

CALTECH NEWS

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Astrophysicist Fritz Zwicky, 74, dies of heart attack

Fritz Zwicky, 74, professor of astrophysics, emeritus, and a member of the Caltech faculty for 50 years, died February 8 of a heart attack. He had just finished translating his latest book, *Every Man a Genius*, into English; it originally had been published in German.

Active in research on supernovae, he had organized a worldwide search for these exploding stars and had discovered 100 of the 378 that had been detected by mid-1973. He was writing a book on the subject at the time of his death.

Zwicky was the co-author of a series of several volumes on clusters of galaxies. He discovered compact galaxies, and many years ago he predicted the existence of neutron stars.

Colorful and outspoken, he developed 25 patents and wrote at least eight books and 400 scientific papers. He was an authority on a wide range of subjects including jet propulsion, astronomy, space, morphological methods of thinking, artificial meteors, and civilian and military defense. He was the inventor of several exotic propulsion systems.

From 1943 to 1945 he was research director for Aerojet Corporation, the forerunner of the Aerojet General Corporation. Among the many honors he received during his career was the Medal of Freedom for services to the U.S. Government, awarded in 1949.

Zwicky was vice president of the International Academy of Astronautics, and a member of physical and astronomical societies in the United States and Switzerland. He received his PhD in 1922 at the Federal Institute of Technology in Zurich.

Born in Varna, Bulgaria, in 1899, he was a citizen of Switzerland where he maintained a home in addition to one in Pasadena. Surviving are his wife, Anna Margaritha of Pasadena and Gumligen, Switzerland; and three daughters, Margrit and Barbara (of Berne and Pasadena), and Mrs. Hans Pfenninger of Zurich.

A Fritz Zwicky Memorial Fund has been established; individuals wishing to contribute should send their gifts to the fund at Caltech.



The only answer to our immediate energy needs is an increased supply of petroleum, and the U.S. should give top priority to seeking its own undiscovered oil-producing resources. This is the conclusion of top geologists under the leadership of Harrison H. Schmitt, BS '57, above.

U.S. should launch massive oil search, geologists urge

Soon after coming to Caltech as a Sherman Fairchild Distinguished Scholar, Harrison H. Schmitt, BS '57, geologist-astronaut of the Apollo 17 mission, began bringing visitors from many fields to the campus for informal conferences with Caltech people. One of these conferences—composed of top geologists—led to a series of meetings on the capacity of the U.S. to become self-sufficient in energy production.

As an outgrowth of these meetings, the geologists made a recommendation to government leaders. As many as 300 billion barrels of oil—and equally large amounts of natural gas—probably lie in unexplored regions accessible to U.S. domestic production, they said, and the U.S. should give top priority to seeking them. This recommendation was outlined in letters to President Nixon and several senators and representatives.

"Without the development of this potential, the present crisis of supply can be expected to continue into the 1980's" the geologists asserted.

Besides Schmitt, other members of the Caltech faculty on the committee are Barclay Kamb, chairman of the Division of Geological and Planetary Sciences and

professor of geology and geophysics; and Leon T. Silver, professor of geology.

The committee recommended that a Petroleum Resource Assessment Commission be formed and that the government spend \$2 billion to fund the search. As the assessment progressed, they then proposed that private industry conduct the exploration and development of new areas favorable to petroleum production.

The geologists believe that no more than half of the nation's petroleum-producing potential has been explored and developed. They pointed out that unexplored areas of 1.3 million square miles may be rich in oil and gas—a large portion of these lying offshore under as much as 8,000 feet of water.

It is within these offshore areas that they believe the richest finds will be made.

To expedite the search, the committee recommended that the Petroleum Resource Assessment Commission be chartered for five years, and that it contain geologists, geophysicists, and other technical advisers from industry, universities, and the government. It was urged that the assessment program be managed by the United States Geological Survey.

The Schmitt Committee pointed out that before the energy crisis, the United States was using about 17.1 million barrels of oil a day while producing about 9.5 million barrels a day—with a deficit in terms of internal production of about 7.6 barrels.

"Even if the consumption level drops by about 4.7 million barrels a day as the result of conservation, we still are faced with a daily deficit of about 2.9 million—a deficit that the committee believes will grow to about 7.5 million barrels by 1980, even by conservative estimates," Schmitt said.

Other committee members are: James Boyd, BS '27, executive director of the National Commission on Materials Policy, Washington, D.C.; Robert R. Berg, professor, Texas A & M University; Daniel A. Busch, president of the American Association of Petroleum Geologists, Tulsa; Mason L. Hill, past president of the American Association of Petroleum Geologists; Michel T. Halbouty, petroleum engineer and past president of the American Association of Petroleum Geologists; Grover E. Murray, president, Texas Tech University; and Caswell Silver, president, Sundance Oil Company.

Details of 15,340 tremors offered in earthquake book

Until recently, seismologists studying southern California earthquakes have been threatened by an avalanche of gigantic proportions.

The avalanche has not been one of rocks or mud. Rather, it has been one of numbers produced by data recorded for the more than 15,340 earthquakes that occurred in the southland between 1932 and 1972.

For years, a listing of southern California quakes was published on an annual basis. But as the years proceeded and the number of detected earthquakes increased, the published listings fell farther and farther behind.

Now, with the aid of the computer, the numerical avalanche has been brought under control. The result is a 494-page book co-authored by Clarence Allen, professor of geology and geophysics; James Hileman, graduate student in geophysics; and John M. Nordquist, senior research engineer.

Characterized by Allen as "the most complete record available on southern California earthquake data," the book lists all earthquakes of magnitude 2 or higher on the Richter scale over a 40-year period. It gives their latitude and longitude, their location by quadrangle name, their time, magnitude, depth, and accuracy of location.

A special computer program developed by Hileman provided detailed epicenter maps of most of the earthquakes listed for the book.

According to Allen, "The book is aimed toward geologists interested in the area's seismicity, and engineers who need information about seismic patterns in order to select suitable sites for nuclear power plants or make other decisions. Essentially, it is a compilation of basic data and not an interpretation."

Among other things, the book shows that the Imperial and Coachella Valleys are the most seismically active parts of southern California. Through each of these two valleys run major branches of the San Andreas fault system. The branches join at Cajon Pass, near San Bernardino.

But for 200 miles beyond this point on the San Andreas fault, there has been,

oddly enough, no significant activity since 1857.

The maps show that although earthquakes occur over wide sections of southern California and Baja California, their frequency diminishes east toward the Colorado River.

"Hopefully," said Hileman, "the book will serve as the basic source book on southern California seismicity and will help scientists determine what earthquakes actually are trying to tell us."

APS picks Fowler as vice president-elect

William A. Fowler, Institute Professor of Physics, has been voted vice president-elect of the American Physical Society; he will automatically become vice president next year and president in 1976.

The president of the society this year is W. K. H. Panofsky, PhD '42, director of Stanford University's Linear Accelerator Center.



Karl Rudnick, graduate student in mathematics, has found his own solution to the energy crisis. He rides a unicycle to the campus from his home in South Pasadena—traveling mostly uphill.

The search for a Caltech freshman:

Finding the bright and the curious



Qualifications of applicants for admission are discussed at a meeting of the Freshman Admissions Committee. Above: Stirling L. Huntley and sophomore Jonathan Teich.

by Winifred Veronda

"I knew my son was destined for Caltech," the alumnus parent of an entering freshman said recently. "When he was in the sixth grade his science class studied earthquakes, and the next week he was building his own seismometer."

The ranks of incoming Caltech freshmen are filled with students who exhibited that kind of behavior at an early age. In fact, a scientific curiosity that overflows the classroom and fills garages, basements, and rooms with its progeny is an earmark of those who are admitted.

This is so true that Stirling L. Huntley, director of admissions and financial aid, remarked recently, "Over the years we've attempted more and more to evaluate students for their ability to succeed at Caltech—not merely on their academic achievement, but on their extracurricular scientific interests as well."

"These interests reveal a deep love of science—and a drive to express that love—that goes beyond mere desire to learn the course work. The presence of this drive suggests students who will stick with the class material when it seems tedious and unrewarding—and there will be such times."

Supporting this devotion to scientific and engineering material are agile, brilliant minds. For the Caltech freshmen have scored nationally in the upper two or three percent on the college entrance board tests for the past 20 years. This year was no exception.

They scored particularly well in science and mathematics, generally not just because they were bright but because they loved those subjects and soaked in the material like a sun-parched sponge.

The typical freshman makes his (or her) contact with Caltech early in the senior year. If he ranked high on the preliminary scholastic aptitude test then Caltech may have sent him a copy of *Facts* and expressed an interest in considering him as a future student. But probably he initiated contact himself by requesting information before he submitted an application to enroll.

After the February 1 deadline for applying, his request—and the 900 or so others that are submitted—fall under the scrutiny of the Admissions Committee. This important group is composed of 15 faculty members representing all divisions, and 6 students elected by the Inter-House Committee.

Looking beyond his college board scores, they study his grades—for they recognize that one examination alone cannot give a true picture of a student's abilities. Then they evaluate the hobbies and extracurricular activities that he has listed.

If he still looks promising after all this probing, then he and two or three of his teachers probably will be interviewed in person. A faculty member, or

a faculty-student team will fly to his home town.

Personal interviews reveal many things about a student that would never be evident on a written form; brief discussions with the applicant's teachers may be even more helpful.

Gregory Stone, a senior chemical engineering major who has been a member of the Admissions Committee for two years, feels that his participation in this group has been one of his most rewarding experiences at Caltech.

In describing the purpose of a student interview he said, "We look for the applicant who has a genuine interest in science, not just in grades. We feel that without that interest, he may quit when the going gets rough."

Stone said the interviewers also are looking for insights into the applicant and his situation that may not have emerged on paper.

He said, "For example, we found that one boy who came from a poor family had been holding down two jobs and working a 40-hour week. That explained his lack of extracurricular activities pretty quickly."

Stone feels that Caltech undergraduates are particularly valuable on these interviews because of their knowledge of areas that are the source of frequently asked questions—life in the student houses, for example, or how much time there is to study.

He also believes they may be better qualified than faculty to answer the question about Caltech that both students and teachers ask the most frequently. That question: "Is Caltech as competitive as I've always heard?"

Stone said, "I tell them that everyone

develops his own philosophy about grades at Caltech. If getting grades is what's important to you, then you'll work hard for them. But if what you're learning in the course is the most important, then maybe the grade itself won't matter as much. I emphasize that it's frowned on here to try and get a good grade just to beat someone else—and that top grades are not essential for social acceptance."

Acceptances will be mailed around mid-April to students admitted to the class of 1978. May 1 is the deadline for them to respond.

This year, there were 891 applicants for admission, compared with 904 in 1973. There will be 220 in the class, the same number as last year; approximately 30 of these will be women.

Because of the gasoline shortage, personal interviews with applicants in their home towns this year were curtailed.

In telling freshmen what Caltech has to offer, Stone said there are two strengths that he always emphasizes: the accessibility of faculty and the chance to do research early in the undergraduate program.

Huntley said, "Personal interviews with applicants have been a tradition at Caltech for many years; we're open to seeing what other techniques will help us attract the best possible group of applicants and, ultimately, the best freshman class. One way to achieve this goal may be through more visits by our faculty members to high schools in the fall to arouse interest in Caltech among the students."

After the interviews, both the Admissions Committee and the high school seniors decide whether they would make a good match. By the first of May, the Institute knows who most of its freshmen will be.

Most of the new students are the sole representatives at Caltech from their student body. On arrival many of them experience an environmental shock to complement their academic tensions. To ease the discomfort and help them meet fellow classmates before they come to Pasadena, the Alumni Association has been working with alumni chapters in several cities to sponsor welcoming dinners for the freshmen. Frequently Caltech upperclassmen from the area also are invited. This year, Washington, D.C., joined New York, Chicago, and San Francisco in being hosts for these get-togethers.

Finally, the freshmen arrive in Pasadena where they prepare to set sail for Freshman Camp and a crash program of Caltech togetherness. After that, it's time for them to start applying that scientific enthusiasm in earnest.



Paul D. Saltman, BS '49, PhD '53, with new Gnome president, Oliver H. Gardner, BS '51, at Founder's Day Dinner.

Plans initiated for five-year class reunions

Plans have been announced by several of the classes holding reunions this year; the other classes will make their announcements soon. In a departure from tradition, wives will be invited.

Classes holding reunions are those that graduated at five-year intervals: 1924, 1929, 1934, 1939, 1944, 1949, 1954, 1959, 1964 and 1969.

The Class of 1924 will hold its reunion on June 7 with a luncheon at the Huntington-Sheraton Hotel; all those present will be inducted into the Half Century Club.

The Class of 1929 will celebrate its 45th anniversary at 5:30 p.m. on June 14 with an informal dinner at the home of Milton Sperling, BS '29, in South Pasadena.

The class of 1934 is planning a dinner at 7 p.m. on June 7 in the Athenaeum, preceded by a social hour at 5:30 p.m.

The class of 1939 will announce plans shortly for a dinner party which probably will be held in the Athenaeum on June 7.

The class of 1949 plans its reunion on October 25, in conjunction with homecoming activities.

The class of 1954 will hold a reunion dinner at the Athenaeum on June 7, details to be announced later.

The class of 1959 is planning its reunion in the fall on the night of the Inter-House Dance.

The class of 1964 is holding a get-together on the evening of May 17, the location to be announced later.

The class of 1969 is deciding between a dinner in the Athenaeum on June 7, or a picnic on June 8 in Tournament Park followed by dinner in the Athenaeum.

All reunion class members will receive formal invitations to their individual reunions, outlining the specific programs.

The Alumni Association will hold its annual meeting at 1 p.m. in the library of the Athenaeum on Friday, June 21.

ALUMNI EVENTS

April 8

Alumni Dinner—Earnest C. Watson Caltech Lecture. Social hour, 6 p.m., followed by dinner at 6:45 p.m., the Athenaeum, and lecture at 8 p.m., Beckman Auditorium. George W. Housner, Carl F. Braun Professor of Engineering, Caltech, will speak on "Coping with Natural Disasters."

May 18

Alumni Seminar Day. Caltech campus.

Gnomes hear Paul Saltman

More than 50 Gnomes from throughout southern California gathered in the Athenaeum on March 9 for their annual Founder's Day dinner; there they heard Gnome Paul D. Saltman, BS '49, PhD '53, give the featured address on "Mysticism Versus Reason—a Struggle for Men's Minds." Saltman is provost at Revelle College, the University of California, San Diego.

Installed as the new president was Oliver H. Gardner, who received the gavel from outgoing president Richard C. Nielsen, BS '66, MS '67, PhD '71. Other Gnome officers are: Peter S. Blumfield, BS '68, vice president; William A. Drake, BS '51, secretary; Stephen H. Garrison, BS '65, MS '66, treasurer; Fred A. Wheeler, BS '29, and Russell Pinizzotto, BS '72, directors; Earl C. Hefner, BS '51, MS '52, newsletter editor.

Even older than Caltech, the Gnome Club had its beginnings in Throop Polytechnic Institute in 1897, a founding date that gives it the distinction of being Caltech's oldest fraternity.

Speakers Announced for Seminar Day

Daniel J. Haughton, chairman of the board, Lockheed Aircraft Corporation, will be the featured speaker for Alumni Seminar Day, Saturday, May 18. Haughton will speak at the 2 p.m. general session in Beckman Auditorium on "The Future of Air Transportation."

Alumni and their guests will have the opportunity to hear about the newest developments in research and education at Caltech from 12 outstanding speakers.

Open to visitors will be displays in several campus buildings, presented by the Division of Engineering and Applied Science. These will include:

Thomas Laboratory

The only pump testing facility designed specifically for the characteristics of cavitating pumps—important in the field of liquid-rocket propulsion.

Displays of the application of fluid mechanics to human organisms in the study of propulsion of bacteria and protozoa.

The Wayland-Frasher intra-vital



Daniel J. Haughton

microscope—used to make quantitative studies of the flow and exchange in the micro-circulation of animals; and televised and tape shows of research studies in micro-circulation.

Photographs and laboratory demonstrations of earthquake engineering research equipment.

Calcit

Specially designed equipment for testing hydrofoils.

Keck Laboratory

An X-ray video system for scientific and medical use.

Specialized equipment and studies related to tsunamis (waves caused by earthquakes).

Displays in information science and electrical engineering and applied physics will be announced later.

Registration for Seminar Day will begin at 8:30 a.m. and lectures are scheduled from 9:30 a.m. to 5:30 p.m. Luncheon will be served in the Athenaeum area from 12:30 to 1 p.m. and again from 1:15 to 1:45 p.m. Luncheon times will be assigned in advance. The Caltech Band will entertain alumni and their guests during this period.

There will be a no-host cocktail party at the Athenaeum beginning at 5:30 p.m. followed by dinner at 6:30. The Caltech Glee Club's annual home concert at 8 p.m. in Beckman Auditorium will conclude the program.

Here is a listing of the featured speakers and their topics:

Beyond Man's Genetic Lottery

James F. Bonner
Professor of Biology

What is the future of our species? Is our fate to become extinct and to be replaced by a superior creature who will then fill our niche? This has happened literally millions of times since the appearance of life on earth. Is man clever enough to use his knowledge of genetics to escape this fate by guiding his own evolution?

Mariner 10 Mission to Venus and Mercury

W. E. Giberson
Project Manager, Mariner 10 Mission to Venus and Mercury
The Jet Propulsion Laboratory

Three planets, five months, \$98 million! No travel agency can yet offer such a packaged winter tour to anyone. But seven scientific teams took a tour from the Earth-Moon system, by way of Venus to Mercury, by proxy, in late 1973 and early 1974, with a midflight survey of Kohoutek's comet and a return trip to the planet Mercury as added attractions.

Nuclear Power Plant Siting in California

Martin Goldsmith
Visiting Associate
in Environmental Engineering

EQL has examined the suitability of the California coastline for locating nuclear power plants, using seismic considerations, separation from population, construction problems, and competing land use as criteria. Very few coastal areas were found suitable for siting. The alternative of inland siting depends on a supply of cooling water. Possible sources of cooling water have been evaluated, including agricultural and municipal waste water. For the near-term, adequate sources were identified for inland sites.

The Evolution of a Dying Star

Jesse L. Greenstein
Lee A. DuBridge Professor of Astrophysics

Stars contract, become hotter, and undergo complex evolution when exhausting nuclear energy. Such unusual, faint, blue stars have been observed at Palomar. Very hot stars have been found just approaching the white dwarf (or degenerate star) stage. Their composition is important, since they are the oldest stars in our galaxy. Several important questions arise. One is the rarity of helium in these stars. Another concerns

the types and numbers of stars in late evolutionary stages.

Home-Grown Transistors

James W. Mayer
Professor of Electrical Engineering and
J. O. McCaldin
Professor of Applied Science and Electrical Engineering

Transistors like those in pocket calculators and many other devices are made commercially by rather sophisticated techniques. A simple method of making a transistor on a hot plate or a stove is to use the phenomenon of crystal growth through a solid metal film. The process is analogous to growing rock candy from a liquid solution. Here, the semiconductor is the rock candy and the solid metal film is the liquid. These processes will be demonstrated.

The Mormons of Yesterday and Today

Rodman W. Paul
Edward S. Harkness Professor of History

Today an influential and well-to-do denomination of several million, the Mormons started 140 years ago as a tiny and persecuted religious minority whose crowning blasphemy, in the public mind, was polygamy. What inner strengths have enabled them to prosper despite years of hardship in a singularly arid land, despite periodic assaults by all the powers of the United States Government, and despite the constant hostility of the general public?

Laser Light Monitors the Motion of Molecules

Cornelius J. Pings
Vice Provost, Dean of Graduate Studies, and Professor of Chemical Engineering and Chemical Physics

New techniques have been developed for studying the motion of molecules by observing slight changes in the color of laser light passing through a fluid. Frequency changes as small as one part per million can be detected. A practical consequence is quick and easy measurement of the thermal and diffusional properties of liquids, essential in the modern design of chemical and petroleum plants.

Ice on the Sierras

Robert P. Sharp
Professor of Geology

Californians harbor memories of exhilarating visits to the glacially sculptured High Sierras. Appreciation of this scenery is heightened by understanding of how it was formed. Glaciers are living, dynamic, geological agents endowed with unusual powers of erosion, transportation, and deposition. Their delicate sensitivity to climatic fluctuations and rigorous maintenance of a balanced budget

through expansion or contraction has created a record covering nearly three million years in the Sierra Nevada.

Where Was the Dark Lady When the Lights Went Out?

Hallett D. Smith
Professor of English

Shakespeare's sonnets, first published in 1609, probably without the poet's knowledge or cooperation, refer to a dark-haired lady, the poet's mistress and also, it seems, the mistress of the fair young man to whom many of the sonnets are addressed. This triangle has been a mystery for many years. Recently, an eminent English historian has claimed that he has at last discovered the true identity of the Dark Lady. This claim will be examined and a survey of the controversy it aroused will include a look at other candidates.

The World Population Outlook: Hope or Despair?

Alan R. Sweezy
Professor of Economics

Is world population growth bound to continue until checked by disaster? The urgency of this question has been underlined again by the worldwide food and energy shortage. Population growth rates differ widely. In highly developed countries, birth rates have decreased to near the replacement level, while in less developed countries, they remain much higher. Although the outlook is still ominous, there are some significant signs of hope.

A New Look at the Origin of Ore Deposits

Hugh P. Taylor, Jr.
Professor of Geology

Until recently, geologists believed that most ore deposits, such as gold, silver, and copper, are formed from solutions emanating outward from molten magma at great depth. However, by measuring hydrogen and oxygen isotope ratios of natural waters and minerals, we can now prove many such deposits were formed from heated rain water or ocean water that migrated downward as much as two or three miles through fractures in the rocks.

Building Biological Structure

William B. Wood
Professor of Biology

T4 virus is an intricate molecular machine for injecting viral DNA into bacterial cells. Inside the cells, the DNA directs the formation of more viruses from newly synthesized macromolecular parts. The building process resembles a miniature automated assembly line, with built-in regulation of parts, inventories, and quality control. Virus assembly gives us clues as to how some of our own biological structures arise.



Slide rules, sticks, and ladles were put to a new use when ASCIT staged a spaghetti-eating contest in Winnett Center last month. The rules: competition between boy-girl teams, with one member feeding the other—and no normal eating utensils permitted. Here, Helen Wheelock crams spaghetti into Alton Vaughn, Jr., of Lloyd House. Despite Vaughn's massive effort, victory went to another entrant—John Tristano of Page House, whose teammate was Katherine Myers. Tristano consumed 8 2/3 cups of spaghetti in half an hour. But even Tristano was upstaged at the contest's conclusion—by three streakers.

THIRTY-SEVENTH ANNUAL CALTECH ALUMNI SEMINAR PRE-REGISTRATION FORM

Name _____ Class _____ Phone _____

Names of Guests _____

Number:	
_____ Registrations for Adults, \$4.50 per person.....	\$ _____
_____ Registrations for Students, \$2.50 (thru High School).....	\$ _____
_____ Lunch, \$3.00 per person.....	\$ _____
_____ Dinner, \$7.00 per person (The Athenaeum).....	\$ _____
_____ Glee Club Home Concert, \$2.00 per person (Beckman Auditorium) .	\$ _____
	TOTAL \$ _____

Please attach a check payable to Caltech Alumni Association and mail to the Alumni Office before May 13, 1974. Tickets will not be mailed—they will be issued at time of registration.

PERSONALS

1930
IRA C. BECHTOLD was designated Engineer of the Month for February 1974 by the Southern California section of the American Institute of Chemical Engineers. He is a private consultant in chemical and metallurgical engineering, geology, and electronics.

1932
ROBERT W. WEBB, MS, PhD '37, has received the Robert Wallace Webb Award for "sustained excellence of earth science teaching and sustained exceptional service to the geological teaching profession." The award was established in his honor by the Far Western Section of the National Association of Geology Teachers. In the same month, Webb, who is professor of geology at UC Santa Barbara, received the Neil Miner Award.

1934
CARSTEN C. STEFFENS, PhD, writes, "For nine years, from the end of 1961 to 1970, we lived in Tokyo where I was director of the Stanford Research Institute in Japan. When we returned from Japan at the end of 1970, I took early retirement from the SRI and have done nothing professional since then except occasional consulting."

1937
JOHN S. RINEHART, MS, writes, "After nearly 23 years of varied government service, I retired on June 29, 1973, from my last position as senior research fellow with the National Oceanic and Atmospheric Administration. We sold our Boulder, Colorado, home and built our retirement home in Santa Fe, New Mexico. I plan to retain my professor adjoint position in the Mechanical Engineering Department, University of Colorado, for at least a few months and will continue with my geyser, earth tide, and earthquake research. As a reemployed annuitant, I will also be working part time for the Naval Weapons Center, China Lake, California, on ordnance research and development problems. In addition, I hope to work as a consultant with other government agencies and private companies. My retirement provides an excellent opportunity to expand substantially the activities of HyperDynamicS, a company which I founded a number of years ago and of which I am technical director."

1939
ROBERT T. CARTER, BS '40, was elected vice president of Texaco Inc., on March 1. In his new capacity he has responsibility for development of Texaco's coal properties in northeastern Wyoming.

WILLIAM F. ROPP, formerly president of Ropp & Ropp Structural Engineers, is associate vice president of the structural engineering firm of Daniel, Mann, Johnson & Mendenhall in Los Angeles.

1943
JACKSON C. BROWNSON, MS, was recently promoted to vice president at the home office at Occidental Life Insurance Company of California in Los Angeles. He had been second vice president since 1968.

1945
DUANE T. McRUER, MS '48, president of Systems Technology, Inc., in Hawthorne, California, has been elected a Fellow of the American Institute of Aeronautics and Astronautics.

1946
ALI B. CAMBEL, MS, was appointed deputy assistant director for analysis and planning, research applications directorate of the National Science Foundation in Washington, D.C., effective February 4, 1974. His responsibility includes analysis and synthesis of RANN policy and modeling activities and the establishment of program plans for achievement of directorate goals. Prior to joining the NSF, Cambel was vice president of the General Research Corporation.

1948
ARTHUR N. COX is on loan to the National Science Foundation's astronomy section in Washington, D.C., from the Los Alamos Scientific Laboratory of the University of California.

1949
JOHN F. KOSTELAC has been appointed general superintendent—maintenance and utilities of the Sharon Steel Corporation in Sharon, Pennsylvania. He came to Sharon

Steel from Empire-Detroit Steel Company at Portsmouth, Ohio, a division of the Cyclops Corporation, where he was manager of maintenance and construction.

WILLIAM T. VICKREY, formerly regional manager of Contemporary Mobilehomes Corporation in Los Angeles, is vice president of U.S. Communities, Inc., in Wichita, Kansas.

1950
DAVID C. OAKLEY, MS '52, PhD '55, a former physicist at the Lawrence Livermore Laboratory at UC Berkeley, is assistant to the deputy director for science and technology with the Defense Nuclear Agency in Washington, D.C.

1953
C. WAYNE BURNHAM, MS, PhD '55, professor of geochemistry at The Pennsylvania State University, has been named head of the Department of Geosciences. An expert in experimental petrology and the geochemistry of ore deposits, he has been a member of the university faculty since 1955.

1955
FRANK B. SALISBURY, PhD, writes, "I am spending a year with the Atomic Energy Commission at its headquarters in Germantown, Maryland, where I am a technical representative in plant physiology. This means that I am administering outside grants and contracts in plant physiology with individual workers at universities and also overseeing plant physiological research in the national laboratories operated by the AEC. My present plans are to return to Logan, Utah, at the end of August 1974. I will resume my teaching duties as professor and head of the plant science department at Utah State University and I hope to get back to some textbook writing projects in which I have been involved."

1957
RICHARD J. KERR, PhD, is senior vice-president—commercial of chemicals and plastics for Union Carbide Corporation in New York City.

1958
JAMES E. MALINAK, MS, a first lieutenant in the U.S. Air Force, is in his third year of military service, currently as an Air Force project engineer with the Air Force Flight Dynamics Laboratory at the Wright-Patterson Air Force Base in Ohio.

PHILIP L. REYNOLDS, MS '59, is a partner in the law firm of Latham & Watkins in Los Angeles.

RALPH G. SCHINNERER, a former supervisor in the aerospace defense section of Philco-Ford in Newport Beach, is a space computation center program manager with that same company in Colorado Springs, Colorado.

1961
ALEXANDER F. H. GOETZ, MS '62, PhD '67, is supervisor of the solid earth applications group at JPL, working with ERTS and Skylab data.

ROBERT D. NASON was among the group of earthquake geophysicists recently transferred to the U.S. Geological Survey for continuing work on the San Andreas fault movements.

THOMAS A. TISCH, vice president of Harshman Associates, Inc., is the proud father of Melinda Anne, born May 21, 1973.

1963
DAVID L. BARKER and his wife, Judith, write that they are "the glowing parents of Alexander Kohoutek, called 'Sasha,' who settled on earth October 4, 1974."

1965
ROGER C. DAVISSON, MS '66, writes, "I am a principal with Brentwood Associates, a Los Angeles-based venture capital investment firm. Formerly, I was vice president and treasurer of the United States Filter Corporation."

ROBERT E. GILLON is a financial analyst with the Geosystems Corporation in New York City.

KENNETH R. LUDWIG, MS '67, is a geologist for the U. S. Geological Survey in Denver, Colorado.

1966
JOYCE Y. SHEN HSU, MS, a former research chemist with the Lawrence Radiation Laboratory, is a life science research assistant at the Stanford University Medical Center in Palo Alto, California.

JEN K. KUNG, MS, was graduated from USC with a PhD degree in materials science in August 1973. He is an engineer in research and development for Hewlett-Packard Company in Palo Alto, California.

PANOS MARMARELIS, MS, PhD '72, has joined the biotechnology department faculty of the Carnegie-Mellon University in Pittsburgh, Pennsylvania, as an assistant professor of electrical engineering and bioengineering.

J. HUSTON McCULLOCH received his PhD from the University of Chicago in 1973. He is an assistant professor of economics at Boston College, Massachusetts.

1968
TERRY R. BRUNS is a geophysicist for the Standard Oil Company of California in San Francisco.

TERRY J. DELPH, MS, AE '69, formerly a lieutenant in the U.S. Navy, is a graduate student in applied mechanics at Stanford University.

LESLIE G. FISHBONE writes, "After receiving my PhD in physics at the University of Maryland, I went on a seven-month odyssey to Moscow as a National Academy of Sciences Exchange Fellow. I am now in the Physics Department at the University of Utah."

AMES E. FISHER, MS, writes, "Recently accepted a position as senior engineering geologist with R&M Engineering & Geological Consultants in Anchorage, Alaska."

MICHAEL MAJTELES, MS, a former graduate student at UC Berkeley, is a physicist in the nuclear medicine and radiotherapy departments at the Beilinson Hospital in Petah Tigwa, Israel.

FRANCOIS M. M. MOREL, MS, PhD '72, formerly a research fellow at Caltech, is an assistant professor in the Department of Civil Engineering at MIT.

1969
RICHARD R. SMITH, MS, PhD'72, a former physicist at the Lawrence Livermore Laboratory, UC Berkeley, writes that he has a post-doctoral appointment at Princeton Plasma Physics Laboratory for 1973-74, and is working on neutral injection heating for the adiabatic toroidal compression experiment.

1970
PIERRE CHARLES, MS, writes, "After two years with the Procter and Gamble Company at its European headquarters in Brussels, I went to INSEAD (European Institute for Business Administration) where I will get my MBA in June 1974. I would like to meet Caltech alumni living in the Paris area; please contact me at INSEAD, 77305 Fontainebleau, France."

JACK L. FALK, Ex'70, has moved to Portland, Oregon, and is team-teaching in a learning-disabilities classroom at the West-side School for Exceptional Children.

WILLIAM C. LYFORD, MS, PhD '73, is a research mathematician at the Institute for Applied Mathematics at the University of Bonn, West Germany.

DAVID M. MOG, PhD, has been appointed to the Oberlin College faculty in the College of Arts and Sciences as an assistant professor of chemistry. He was formerly an overseas research fellow with the National Academy of Sciences.

1971
JACK A. STONE, JR., is a graduate student in the Department of Physics at the University of Massachusetts in Amherst.

1972
ROBERT C. DULLIEN is a PhD graduate student in "Decision and Control" at Harvard University.

PAUL S. ZYGIELBAUM, MS'73, writes, "I left my position with AiResearch Manufacturing Company of Los Angeles to join the technical staff of the Fossil Fuels and Ad-

vanced Systems Division of the Electric Power Research Institute, which has its headquarters in Palo Alto, California. My duties will include program planning, review of research proposals, and guidance of research projects in the area of advanced systems."

OBITUARIES

1928
JACK Y. BERMAN of a heart attack on January 29, 1974. He became the founding director of the Variety Club, Tent 25, and president of the Southern California Theatres' Association. He is survived by his wife, Jean, and two sons, Lester and Michael.

1936
WILSON H. BUCKNELL on February 9, 1974. He was president of the Bucknell Engineering Company, Inc., of South El Monte, California.

1949
HAROLD J. LINDERMAN in February 1974. He was vice president and treasurer of the Collier Carbon and Chemical Corporation in Los Angeles.

CLAYTON M. ZIEMAN, PhD, of a heart attack on January 30, 1974. He had been professor of electrical engineering at the Air Force Institute of Technology at the Wright-Patterson Air Force Base in Dayton, Ohio.

1952
DOUGLAS C. ALVERSON in Arlington, Virginia, on February 4, 1974. He was a U. S. Geological Survey specialist in the geology of the Soviet Union and in Russian geologic literature. Survivors are his mother, Mrs. O. C. Alverson of San Mateo, California, and a son, Edward Smith.

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