

Two Caltech trustees elected: Atkins, Gould

R. Stanton Avery, chairman of the Caltech Board of Trustees, has announced the election of two new members: Victor K. Atkins, president of Doran Company of Oakland, and William R. Gould, who became president of Southern California Edison Company on February 1.

Atkins was named president of Doran Company in 1951 after four years with Pacific Car & Foundry Company. He received a B.S. degree at the U.S. Naval Academy in 1942, served during World War II in the Submarine Service, and was decorated with the Silver Star. He received an M.S. degree from MIT in 1947.

He is a member of the California and Oakland Chambers of Commerce, the Society of Naval Architects and Marine Engineers, and the Marine Exchange of San Francisco.

Gould, in addition to his duties as a director and officer of Edison, is an internationally known engineering executive. He is a member of the National Academy of Engineering and serves on the executive committee of the Assembly of Engineering, National Research Council. He is chairman and a fellow of the Institute for the Advancement of Engineering, which honored him as "Engineer of the Year" in 1970, and he is a fellow of the American Society of Mechanical Engineers.

Gould is a director of the Edison Electric Institute and is chairman of EEI's executive advisory board of the policy committee on nuclear power. He also is a director of the Electric Power Research Institute, the Eyring Research Institute, the Kaiser Steel Corporation, and Project Management Corporation.

He also is past chairman of the board and a director of Atomic Industrial Forum, president and a director of WEST (Western Energy Supply and Transmission) Associates, and president of the U.S. National Committee of CIGRE (International Conference on Large High Tension Electric Systems). He is a member of the advisory committee of UCLA's Electric Certificate Pro-

Marvin L. Goldberger

Physicist named Caltech president



On a visit to the campus, Marvin Goldberger discusses his views about Caltech undergraduate education with ASCIT president Bert Wells. (Photo by Albert Kellner).

Dr. Marvin L. Goldberger, a theoretical physicist at Princeton, will become the new president of the California Institute of Technology on July 1, 1978. His appointment by the Board of Trustees was announced on March 6 by R. Stanton Avery, chairman of the Board, after a presidential search that lasted over a year and considered some 200 nominees and candidates.

Mr. Avery, in making the appointment, said, "The Trustees look forward to Dr. Goldberger's stewardship with confidence and enthusiasm. Caltech is fortunate indeed to have attracted so distinguished a scientist and academic leader to the presidency."

Recognized as an outstanding theoretical physicist of international stature, Dr. Goldberger is perhaps best known for his work on the application of dispersion methods to problems in interaction among elementary particles and for his book, *Collision Theory*.

When he visited the Institute in January to meet with faculty, students, and trustees, Dr. Goldberger expressed a particular interest in the quality of undergraduate teaching at Caltech. "Caltech is a unique institution," he has said, "combining the

gram and on the national advisory board of the University of Utah.

Born in Provo, Utah, Gould is a graduate of the University of Utah. He received his post-graduate education at MIT.

best features of a university with those of a pure research institute, a brilliant faculty and research staff, and outstanding students."

Currently Joseph Henry Professor of Physics at Princeton, Dr. Goldberger was born in Chicago in 1922. He received his BS from Carnegie Institute of Technology (now Carnegie-Mellon University) in 1943, served in the Army from 1943 to 1946, and received his PhD in physics from The University of Chicago in 1948.

He has held appointments at the radiation lab at UC Berkeley, at the Massachusetts Institute of Technology, and at The University of Chicago. He has been a member of the faculty at Princeton since 1957, and was chairman of that university's physics de-

partment from 1970 to 1976.

Dr. Goldberger is a member of the National Academy of Sciences, a Fellow and vice president-elect of the American Physical Society, a Fellow of the American Academy of Arts and Sciences, and a member of the Council on Foreign Relations. He was awarded the Dannie Heineman Prize for Mathematical Physics in 1961.

Dr. Goldberger has been active for many years as an advisor to various government agencies on national security affairs. He was one of the founders, in 1959, of the Jason Group of about 35 scientists who have worked for the Department of Defense and other agencies on problems involving advanced technological concepts. He was a member of the President's Science Advisory Committee from 1965 to 1969, and was chairman of the Federation of American Scientists during 1972 and 1973.

Dr. Goldberger has been heavily involved in international scientific affairs. From 1963 to 1969 he was Chairman of the High Energy Physics Commission of the International Union of Pure and Applied Physics.

Dr. Goldberger and his wife, Mildred, have two sons. Mrs. Goldberger is a professional economist who has been associated with the Princeton Center for Environmental Studies. Her hobbies include writing original contributions for improvisational theater and co-teaching a course at the Princeton Adult School on "Improvising a Novel."

With a boost from Caltech

Here's a revolution in astronomy

A team of scientists and engineers led by Caltech Professor of Planetary Science James Westphal has been named to design one of the principal cameras for the Space Telescope under a \$20-million grant from NASA. The Space Telescope, a 10-ton instrument to be carried into orbit in 1983 by the Space Shuttle, promises to revolutionize the science of astronomy because it will enable scientists to view celestial objects more clearly than ever before.

Orbiting 311 miles above the earth, beyond the haze and distortion of the earth's atmosphere, the telescope will allow astronomers to detect objects 100 times fainter than the present ground-based limit, and with almost 10 times greater resolution. The scientists believe use of the telescope will lead to advances in the understanding of the origin, evolution, and structure of the universe, as well as our solar system.

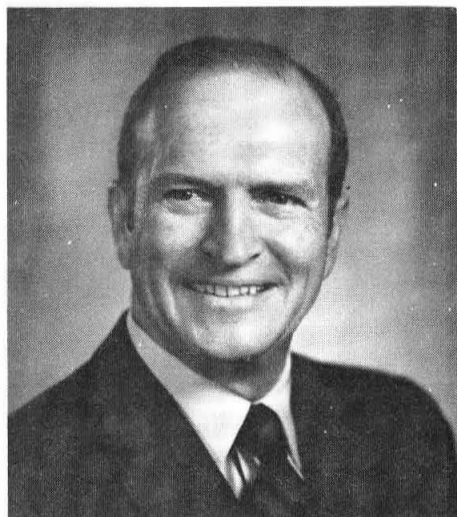
"It will be as though everything in the heavens were suddenly brought 10 times closer," Westphal said. He explained that observations now made with great difficulty at the limit of ground-based capabilities

will suddenly become easy, while observations that are now only hopes will become routine.

Westphal and his colleagues have been commissioned to build the Wide Field Camera, one of two cameras for transforming images from the telescope's optical system into digital impulses to be beamed to earth. This camera, to be constructed at JPL, will be able to detect a wide spectrum of light, ranging from the ultraviolet through the visible to the infrared region.

With the Space Telescope, scientists will be able to examine such objects as quasars, galaxies, gaseous nebulae, and variable stars invisible to ground-based telescopes. They also will be able to monitor planetary atmospheres and surfaces with much greater precision than is possible using earth-bound telescopes.

Additionally, for the first time astronomers can search for planets that may be orbiting other stars. "The possibility for discovering other planetary systems is undoubtedly one of the most exciting prospects for the use of the telescope," Westphal said.



Victor K. Atkins



William R. Gould

The Associates honor their new members

"You are now part of an organization that has provided invaluable strength and support to Caltech for 52 years," Acting President Robert F. Christy told new members of The Associates at a dinner in their honor during February. "Your gifts enable us to remain flexible and independent, and your friendship and loyalty help us in many ways that cannot be measured." Forty-nine new Associates were recognized at the dinner in the Athenaeum, which featured Clarence R. Allen, professor of geology and geophysics, and a new member of The Associates, as the speaker.



Mr. and Mrs. Charles W. Gates II are introduced as new members of The Associates.



William R. Gould, newly elected to the Caltech Board of Trustees, and Mrs. Gould, are welcomed by Associates' members Mr. and Mrs. George D. Jagels. Mr. Jagels is president of The Associates.



Dr. Carey Stanton with Miss Marion Witbeck, a new life member of The Associates, and Miss Witbeck's sponsor, Francis McComb, a member of The Associates' Board of Directors.



David W. Morrisroe portrays a hired heckler badgering two garment company employees as they strike for a living wage: Jennifer Solomon, left, and Mary Bolton, right. Morrisroe is Caltech's vice president for financial affairs and treasurer.



Korean born Young-il Choo, a senior mathematics major, plays "Italian-Jewish-Episcopalian" Fiorello LaGuardia, depression-era New York mayor. Here he confronts a U.S. Senator (Edwin S. Munger, professor of geography). Onstage for the production is Robert A. Millikan's desk, now the property of the Caltech archives.

The faculty: onstage in "Fiorello!"

Last year when Caltech students presented "Guys and Dolls" as their annual musical, director Shirley Marneus found herself short of bit players. She recruited faculty members to perform some of these roles and thus launched what seems destined to become an increasingly popular tradition. This year, the musical production of "Fiorello!" attracted some of Caltech's leading academic and administrative stars to cameo roles, much to the delight of the Caltech community. Besides those pictured here, the musical featured Acting President Robert Christy as a radio announcer and Director of Admissions Stirling L. Huntley as a bartender. "The production gives students the chance to work closely, outside classrooms and labs, with men and women of rare professional ability," Marneus said. "Onstage, everyone is an equal."



Scheming against LaGuardia at a Tammany Hall party are Larry Seiler and Crooked Judge Carter, played by Harry Gray, the William R. Kenan, Jr. Professor and professor of chemistry.



Portraying an Italian immigrant befriended by LaGuardia is Charles R. De Prima, professor of mathematics. At a LaGuardia rally, De Prima attracts the attention of chorus girls Janet Cattano, left, and Jenijoy La Belle, associate professor of English.

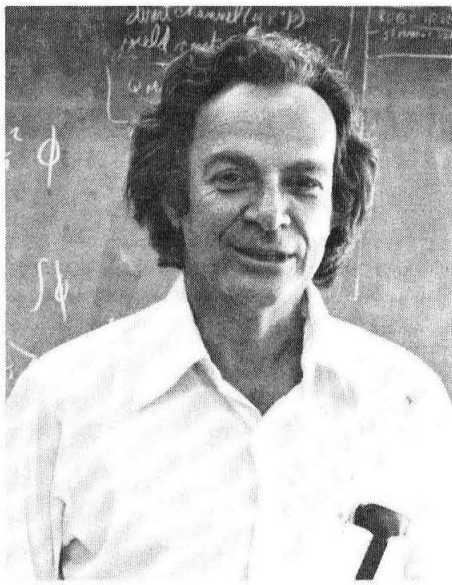


Applauding LaGuardia's nomination as mayor are Ben Chastain, visiting associate in chemistry, and Nobel Laureate Richard P. Feynman, the Richard Chace Tolman Professor of Theoretical Physics. "Fiorello!" featured Feynman in a cameo role as gangster Frankie Scarpini.

Feynman: speaker at Seminar Day general session

Nobel Laureate Richard P. Feynman will be the general session speaker on Alumni Seminar Day, May 13. Feynman is the Richard Chace Tolman Professor of Theoretical Physics at Caltech. Equally known on the campus for his rapport with students and for his scientific stature, he is the author of the widely used physics texts, *Feynman Lectures*.

Feynman is the recipient of many honors in addition to the Nobel Prize, among them, the Niels Bohr International Gold Medal and the Albert Einstein and E. O. Lawrence Awards. He has made outstanding contributions to the understanding of the atom's structure, particularly in quantum electrodynamics, and he developed the "Feynman Diagrams," which greatly accelerated and simplified many calculations in quantum mechanics. He was awarded the Nobel Prize in 1965 for his



Richard P. Feynman

work in quantum electrodynamics.

Born in New York, Feynman received his BS degree from MIT and his PhD from Princeton. He was associated with the Manhattan Project in its early stages and later joined the Los Alamos Scientific Laboratory. He became professor of theoretical physics at Cornell University in 1945 and joined the Caltech faculty in 1950.

Clark to staff Alumni Fund

Floyd C. Clark, a member of the Caltech public relations staff since 1969, has been appointed associate director of annual giving with responsibility for coordination of Alumni Fund activities, it was announced by William H. Corcoran, vice president for Institute relations. Clark replaces Robert G. Lamkins, now director of development for the Little Company of Mary Hospital in Torrance.

Clark has handled various assignments for the public relations department at Caltech, including those of Institute photographer and media representative to television and radio news and feature departments. Over the past nine years he has met and worked with hundreds of alumni.

"We are fortunate in having someone of Floyd Clark's skills, his rapport with alumni, and his knowledge of the goals and philosophies of the Institute, to fill this important role," Corcoran said. "He has proved himself to be a person of outstanding competence and ability, and we

Fowler honored

William A. Fowler, Institute Professor of Physics at Caltech, has been awarded the Eddington Medal of the Royal Astronomical Society (RAS) for his outstanding contributions to nuclear astrophysics.

The Society cited Fowler for his pioneering research in nuclear physics and its impact on astrophysics. Particularly noted were his investigations of the origin of the chemical elements, the production of deuterium and helium in the universal fireball and massive objects, and the release of gravitational and nuclear energy in massive objects.

The Eddington Medal, which commemorates the late Sir Arthur Eddington, British astrophysicist, is awarded approximately every three years for specific investigations in theoretical astronomy.

Alumni Fund edges toward new donor goal

Caltech's Alumni Fund has received gifts from more alumni than last year at the same time and is well on the way toward its goal of 4,500 donors, according to Ed Foss, BS '32, national Fund chairman. The Fund had received support on February 10 from 2,404 donors, compared with gifts from 2,389 alumni at the same time in 1977.

These figures show that 18 percent of Caltech alumni had contributed to the Fund by February 10. But Foss pointed out that six area chairmen had received gifts from more than one third of the alumni in their areas by that date. These chairmen, and their percentages, are:

Dan Markoff, BS '50, San Luis Obispo, 46 percent; Jeff Williamson, BS '48, MS '49, Eng '55, Central San Fernando Valley, 41 percent; Dick Smyth, BS '51, Newport-Corona del Mar, 37 percent; Paul Armstrong, BS '51, MS '55, Orinda-Moraga, 34 percent; George Gleghorn, MS '48, PhD '55, TRW employees, 33 percent; Ed Hayes, BS '33, Tucson, Arizona, 33 percent.

The stock market performance has caused a drop in the number of gifts of \$10,000 or more this year and thus in the Fund's total dollar income. Large Fund contributions have consistently fluctuated with the stock market. Last year on February 10, the Fund had received 15 gifts of \$10,000 or more, most of them of stock; this year, the Fund has only received 12 gifts of that size. Contributions to the Fund on February 10 totaled \$542,374 toward a goal of \$750,000.

An example of the stock market impact is evident in an annual gift of

100 shares of stock in a major corporation. Last year its value was \$12,000, compared with \$7,000 this year.

Foss praised the efforts of the 550 volunteers whose hard work during the first half of the Fund year was responsible for the donor increase. He said the annual telephone program, personal contacts, and a mailing should continue to boost the number of alumni making gifts to the Fund. About 4,000 alumni throughout the country will be called during April, May, and June by Fund workers using the facilities of the West coast headquarters of a major corporation.

Foss said an encouraging Fund achievement is the number of alumni who have become members of The Associates. During 1977, 47 individuals joined the organization; 26 of these were alumni. They include:

Clarence R. Allen, MS '51, PhD '54; Paul H. Allen, BS '42; Kenneth B. Anderson, BS '24; Robert C. Brumfield, BS '40, MS '41, PhD '43; John C. Carney, BS '56, MS '57; William J. Carroll, BS '48, MS '49; Wilfred P. Charette, BS '62, MS '64, PhD '69; John M. Clark, Jr., PhD '58; Hugh F. Colvin, BS '36; Philip R. Conley, BS '56; Richard D. DeLauer, Eng '50, PhD '53; Cecil W. Drinkward, BS '50; John R. Fee, BS '51.

Fred H. Felberg, BS '42, MS '45; Robert I. Gardner, BS '36; George J. Gleghorn, MS '48, PhD '55; Thomas P. Gordon, MS '56, PhD '59; Lawrence K. Gould, BS '33; Jesse B. Graner, BS '43; Robert T. Nahas, BS '44; Martin Poggi, BS '37; Roland N. Smoot, BS '50; Robert Stanaway, BS '52; John L. Stern, BS '45; Thomas H. Tebben, BS '60; Thomas A. Tisch, BS '61.

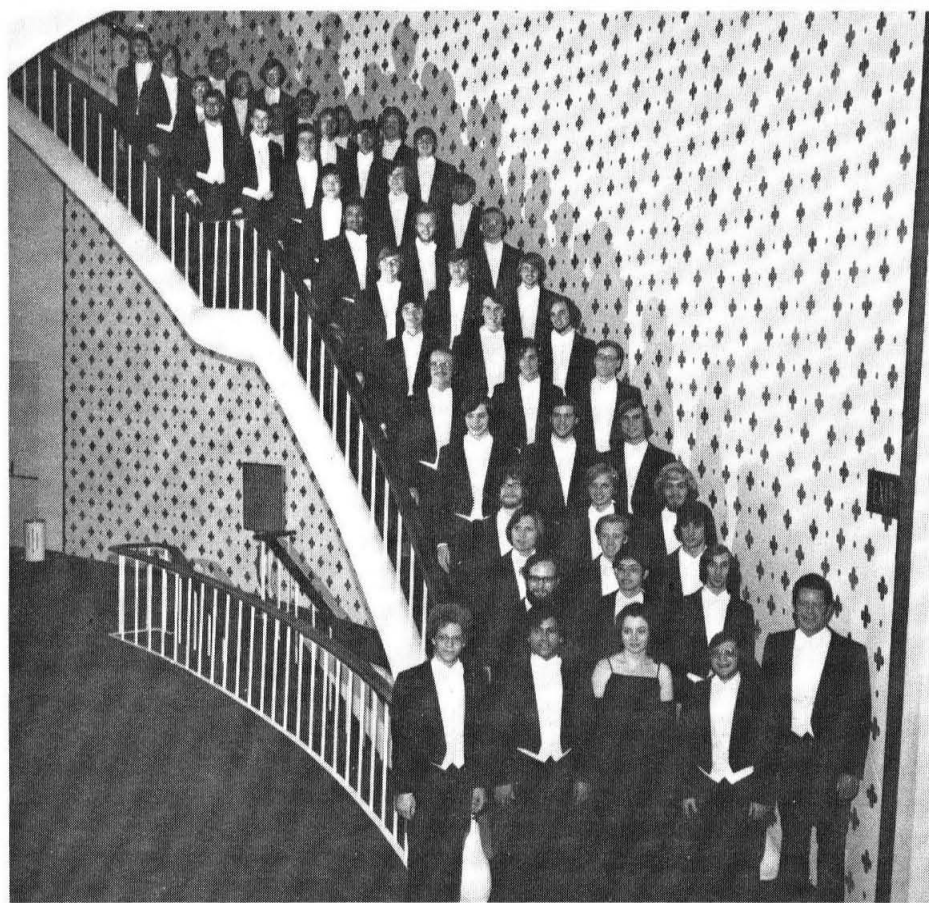
In conclusion, Foss urged workers to continue to contact as many alumni as possible.

Neutrinos missing

What's happened to the sun's missing neutrinos? Giant masses of the metal, gallium, may be used as traps to locate the missing particles, according to William A. Fowler, Institute Professor of Physics.

In an Earnest C. Watson Caltech lecture, Fowler explained that neutrinos are atomic particles with no charge and no mass that can zip through matter as if it didn't exist. Fowler said that experiments in which neutrinos streaming from the sun are trapped in giant tanks of liquid beneath the earth's surface have recorded the capture of only about one neutrino every three days. But theories predict that the number should average one per day.

According to Fowler, the discrepancy may occur because scientists don't understand how the sun creates its energy. Another possibility is that neutrinos may transform into another form of elementary particle during their eight-minute journey from the sun to the earth. In the proposed new experiments, giant gallium masses would attempt to capture low-energy neutrinos that many scientists believe are missed by the current method.



The Caltech Men's Glee Club.

Caltech Glee Club on tour

Alumni in several regions of California will have the opportunity in April to hear the Caltech Men's Glee Club and Chamber Singers on spring tour. The performances and locations include: Thursday, April 6, 8 p.m., First United Methodist Church, Corcoran; Friday, April 7,

12 noon, West Hills Community College, Coalinga; Friday, April 7, 8 p.m., Trinity Presbyterian Church, San Carlos; Saturday, April 8, 7:30 p.m., Metropolitan Community Church, San Francisco; and Sunday, April 9, 1 p.m., Mission United Presbyterian Church, San Francisco.

Alumni Board nominates officers

The Board of Directors of the Alumni Association met as a nominating committee on January 10, 1978, in accordance with Section 5.01 of the Bylaws. Five vacancies on the board, in addition to the positions of the president, vice president, secretary, and treasurer, are to be filled. The current members of the board, and the years in which their terms expire, are as follows:

Oliver H. Gardner, BS '51 – 1978
 John D. Gee, BS '53 – 1978
 Joseph A. Dobrowolski, BS '49 – 1978
 Howell N. Tyson, Jr., BS '50 – 1978
 Richard L. Van Kirk, BS '58 – 1978
 Peter M. Wilzbach, BS '70 – 1978
 Clarence R. Allen, MS '51, PhD '54 – 1979
 James R. Davis, BS '48, MS '49 – 1979
 Hiroshi Kamei, BS '51, MS '52 – 1979
 Carel Otte, MS '50, PhD '54 – 1979
 James W. Workman, BS '57, MS '58 – 1979
 Cydnor M. Biddison, BS '40 – 1980
 John R. Fee, BS '51 – 1980
 James King, Jr., MS '55, PhD '58 – 1980
 Louise Kirkbride, BS '75, MS '76 – 1980
 Philip L. Reynolds, BS '58, MS '59 – 1980

The following individuals have been nominated for terms beginning at the close of the annual meeting in June 1978:

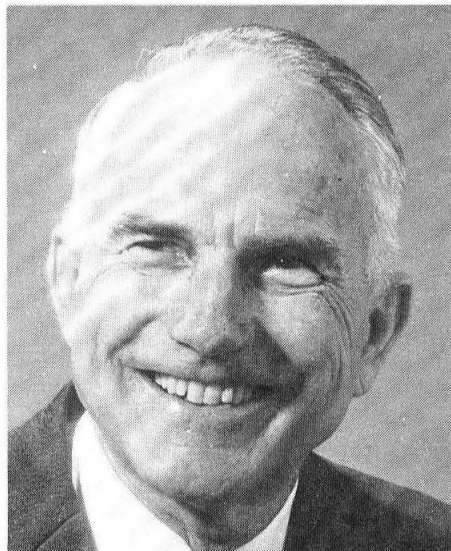
President: John R. Fee, BS '51 — 1 year
 Vice President: Carel Otte, MS '50, PhD '54 — 1 year
 Secretary: Philip L. Reynolds, BS '58, MS '59 — 1 year
 Treasurer: James W. Workman, BS '57, MS '58 — 1 year
 Directors: Stanley A. Christman, BS '65 — 3 years
 Munson W. Dowd, BS '38, MS '46 — 3 years
 Steven D. Hall, BS '65, MS '66 — 3 years
 J. Steven Sheffield, BS '72 — 3 years
 Thomas A. Tisch, BS '61 — 1 year



Stan A. Christman

Stan A. Christman, BS '65, is division supervising engineer for the California Drilling Organization of Exxon Company, U.S.A. Previously he completed design technology projects for the Prudhoe Bay, Alaska, oil wells and for natural gas processing concerns in the south Texas area. He is a member of the American Institute of Chemical Engineers and the Society of Petroleum Engineers of the American Institute of Mechanical Engineers.

A member of the Alumni Association since his graduation, Christman was on the Alumni Seminar Day Committee from 1974 to 1976, and for three years he has served as an Alumni Fund worker.



Munson W. Dowd

Munson W. Dowd, BS '38, MS '46, joined the Metropolitan Water District of Southern California in 1946 and was named chief engineer in 1971. Engineering projects totaling more than \$1 billion have been constructed since he joined the district, many of them under his direction. Among the projects are dams, canals, pipelines, tunnels, and water treatment plants.

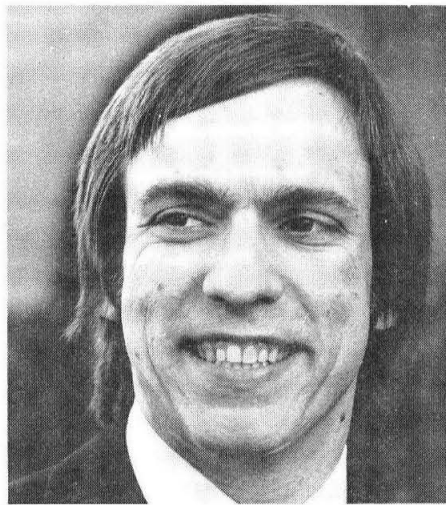
A registered civil engineer, Dowd is a fellow of the American Society of Civil Engineers and a member of the executive committee of its Technical Council for Lifeline Earthquake Engineering. He also is a member of the American Water Works Association and the U.S. Committee on Large Dams. He was the 1977-78 chairman of the California Water and Power Earthquake Engineering Forum and he served on the "Independent Panel to Review Cause of the Teton Dam Failure" in 1976.



Steven D. Hall

Steven D. Hall, BS '65, MS '66, is manager of market research in Atlantic Richfield's Synthetic Crude and Minerals Division. The division has responsibility for ARCO's coal and oil shale operations.

After graduating from Caltech, Hall worked for five years in Texas for ARCO's oil and gas exploration operations before moving to Los Angeles with the company's minerals group. He has been a member of the Alumni Seminar Day Committee for four years.



Steve Sheffield

Steve Sheffield, BS '72, completed his Caltech PhD requirements in June and will receive his degree at 1978 commencement ceremonies. He works in the Aero-Analysis Group at TRW in Redondo Beach, on high-angle-attack missile aerodynamics.

As a Caltech graduate student, Sheffield was a resident associate in Fleming House and athletic manager for the Graduate Student Council.



Thomas A. Tisch

Thomas A. Tisch, BS '61, is vice president of Culbertson Industries, Inc., Palo Alto, California, a manufacturer of digital communications equipment for sale to U.S. and Canadian telephone companies. He received his MS degree in electrical engineering in 1962 and his MBA in 1964, both from Stanford University.

Tisch is a registered professional electrical engineer in California and president of the San Francisco Chapter of the Caltech Alumni Association. He is active in the San Francisco Symphony Association and is a member of The Associates.

NOTICE IS HEREBY GIVEN that pursuant to the bylaws of the Alumni Association, California Institute of Technology, the annual meeting of the members thereof will be held Thursday, the twenty-second day of June, nineteen hundred and seventy-eight, at 6:00 p.m. in the Athenaeum, 551 South Hill Avenue, Pasadena, for the purpose of receiving results of the election of officers and directors and for the purpose of transacting any and all business that may properly come before such meeting of the members.

RICHARD L. VAN KIRK, BS '58, PRESIDENT
 WILLIAM L. MARTIN III, BS '69, MS '70, SECRETARY

Memories tapped for Caltech history

History is recorded in the memories of human beings as well as in documents and letters, and Caltech is launching a program to tap this valuable, and perishable, resource for its archives. With the receipt of several small anonymous gifts, Institute archivist Judy Goodstein is organizing Caltech's first oral history project.

To implement the six-month pilot program, two researchers will con-



Archivist Judy Goodstein

duct a series of taped interviews with eight faculty members and administrators who played diverse roles during three eras of Caltech history: from the arrival of Robert A. Millikan in 1921 to the outbreak of World War II; the war years when Caltech was deeply involved in military research; and Lee A. DuBridge's presidency, from 1946 to 1968.

These interviews, Goodstein notes, will provide valuable resources for Caltech historians and also for writers interested in the rise of science and technology as a dominant influence in twentieth-century society — a rise in which Caltech had a major part.

"The interviews should also yield important information for scholars interested in the growth of higher education in the West," Goodstein says. "Traditionally, East Coast traditions have dominated American culture, but Caltech's founders carved out an institution quite different from any other. Through the project, we'll be gathering information on a unique experiment in higher education." A challenge for the interviewers, Goodstein explains, will be to second guess future scholars in order to obtain material about issues that will grow in importance.

The interviews, involving people from the six divisions, will provide an additional historical dimension to Caltech's collection of papers, which currently includes everything from notebooks and committee reports to personal and professional correspondence, photographs, scientific journals, and preprints. In addition, the oral histories will add to the archives' already strong resources in the physical and biological sciences.

The Caltech archives is one of the few anywhere to be devoted exclusively to science, and it is the first of its kind on the West Coast. Scientific historians from all over the country consult its collections.

Confronting the aging process

Observing the effects of the aging process on one's former classmates and comparing their appearance with one's own youthfulness is a ritual sometimes known as the class reunion. Caltech's own series of May and June reunions for alumni who graduated five years ago and at previous five-year intervals are being planned through the Alumni Association.

Members of the **class of 1928** will celebrate their 50th reunion on Friday, June 2, at the traditional Half Century Club luncheon at the Huntington-Sheraton Hotel where they will be guests of the Alumni Association. Any alumnus who graduated 50 or more years ago is invited. W. Morton Jacobs and Guy L. Chilberg head the planning committee.

This year the members of the **class of 1928** and their guests also are invited to dinner Friday evening, June 2, at the home of James B. Black, executive director of the Alumni Association, and Mrs. Black.

Members of the **class of 1953** will celebrate 25 years of post-graduation life with a campus tour, social hour, and dinner in the Athenaeum on Friday, May 12, the evening before Seminar Day. Dinner will feature live music and plenty of time to reminisce, according to John D. Gee, chairman of the planning committee. On Saturday, May 13, Seminar Day, class members will attend a luncheon in Dabney Garden and a social hour in the Millikan Board Room where they will be joined by several faculty members.

The **class of 1933** will hold its reunion on Friday, June 2, with campus tours at 4 p.m., a social hour

at 5:30 p.m., and dinner at 7 p.m. in the Athenaeum. Class secretary John Meskell is in charge of arrangements.

Charles W. Clarke, secretary, heads a reunion committee with William F. Nash Jr., Robert J. Barry, and Ralph W. Jones for the **class of 1938**. The class will meet on Friday, May 12, at the San Gabriel Country Club for a social hour at 6:30 p.m. and dinner at 7:30 p.m.

Jesse B. Graner and Benjamin Nevill are in charge of arrangements for the **class of 1943** reunion on June 10, featuring campus tours at 4 p.m., cocktails at 5:30 p.m., and dinner at 7 p.m. Class secretary Tom Tracy is planning a weekend-long celebration for the **class of 1948**, featuring a dinner on June 3.

Class secretary Jonathan C. Tibbits, Jr., is in charge of arrangements for the **class of 1958** reunion on Friday, June 2, including campus tours at 4 p.m., a cocktail party at 5:30 p.m., and dinner at 7 p.m. in the Athenaeum. Plans will be announced later for the **class of 1963** reunion on Saturday, June 10.

Gregory J. Brewer is arranging a program on June 10 for the **class of 1968** with tours at 4 p.m., a social hour at 5:30 p.m., and dinner at 7 p.m. in the Athenaeum.

Charles W. Almquist is planning the **1973** class reunion. No Athenaeum dinner is slated for these alumni; they've planned a picnic in Tournament Park on Saturday, June 10, followed by swimming and athletic contests.

Besides having all that energy, alums of the class of '73 probably don't look much older than when they received their degrees either.

Nostalgic? Try a Big T Special

Alumni in the classes of 1968-1977 who didn't buy *Big T's* when they were students and feel a belated attack of nostalgia can take advantage of a unique opportunity. A campaign to clean out the ASCIT offices has unearthed unsold *Big T's* from this era, according to ASCIT President Bert Wells.

Wells says alumni can purchase copies of the yearbooks while they last at prices far below the original cost of most volumes. A special attraction is the 1970 issue, designed to look like a volume of Feynman freshman physics lectures.

Those who want to help with the

housekeeping project can order their *Big T's* through the ASCIT office on campus. Volumes for sale and their prices are: 1968, \$5; 1969, \$5; 1970, \$10; 1971, \$5; 1972, \$5; 1973, \$5; 1974, \$5; 1975, \$5; 1976, \$10; 1977, \$20.

Please send me a copy of the 19__ *Big T*. Enclosed is \$ _____ for the yearbook plus \$1 for postage and handling.

Name _____

Address _____

Cheerleaders at last



Because of Caltech's former all-male enrollment, its athletic teams for many years faced their opponents without cheerleader support—or else recruited cheerleaders from nearby women's colleges. This year, for the first time, the Beavers can boast of their own coed cheering contingent: freshman Lynette Brown; Susan Fuhs, a sophomore majoring in chemical engineering; Lynn Hildemann, a sophomore majoring in biology; and Leslie Paxton, a junior majoring in engineering.

Messy Mudeo madness



In Caltech's annual rite of messy madness, the Mudeo, the freshmen this year claimed the victory over their traditional opponents, the sophomores. The frosh, losing 4-1 until the final event, amassed 21 points in the tire spree to win 22-4. Each team can throw its total forces into this contest; thus the frosh possessed a distinct advantage because they outnumbered the sophomores 21-9. The judges escaped their traditional dunking at the hands of the losers by slipping away during the final event.

ALUMNI ACTIVITIES

March 17

San Francisco Chapter meeting. Cocktails, 6 p.m., dinner, 7 p.m., the Engineers' Club, Hong Kong Bank Building, 180 Sansome Street, San Francisco. Leroy E. Hood, the Ethel Wilson Bowles and Robert Bowles Professor of Biology, will speak on "Immunology and Disease." Cost: \$8.50/person.

March 29

Alumni Dinner/Earnest C. Watson Caltech Lecture. Cocktails, 6 p.m., dinner, 6:30 p.m., the Athenaeum; lecture, 8 p.m., Beckman Auditorium. William A. Fowler, Institute Professor of Physics, will speak on "The Case of the Missing Solar Neutrinos." Cost: \$10/person.

March 31

San Diego Chapter meeting. George R. Rossman, associate professor of mineralogy, will speak on "Gems or Gyps." Details to be announced.

April 12

Denver Chapter meeting. Cocktails, 6 p.m., dinner, 7 p.m., Regency Hotel, 3900 Elati Street, Denver. James W. Mayer, professor of electrical en-

gineering and master of student houses, will speak. Cost: \$9/person.

April 13

Albuquerque Chapter Meeting. Cocktails, 6 p.m., dinner, 7 p.m., at a location to be announced. James W. Mayer, professor of electrical engineering and master of student houses, will speak.

April 15

JPL Open House for Caltech alumni, 10 a.m. to 4 p.m. Registration limited to 1,000 persons; make reservations through the Alumni Office. Cost: \$6/person.

May 2

Philadelphia Chapter meeting. Professor Edwin Munger will be the guest speaker. Details to be announced.

May 3

New York Chapter meeting. Cocktails, 6:30 p.m., dinner, 7:30 p.m., Tarrytown Hilton, 445 S. Broadway, Tarrytown. Professor Edwin Munger will speak on "Recent Explosions in Africa." Cost: \$12/person.

May 13

Alumni Seminar Day. The Caltech campus.

Football stages a comeback

Football will return to the Caltech campus this fall, according to Coach Tom Gutman. Caltech was forced to suspend its program last fall when only 15 players, or 10 less than the minimum, showed up for practice.

But Gutman was determined to resurrect the football program, in spite of obstacles and a dearth of victories in recent decades. "It is difficult to build a team here because of the students' academic pressures," he noted.

Gutman wrote articles for the *California Tech* inviting those students willing to make a commitment to play next year to attend a meeting. Twenty-seven Techers showed up and, after a day to think it over, 25 said they wanted to join the team. Several others later added their names to the roster.

As a condition for membership, Gutman is requiring all the players to work out this spring in a physical conditioning program that he has developed, involving weight lifting and other exercises, and he's asking them to help recruit 1978 freshmen.

"We'll begin the season with 25 to 30 deeply committed players, compared with 25 to 30 in other years whose involvement wasn't always so deep," he said. "So we'll start out on a stronger basis than normal."

Gutman said several alumni have called him since an article about the revival of football appeared in a local newspaper, and expressed their delight that Caltech will field a team again.

Robert Gray lauded

Robert D. Gray, recently retired director of Caltech's Industrial Relations Center, has been honored by the Los Angeles City Council for his contributions to labor relations and management education in Los Angeles, the state, and the nation.

In a ceremony at City Hall, a resolution was presented to Gray citing him for his accomplishments which "have been an important factor in the economic development of the Los Angeles metropolitan area."

PERSONALS

1934
H. T. HOLTOM, MS '35, and H. Thomas Holtom, Jr., have formed the Holtom Engineering Corporation in Newport Beach, California, specializing in civil and industrial engineering.

1935
CHESTER W. LINDSAY retired in November after 31 years with Sunkist Growers in Ontario, California. He was most recently manager of quality assurance with responsibility for the quality of licensed products.

1941
CLIFFORD TRUESDELL, MS '42, received the George David Birkhoff Prize in Applied Mathematics during the January meeting of the American Mathematical Society in Atlanta, Georgia. He was honored for his "outstanding contributions to our understanding of . . . rational mechanics and nonlinear materials, for his efforts to give precise mathematical formulation to these classical subjects, for his many contributions to applied mathematics in the fields of acoustic theory, kinetic theory, nonlinear elastic theory, and the thermodynamics of mixtures, and for his major work in the history of mechanics." Since 1961 he has been professor of rational mechanics at Johns Hopkins University.

LAWRENCE C. WIDDOES is president and chief executive officer of Magna Corporation of Houston, Texas, as of January 1. He fills the post formerly occupied by CHARLES M. BLAIR, PhD '35, who remains with the company as senior scientist and consultant. Magna is a worldwide supplier of specialty chemicals used in the petroleum production and refining, industrial water treating, pigment, and agricultural industries.



Lawrence Widdoes
BS '41

1943
FREDERICK W. BOLLINGER, MS, has been elected chairman of the North Jersey Section, American Chemical Society, for 1978. This is the largest local section of the ACS, with a membership of 6,500. Bollinger lives in Westfield, New Jersey, and is a senior chemist with Merck & Co., Inc., Rahway.

1944
FLOYD E. WEAVER, a structural engineer, has recently moved his offices to Newport Beach, California.

1945
RICHARD J. REED, professor of atmospheric sciences at the University of Washington, has reported finding a close relationship between disturbances in large-scale easterly air currents and smaller-scale lines of showers and thundershowers over the tropical Atlantic — a finding that he said could eventually help predict hurricanes. The past president of the American Meteorological Society gathered his data during the Global Atlantic Tropical Experiment, a segment of a larger international effort, the Global Atmosphere Research Program.

1946
WILLIAM H. LIBBEY has been named vice president of operations of Diamond-Sunsweet Inc., a marketing cooperative based in Stockton, California. In his new position, Libbey directs the organization's department of manufacturing, distribution, industrial relations, systems and planning research, and quality control and field services. He lives in Stockton with his wife, Mary Ann, and has two married daughters.

ROBERT H. REECE, MS, has been named meteorologist in charge of the National Weather Service Forecast Office in Los Angeles. Since 1972 he has been principal assistant at the San Francisco Weather Service Forecast Office. A veteran of 35 years of meteorological service, Reece was an Air Force weather officer during World War II and

the Korean War. The remainder of his career has been with the National Weather Service.

1951
CECIL V. CARTER, MS, received his PhD in fluid mechanics from the University of Miami in December. He is a member of the technical staff with Analytic Services Inc. of Falls Church, Virginia.

1952
RICHARD R. DICKINSON has been transferred to El Paso, Texas, where he is an area manager over Texaco's combined refining and marketing facilities between Phoenix, Arizona, and Amarillo, Texas.

1955
GEORGE EPSTEIN is an editor of *Modern Uses of Multiple-valued Logic*, 1977. This book is volume two of *Episteme*, a series on aspects of the sciences. Epstein is a member of the faculty at Indiana University, Bloomington.

1956
HANS H. KUEHL, MS, PhD '59, professor of electrical engineering at the University of Southern California, has been named the outstanding professor of the year by USC's Upsilon chapter of Eta Kappa Nu, the national electrical engineering honor society, at the chapter's annual dinner in December. A resident of Palos Verdes, Kuehl has been at USC since 1960.

1963
GERALD D. CHANDLER and his wife have been traveling overland, eastward from Tehran, Iran, since November. Chandler writes, "So far my wife and I have only seen Afghanistan and Pakistan. We have a lot to see before getting to the USA." Chandler had been a professor in the department of computer science, School of Planning and Computer Applications, in Tehran.

JOHN LETCHER, MS '64, PhD '66, was honored at the annual banquet of the Maine Society of Professional Engineers for having achieved the year's highest scores on the state licensing examinations. His company, Letcher Offshore Design, is engaged in design and engineering of sailing and commercial fishing vessels. His second book, *Self-Contained Celestial Navigation*, was released last spring by International Marine Publishing Company. Letcher is living in Southwest Harbor, Maine.

1964
P. FRANK WINKLER was promoted to associate professor of physics at Middlebury College, Middlebury, Vermont, in September.

1965
JON L. EVANS completed an MA degree in drama at California State University, Los Angeles in June 1977. He is a graduate student in the drama department of the University of Arizona, Tucson.

1966
ROBERT K. WEATHERWAX is chief energy forecaster for the state of California. He writes that he and his family are "enjoying the country life in nearby Placer County." They live in Loomis.



R. H. Reece
MS '46

OBITUARIES

1922
THOMAS G. MYERS on January 25. He was retired and living in Newport Beach.

1925
HUGH K. DUNN, PhD, died December 16.

1926
G. HARVEY CAMERON, PhD, on December 24. He was professor emeritus of physics at Hamilton College, Clinton, New York. Chairman of the physics department from 1932 to 1968, he retired from teaching in 1972.

Since then he had designed and built a high resolution diffraction grating spectroscope and a set of eight student telescopes for Peters Astronomical Observatory. He is survived by his wife, a son, two daughters, and five grandchildren. A fund in his memory is being established at Hamilton College to provide a scholarship prize in physics.

1931
JAMES H. KEELEY on December 23. He is survived by his wife.

1944
CLARENCE L. WELLIVER, MS '48, on December 28. He was a project manager with Hughes Aircraft.

1945
WARREN O. WAGNER, PhD. He lived in Palos Verdes Peninsula, California.

1946
JOHN J. BURKE, MS '48, on January 27. As a former deputy director of JPL, he was an important contributor to the development of the first U.S. ballistic missiles and spacecraft. He was most recently a business consultant in Pacific Palisades, California.

GORDON L. JOHNSON on January 1. He was the owner of an electrical engineering firm in Los Alamitos, California, Johnson, Brent & Associates. He lived in Garden Grove.

1952
LELAND J. CUFF on January 8. He is survived by his parents.

Winter sports report

Basketball

by Coach Hudson Scott

The Caltech varsity is playing good team basketball for the first time in several years. The team features a strong group of veterans and one freshman, a good one, Pat McMurry. Captain John Pender, a senior, has performed excellently, and juniors Bart Croes, Ernie Lewis, and Charles Curatalo are blending well with sophomores Greg Blaisdell, Joe Zasadzinski, and Peter Edwards. These players, with their well-balanced scoring and rebounding, form the nucleus of the team.

With luck, Tech may finish the season with its best record in some time. The team — a scrappy and never-say-die group of players — carries the Caltech spirit: "Never give up!"

Wrestling

by Coach Tom Gutman

The 1977-78 Caltech wrestling team faced special difficulties this year because only five wrestlers stayed with the program for the entire season. The small number of participants crippled Tech in dual meets since ten weight classes represent a complete wrestling team. But Caltech managed to win two matches despite the shortage of performers.

In spite of the difficulties, the season featured two bright spots. First, every wrestler proved outstanding, and second, four out of the five will be back next year, providing a strong nucleus. The team lost several matches by only a few points, illustrating the individual strengths of the members. On a man-for-man basis, the season was very successful.

Whittier and Pomona-Pitzer led the conference in victories this season.

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Meetings: University Club, 917 "H" St. Luncheon second Friday of each month at noon. Visiting alumni cordially invited — no reservations.

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San Francisco Peninsula luncheons: Ming's Restaurant, Palo Alto. Luncheons third Thursday of every month at 12 noon. Call Hugh Dubb, 415/421-2674, for information or reservations.

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Secretary/Treasurer Michael B. Wilson '71
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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 91125

Please send me: (Check one)

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

Name

Degree(s) Year(s)

Address

.....

The Millikan papers

Chicago or California: closeup of a choice

Robert A. Millikan was probably better known during his lifetime than any other scientist in the United States except Albert Einstein. His papers have just been catalogued by the Caltech Archives staff. Their contents range widely over such issues as the social and political conditions in Germany and Italy during the 1920s and 1930s, the plight of the intellectuals forced out of Fascist countries, the expansion of higher education after World War I, the presidency of Herbert Hoover, and the impact of the depression on scientific research.

They also reveal the human concerns of Dr. and Mrs. Millikan as they raised three sons and weighed the impact of their decisions on their family's future. Foremost among these decisions was whether to leave their home and friends in Chicago in 1921 and move to the far West where Dr. Millikan would head a little-known but promising scientific institution — the California Institute of Technology.

As Caltech welcomes its new president 57 years later, the Millikan family letters from this period are particularly interesting for their insights into the culture and mores of the 1920s — and into the Millikans' feelings as they ponder a choice that will shape the rest of their lives. The letters are quoted here with permission of the Archives.

Most of the letters excerpted were written by Mrs. Millikan to their oldest son, Clark, at Yale University. Later Clark earned his PhD degree at Caltech, and eventually he became professor of aeronautics and director of the Graduate Aeronautical Laboratories at the Institute.

Mrs. Millikan to Clark, March 1921: People are courting your father quite openly ... Everyone is hoping it is "going to be California" with an extra little squeeze in the handshake. It will not be decided absolutely until we return from Chicago ... I am a bit disappointed in your accounts. \$7 for tea with a strange young woman — I mean, one to whom you had no possible obligation and in whom you could have had no particular interest — seems to me unwise ...

Mrs. Millikan to Clark, April 1: Mr. Hale called up today [George Elery Hale, a Caltech Trustee and member of the Executive Council] reading the Pasadena position as formally voted by the Trustees, and it certainly sounds good. Three-fourths time to research, \$50,000 for the laboratory, no responsibility for fund raising for the institution.

A letter from your father today made me frisky. He was in Paris and busy seeing physicists and old friends ...

Robert A. Millikan to Clark, April: I am going to chuckle a bit over [what you have written us about] your inability at bridge because it is one of your safeguards against the worst of habits. Mother's kind of bridge is all right, but the kind most men sharks play at is thoroughly vicious and demoralizing. So keep away from it and rather glory in the fact that you have not acquired the habit or the taste ...

Mrs. Millikan to Clark, April: Your father has put Mr. Hale off until May 21 at which date he will be in New York. He is now telling his

friends about the probability of change. Some of them are in arms and declare they will move heaven and earth to keep him here.

It would be nice [for you] to run up to Waterbury some Sunday. I think Aunt Mabel feels a bit hurt that you have not come oftener ...

Mrs. Millikan to Clark, May 21: Your father went to New York last

decision to leave Chicago and Ryerson [the University of Chicago physics laboratory] where he is so deeply rooted. Going is worse than physical pain. It would be a comfort [for him] to have you by for I know you would be understanding.

The opportunities for the new institute at Pasadena have been growing. Mr. Hale has of course worked



The Robert A. Millikan family members shortly before their move to Pasadena: Top Row—Dr. and Mrs. Millikan and Clark; bottom row—Max and Glenn.

night to try to disentangle the question of his remaining at or leaving Chicago. The trustees here who had known nothing of his proposed move became much exercised on learning about it and have stirred things up. They are pressing hard at California, four million in new endowment being promised as a condition of your father's acceptance. Your father is now chiefly concerned about getting out of the situation as much as possible for American physics ...

At any rate, let me tell you that it has been truly wonderful to see the masterly way in which this daddy of yours has played the game, each move made carefully, often after much consideration, and not a single false move up to this point. We have talked hours together — he thinking out loud is really what it amounts to.

Congrats on the Princeton meet. Here's the best 'o luck in the Harvard game. Don't fail to make a dinner call on the Johnstones. Did you meet Miss Everts? We both feel you had better have your tonsils out soon after you get home ...

Mrs. Millikan to Clark, June 2: We have been passing through a rather dark valley the last day or two. Your father has been in real distress of mind this evening and that is rare for him you know. It is the

them up — and Chicago has seen its way to offer only a part of what your father had indicated he would be willing to forego the Pasadena opportunities for. Henry Hilton ... says as things have gone that there is only one thing for your father and that is Pasadena. Mr. Noyes [Arthur A. Noyes, director of Caltech's Gates Chemical Laboratory] came from the west and Mr. Hale came from New York. He has stayed nearly two months in the east just to work on this matter.

The announcement will probably be in the papers in a few days. Meanwhile please don't say anything about it. One happy feature of the matter is the possibility I see of your perhaps choosing to do your graduate work at the Institute in which case I could take to paddling you again ...

... I liked your going your own way about staying on the campus when all the others were off larking — of course you didn't have any money to spend on that, did you? But I'm sorry you were lonely — couldn't you have run up to see Aunt Mabel and Uncle Rob?

Did I tell you how proud we are of your pictures? I have shown them to everyone who comes in. Your father thinks the hurdling is done in fine form ...

Robert A. Millikan to Clark, Glenn, and Max, July 17: The Rubicon has been crossed for the Millikans and we are surely going to California next October. The change in our home will give both of you a chance to spend some summers in the Rockies and beyond. This ought to add interest to your life and your development, too. Altogether we are beginning to be enthusiastic about our prospects and we hope you will be, too ...

A mother who doesn't hear a word from either of her boys on her birthday has some reason for thinking their father didn't transmit quite all of the qualities to them that he should have done ... his reputation at home as well as abroad is in your hands, my boys!

The Rubicon and the Rockies having been crossed, the Millikans settled in California. Caltech's growth under Dr. Millikan's leadership became a success story without parallel in the history of American private education. Despite the assurances noted by Mrs. Millikan that the future Nobel laureate would not be asked to raise funds, Dr. Millikan plunged enthusiastically into this sphere of activity and proved himself a master.

Clark Millikan fulfilled his parents' hopes by earning a PhD at the Institute in 1928. Mrs. Millikan's letters do not reveal whether he ever again dated the young lady on whom he lavished \$7 for tea.

Ian Campbell dies

Ian Campbell, professor of geology, emeritus, at Caltech, died February 11 in San Francisco.

Campbell joined the Caltech faculty in 1931 and was instrumental in building the Institute's Division of Geological and Planetary Sciences. He served over a 17-year period as its associate chairman, acting chairman, and executive officer. He left his post as professor of geology in 1959 to become State Geologist of California and chief of the California Division of Mines and Geology in San Francisco. He retained faculty status as research associate at Caltech and became professor emeritus in 1970.

As state geologist, Campbell was influential in a study of the state's mineral resources, a subject in which he was a widely recognized expert. He developed new programs in the study of geothermal energy and geologic hazards, and under his guidance the state's geologic map was completed.

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EDITORIAL STAFF

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Staff associates: Phyllis Brewster, Paula Hill, and Kay Walker.

In his new book

Kevles analyzes the American physicist

by Phyllis Brewster

Daniel J. Kevles has just parted company with a book that has been a major part of his life for the past ten years. But the separation is a happy one.

Kevles, an associate professor of history at Caltech, is the author of *The Physicists: The History of a Scientific Community in Modern America*, published in early January by Alfred A. Knopf, Inc. The book, nearly 500 pages long, has been receiving widespread praise in the national press. Kevles is delighted — that the book is finished and that the reviews are so favorable.

"Some people have withdrawal pains when they wind up a major project," Kevles commented, "but I didn't. It's a joy to be released from a task that dominated my life for the last decade."

In his Caltech office Kevles has six file drawers of documents and 13 boxes, each containing at least 1,000 slips of paper crammed with notes for the book. To gather that material, Kevles spent countless hours in libraries and private archives, and among collections of government records. His studies took him, among other places, to Washington, D.C.; Independence, Missouri; Berkeley, California; and Hyde Park.

"Historical research away from home is often lonely," Kevles says. "I've worked in towns where I couldn't get a decent meal, find a bar, or go to a movie. Yet research is never lonely. You're reading other people's mail or journals or records, and eventually you find yourself becoming involved in their lives."

The Physicists covers the people who lived and worked in physics in the U.S. during the years from 1865 to the present. Some of those whom Kevles interviewed are now dead.

"The interviews were one of the most enjoyable parts of the research," Kevles recalls. "It was quite an experience to chat with J. Robert Oppenheimer and Edward Teller, and I. I. Rabi and Lee DuBridge about their careers."

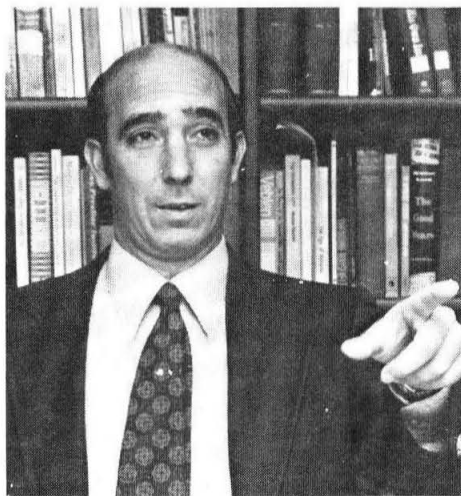
The Physicists ranges across an enormous variety of subjects — from women, Catholics, and Jews in American science to the development of academic research, the popularization of science, and its involvement with the military.

"One of the most difficult tasks I faced," Kevles declares, "was to organize and interpret the material in a coherent fashion. I often became obsessed with the intellectual and literary problems that were facing me." At times like these, Kevles says, he wasn't very good company to his friends or family.

He did find escapes from the obsessiveness by swimming in the Caltech pool (he competes in masters swimming in southern California) and restoring old British cars, but these outlets didn't solve the "good company" problem. Kevles admits that he became as absorbed in his hobbies as in his book. His wife, Bettyann, also a writer (she is author of the recently published, award-winning *Watching the Wild Apes*) says that it is no easier to break through her husband's train of thought when he is fiddling with a carburetor than

when he is pondering a paragraph.

The mechanic in Kevles may be a throwback to his undergraduate years at Princeton. He enrolled in the engineering program, then earned his AB in physics. But somewhere



Daniel J. Kevles

along the way, he says, he was "seduced by the liberal arts environment."

"I remained interested in science," Kevles says, "but after I discovered that there were so many other intriguing subjects to study I decided

to become a professional historian."

Kevles's interest in physicists as individuals, and as members of society, forms the central thrust of his book. "It was important to me to write, not just about the development of scientific ideas, but about this remarkable group of people," he says.

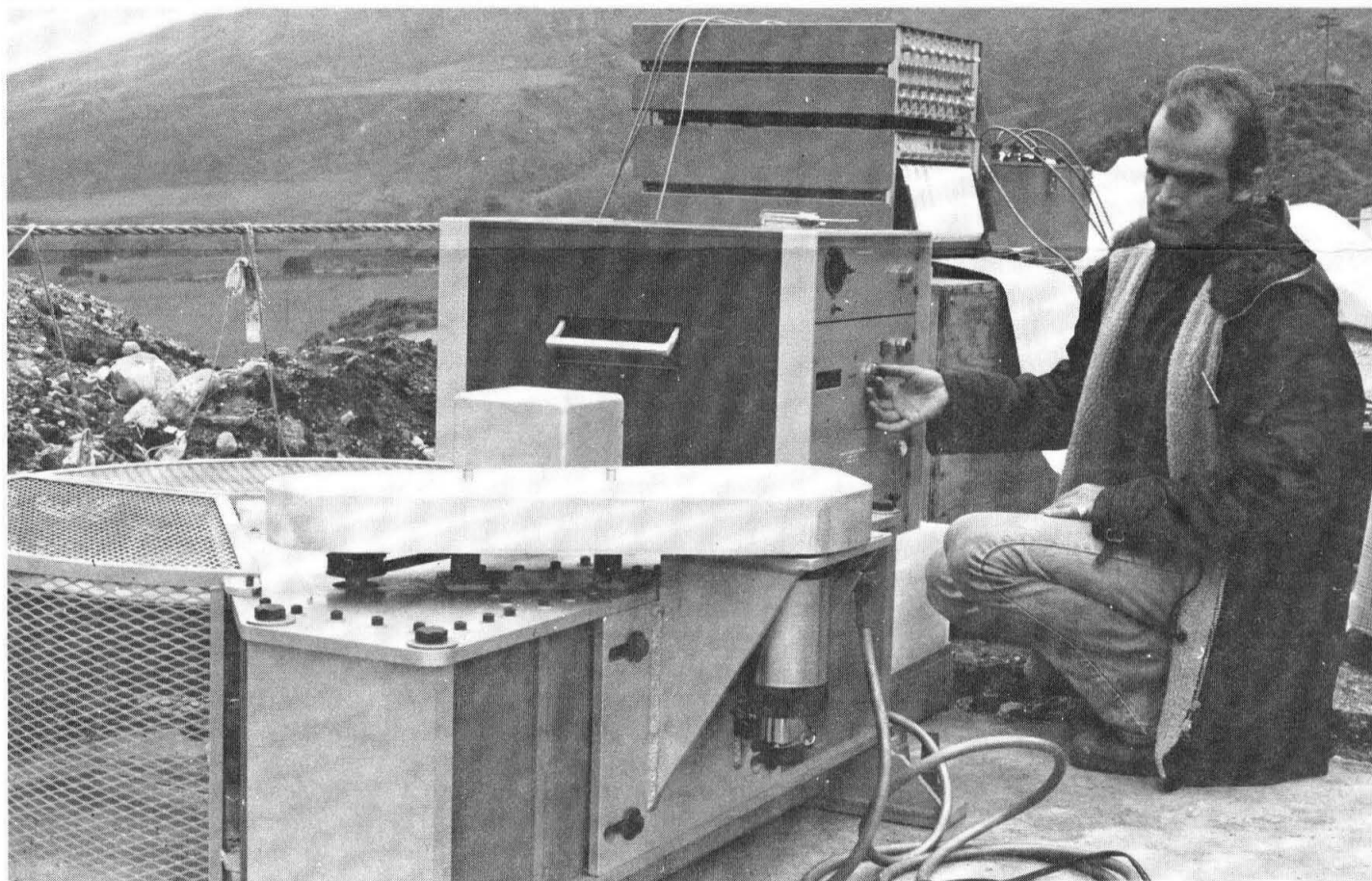
He denies that he can impart any special wisdom about how Americans are to cope with the advance of science, but he holds that if we are to function as a democracy, it is imperative that we try to understand the forces that science compels us to deal with. At the base of these forces, he emphasizes, are humans.

When Kevles started out to learn who this particular group of people were, where they came from, how they established themselves professionally, what was important to them, and how they dealt with each other in political, social, and economic arenas, he had only a rough idea about what he would find. He says he definitely did not know what interpretive framework he would adopt to tell the story of the physicists in the United States.

The Physicists leaves no doubt about the framework he decided on. His first premise is that scientists display the same kind of emotional vulnerability, status striving, competitiveness, and economic concerns as anyone else — in public affairs, in organizational relationships, and sometimes even in their science. Kevles's second premise is that scientists' insistence on determining the course of their research without lay interference has often pitted them against the public right to determine the expenditure of public funds.

Fortunately for Kevles, living and working at Caltech has given him a personal view of science that has been a great advantage to him in writing about physicists.

"In some respects I've been able to study scientists in the way an anthropologist might study a foreign civilization," he says. He adds, "It's a shame that all too often humanists and scientists are cut off from each other. My friends at Caltech have contributed much to my perception of scientists as richly interesting and diverse human beings."



On the crest of Santa Felicia Dam, Research Engineer Michael Craig adjusts equipment that is generating tiny vibrations in the structure. The equipment measures and records the dam's response to the vibrations. Results of the test eventually may help engineers to develop dams that are more earthquake resistant.

About dam safety

These tests shake up our insight

Highly sensitive seismometers developed for the first moon probes are helping Caltech engineers learn more about the way dams respond to earthquakes. Results of the tests eventually will aid in developing better methods of testing dams for earthquake resistance and designing more earthquake-resistant structures.

Using large motor-driven weights in their experiment, the engineers subjected the Santa Felicia Dam, an earth dam in the Santa Clara Valley, to controlled vibrations over a period of several weeks. The Santa Felicia structure was chosen because the

scientists already have data on its behavior during two California quakes — the 6.5 magnitude San Fernando earthquake of 1971 and a 1976 earthquake with a magnitude of 4.7.

The engineers conducting the research include Ronald F. Scott, professor of civil engineering; Paul C. Jennings, professor of civil engineering and applied mechanics; George W. Housner, the Carl F. Braun Professor of Engineering; and research fellow Ahmed Abdel-Ghaffar.

For the project they installed two electrically powered vibration generators on the crest of the dam. The generators simultaneously spun

off-balance weights horizontally to create the shaking force. Each generator spun 400 pounds of lead at two revolutions per second at a maximum strength of 5,000 pounds, creating an oscillating force in the upstream-downstream direction of the dam. To measure its response, the engineers used six seismometers, placed along the dam's crest and down its slope. The seismometers were developed for Ranger unmanned moon landers.

Scott said the experiments were conducted over a period of three to four weeks, but that analyses of the results may take a year.