEPHEN WOODWARD was married in September to Clare Veness. He is now doing graduate work in information science at the University of North Carolina, Chapel Hill.

OBITUARIES

1920

ROSCOE R. ROCKAFIELD, retired engineer living in West Allis, Wis., died November 12 at the age of 70. He was an engineer with the Allis-Chalmers Corp. prior to his retirement in 1965. He is survived by his wife, Norma, two sons, and seven grandchildren.

ROSCOE E. (BRAD) WOODBURY, former district traffic supervisor in Pasadena for the Pacific Telephone and Telegraph Co., died December 12. He retired in 1965 and was living in La Canada, Calif. He is survived by his wife, Esther, and a daughter, granddaughter, and great-grandson.

1924

LYMAN P. STOKER died October 19 in San Francisco. He retired from business 13 years ago and had taught until 1964 at the San Luis Obispo campus of California State Polytechnic College, specializing in machine design and kinematics. He is survived by his wife, Lorene, two daughters, a stepson, and six grandchildren.

1928

DONALD S. NICHOLS, president of the Barnard Engineering Company, Redwood City, Calif., died November 3.

1930

WILBER W. AYERS died October 28 in Northridge, Calif. A 26-year employee of Lockheed Aircraft Corp. in Burbank, Calif., he and his wife had traveled extensively since his retirement in 1966. He died suddenly while taking part in a "jogging" program at San Fernando Valley State College in Northridge.

FRANKLIN G. CRAWFORD, retired managing director of Fluor Nederland N.V., a subsidiary of Fluor Corp., died in December following an accident at Crestline, Calif. He was 60. Crawford joined Fluor Corp. in 1942 and had been with the Holland subsidiary in Haarlem since 1963, returning to the United States in October 1968. He is survived by his wife, Doris, and a son.

1933

KEDRIC V. KEELEY, a self-employed consulting engineer in Los Angeles, died November 27. He had previously been a communications engineer for the City of Los Angeles. He is survived by his wife and son.

1943

W. KENT WONG, MS, (formerly Yung-Chiang Hwang) died in September. He was the principal engineer for Lockheed Electronics, Inc., at NASA and was a member of the Texas State Board of Registration for Professional Engineers. He is survived by his wife, Donna, and a son.