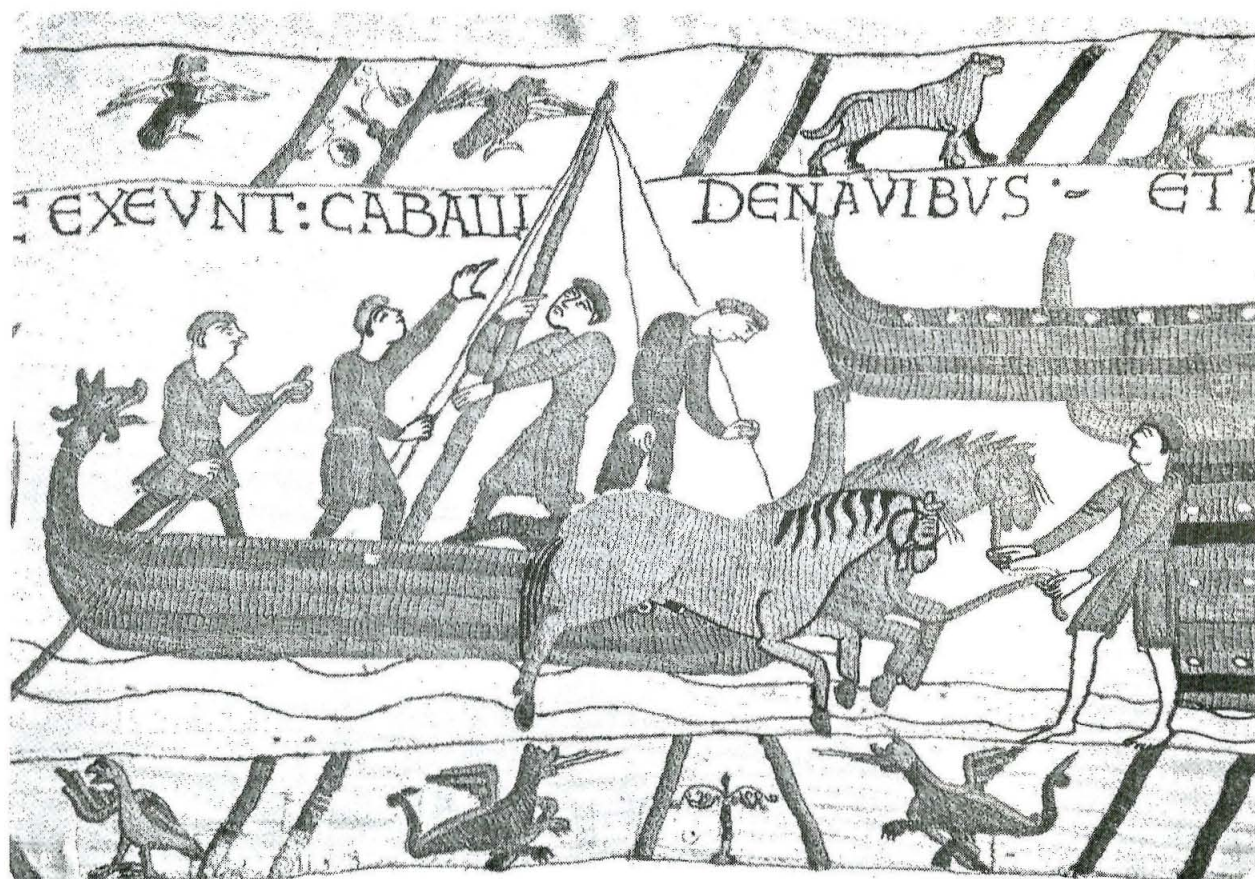


Caltech *News*

A Caltech historian examines the forces that made the Normans a formidable power.



Unloading horses at the Bay of Pevensey, England. Detail from the Bayeux Tapestry.

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The roots of Norman conquest

by Heidi Aspaturian

Around 843 A.D., at the height of Europe's so-called Dark Ages, bands of Viking raiders swept into northwest France, and, in the process, changed the course of history. Their banner year came in 1066, when their descendants, no longer "Northmen" but French-speaking Normans, crossed the English Channel and invaded England. The two centuries between the barbarian invasions of Europe and the Norman Conquest of England were among the bleakest in European history, but throughout this period, the Normans made remarkable progress. Surrounded by hostile French who regarded them as uncivilized thugs, the Normans took over a strip of northwest France that came to be called Normandy and transformed themselves from scattered and unruly barbarian communities into one of the best-organized and most effective states in western Europe.

After the Normans invaded England and made their leader, William the Conqueror, its king, they repeated their

success on a grander scale. They built upon the foundation of Anglo-Saxon society a new, military organization adapted both to controlling a subject people and to defending their conquest from any outside threat. They added thousands of new words to the English language, and over the next few hundred years laid the foundations of the English legal code and, eventually, the British Constitution.

What made the Normans so successful? Caltech historian Eleanor Searle has spent eight years researching the subject, and her explanation differs from that of most historians. According to Searle, the Edie and Lew Wasserman Professor of History and a specialist on the medieval history of Northern Europe, research on this period has been dominated by assumptions that have only recently been called into question.

"One is that the Norman state simply sprang into existence. A few ultra-powerful lords got control of all the land and bang! you had Normandy.



Fierce animal heads, of gold or silver, decorated the prows of Viking-Norman warships. This medieval sea dragon is from Oslo's Viking Ships Museum.

Another is that rulers (kings, dukes, and counts) could command obedience from their subjects, even when such obedience went against their subjects' interests. It has also been assumed that there was no significant place for women in this warrior society."

In her new book *Predatory Kinship and the Creation of Norman Power, 840-1066*, Searle challenges this view and presents a different model of state-building. The unification of Normandy, she suggests, grew out of a complicated network of kinship alliances in which women participated as fully as men.

"The notion that an effective state can be built on loyalty expressed in terms of kinship is remote from our experience," says Searle, "but it was a way of tying together local war bands and therefore of spreading and increasing the bands' security. That is why I have characterized it as predatory—security was a matter of controlling ever

Continued on page 2

Searle's approach provides a fresh look at how women were viewed in Norman society.

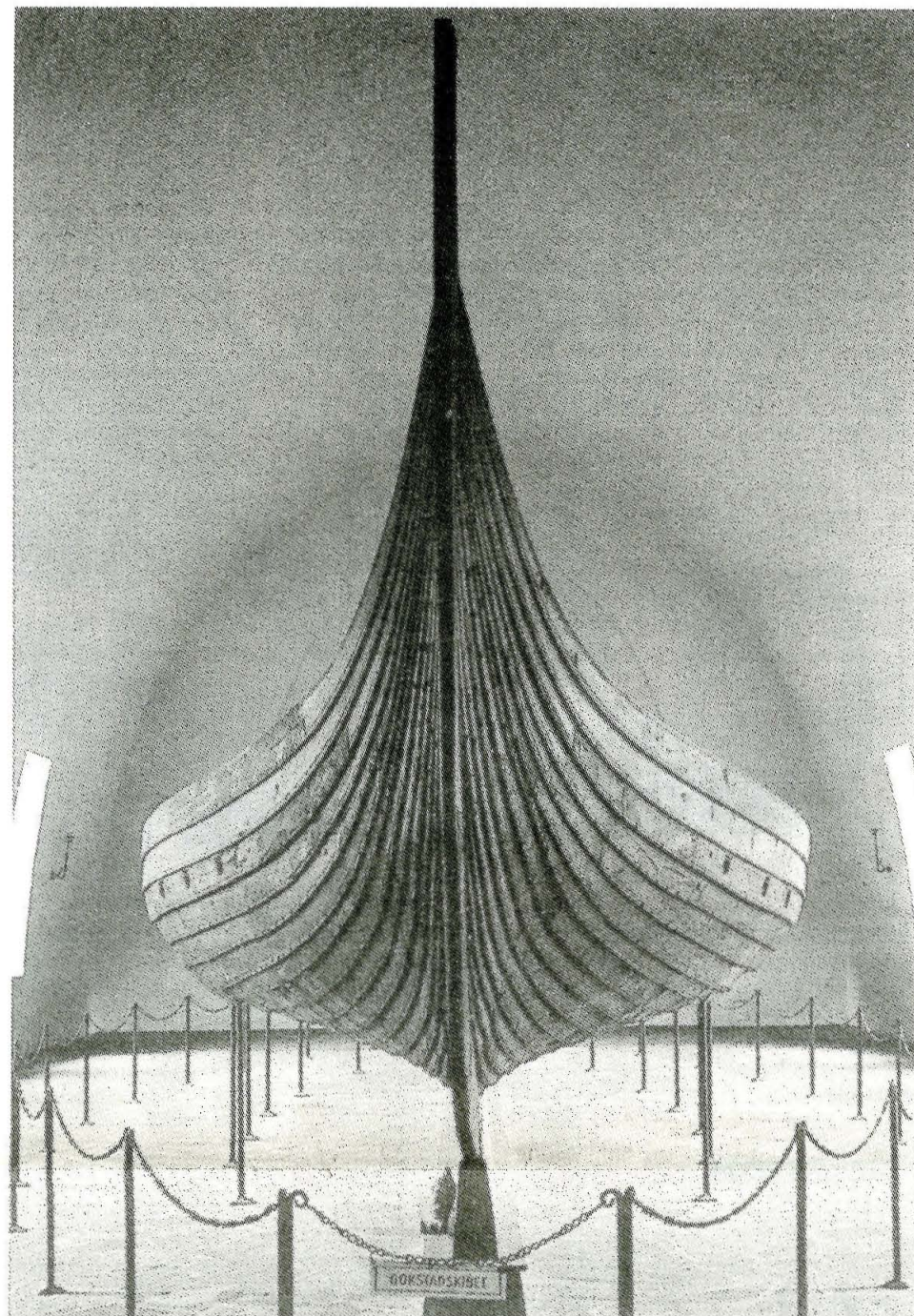
Continued from page 1

greater blocs of territory. But ultimately, of course, it brings predatory groups into conflict with one another."

The turning point for Normandy, says Searle, came around 960 A.D., when the quarrelsome descendants of the Vikings had to choose between fighting with each other and making a unified stand against the French, who had mobilized to push them out of Normandy. "At that point," she says, "endangered war leaders in eastern Normandy, living in and around the Norman community of Rouen, formed a relatively widespread alliance, based upon certain marriages, that brought them into a kin relationship with Richard the Fearless, the Viking leader of Rouen, and his wife, Gunnor. This was the beginning of a recognized leadership, which could channel resources to the seriously endangered and could coordinate policy. Kin loyalty was added to the more fragile bonds of chosen leadership." From then on, not only could this group of cousins-by-marriage defend itself against French threats, but it could (and did) see to it that no other allied group flourished in Normandy. "Not all those who were cousins of the Rouen leader prospered," says Searle, "but certainly, only cousins prospered."

Searle's approach also provides a fresh look at how women were viewed in Norman society. "Insofar as historians are interested in women's roles at all, there has been a tendency to see them as chattel, who existed to be married off and kept pregnant, and who had no substantive role in the political life of the community. But this view is not borne out by the records of the period. The marriages of men and women alike were of importance to the success of the family as a unit of defense and predation. In nearly every account of an accord between powerful Norman lords, we find that a woman, her property, and her marriage are crucial to the arrangement. Among the propertied, female heirs were often given preference over their brothers, if the group wished to recruit a talented fighter or wished a particular alliance. The political complexities of marriage were almost endless. Only the destitute were free of control."

In preparing her book, Searle relied on documents of the period from Normandy and Britain, and spent a year at Cambridge University, as well as considerable time researching the extensive



A Viking ship in the Viking Ships Museum in Oslo.

Norman conquest

medieval collection at San Marino's Huntington Library, where she is a senior research fellow. A scholar fluent in Latin, she confesses to a particular fondness for "the convoluted and awkward Latin" of tenth-century chronicles, with which few scholars have patience—and for "the curious standards of truthfulness of their authors." One example is a long-neglected tenth-century "house history" of the Rouen-based dukes of Normandy.

"From our standpoint," says Searle, "this is neither biography nor history, but a concoction of highly entertaining misinformation, clearly written to be recited in the vernacular and to make up a glorious story of how the Rouen ducal family was chosen by God, came near to disaster, and won out in the end, against all odds. It doesn't tell many truths, except the crucially important one, which is how the Normans perceived themselves."

One of the pleasures of researching her book, she says, was writing the article that gave the chronicle a place once more as a historical source. "Everyone's reading it now," she says, "and I think it's even being translated at last." One of the significant aspects of the chronicle

is its praise of Norman women, and in particular of Gunnor, wife of Richard the Fearless.

For a firsthand example of how Norman noblewomen viewed their role, Searle points to a remarkable chronicle, written in the 11th century, that celebrates the life of Richard the Fearless's daughter Emma. Emma was born around 990, and, in a classic exercise of kinship politics, was married at an early age to the king of England to seal an uneasy alliance between him and her brother, who had succeeded his father as Normandy's duke. After a few years, Emma's English husband died, and Emma married his successor, the Danish king Canute, who had invaded England, made himself the country's monarch, and restored peace after years of turmoil.

In the chronicle, which Emma commanded to be written in her later years, two themes are blended—Emma the peacemaker, and Emma the daughter of conquering warriors. "All the other characters are presented in such a way as to praise Emma, the queen of prosperity and peace, who has actively achieved reconciliation among the contenders for the right to wear the crown of England.

But the document's descriptions of military and seafaring expeditions are also among the most stirring of their time."

One of the most important aspects of her study, according to Searle, is the new light it sheds on the Normans' concept of the exercise and distribution of political power. "In studying how the Norman state arose," she says, "contemporary historians have tended to rely too much on the modern idea that the state is always a dominant, centralizing force. They have brought their experience of the present too much to bear upon the past. I'm trying to demolish the notion that there was a 'state' to obey. In general, historians have also seen the people of this period as too subservient to a few ultra-powerful lords. The warrior quality of men, and indeed of women, has been overlooked."

As for the Norman Conquest, Searle sees it as a logical—if not inevitable—outcome of Norman kinship politics.

"Here was a society," she says, "in which the moral norms assumed that all children would inherit and would be, or could provide, fighters. There is just one major problem with this arrangement. To make it succeed you constantly need to expand your resource base—which in those days meant increasing your holdings of land." By the time William the Conqueror had at last achieved the unification of Normandy—around 1060—and all the bishops and important war leaders were his close cousins or in-laws, land in the duchy was becoming scarce. And Duke William and all his cousin-warriors had large and growing families.

Then, in 1065, a political crisis arose in England. William was one of several contenders who had a claim to the English throne—through the marriage of Emma, prudently arranged 60 years before by his grandfather. And, says Searle, he had a cohesive kin-group of chosen fighters, all hungry for land and all used to coordinating their actions. No other contender had anything like the effectiveness of this group.

Although the aftermath of the Conquest does not occupy much of Searle's book, she believes that the Normans' political arrangements remain relevant today. "The fact that the Normans were first and last a voluntary association, bound together through kinship, meant that the leader served at the pleasure of his fellow warriors. He could be deposed, or his power could be curtailed, and this did happen several times in Normandy and, after the Conquest, in England as well. It is worth pausing to reflect that it was these people's great-grandchildren who wrote *Magna Carta*, telling their then king [William's great-great grandson] that he was in power at the will of the people (however the 'people' are defined). And it was their successors, ultimately, who wrote our Constitution."

FRIENDS

Hugh Colvin seeds five SURF endowments

Caltech has established five new funds for the purpose of endowing, in perpetuity, its Summer Undergraduate Research Fellowship (SURF) program. To encourage contributions to these \$50,000 funds, Hugh Colvin, chairman of the SURF board and president of The Caltech Associates, has underwritten each endowment for \$10,000.

Now in its 10th year, SURF is highly regarded for the special opportunities it offers undergraduates to design and carry out research projects on a one-to-one basis with a senior researcher in a field of the student's choice. Each student receives a summer stipend of approximately \$3,000 to support 10 weeks of research, conducted in association with a Caltech faculty member or with a staff scientist at JPL. The program also sponsors research seminars and career workshops throughout the summer. SURF is supported through a combination of private contributions, institutional funds, and corporate grants.

The five Caltech faculty members commemorated by the new endowments are:

—Donald Sherman Clark (1906–1976), a Caltech alumnus and pioneering metallurgist, who served on the Institute's faculty for more than 40 years.

—William Noble Lacey (1890–1977), a principal founder of Caltech's internationally known chemical engineering program and a member of the chemistry and chemical engineering faculty from 1916 to 1977.

—Thomas Hunt Morgan (1866–1945), professor of biology at Caltech from 1928 to 1945 and recipient of the 1933 Nobel Prize in Physiology or Medicine for his discoveries concerning the relationship of chromosomes to heredity.

—Arthur Amos Noyes (1866–1936), the founder of Caltech's chemistry program, the director of chemical research at the Institute from 1919 to 1936, and a principal founder of Caltech's undergraduate research program.



Dr. and Mrs. Arnold O. Beckman (center) with Don K. Toy and President Thomas E. Everhart at the first pouring of concrete for the foundation of the Beckman Institute. Toy is with the architectural firm of Albert C. Martin & Associates.

—Ernest Haywood Swift (1897–1987), a Caltech chemistry faculty member from 1920 to 1987, and chairman of Caltech's Division of Chemistry and Chemical Engineering from 1958 to 1963.

Hugh Colvin received his BS from Caltech in 1936 and his MBA from Harvard in 1939. He became a director and assistant to the president of Consolidated Electrodynamics in 1947 and was named the firm's president in 1956. In 1963 he became president of Unitek Corporation, a manufacturer and marketer of orthodontic and dental materials. Unitek was acquired by Bristol-Myers in 1978, and Colvin served as a vice president of that company until his retirement in 1982.

Colvin served on the board of directors of the Caltech Alumni Association and was editor of *Engineering & Science* magazine in the early 1940s. He was elected president of The Caltech Associates for 1988, and is a member of the President's Circle. He became a member of the SURF board of directors in 1984.

Blake awarded Packard Fellowship

Geoffrey A. Blake (PhD '86), assistant professor of cosmochemistry, has been awarded a 1988 David and Lucille Packard Fellowship for science and engineering. The fellowship provides funding of \$100,000 a year for five years of research expenses.

The Packard Fellowships are awarded to talented young faculty members to support basic scientific research at U. S. universities, as well as to encourage these faculty members to continue productive university careers.

The David and Lucille Packard Foundation was founded in 1964 to support and encourage organizations dependent upon private funding and volunteer leadership.



Fellowship honors F. Beach Leighton

An annual fellowship funded by Leighton and Associates has been established at Caltech in honor of F. Beach Leighton (MS '49, PhD '52). The \$5,000 fellowship will be awarded annually to a graduate student in the Division of Geological and Planetary Sciences. The first recipient is Charles Rubin.

Leighton retired as head of Leighton Associates this fall. A banquet was held in his honor on November 17.

Rubin is doing a PhD thesis that involves a combined mapping, petrological, age-dating, and geochemical study of a large area in southeastern Alaska.

Beckman recipient of Parsons Award from ACS

Arnold O. Beckman, chairman of the Caltech Board of Trustees, emeritus, has been given the 1989 Charles Lathrop Parsons Award, presented by the American Chemical Society.

The award was given for his encouragement of interaction between academe and industry; for his involvement in upgrading education; for his leadership at the national level as a protector of the environment; for contributions to national defense and security through the development of instruments vital to new technologies; and for his philanthropy in support of research institutions.

At the annual McLean Brothers scholarship luncheon are Don McLean, Barry Lind, Mrs. William McLean, Michael Jones, Diana Chu, Randy Levinson, Caltech Trustee James E. Robison, President Thomas E. Everhart, John Chen, and Steven Olafson. The McLean Brothers Scholarship Fund was established in honor of the late William McLean (BS '35) and John McLean (BS '38), both of whom received the Distinguished Alumni Award. The luncheon honored McLean scholars for their scholarship and leadership.

FRIENDS

IA conferences for academic year announced

The Office for Industrial Associates will sponsor three conferences during the academic year. The first, the Research Directors Conference, is an annual review of research at Caltech, aimed at industrial vice presidents, directors, and managers with responsibility for research and development, engineering, and university relations. It will be held on February 7 and 8, 1989.

Faculty speakers will describe their research in a number of computational and experimental areas. Murray Gell-Mann, the Robert Andrews Millikan Professor of Theoretical Physics, will give a special address on complexity, and P. Roy Vagelos, president and CEO of Merck and Company, Inc., will give the keynote address.

Peter B. Dervan, Bren Professor of Chemistry, and Robert H. Grubbs, professor of chemistry, will be chairmen of a special conference on March 14-15: the "John D. Roberts Symposium—Frontiers in Organic Chemistry." To celebrate Roberts's 48 years of research and teaching, a series of lectures will highlight frontiers in organic chemistry.

On April 25-26, Fred Culick, professor of mechanical engineering and jet propulsion, will be chairman of a conference, "Autonomous Systems and Robotics." This conference will cover recent research on autonomous systems and robotics, emphasizing current work on the Caltech campus and at JPL. Applications to industrial problems and space exploration will be featured.

These conferences are open to the public, and registration fees are waived for all Industrial Associates representatives, the faculty, students, staff, and alumni of Caltech, and the faculty, students, and staff of other universities. A \$450 registration fee is charged those not included in the above categories.

More information is available from Linda McManus, events coordinator, Development, 105-40, Caltech, Pasadena, California, 91125, or by calling 818/356-6599.

Enterprise Forum receives MIT alumni award

The Caltech/MIT Enterprise Forum has been chosen by the Board of Directors of the MIT Alumni/ae Association to receive one of its 1988 Presidential Citations for excellence of the joint program. The Presidential Citation is awarded for distinguished service to MIT and the Alumni/ae Association in recognition of outstanding activities carried out by alumni groups.

The Enterprise Forum presents young alumni from both universities who tell the stories of their companies and how they became successful.

Caltech is 97!

Caltech observed its 97th birthday on November 2—the anniversary of the date that Throop University opened its doors as a vocational school at the corner of Fair Oaks and Green (then known as Kansas Street). Officials are already looking forward to 1991, when a centennial celebration will be held.



Visitors' center opened by PR office

A new visitors' center opened by the public relations office at Caltech is making the campus more accessible to the community and to visitors. The center is in the public relations building, and its representatives provide free daily tours and a variety of information about the campus. Officials say the center encourages visits from prospective students, as well as others interested in the school.

Tour guides note special points of interest at buildings such as South Mudd Laboratory's Seismological Laboratory, the epicenter of information in southern California every time an earthquake hits. Tours are usually led by Caltech students called president's hosts and include information about many of the buildings and laboratories—both on campus and off.

The lobby of the public relations building has been converted into a "history room" for the information center, which opened in June. Pictures along one wall capture student pranks, Albert Einstein's visits, and early campus history. A video called "Caltech in the News," featuring recorded news coverage of Caltech, is available for viewing.

The visitors' center idea was initiated by Robert O'Rourke, Caltech's assistant vice president for public relations, when he came to Caltech from Boston University.

Tours last about an hour and are offered on Mondays, Thursdays, and Fridays at 3 p.m. and on Tuesdays and Wednesdays at 11 a.m. Information on the center or the tours is available by calling 818/356-6326.

At a recent meeting of the Los Angeles County Board of Supervisors, President Thomas E. Everhart was presented with a resolution welcoming him as the new president of Caltech. The resolution was introduced by Supervisor Kenneth Hahn (above left).



Members of a committee to plan the new "Student Sunday" program: Marilyn Brumder, Harold Levy, and Virginia Paige.

Associates host students as Sunday guests

Sixty-four Caltech students enjoyed the hospitality of 14 Associate families during September as part of a new "Student Sunday" program sponsored by The Associates. The purpose of the program is to increase involvement between students and members of The Associates, and to help them get better acquainted. The Caltech Y coordinated the student sign-ups.

Response to the event was positive. "We enjoyed our six students very much," commented George and Marilyn Brumder, while Ward Calaway (BS '61, MS '62) remarked that "our students were pleasant and polite." Robert M. Lehman (BS '31) and Evelyn Lehman said, "We enjoyed the evening very much and think it should become a tradition." Henry F. and Bobbie Moon noted that "it was a very enjoyable evening." Other similar "Student Sundays" are anticipated.

Solow addresses Associates at annual dinner

Nobel laureate Robert M. Solow, the Institute Professor and professor of economics at MIT, focused on the country's trade and federal deficits when he appeared as the featured speaker at the annual dinner of The Caltech Associates. Solow, who spoke on "American Productivity and International Competitiveness," warned, however, that looking at deficits alone is a simplistic way to view the economy. He noted that many countries that have no trade deficit at all are impoverished. For example, he pointed out, a number of economically poor Latin American countries have trade surpluses.

"The trick is to achieve a reasonable standard of living, a reasonable wage level, and a reasonable profit margin, and to balance trade," Solow said.

As a solution to the twin-deficit problem, he recommended increased investments. He said investment is an important factor in any economy, and particularly that of the United States—the way to improve the standard of living in the future.

Solow predicted a decline in U.S. productivity in 1989 as the recent upswing comes to an end.

Widely recognized as an economic theorist, Solow's special fields of interest are mathematical economic theory, the theory of capital and growth, macroeconomics, and the economics of natural resources. He was awarded the Nobel Prize for his work showing how technological change affects long-term economic growth.

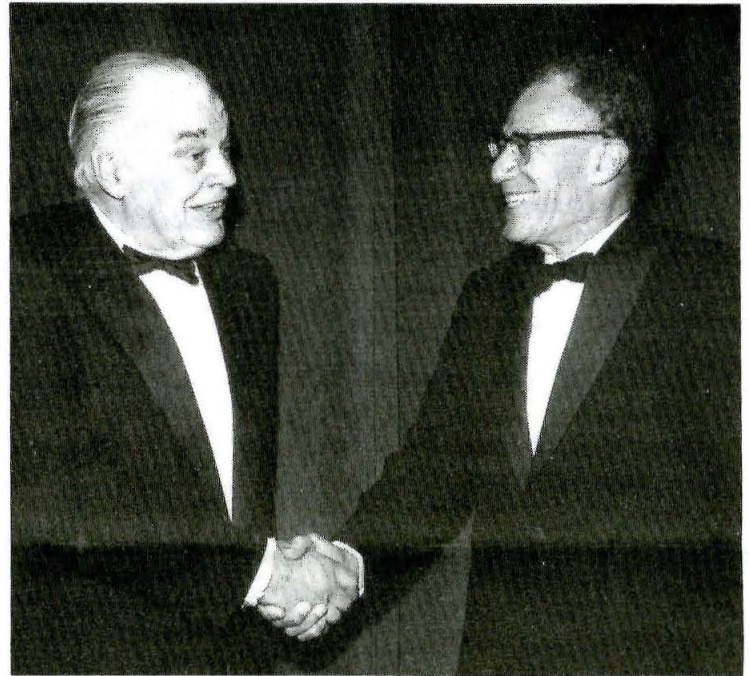
Hugh F. Colvin, president of The Associates, introduced President Thomas E. Everhart, who welcomed The Associates and introduced the speaker. Some 360 people attended the event.



President and Mrs. Thomas E. Everhart (Doris) with Dr. and Mrs. Robert M. Solow (Barbara).



Mrs. Sharon S. Black dances with her guest, John Krummell.

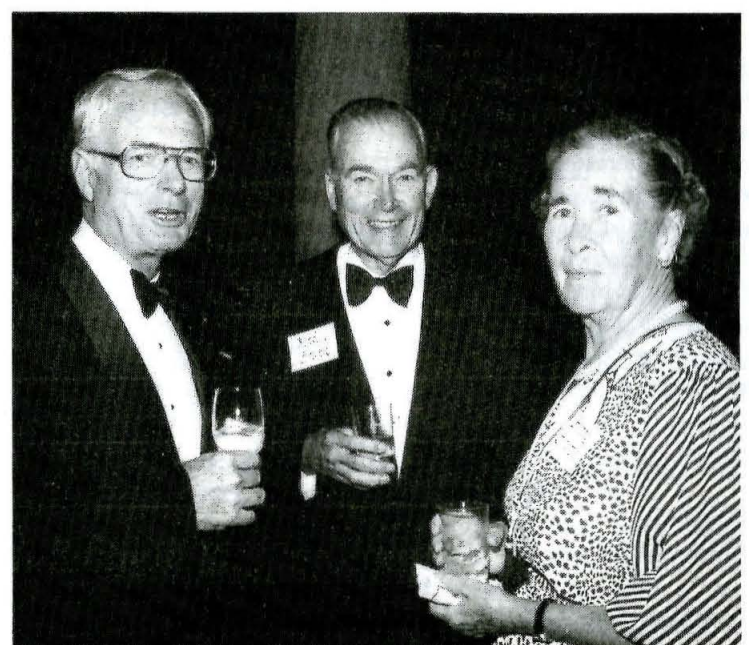
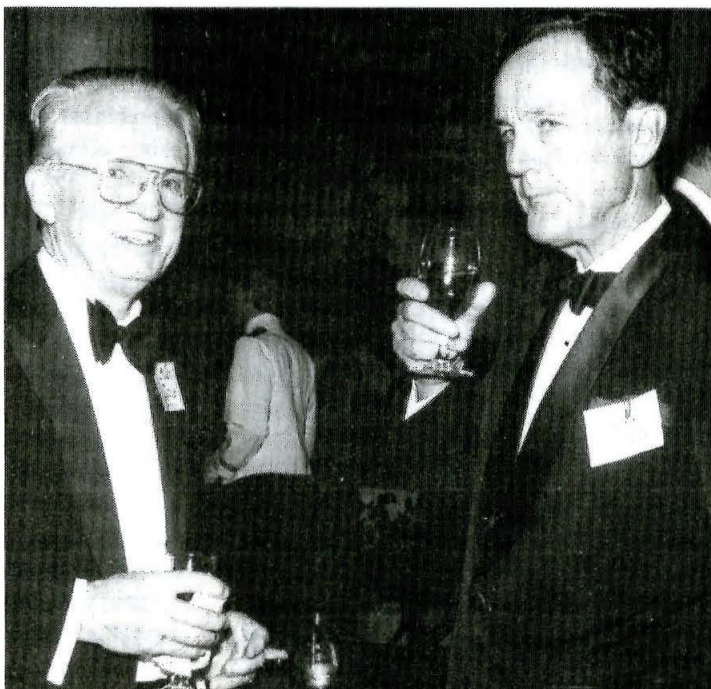


Hugh F. Colvin, president of The Associates, greets Dr. Solow.



Mrs. Laurence J. (Mary) Stuppy with Gregory M. Simon and his guest, Kathy Losey.

Allen V. C. Davis and Robert W. Mapel.



Joseph B. Earl with Mr. and Mrs. Kimball D. Smith.

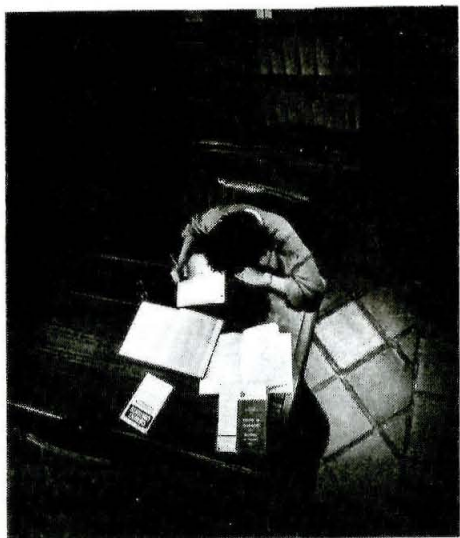
CALTECH IN THE NEWS

"Another year will begin Monday at Caltech where, in keeping with rich tradition, students will pull off some outrageous prank, the faculty will acquire more international prestige, and Harry (the Horse) Gray will convulse Chem I. That's how it has been during the 22 years that the eminent chemist Gray has been whipping up his unique brew of creativity and clowning. As Gray likes to say, 'You gotta keep people excited.'" *Los Angeles Times*, from a feature story about Gray.

"What was five months ago merely an idea for an international council to promote collaboration on the mapping and sequencing of the human genome has now coalesced into a bona fide organization with money in its pocket. HUGO, the Human Genome Organization, held its first council meeting on the 6 and 7 [of] September in Montreux, Switzerland. . . . HUGO was born at a rump session of a Cold Spring Harbor meeting last April. . . . Leroy Hood of the California Institute of Technology [was one of] HUGO's intellectual godfathers." *Nature*.

"[A] design [for a primary telescope mirror] which is being employed by the University of California and the California Institute of Technology in a 10-meter telescope that is nearing completion on the summit of Mauna Kea in Hawaii, uses a mirror made from 36 hexagonal segments that fit together like bathroom tiles. Each of the segments is supported by movable, computer-controlled pads to keep the mirror in proper alignment." *The Chronicle of Higher Education*.

"If the quality of a college faculty can be measured by its professorial 'stars,' then the constellation at the California Institute of Technology ranks among the most luminescent on any American campus. With five Nobel laureates, three MacArthur Prize recipients, and scores of other illustrious award winners in science's most renowned competitions, Caltech's faculty produces the sort of intellectual critical mass that any national university might envy." *U.S. News & World Report*.



Caltech's new students were soon hard at work.

Brennen appointed dean of students

Christopher E. Brennen, professor of mechanical engineering, has accepted an appointment to serve a three-year term as dean of students at Caltech. Along with Associate Dean Jeanne Noda, Brennen will advise and counsel undergraduate students on academic and extracurricular matters and will be concerned with the overall undergraduate program and curriculum.

Brennen served for four years, from 1983 to 1987, as master of student houses. In 1982, the undergraduate student body presented him with an ASCIT (Associated Students of the California Institute of Technology) award for teaching excellence.

"Chris Brennen is known among his colleagues for his dedication to the welfare of Caltech students—as a research adviser, as a teacher, and as master," said James J. Morgan, Caltech's vice president for student affairs and the Marvin L. Goldberger Professor of Environmental Engineering Science. "We look forward to his return to student affairs as dean."

Steve Buratto, Caltech quarterback, throws a pass in a game with the Orange County Cowboys. In mid-November, the team's record was 6-1 with one game remaining. The Beavers' only loss so far has been a 28-14 defeat at the hands of the Cowboys.



Gibson appointed Caltech Y director

Paul Gibson has been appointed director of the Caltech Y, succeeding Ken McGuire. Before coming to Caltech, Gibson directed a program to help disadvantaged high school students obtain better educational opportunities. Before that, he had been a teacher, a campus minister for Inter-Varsity Christian Fellowship, an academic advisor, an advisor for international students, and a community outreach coordinator for community and social service projects in northwest Pasadena.

He holds a BS degree in biology from Harvard and a Master of Divinity degree from Fuller Theological Seminary in Pasadena.

Caltech registers record-breaking fund-raising year

Caltech received more than \$97 million in gifts during the fiscal year ending last September 30 from some 8,200 donors, the highest number of contributors in the 97-year history of the Institute. This is an increase of \$17 million over last year and is the largest amount recorded in the history of Caltech.

The \$97,425,992 in funds raised in 1987-88 is certain to rank Caltech among the top of all U.S. colleges and universities.

Gifts from individuals in 1987-88 accounted for nearly \$66 million of Caltech's \$97.4 million fund-raising total, including \$30 million from industrialist and chairman emeritus of the Caltech Board of Trustees Arnold O. Beckman and his wife, Mabel, for Beckman Institute, a biochemistry center scheduled to open its doors next fall.

Foundations contributed \$20.9 million. Corporations contributed \$10.9 million, 70 percent of that in matching gifts.

"Well-rounded" freshman class hard at work

Three Orthodox Jews who keep a kosher house, a woman enrolled in Naval ROTC, and the first undergraduate from the People's Republic of China—these are some of the new undergraduates who entered Caltech this fall in a group that is considered "well-rounded." Included are students talented in instrumental music, debate, drama, choir—and several who play lacrosse. Also entering were several who indicated they were interested in social service activities.

A total of 201 freshmen and 255 new graduate students began studies in September. Of the entering freshmen, 33, or about 15 percent, are women. Along with the freshmen, 25 transfer students arrived on campus, the majority of them to start their junior year.

Last year, 214 freshmen, including 35 women, enrolled. The decrease is not considered statistically significant.

One of the freshmen is an early-decision student who, as an applicant, received the admissions office mailing that included a mathematical expression whose solution spelled out "Caltech." He responded with another mathematics expression that, when worked out by Tom Apostol, professor of mathematics, spelled "admit me." Apparently his unusually posed request was well-received.

The freshman class is academically as impressive as ever, with SAT scores in the top two percent of the nation. In choosing its students, the Institute continues to look for students who have a commitment to science and technology and whose enthusiasm for those fields transcends good academic performance.

In geographic diversity, the freshman class is similar to that entering last year. This year, 34 percent are from California, 16 percent from other western states, 17 percent from the Midwest, 10 percent from the Northeast, 19 percent from the South, and 4 percent from overseas. Among the foreign countries represented are Germany, Canada, Hong Kong, Japan, and Pakistan.

The 255 new graduate students who joined the 790 graduate students already enrolled at the Institute include 43 women and 138 foreign students. Of the entering graduate students, 15 are in biology; 49, chemistry and chemical engineering; 156, engineering and applied science; 12, geology and planetary science; 4, humanities and social sciences; and 19, physics, mathematics and astronomy. Their arrival brings Caltech's total graduate enrollment to 1,046, of whom 185 (18 percent) are women and 431 (41 percent) are foreign students.

*Caltech
alumnus
Robert Hahn
helped to
found a
middle school
for inner-
city kids.*

For Caltech alumnus Robert Hahn (MS '79, PhD '81), being a member of the President's Council of Economic Advisers is only part of his responsibilities. He also finds time to work on development and curriculum projects for the independent middle school for inner-city kids that he founded with his friend, Daniel Corley, in 1983.

The two young men were friends and roommates at Brown University when both became concerned about the educational system. Hahn, an economics major who taught math in an alternative high school for dropouts as a part-time job, mulled over the question of why the pie gets divided as it does—why the rich are rich and the poor are poor. Corley was also involved in education, and the two decided that, together, one day they just might be able to offer a better alternative for the education of young people than any the two young men had seen.

But their years at Brown ended and Hahn had other goals for his immediate future. He came to Caltech to work under Roger Noll (BS '62), then professor of economics and chairman of the Division of Humanities and Social Sciences, on environmental regulation topics as he conducted research for his PhD. "We were trying to find cheaper and better ways to clean up smog, things like that," Hahn says.

After earning his PhD at Caltech he went on to Carnegie Mellon University as an associate professor of economics. Meanwhile, his friend Corley had been busy in a variety of teaching roles. He had taken a year off from Brown and had worked in a soup kitchen in the Bowery section of New York. After obtaining a degree in education, he taught for a year in a Providence,



**Daniel
Corley**

Rhode Island, Catholic high school, worked as a VISTA volunteer, and then taught for five years at a school for delinquent boys in Narragansett, Rhode Island.

One day in 1982 he approached Hahn and reminded him of their dream of starting a school together. Hahn took up the challenge and soon was spending 30 to 40 percent of his time working to get an inner-city school under way for students in grades four



**These Community
Prep students
participate
enthusiastically in
a problem-solving
game during math
class at their
Providence,
Rhode Island,
school.**

A better chance for kids

By Winifred Veronda

through eight. The school would focus its efforts on kids—many of them from poor families—who had good potential and the desire to try, but who weren't getting the educations they deserved in the big city schools.

Both Hahn and Corley worked hard to build community and financial support for the school, and to overcome the bureaucratic obstacles to creating a new institution. Both found themselves hard at work as salesmen for kids—many of whom had no other opportunity for a decent education. In 1983 they founded Community Preparatory School in Providence with 25 students.

When Community Prep was launched, the average student was Black and most came from single-parent families, many of them below the poverty line. But since it has become increasingly well-known, the school has also attracted some students from middle-income families who want a demanding academic environment for their children, with a broad cultural diversity among the students. Meanwhile, enrollment has grown to 50, and the goal for the fall of 1988 was 65.

Only a handful of the students—whose median family income is \$14,000—can afford the \$3,000 tuition, so Community Prep is forced to depend on corporate donors, foundations, and individuals to make up the difference.

Creating their own school gave Corley and Hahn the chance to devise a rigorous academic program with a strong emphasis on basic skills—a curriculum that would allow students to work at their own pace and so develop a sense of independence and responsibility.

By the time they opened the doors in 1984 with a staff of three, Corley and

Hahn had managed to scrape together a \$61,000 budget. Since then enrollment has climbed and community support has broadened. The school's board of trustees has grown to 31, including the state's lieutenant governor.

A key ingredient in the school's program is parental involvement. "We demand that parents get involved on the



**Robert
Hahn**

ground floor," says Hahn. "One result of this is that we have virtually no unexcused absenteeism." Much of this involvement takes place five times a year when both parents and students sit down with teachers to participate in goal-setting for the students' academic growth.

Students at Community Prep spend an hour each day on math, reading, writing, and creative arts. Writing is integrated into all aspects of the curriculum. Says Hahn, "We want our kids to master basic writing skills. There were a lot of students at Caltech who could write beautiful equations, but who couldn't write science reports."

After lunch, they spend another hour and a half in history, science, or physical education classes. As rewards for those who qualify academically, students may take electives after school, such as photography, computer science, and

language. Class size, at about 10 or 12, allows teachers to learn the needs and personalities of each child. Some students have little home life; the school is their family, and they're there from 7 in the morning until the doors are locked at 5.

Comments Hahn, "We offer the advantage of being small. We can provide a caring environment, and a focus on positive, creative problem solving. When a kid has a problem, the teachers know it, and they discuss it with one another. It doesn't go ignored."

In this environment, most Community Prep students excel. According to Hahn, before being admitted, most must rank in the 70th percentile in at least one subject at their current school. Community Prep uses national standardized tests to assess each of its students every year, and the results show that after their first year at Community Prep, students who come from public school jump ahead an average of almost two years in reading and in math.

Part of the secret to this success lies in the fact that Community Prep allows students to work at their own pace—often an accelerated one—and challenges them to develop leadership skills and personal responsibility through "dynamic discipline," as Corley calls it. ("It's dynamic because the goals change with each eight-week cycle; it's discipline because once a student sets goals he has to stick to them.")

Why did the Corley-Hahn team pick a school for students in grades four through eight? "Because that's when kids are in their 'wonderbread years,'" says Hahn. "At that age you can teach them new tricks. You can begin to make a difference. It's not so easy to undo old patterns at the high school level."

But what is going to happen to the Community Prep students when they finish their four years in this special environment? "It isn't absolutely clear yet, but so far things look promising," Hahn reports. "Many of our students have been placed in special public schools with accelerated programs, or in magnet schools. And now that we have a track record, private schools are wooing our students with offers of full scholarships. They know they're getting kids from deprived backgrounds who have been well-trained in the basic skills."

How can one school make a difference—except for a few students? "We offer a model, and a first-rate education," says Hahn. "People are increasingly dissatisfied with public schools—not with the teachers, but with the way the schools are organized. We can demonstrate viable educational alternatives and greater choice for parents and students."

This summer, Hahn pointed out, a public school teacher worked with Com-

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A better chance

Continued from page 7

munity Prep teachers on a grant, seeking to implement new ideas. He believes that more of this kind of interaction will happen.

Now that Community Prep is solidly grounded as a part of the educational environment, what comes next? One possibility that Corley and Hahn have given some thought to is to expand backwards toward first grade. Another dream is a new location—although both agree that the current facilities in the Providence YMCA have served the school well. More competitive teachers' salaries are another goal. Meanwhile, the work goes on to strengthen Community Prep's base in the community, to create a curriculum that is increasingly creative, and to help kids get top-flight educations. Hahn puts it a little more succinctly: "I'd like to see us become one of the best private schools in the nation for kids who never dreamed they'd get there."

William Smythe, emeritus professor, dies in Colorado

William R. Smythe, professor of physics, emeritus, died in Boulder, Colorado, of heart failure, in July. Born July 5, 1893, he was 95.

Smythe earned his AB degree from Colorado College in 1916, his AM degree from Dartmouth College in 1919, and his PhD from the University of Chicago in 1921. He came to Caltech in 1923 as a national research fellow after teaching physics at the University of the Philippines. He was named professor of physics in 1940, and professor of physics, emeritus, in 1964.

Smythe originated a method of separating large quantities of isotopes electromagnetically. He is responsible for solving problems in eddy currents and electromagnetic theory, and for developing a solar yaw camera for rockets.

For years he taught classes in electricity and magnetism, and he is author of a reference book, *Statistic and Dynamic Electricity*, which was widely used for many years.

The physicist saw service in both world wars—in the first one as an artillery captain in the American Expeditionary Force, and in the second as supervisor of the ballistics section of a Caltech rocket project.

Eli Sternberg, pioneering researcher, dies

Eli Sternberg, Caltech professor of mechanics, emeritus, whose pioneering research into the theory of structural elasticity is known worldwide, died this fall from an abdominal aneurism. He was 70 years old.

Born and educated in Vienna, Sternberg also studied at the University of London, the University of North Carolina, and the Illinois Institute of Technology, where he received a doctorate in mechanics in 1945. After teaching at IIT and Brown University, he joined the Caltech faculty as a professor of applied mechanics in 1964.

Sternberg's work was on the cutting edge of theoretical mechanical research into elasticity—the way in which substances change their shape when acted upon by an outside force. His theoretical research found many applications in both mechanical and civil engineering.

Born in Austria on November 13, 1917, while World War I still raged in Europe, Sternberg left Austria in 1928. Friends said his relatives who stayed behind suffered in the Holocaust.

He was a fellow of the American Academy of Arts and Sciences, and a member of the National Academy of Engineering and the National Academy of Science. His awards included a Guggenheim Award in 1963 and two Fulbright Awards in 1956 and 1970.

Dervan elected AAAS Fellow

Peter Dervan, Bren Professor of Chemistry at Caltech, has been elected a Fellow of the American Academy of Arts and Sciences, one of the oldest honor societies in North America. The Academy was established in 1778 by John Adams and other leaders of the American Revolution and annually recognizes leading figures in the arts, letters, sciences, and public life. Dervan is one of 83 new Fellows elected this year.

Dervan heads a research team that has pioneered in the development of chemical methods that can analyze precisely where and how anti-tumor, antiviral, and antibiotic drugs and proteins bind to DNA, the basic material of genes. This research is expected to provide new insights into how these drugs function in fighting a wide spectrum of diseases and may be applied to the development of more effective treatment for cancers and viral illnesses.

Dervan's group is also developing chemical compounds that will expand scientists' ability to locate and study rare genes.



On experiencing initiations

Life as a series of passages—some of them quite painful—from one age group, role, or occupation to another is a concept with which we are all familiar. But people in modern society are unique in having to deal with these shifts without rites of passage that help them adjust to their new circumstances.

So observes David Smith, Caltech professor of literature, who incorporates the lore of initiation into a course in American literature. In this class he deals with initiations as the rituals that guide people "from innocence into experience," and that mediate "the emergence of a new identity during a critical period of confrontation, testing, and conversion."

Smith points out that the goal of such ceremonies in pretechnological cultures has been to give the participants a sense of their roles within their societies, and he notes that such prestigious anthropologists as Mircea Eliade have bemoaned the loss of these experiences in modern life. Eliade believes that, without them, loss of one's sense of identity comes easily.

"It does not fall to us to determine to what extent traditional initiations fulfilled their promises," Eliade wrote. "The important fact is that they . . . professed to possess the means of transmuting human life. The nostalgia for an initiatory ritual which sporadically arises from the inner depth of modern man seems to us most significant."

In some traditional cultures, initiations continue to exist, Smith notes, recalling that in one class his lecture about rites of passages to manhood was greeted with skepticism. The class members became believers when a young man of East Indian extraction, just back from the Philippines, broke in to say that he had just been home to participate in such a ceremony, and that Smith's lecture had helped him to have a deeper appreciation for it.

Smith finds many examples of the initiatory process in American literature of the nineteenth century—in the writings of Mark Twain, James Fenimore Cooper, Herman Melville, and Nathaniel Hawthorne, for example, as well as in the literature of psychoanalysis. He raises the question as to why Mark Twain drew upon so

many examples of the process when he wrote *Huckleberry Finn*, and he concludes that the examples were all about him in his culture—in the literature of the Bible, for example, and in rituals of initiation practiced by young boys in the community, who would, for example, crawl through a dark cave to gain membership in a peer group.

But those of us in modern society must—for the most part—struggle along without initiatory ceremonies, Marine Corps recruits and novitiates in religious orders being possible exceptions. Not generally available to us are the experiences depicted in the literature studied in Smith's class: experiences involving separation from one's family and friends, descent into darkness and the unknown, subjection to a series of rigorous trials that test the individual to the core, and reemergence as a person of identity and self-possession.

Smith points out that in some instances, the initiatory experience permits its candidates to indulge in episodes of pranksterism, and that the individual who reemerges successfully has become a heroic figure with the capacity to bestow rich gifts on fellow humans.

Some of Smith's students may note parallels in the initiatory pattern to an experience they are undergoing: their educational process as Caltech undergraduates. Immersed in the darkness of an alien alley in a student house, their family and friends far away, they confront such trials as Physics 1 and other aspects of the core curriculum as they begin a critical period of confrontation and testing. If they persevere—their stresses relieved by occasional opportunities for pranksterism—they eventually will be reborn as strong, self-reliant human beings, confident of their ability to solve any problem that may confront them, and capable of bestowing rich gifts upon fellow members of their society.

Unusual in having had the opportunity for such an experience, they will have survived their rite of passage into one of the most intensely initiated bodies on earth—the Caltech alumni.

About 100 members of the Caltech community turned out to skate at the Pasadena Ice Skating Center on "Caltech night."



Fred and Fritzie Culick were dissatisfied back in the mid 1970s that Pasadena had no ice-skating rink. The old Winter Garden had closed in the late 1960s, and Culick coached a youth hockey team in Pasadena whose home ice was inconveniently located in Covina or Ontario.

So the two decided to do something about the lack. With another couple, they submitted a proposal to the city for an ice rink in the exhibition hall behind the Pasadena Civic Auditorium. The city was considering other proposals but accepted the Culicks', and Pasadena had an ice-skating rink again. The Culicks have a 20-year lease, and they've made a long-term commitment to the Pasadena Ice Skating Center.

"We've always regarded this rink as a community facility. Fritzie and I think skating is a very healthy sport," says Culick, professor of mechanical engineering and jet propulsion at Caltech, who skated and played hockey when he was growing up in New Hampshire. "We didn't create it with the expectation of becoming rich, because the ice-skating business is seldom lucrative. There are only so many hours in a year and you only have a sheet of ice to sell. You have to work hard to make an ice-skating rink a viable operation."

For the Culicks, the real satisfaction in owning the rink has come in seeing it provide recreation for local people. Last winter during the peak of the season, 500 students were taking lessons, figure skaters were practicing their skills on ice before school, Scout troops were earning merit badges in skating, several hockey teams were practicing and playing games on the ice, church groups were turning out for broomball contests (played in sneakers with a broom and a ball eight inches in diameter), and recreational skaters were coming for sessions several nights a week.

A peak in demand came after Katarina Witt and Debi Thomas danced on the ice during the Winter Olympics in Calgary last February. Hundreds of skaters showed up in the following days to sign up for lessons or just to skate for a few hours. While some lost interest as the Olympic fever died away, many continued to be enthusiastic advocates of the new sport they had discovered.

The Caltech community is very much a part of the larger community that uses the rink. The Caltech Hockey Club practices and plays there (the first Beaver Cup contest against MIT was on the Pasadena ice), Caltech physical education students take classes there for credit, and, this summer, about 100 members of the Caltech community turned out to skate at special rates on "Caltech night."

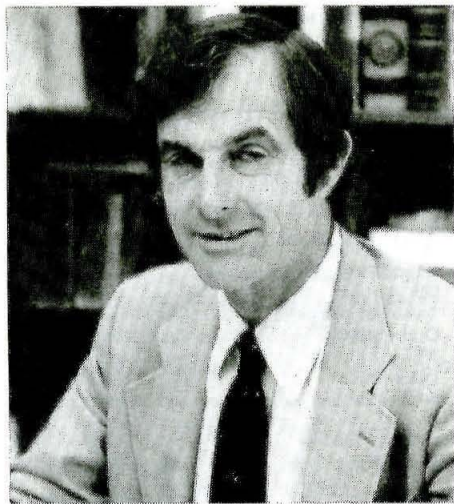
Activity at the rink has increased substantially since the Culicks cancelled a contract with the Ice Capades in 1984 and brought in new managers. The Ice Capades is the largest operator of rinks in the world but runs enterprises accord-

Committed to ice skating

By Winifred Veronda

ing to a certain formula, Culick explains. Most of the rinks it operates are in malls, with lots of walk-in traffic and plenty of free parking. "We didn't fit the formula," says Culick. "The rink wasn't doing what they wanted it to do, and it certainly wasn't doing what we wanted to do, which was to provide an ice-skating facility for the city of Pasadena. They couldn't market the rink profitably. So we parted company amicably."

Since then, the rink has recovered from a financial loss, expanded its skating class program, and become more



Fred Culick

accessible to the community. The successes followed another crisis in 1985, when insurance companies cancelled all policies that dealt with ice skating and roller skating in the U.S. The rink closed for a week before finding coverage that enabled it to continue—with rates 10 times what they had been before. "We lost a lot of money that year," says Culick.

"Since that time," he continues, "we've had some relief from the city in terms of the amount of liability insurance we have to carry. An insurance initiative passed that helped to solve the deep-pockets issue."

As an independent facility, the rink is something of a rarity. There are only roughly 800 rinks in the country, and some 600 of these are municipal rinks, funded by a city. "The reason why there aren't more rinks," says Culick, "is that ice skating is very expensive—probably the most expensive individual sport. There are the instruction, the

outfits, the use of the facility, the skates. What this means is that there isn't a huge market for a rink out there."

The business is also seasonal, Culick notes. Relatively few people choose the coolness of an ice-skating rink on a hot smoggy day. They head for the beaches instead. The cool months of the winter are the rink's busy time—and these days, lots of people from the Pasadena area are seeking out the rink.

Among them are members of the Pasadena Youth Hockey Association, which enrolls about 100 members and is split into groups by age, in two-year increments starting at six years and continuing to 18. The local team of a national organization called the National Novice League plays on the Pasadena ice, as do teams from each of three local men's hockey leagues which also practice at the rink.

Those who come to skate in special activities are willing to practice at times that may be inconvenient. Figure skaters practice in the morning before school, men's hockey teams and broomball teams play after 10 p.m., youth hockey teams practice on Sunday mornings. Prime evening times must be kept for recreational skaters, who simply come in to enjoy the ice.

About half the skaters are high school age or younger, says Culick, although many skaters come who are in their thirties and forties.

The Culicks themselves spend little time at the rink, leaving its day-to-day operation to the manager, who is a minority owner. (They now own approximately three-fourths of the rink.) Culick is there several hours a week, and he and Fritzie Culick participate in weekly Board of Directors meetings.

Culick used to play on the Caltech soccer team (he was a founding member), but he broke his leg a few years ago and that stopped his participation. He has thought about getting involved again, but in the meantime he has started taking art lessons, and that interest has absorbed much of his free time. So the Culicks' time on the ice is limited to some occasional skating.

But their satisfaction is not limited, as they view the rink and its programs and see that they've accomplished a major goal—to give Pasadena an ice-skating rink that attracts broad community participation.

Co-generation to save Caltech \$1.5 million

New power-producing equipment has been installed at Caltech's central plant that will allow the Institute to recover normally "wasted" energy and convert it into additional electricity. This new co-generation operation, which is part of the existing power system on campus, is expected to save the Institute about \$1.5 million a year in energy costs. When the operations begin early in 1989, Caltech will be producing about 70 percent of its electrical energy usage.

The central feature of the new installation is a jet engine. The hot (900 degrees Fahrenheit) exhaust gases produced by the engine will boil the water in a new heat-recovery boiler, which, in turn, will produce a portion of the steam used in the Institute's heating and air conditioning systems. The jet engine itself will turn a generator to produce electric power.

According to physical plant director Robert Fort, 'co-generation'—the practice of utilizing energy that normally has been wasted—was first used on campus in 1968. That year, in the newly built central plant on Wilson Avenue, Caltech installed its first air conditioning (refrigeration) system, which was operated with energy from the steam heating system. Steam from the boilers, produced at 300 pounds of pressure, was (and still is) siphoned off the main pipelines and used to run the steam turbine that operated some of the refrigeration equipment. Exhaust steam—instead of being wasted—is used to power additional refrigeration equipment.

In 1981, after five years of skyrocketing fuel prices, the Institute took another major step in co-generation, adding a second steam turbine, this time to turn an electric generator. Although more fuel had to be used, the net result was a saving of \$450 thousand a year in producing electrical energy that formerly had to be purchased from the city.

Help us find these lost alumni



Caltech has no record of the addresses of these alumni. If you know the current locations of any of them, please relay the information to the Alumni Association office, 818-356-6592, 1-97, Caltech, Pasadena 91125.

1922		Edwin B. Michal	MS	Arthur M. Compton	BS	Courtland L.	
Blake Beatty	BS	Winston H. Rice	BS	William E. Gentner	MS	Washburn	MS
Arthur J. Garfield	BS	Maple D. Shappell	PhD	Arville C. Gibson	MS	1944	
1923		Warren H. Smith	BS	William J. Green	MS	Frank A. Alonso	BS
Robert J. Hammond	BS	1934		George A. Hatton	MS	William O. Ballard, Jr.	BS
Lewis M. Mott-Smith	BS	Duncan L. Hooper	MS	William J. Howell	MS	Francisco Barriga	MS
Hubert Woods	BS	1935		Rolf O. Langerud	BS	William E. Bell	MS
1924		Leon S. Becker	BS	Adolph Lovoff	MS	Donald G. Benjamin	MS
Mitchell C. Lukens	BS	Edward A. Bertram	MS	Luigi Menis	BS	Mehmet N. Berkant	MS
Willard H. Tracy	BS	M. Harrison Evans	BS	Robert A. Phillips	BS	Ertugrul Birlik	BS
1925		Paul F. Genachte	PhD	Shih C. Tao	MS	Joseph E. Burch	MS
William H. Allen	BS	Fun-Chang Huang	MS	Sabin A. Ustel	MS	William G. Burke	MS
Wilfred G. Thompson	BS	Russel L. Maycock	EX	Tsung-Su Wang	MS	Ahmed Cebeci	MS
Conrad J. Waller	BS	Dagoberto Rivas	BS	James M. Watkins, Jr.	BS	Carlos A. De Medeiros	MS
1926		1936		1941		Weldon R. Donsbach	BS
Hung Y. Chang	BS	W. Bruce Beckley	BS	Norman Z. Alcock	MS	E. J. Goehring	EX
Riley L. Gilbert	EX	Calvin M. Bolster	MS	Glenn W. Billman	BS	Charles P. Harrison	MS
John R. Howell	BS	Howard F. Hamacher	BS	Chieh-Chien Chang	MS	Robert F. Laabs	BS
1927		Larry L. Young	MS	Morris R. Clark	BS	Paul J. Labanaukas	MS
Frank F. Peterson	BS	1937		Samuel J. Easley	MS	John W. Marshall	BS
1928		Thomas R. Burnight	BS	John M. Feeley	BS	Carl O. Mattinson	BS
Francis C. Martin	MS	Ju-Yung Cheng	MS	Glyn Frank-Jones	BS	Kenneth L. McBreen	MS
Huston W. Taylor	BS	Anthony Easton	MS	Robert C. Geitz	BS	Merrill E. Onstad	MS
1929		James A. Hurst	EX	Donald L. Harvey	BS	Ethem Ozkaragoz	MS
John D. Elder	PhD	Paul F. Jones	MS	Leo C. Levitt	BS	Donald W. Pendery	BS
Lawrence J. Grunder	BS	Thomas N. Shaw	BS	Lloyd A. Lewis	MS	Jim M. Riddlehuber	MS
Reymond J. Kircher	BS	Ellis W. Shuler	MS	Blaine R. Nelson	BS	Mayo G. Shults	MS
Kam H. Lau	BS	Luther P. Spalding	BS	George I. Reimers	BS	Enrique F. Silgado	MS
Julius Nelson	BS	Meyer J. Test	BS	Frederick G. Robinson	BS	Roberto L. Stein	MS
True W. Robinson	BS	Clark H. Wiget	BS	William Schubert	BS	R. S. Tanyildiz	BS
Willem Uytendhoeven	PhD	1938		C. B. Stadium	BS	Garland S. Taylor	BS
1930		Kamal Djanab	PhD	Clyde T. Standridge	MS	William M. Trimble	BS
Donald K. Allison	BS	Duane W. Farnham	MS	Norman F. Svendsen	BS	D. R. Wight	MS
Herbert H. Deardorff	BS	Hyman D. Goodman	MS	Robert L. Weaver	MS	John J. Wirtz	MS
William Kelley	BS	Arthur G. Gross	BS	Colman Zola	MS	1945	
Frank N. Moyers	BS	Arnulfo G. Gutierrez	MS	1942		Victor A. Ari	MS
Jack D. Pritchett	BS	Frank C. Lowe	BS	Mehmet F. Bebe	ENG	Harry F. Bunze	MS
Katsunoshin Suzuki	BS	William Rhett	BS	Orhan M. Emre	ENG	Harry W. Carlson	MS
1931		Chi-Cheng Tsao	BS	Frank I. Given	BS	F. Miles Day	BS
Jack H. Amann	BS	Hsih-Heng Wang	MS	Chong-Hu Go	MS	Roy G. Killian	BS
Tseng-Loh Ho	MS	James W. Watson	BS	Alfred Landau	BS	Emanuel J. Miller	BS
James B. Taylor	EX	1939		Victor H. Martinez	MS	Jonathan F. Rice	BS
William T. West	BS	Richard H. Bishop	BS	Enver M. Muradoglu	ENG	Robert G. Trout	BS
Carl K. Yoshioka	BS	Andrew Frejer	BS	Russell Rhyne	BS	Necat Turkbas	MS
1932		Winthrop G. Jones	MS	1943		Bruce R. Vernier	BS
F. B. Phleger, Jr.	MS	Spencer W. Oakley	BS	Kenneth E. Anspach	BS	1946	
Richard A. Searle	BS	Walter B. Powell	BS	James M. Brown	EX	Charles W. Allison Jr.	BS
1933		David H. Scott	BS	James M. Brown	MS	Morton M. Astrahan	MS
Thomas C. Burk	EX	Lester G. Zukerman	BS	Wayne H. Brown	BS	Khosrow Behroon	MS
Luis E. Kernitzer	MS	1940		Ted L. Crosthwait	MS	Ke-Yuan Chen	MS
William A. Larsen	MS	George A. Brettell, Jr.	MS	Benjamin A. Daleon	MS	Robert H. Conrad	BS
Wyatt H. Lewis	BS	Robert C. Brumfield	BS	Warren V. Eaton Jr.	MS	Jerome P. Dyson	BS
				Harold K. Garner	BS	Hassan F. Fareh	MS
				Edward G. King	MS	Robert W. Foote	BS
				Robert H. Koch	MS	R. Bruce Foster	MS
				William L. Leeds	MS	George S. Gill	BS
				Roland E. Lundquist	MS	Luther A. Hall	MS
				Klaus Mampell	PhD	Benjamin S. Hayne, III	BS
				Robert W. Mitchell	EX	H. T. Huang	BS
				Norman Newsome Jr.	MS	Frederick J. Lewis	MS
				Lawrence K. O'bert	EX	Norman J.	MS
				Richard E. Pentoney	EX	MacDonald	BS
				Fred D. Roberts	MS	Stanley R. Nixon	BS
				Dan R. Scholz	MS	K. V. Prasad	MS
				Leslie A. Shannon	MS	Carl K. Salbach	MS
				Thomas B.	MS	Elmer R. Shepard	BS
				Smitherman	MS	Harvey F. Smith	MS
				William Snyder	BS	Yu-Sin Tung	MS
				Peter A. Tileston	EX	Harry L. Vincent, Jr.	MS
				Ernesto Vicente	MS	Thomas F. Weldon	MS

1947	Bernard J. O'Neill, Jr.	MS	Etienne Macke	MS	Jean M. Moysan	MS	
Roland S. Asher	BS	Basil R. Parnes	BS	Ann R. Massar	PhD	Robert C. Neveln	BS
Adolfo J. Atencio	MS	William C. Robison	MS	Lawrence W.		John C. Perrin	MS
Paul K. Charlu	MS	Yung-Chung Shen	MS	McCombs	BS	Michael A. Scavennec	MS
Fredric B. Clarke	ENG	Donald E. Sutton	BS	Nick S. Mousouris	BS	Nagendra Singh	MS
Hugh H. Collins	ENG	William L. Wallace	MS	Demetrius Philippou	MS	Vivian L. Steadman	MS
Brain D. Dagnall	MS	Richard W. Weeks	BS	Jean-Pierre Quent	MS	Duke A. Sun	BS
Subodh C. Das	MS	Howard E. Wilson	MS	Dwain J. Reed	BS	Mathilde J. Swank	PhD
Leo Fiorello	MS	1953		Rolf Richter	BS	Paul F. Williams II	BS
Eric Gillam	MS	Stuart G. Lennox	MS	Lewis L. Smith	MS	1968	
Walter Harrington	MS	Wilbur F. Offermatt	ENG	Jeanne M. Weiler	PhD	Alain A. Arnaud	MS
Merwyn E. Hodges	BS	Norman M. Schroeder	BS	1962		Gerald M. Cotreau	MS
Ea-Qua Huang	MS	Thomas R. Slodowski	BS	Nazeer Ahmed	MS	William M. Denny	MS
Paul T. Hutchison	MS	Fred P. Storrer	MS	Clement C. Audet	MS	William J. Driskell	MS
Felix A. Kalinski	MS	David S. Twining	BS	James T. Chang	PhD	Jacques P. Fleuret	MS
James S. Lesko	MS	1954		Michel M. Cousin	MS	Ender M. Kaya	MS
Rodin Lesovsky	BS	John T. Coughlin, II	MS	Michel D'Arbaumont	MS	John M. Lehman	BS
Vicente H. Lim, Jr.	MS	Christian P. Dambrine	MS	Jean C. Dubois	MS	Leroy C. Lin	PhD
John Manoukian	MS	Wesley R. Guebert	MS	Larry D. Fitzgerald	MS	David M. MacKenzie	BS
Michael K. Molloy	MS	James E. Guinane	MS	Donald C. Garwood	PhD	Dale L. Miller	MS
Basil E. Moorehead	BS	Irvin G. Henry	MS	Scott E. Gilles	MS	Brian M. Schaefer	MS
Raymond L. Olson	BS	Richard C. Heyser	MS	Peter W. Hammond	BS	1969	
John L. Orr	MS	Herberto Jimenez	MS	Paul Y. Hu	MS	James B. Andrew	BS
Loys M. Satterfield	ENG	Berdine H. Rogers	MS	Marlyn T. Jakob	MS	Jean-Henry Barth	MS
Alexander Smith	PhD	Francis F. Scott	BS	John F. Murphy	MS	J. Neal Brantner	MS
Francis D. Sullivan	BS	Bruce J. Watkins	BS	Jean M. Noel	MS	James P. Cerne	MS
Russell A.		Paul F. Weyers	MS	Barry N. Pines	BS	George K. Chan	MS
Thompson, Jr.	ENG	Herbert H. Winters	MS	1963		Ted W. Dillingham	BS
George R.		1955		Michael F. Behrens	BS	Theresa Dodds	PhD
Vanden Heuvel	MS	Alain Brethes	MS	Pierre J. Facon	MS	Michel H. Flandrin	MS
Alonzo H.		John D. Britton	PhD	Leo Horowitz	MS	Luis N. Ikwueke	MS
Wellman, Jr.	ENG	Roger J. Dewiest	MS	David F. James	MS	Barry R. Keller	BS
Clifford M. Wimberly	MS	Lewis F. Ellmore	BS	Anthony S. Lau	BS	Yavuz Rona	MS
Edward B. Winters, Jr.	BS	Jean Garcin	MS	Stephen H. Mastin	BS	Stephen E. Savas	BS
1948		William E. Huber	MS	Raymond F. Poggi	MS	George J. Siltanen	MS
Roger A. Anderson	BS	Shankar Lai	PhD	Lee W. Samuelson	EX	Murray D. Smigel	BS
Ying-Ching Au	BS	James Meacham	BS	David S. Siegel	BS	Harding E. Smith, Jr.	BS
James A. Bunce	MS	1956		Will G. Spiegelman	BS	Richard L. Sweet III	MS
Tao-Hung Chu	MS	Arthur H. Blair	MS	Janis Vasilevskis	PhD	Jon E. Weinzierl	PhD
Albert R. Clark	MS	Wilmot G. Brownlee	MS	Randle W. Ware	BS	William E. Wright	MS
Burgess F. Collins	BS	William S. Chen	MS	John Y. Wu	BS	1970	
Charles D. Edwards	MS	Robert W. Edwards	MS	1964		Luiz T. Auler	MS
Patrick N. Glover	BS	Jacques Feige	MS	Eudoxia Aliferis	MS	Robert C. Balcer	MS
James A. Harder	BS	James R. Foster	ENG	Elior B. Bradford, Jr.	BS	David Boss	MS
Robert J. MacNeill	MS	E. Mark Gold	BS	Tzeu-Ching Chang	MS	Sydney P. Craig III	PhD
Herman A. Mason	BS	Maurice Granier	MS	Der-Shyr Chen	MS	Kevin G. Donohoe	MS
Winton G. Roe Jr.	BS	David W. Hill	MS	William S. Cheng	BS	Richard F. Doyle	BS
John S. Swain	BS	James L. Kelly	MS	Duygu M. Demirlioglu	BS	Helio Fagundes	MS
Robert K. Swank	MS	Duncan E. MacDuffie	BS	Jean-Marie F. Grange	MS	Abdol R. Faiz	MS
William H. Voelker	MS	Rolland G. Moody	BS	Takehiko Ikeda	MS	Atef I. Girgis	MS
James E. Whitney	MS	William N. Spence	BS	Karl H. Kanus	MS	Edwin J. Hamilton, Jr.	PhD
Robert S. Winniford	MS	Robert M. Young	EX	Chung-Mo Kwok	BS	William C. Hocker	BS
1949		1957		Jacques A. Parisot	MS	James D. Hutchinson	MS
Thomas E. Allen	ENG	Anthony A. Dupont	MS	Andreas Puhl	MS	Nicole H. Imbert	MS
Thomas J. Andrews	MS	John F. Edsforth	MS	George E. Radke Jr.	BS	Juan E. Leon	MS
Laurence I. Baumann	BS	Douglas B. Holdridge	MS	Leroy E. Sievers	BS	Pierce A. Lynne	MS
Arthur R. Benton, Jr.	BS	Donald T. Meyer	BS	Nelson M. Skalbania	MS	Isaac A. Majerovicz	BS
Joseph F. Burkholder	BS	Robert T. Moore	BS	Harold P. Waits	PhD	Jovka Michova	MS
Harold D. Cooper	MS	Girair M. Nazarian	PhD	David E. Wood	PhD	Vivek C. Monteiro	MS
Harold W. Davidson	MS	Franklin C. Silvey	ENG	1965		Carl R. Neu	BS
Francis C. Foster	ENG	Joseph E. Stureville	BS	Philip R. Austin	MS	Richard W. Noren	MS
Jarvin R. Heiman	BS	Andre A. Treyer	MS	Robert J. Barro	BS	Peter Stavroulakis	MS
George M. Hrebec	BS	John C. Uththoff	MS	Raymond P. Cej	MS	Juan L. Steimle	MS
Frank G. Hylton	BS	Eugene M.		Philippe R. Chalier	MS	George Z. Voyiadjis	MS
Fred E. Krasin	BS	Wisembaker	ENG	Inder Cheema	MS	1971	
Max Krauss	PhD	Chi-Hsiang Wong	PhD	Allyn M. Davis	MS	Luis Y. Aranguren	BS
Pierre J. Leroux	MS	1958		Richard S. Frenk	BS	David W. Arnett	PhD
Dan M. Parker	MS	David A. Ackley	BS	John G. Harnett	MS	Theodor S. Colbert	MS
Thomas G. Petrusas	BS	Majid Arbab	MS	Ronald E. Hutton	BS	Brian T. Cox	BS
Charles C. Petty	MS	Alain Boulanger	MS	Michel A. Lagorce	MS	Ronald A. Friedland	EX
William C. Roesch	PhD	David G. Byles	BS	William P. O'Neill	BS	Ralph B. Graham	BS
Dale D. Ryder	BS	Lawrence I. Kittiver	MS	Dennis L. Oberg	BS	Thomas C. Gunderson	MS
Salim Solomon	MS	Jean P. Lacrouts	MS	Roger L. Peterson	PhD	Gregory E. Kandel	BS
Donald C. Stinson	MS	Rene E. Maurice	MS	George A. Repasy	BS	Milan H. Karspeck	BS
John W. Wilkening	EX	Hugh D. Palmiter	EX	Robert B. Scott	BS	Alan S. Lederman	BS
Jean F. Wiren	BS	Edwin M. Perrin	MS	Bernard C. Soleilhac	MS	Chi C. Lo	MS
1950		Gerald M. Pierrou	BS	Benjamin Stackler	BS	Kirk A. Mathews	BS
Joseph B. Alexander	MS	Jacques M. Rieunier	MS	Melvin M.		Terrence M. Morris	MS
Weldon O. Bergreen	BS	Gunnar E. Stenberg	MS	Stephens, II	BS	Ahmet Ozkul	BS
Stanley C. Boicourt	BS	1959		David O. Swint	MS	Jean-Marie Quirin	MS
Julian Brody	BS	Kenneth H. Adams	BS	Marias J. Turletaub	MS	Richard J. Schwall	BS
James C. Conly	PhD	Victor Backelandt	MS	Philippe Vidal	MS	Shelby A. Sherrod	PhD
Kenneth J. Hammond	BS	Chai B. Byun	BS	Anthony B. Williams	BS	Jack K. Tam	BS
Robert McMillan	MS	Clark E. Carroll	BS	Robert O. Winkler	MS	Joseph L. Templeton	BS
Donald J. Nelson	MS	Ronald A. Christensen	MS	Felix S. Wong	MS	Paul T. Wegener	BS
Robert W. Paulson	MS	Thomas E. Dawson	ENG	1966		William M. Weigel	BS
Richard H. Perry	BS	Andre J. Fossard	MS	Robert T. Barron	MS	William W. Yue	MS
M. Darwin Quigley	ENG	Michel P. Guillemet	MS	Joe Ching	MS	1972	
H. Edwin Reinecke	BS	Jay H. Harris	MS	Harold T. Couch	PhD	Carl R. Anderson	BS
Marco A. Romero	BS	Richard E.		Altan K. Eris	MS	Richard B. Baxter	MS
Martin N. Ross	BS	Hemmingway	ENG	Shaukat M. Feroz	MS	Richard J. Blint	PhD
Charles A. Savant	BS	Ronald B. Leonard	BS	Dario Iaculli	BS	Eric R. Boissaye	MS
Howard R. Schmidt	MS	Robert Maltz	BS	Larry R. Miller	BS	Emmy T. Chan	MS
Victor A. J. Van Lint	BS	Didier Morane	MS	Lawrence R. Newkirk	BS	Robert L. Derham	MS
Robert S. Welte	BS	Kenneth A. Muraoka	BS	Thomas E. Oberjar	BS	Samuel R. Gardiner	MS
Norris D. Whitehill	BS	Stanley Roth	BS	Robert E. Serafin	BS	Frank Kendall III	MS
John D. Wilkes	PhD	Walter V. Weber, Jr.	MS	John C. Urey	PhD	Andrew H. Lo	BS
1951		1960		Donald H.		Kirk T. McDonald	PhD
Ricardo M. Arosemena	MS	Neville A. Black	BS	Valentine, Jr.	PhD	Robert N. Miller	MS
Kenneth R. Berg	BS	Graeme A. Blake	BS	John K. Yoh	MS	George L. Nicolaides	BS
Edward B. Crichton	BS	Paul R. Calaway	BS	1967		Robert J. Panek	BS
John R. Doe	BS	Joseph M. Cauley	BS	Surendra N. Adodra	MS	Dan A. Sinema	BS
Howard C. Goodell	MS	Jacques J. de Barbeyrac	MS	Philippe J. Blondy	MS	Lawrence K. Tu	MS
Carl-Nils Hildabrand	BS	Alain N. Genko	MS	James R. Boyd	MS	Keikichi Yagii	PhD
Jacob P. Lajdjan	MS	Gary C. Goodman	BS	Martin D. Cooper	BS	1973	
Wilfred C. Mosier	MS	Ernest A. Isaacs	BS	John B. Davies	MS	Frederick H. Auld, Jr.	MS
Joseph E. Padgett Jr.	MS	Pierre E. Joffres	MS	Terrall M.		Bruce W. Bennett	BS
Raymond A. Sjodin	BS	Louis Kingsland Jr.	MS	De Jonckheere	MS	Raymond E. Carhart	PhD
Richard K. Smyth	BS	Jimmy C. Larsen	MS	Larry E. Dillehay	BS	William Chia	BS
Allan J. Summers	MS	Melvin K. Neville	BS	Douglas M. Eardley	BS	Deborah D. Chung	BS
1952		Richard A. Newcomer	BS	Payton D. Fuller	MS	Bruce S. Eisenhart	BS
Paul E. Arbo	ENG	Peter D. Noerdlinger	PhD	William C. Galley	PhD	Michael A. Piliavin	PhD
Elias G. Arcoulis	MS	William A. Sinoff	BS	Robert E. Goldwasser	MS	Richard A. Shaw	BS
Oswin N. Brown	MS	Paul R. Widess	BS	Eitan Gonen	MS	Richard L. Short	BS
Smith V. Bucy	MS	Allen D. Williams	ENG	G. Laurie Hatch	PhD	Clifford E. Smith	MS
Frank Capra Jr.	EX	1961		Michel J. Henry	MS	Clement L. Tai, Jr.	MS
Wesley Caspers	MS	Charles A. Allen	MS	Louis Kircos	MS	Wayne K. Warzecha	MS
Jerry Grey	PhD	Lewis W. Hemphill	BS	Chien-Shih Lu	PhD	Rodney K. Womer	MS
Frank C. Lang Jr.	BS	Roland Kitten	MS	Duane P. McClure	BS	Bruce Woodford	EX

1974	Suwat Thanayavarn	BS	Peter H. Stahlecker	MS	Orkum Hasekioglu	MS
Neil S. Berkey	Wayne J. Thompson	PhD	Maritza I. Strapanian	PhD	Jeffrey M. Hicks	BS
Mark W. Coles	George Triantafyllou	MS	Ralph C. Weeks	BS	Chih-Chieh Hu	MS
Dennis B. Creamer	Nikolaos P. Vasilakos	MS	Laura H. Wesson	BS	Karim F. Karagulla	BS
Jay D. Doty	David S. Wong	BS	1982		Francoise J. Lemouel	MS
Andrew P. Dowsett	Ella H. Wong	BS	Stewart W. Baillie	MS	Craig N. Minor	BS
Robert B. Fisher III	King-Wah W. Yeung	BS	John W. Barker	PhD	William K. Moonan	PhD
John E. Gelotsky	Jeffrey C. Yuen	MS	Marc J. Berman	BS	Bruno C. Nadd	MS
Jerry M. Harris	Barton Zwiebach	MS	Robert E. Blair	PhD	Phu T. Nugyen	BS
Joseph F. Karnicky	1979		John T. Bongiovanni	BS	Shouleh Nikzad	MS
Harold J. Katz	Genevieve M. Bliet	MS	Jonathan F. Buss	BS	Nonkululeko	
Betty P. Kwan	Douglas A. Breisky	BS	Loudon L. Campbell	BS	Nyembezi	MS
Daniel F. Lam	Schelte J. Bus	BS	Michael V. Choborov	BS	Jeffrey P. Rhinesmith	MS
David Y. Leung	Richard J. Carlson	BS	Pascal O. Correc	MS	Helio T. Rodrigues	MS
George B. Levin	Liew-Chuang Chiu	BS	Abraham A. Daubajre	MS	Nadira B. Sabanovic	MS
Thanh Luu	Ping Y. Chiu	BS	Kathryn L. Doughty	BS	John J. Schaeck	BS
Albert T. Ng	Bo H. Cho	BS	Ilnur Erbas	MS	Michael P. Schartz	PhD
Sedighah Salim	Kenneth S. Coles	BS	Graeme F. Fowler	PhD	Steven G. Schlipf	BS
Charles F. Schmidt, Jr.	Steven W. Cordray	MS	Joseph A. Garcia, Jr.	BS	Barry A. Swartz	PhD
Satish C. Sharda	Fred J. Crimi	BS	Nak-Hui Hwang	BS	Emre Tokur	BS
Donald J. Sullivan	Mark B. Cronshaw	MS	Randal D. Koster	BS	Nadeem Tufail	BS
1975	Steven T. Eckmann	BS	Marie-Bernard P. Levine	MS	Harold M. Weiser	BS
Michael E. Bandhauer	Kenneth P. Fecteau	MS	Linda B. McAllister	BS	1985	
Wolfram H. Blume	Carl R. Gilray	BS	David P. Miller	PhD	Manuel Acevedo-Ruiz	BS
Erik J. Brune	John M. Golding	MS	Samin A. Michani	BS	Marc Buffet	BS
James C. Conwell	Frederick S. Grennan	BS	David A. Myers	MS	Ariel Caticha	PhD
Christopher L. Cooper	Alvin J. Hill, Jr.	PhD	Hisp Park	BS	Keming Chen	MS
Peter J. Drivas	David S. Horowitz	BS	Pamela J. Phillips	BS	Gary T. Chow	BS
Alexander C. Ekwuatu	Stephen C. Jackson	BS	Russell O. Redman	PhD	Kikis M. Kyriacou	MS
Manuel R. Florez	David L. Keller	MS	Edward Schepps	MS	Blake H. Lewis	BS
Ralph R. Hayward III	Ahmad F. Khorrami	MS	Richard Seifer	MS	Russell L. Natter	BS
Sylvan A. Jacques Jr.	Robert R. Krchnavek	MS	Kenneth R. Sieck	BS	K. M. Papadimitriou	MS
Diane J. Kent	Aleksander	BS	Michael E. Stribila	MS	St. Jacques	BS
Melvin J. Knight II	Kupiszewski	BS	Yun-Chen Sung	BS	Cynthia C. Walker	MS
Robert W. Lim	Albert Y. Lam	BS	Anuchit Tiranuchit	BS	Michael J. Walsh	EX
William C. Moss	Thomas K. Lee	PhD	Liem T. Tran	BS	1986	
Michael L. Norman	Brian T. Lew	BS	Santosh S. Venkatesh	MS	Douglas R. Adkins	PhD
John P. Pelegano	Mark G. McHarg	BS	Joana M. Vizgirda	PhD	Douglas D. Axe	MS
Michael D. Rourke	Charles E. Novitski	PhD	Russell E. Walker	MS	Douglas J. Bennett	MS
Barry Schneidman	Richard C. Parker	PhD	Xian-Li Yeh	BS	David N. Beratan	PhD
Jeffrey B. Smith	Michael B. Porter	BS	1983		Wei Chen	MS
Robert E. Sullivan III	Michael Rubinstein	BS	A.V. Anilkumar	MS	Harry Soot-Shang Chu	MS
Gregory K. Taylor	Augusto Sagnotti	MS	Tadg P. Begley	PhD	Karen L. Condie	BS
Eric N. Vella	Dean G. Sturtevant	MS	Philip S. Beran	MS	Uma Devi Dasika	MS
Bruce D. Westermo	Jebriil A. Swedan	MS	David P. Brady	MS	Denise L. Draper	BS
Eric D. Williams	Steven G. Trabert	BS	Clark D. Brooks	BS	Diana Foss	BS
William A. Zajc	David R. Van Alstine	PhD	William M. Bruno	MS	Brian L. Foster	BS
1976	James C. Walseh	BS	Walter A. Coole	BS	Anthony S. Geller	PhD
Richard L. Anderson	Tak-Yiu Wong	MS	Yongbum P. Cuevas	MS	Marc E. Herant	BS
Ahmet V. Arslan	Gary T. Yamaguchi	BS	James M. Cummings	BS	Chi Fai Ho	PhD
Charles R. Byler	1980		Barry D. Davidson	MS	Tyler L. Housel	MS
Robert H. Higley	Jean-Luc R. Aschard	MS	Keith A. Echelmeyer	PhD	Justin T. C. Ip	MS
Andrew J. Jankevics	Pamela R. Auburn	MS	Lisa L. Flitz	BS	Toru Katsumoto	MS
Thomas J. Lawler	Thomas C. Banwell	MS	James E. Flowers	MS	Julie A. Kern	MS
Keith D. Neerman	Meir Bartur	MS	Brian D. Horn	BS	Paul T. Kinney	MS
Chiu-Yuen J. Ng	Robert J. Bensoussan	MS	Hamid Johari	BS	Marco A.P. Lima	PhD
Douglas G. Perrie	Roland L. Bouchard	MS	Baruch D. Kupperman	PhD	Michael J. McDowell	BS
Stephen Robsky	Johanan L. Codona	BS	Wayne W. Lam	MS	Eric D. Mjolsness	PhD
Stephen R. Roe	David M. Cole	PhD	Maclen B. Marvit	BS	James J. More	MS
Mark G. Rowan	Alain Delsupexhe	MS	Frank A. Meyer	BS	Tak-Kwong Ng	MS
Alan B. Saul	Reda E. El Damak	MS	David J. Muraki	BS	Kevin C. Power	MS
Alan J. Shusterman	James R. Ellison	MS	Matthew P. Newlin	BS	Irene L. Replogle	BS
Don J. Slankard	M. G. Finn	BS	Jane E. Nordholt	MS	Michael A. Rider	MS
Karl D. Stephan	Jeffrey L. Fordon	MS	Wendy A. Olson	BS	Steve S. Roy	BS
Steven M. Sweeney	Deane A. Gardner	BS	Richard L. Paquette	MS	Michael J. Scott	BS
Steven K. Wake	Patrick W. Gallowin	MS	Jonathan E. Parker	BS	Steve S. Shin	BS
1977	Charles E.		Ilene M. Reinitz	BS	Stewart A. Silling	PhD
Mustafa A. Abushagur	Goodhart, Jr.	BS	David C. Sams	MS	John R. Skille	PhD
Jeffrey R. Barnes	Peter M. Goodwin	BS	Balachandran	PhD	Mark E. Thompson	PhD
Andrew Bewsher	John A. Goree	BS	Sathiapalan	PhD	Dale R. Warren	PhD
Mark S. Bickford	Mohammed F. Helwa	MS	Aditya Srinivasan	BS	Robin D. White	BS
K. Ravi Chandar	Kwok K. Ho	MS	Kenneth J. Stern	MS	Karl D. Wittrup	MS
Thomas S. Creswell	Jeffrey B. Johnson	MS	David J. Strader	PhD	Chang D. Yoo	BS
John M. Epperson	David M. Joseph	BS	Steven Y. Tam	MS	1987	
Don S. Goldman	Thorne Lay	MS	Arthur C. Thompson	BS	Asif Ahmed	MS
Bruce G. Herring	Norman T. Lee	BS	Gregory P. Tollisen	BS	Bryan R. Borsch	MS
Bart Jackson	Boscoe H. Leung	MS	Curtis A. Trimble	BS	Paul B. Burridge	PhD
James J. Kelly	Herman S. Li	MS	Walter S. Tsuha	MS	Yie-Hwa Chang	PhD
Thomas D. Little	Mark A. Ludwig	MS	Thiri Vejpas	BS	Thomas M. Gould, Jr.	BS
Kai-Yan M. Ma	Christian Mailhot	MS	Korawit	MS	Arie W. Grossman	MS
Larry J. Ruff	Max Marshall	PhD	Wacharasindhu	MS	John J. Ngai	PhD
Vega D. Sankur	Kevin S. McLaughlin	BS	Timothy L. Williams	BS	Ivan M. Onyszchuk	MS
Michael J. Savage	Karolen Paularena	MS	Brian D. Wilson	MS	Michael Wray Spencer	MS
Frank Stauchhouse	Frank A. Perez	MS	1984		Winters-Hilt	BS
Michael A. Surkes	Michael K. Reach	BS	Stephen C. Anco	MS	Hei S. Wong	MS
Gong P. Yeh	Charles S. Reynolds	BS	Glyn H. Anderson	BS	1988	
Ronald W. Zimmerman	Colleen R. Ruby	BS	Damir I. Barudi	PhD	Julian L. Anthony	MS
1978	Robert Schulz	MS	Paul S. Bloch	MS	Joseph R.	BS
Farhad Barzegar	Bonny L. Schumaker	MS	Kirk E. Bratkus	BS	Beckenbach III	BS
William I. Behen	David C. Shafer	BS	Anne-Marie Brest	MS	Richard T. Boylan	MS
William E. Bratton II	Charles S. Slater	MS	Carol J. Bryan	BS	Wilson Brumiller, Jr.	MS
Daniel G. Canin	Joseph S. Stephens	MS	Mark S. Chitjian	BS	Thomas H.	MS
Reazuddin A.	R. Eric Strong	MS	Haris Christodoulou	MS	Buttgenbach	MS
Chaudhuri	Eric J. Swanson	MS	James M. Devitt	MS	Lutfur R. Khundkar	PhD
David A. Chin	James K. Wang	BS	Michael M. Dory	BS	Michael R. Lewis	MS
Robert M. Claudson	Michael R. Woolley	BS	Michael A. Fernandez	BS	Flavio Noca	BS
Mark B. Dolson	1981		Brian J. Fitzsimmons	PhD	Frederick J.	BS
Christopher L. Frenzen	Philippe G. Boira	MS	Koichi Goroh	MS	Nordby III	BS
Samy M. Hanna	Bret S. Burns	BS	Peter J. Grieve	BS	Mark Olmos	BS
Syed J. Husain	Thomas D. Burton	MS	Armen Hairapetian	MS		
Edward N. Keller	Constantine Chazapis	MS				
Bing H. Ko	Vanevic C. Daniel	MS				
Kristen M. Larson	Katfryn L. DeWitt	MS				
Moses L. Ma	Horace R. Drew III	PhD				
Amelia M. Maxted	Singaravatu Elangovan	MS				
Luis M.	Steven L. Gay	MS				
Medina-Vaillard	Daniel J. Jacob	MS				
Arthur I. Metz	Richard P. Keller	MS				
Lawrence I. Mortin	Robert P. Kreh	PhD				
James H. Mullany	Hin-Wing Kui	BS				
Tor E. Ostro	Luen-Hin Kwok	MS				
Siranush Papazian	Louis Lamarche	MS				
Charunya Phichitkul	Christopher Lamendola	MS				
Stephen P. Pope	James P. Landon	BS				
Jim D. Povlis	Tuan A. Le	MS				
Jack Powell	Derek S. Lillie	BS				
Kenji Shintani	Afshin Nassiri	MS				
Anthony Sneed	Said Rashedmarandy	BS				
Thomas P. Sterk	Paul N. Spathis	BS				

Alumni Fund picks chairmen

Regional, area, young alumni, and Special Gifts II chairmen with responsibility for contacting fellow Caltech graduates during the 1988-89 Alumni Fund year are announced below. They are:

Alumni Fund Chair/Special Gifts I Chair, George S. Holditch (BS '48); Special Gifts II Chair, Gordon McClure (BS '47); Reunion Chair, Kirk M. Dawson (BS '61 MS '62); Regional Chair, Ben G. Burke (BS '61 MS '62); Young Alumni Chair, Leslie A. Paxton-Rousseau (BS '79).

Region 01 Pasadena and Vicinity, David B. Ritchie (BS '80); Area 01-005 Alhambra/South Pasadena, Don E. McFaddin (BS '28); Area 01-010, San Marino, Ralph O. Kehle (BS '56 MS '57); Area 01-015, S. Central Pasadena, Andrew B. Campbell (BS '46); Area 01-020, East Pasadena, Stanley A. Butman (PHD '67); Area 01-025, NE Pasadena, James W. Edmundson (MS '47); Area 01-026 Arroyo, James J. Kosmicki (MS '71 ENG '73); Area 01-035 JPL, Robert E. Covey (BS '51 MS '52); Area 01-045 La Canada/Cres. Val., Roland C. Hawes (BS '30); Area 01-050 Arcadia, Robert F. Cline (MS '46); Area 01-055 Arcadia/Sierra Madre, Joseph B. Earl (BS '44).

Region 02 South Coast Counties, David B. McCarroll (BS '66); Area 02-060 Laguna Beach, Calvin E. Kempton (BS '46); Area 02-061 South Laguna Beach, Malcolm C. Morrison (BS '64 PHD '69); Area 02-065 Huntington Beach, Sanford S. Sweet (BS '51); Area 03--071 Anaheim-Orange, Terry R. Simpson (BS '65); Area 02-075 Newport Bch., Mark M. Morris (BS '81); Area 02-076 Irvine/El Toro, Seymour Lampert (MS '47 ENG '48 PHD '54); Area 02-080 Santa Ana, Paul W. Tuinenga (BS '77 MS '78); Area 02-086 Artesia/Westminster, John J. Kennedy (BS '61 MS '62); Area 02-090 Downey-Whittier, David B. McCarroll (BS '66); Area 02-095 Covina, Michael S. Stefanko (BS '70); Area 02-100 Pomona/Claremont, Donald Stewart (BS '47); Area 02-105 Desert, Michael J. Kaiserman (MS '70); Area 02-110 Riverside-San Bernardino, Frank A. Fleck (BS '42).

Region 03 Western Los Angeles, Reinaldo V. Guierrez (BS '54); Area 03-120 Aerospace, Paul Dergarabedian (PHD '52); Area 03-130 TRW, Mitchell H. Seidman (BS '58 MS '59); Area 03-135 Marina Del Rey, Donald P. Wilkinson (BS '48); Area 03-140 Santa Monica, Fred A. Blum (MS '64 PHD '68); Area 03-145, LA-Brentwood, Douglas G. Conley (BS '82).

Region 04 Central Coast Counties, Carl P. Constantin (BS '72 MS '73); Area 04-175 South San Fernando, William J. Williamson (BS '48 MS '49 ENG '55).

Region 05 San Francisco, Robert Talbot (BS '57); Area 05-210 Monterey/Santa Cruz, Robert L. Shacklett (PHD '56); Area 05-214 Los Gatos/Saratoga, Horacio A. Mendez (MS '64 PHD '74); Area 05-215 San Jose, Ronald G. Findlay (BS '64); Area 05-220 Santa Clara, Luther B. Perry (BS '68); Area 05-225 Los Altos, Robert W. De Grasse (BS '51); Area 05-230 Sunnyvale, Peter P. Tong (MS '81 PHD '85); Area 05-234 Mountain View, Alan M. Breakstone (BS '72); Area 05-235 Palo Alto, Talso C. Chui (BS '77); Area 05-245 Menlo Park, John H. McCoy (BS '64); Area 05-250 San Mateo, Donal B. Duncan (BS '45 PHD '51); Area 05-255 San Francisco, Peter O. Clark (MS '61 PHD '64).

Region 06 East Bay/N. Calif., Thomas J. Buckholtz (BS '67); Area 06-260 Marin County, Robert M. Sherwin (BS '43 MS '50 ENG '52); Area 06-261 Napa/North Coast, Rodney W. Supple (BS '55); Area 06-264 North Bay, Roderic B. Park (PHD '58); Area 06-265 Berkeley, Rollic J. Myers (BS '47 MS '48); Area 06-270 Oakland/Southeast Bay, David B. Sams (MS '80 PHD '86); Area 06-275 Contra-Costa, Norman Bulman (PHD '52); Area 06-280 Livermore, David C. Oakley (BS '50 MS '52 PHD '55); Area 06-286 Sierra, Tracy V. Petersen (BS '86); Area 06-286 Sierra, Clinton L. West (BS '57).

Region 07 Southwestern-Sun Belt, Clay T. Smith (BS '38 MS '40 PHD '43); Area 07-290 Rancho Santa Fe, Robert F. Sensibaugh (BS '46); Area 07-295 North San Diego, Orin H. Shoemaker (BS '34); Area 07-300 San Diego, William D. Squire (BS '50



MS '60 PHD '64); Area 07-305 La Jolla, James W. Posakony (BS '74 PHD '82); Area 07-310 South Bay/San Diego, Gary O. Fitzpatrick (BS '65); Area 07-315 Hawaii, Sheldon C. Crane (BS '40); Area 07-325 Tucson, Seymour E. Goodman (PHD '70); Area 07-330 Albuquerque, Thomas K. Bergstesser (BS '60); Area 07-335 Los Alamos, Klaus Lackner (EX '79).

Region 08 Northwest, Frederick W. Thiele (BS '41); Area 08-345 Non/Metro Oregon, John J. Deniston (BS '47); Area 08-348 Northwestern Washington, Frank A. Woodward (ENG '52); Area 08-349 Bellevue/Eastside, Rex B. Peters (BS '56 MS '63 ENG '69); Area 08-350 Seattle/Tacoma, Steven A. Shaiman (BS '72); Area 08-351 U. of Wash., Elbert E. Miller (BS '28); Area 08-352 Alaska, Tak Sing Lo (BS '73); Area 08-353 W. Canada, Richard W. Forester (MS '71 PHD '75); Area 08-355 Boeing, Ernest G. Janzen (BS '61); Area 08-360 E. Washington-N. Idaho, Frederick M. Mann (PHD '75); Area 08-365 Utah/Nevada, Forrest S. Allinder (BS '49 MS '50); Area 08-370 Boulder, Richard D. Hackathorn (BS '67); Area 08-375 Denver, William L. Rogers (BS '42); Area 08-380 South Colorado, Jacques G. Bourque (BS '68).

Region 09 South, Henry A. Corriher (MS '50); Area 09-385 Oklahoma/Arkansas, Leon W. Zelby (MS '57); Area 09-390 Dallas-Ft. Worth, William C. Swalley (BS '64); Area 09-395 Austin, Richard C. Montgomery (BS '59); Area 09-400 Houston, Richard Rosencranz (BS '38); Area 09-400 Houston, Ted S. Meyer (BS '82); Area 09-410 Louisiana, Albert Schweizer (PHD '74); Area 09-415 Tennessee/Alabama, John W. Wachter (MS '49); Area 09-420 North Florida, Scott H. Hochwald (BS '78); Area 09-421 South Florida, Tsung-Chow J. Su (MS '70 ENG '73); Area 09-425 Georgia/S. Carolina, Samuel A. Bradley (MS '69); Area 09-430 North Carolina, William V. Wright (BS '51 PHD '55).

Region 10 Midwest, Michael J. Otto (MS '80); Area 10-435 Missouri/South Illinois, Edwin A. Matzner (BS '51 BS '51); Area 10-440 Central Plains, Gregg F. Wright (BS '69); Area 10-445 Minnesota, George W. Beeler (MS '61 PHD '65); Area 10-450 Wisconsin, John S. Mathis (PHD '56); Area 10-455 North Chicago, Roger Brandt (BS '42); Area 10-460 South Chicago, Edwin B. Seidman (BS '55); Area 10-465 Champaign/Urbana, Kenneth S. Suslick (BS '74); Area 10-470 Indiana, Edward H. Simon (PHD '60); Area 10-472 West Michigan, Ernest R. Boller (MS '59); Area 10-475 East Michigan, Donald R. Petersen (PHD '55); Area 10-480 Cleveland, Stuart J. Meyer (BS '82); Area 10-485 Cincinnati, Lawrence A. Hunt (BS '69).

Region 11 D.C./Virginia, Raymond Cromley (BS '33); Area 11-495 Baltimore, David B. Shaffer (PHD '74); Area 11-500 Bethesda, Raymond Cromley (BS '33); Area 11-505 D.C./East Maryland, Robert S. Williams (BS '62); Area 11-507 Washington D.C., Stewart R. Davey (BS '67); Area 11-510 Northwest Virginia, William D. Harkins (ENG '54); Area 11-515 Northeast Virginia, David L. Turner (BS '71); Area 11-518 Government Agencies, Robert L. von Gerichten (ENG '54); Area 11-520 Southern VA/West VA, Brian Storrie (PHD '73); Area 11-525 Delaware, William M. Hardam (PHD '65).

Region 12 Mid-Atlantic, E. Ted Grinthal (PHD '69); Area 12-526 Philadelphia, Kevin J. Meaney (MS '78); Area 12-530 East Pennsylvania, Charles V. Goebel (BS '57); Area 12-533 West Pennsylvania, Jacobo Bielak (PHD '71); Area 12-533 West Pennsylvania, Cliff I. Davidson (MS '73 PHD '77); Area 12-535 Princeton, John Walden (MS '59); Area 12-540 Northern New Jersey, Alfred B. Brown (MS '47 PHD '50); Area 12-545 Central New Jersey, Dhiraj K. Sharma (MS '72 PHD '75); Area 12-548 East New Jersey, Nim-Kwan Cheung (MS '72 PHD '76); Area 12-550 New York City, Lance N. West (MS '83); Area 12-555 Long Island, Lim H. Cheung (BS '75);

Continued on page 13

ALUMNI

Washington, D.C. trip planned for spring

Join the Caltech Alumni Association and experience Washington, D. C. in a special five-day travel opportunity, April 30-May 5, 1989. The trip will be a blend of historical Washington, art, entertainment, and science and technology, with time on your own to explore the city.

Special tours will be scheduled at such institutions as the National Air and Space Museum, the Goddard Space Flight Center, the National Bureau of Standards, the National Institutes of Health, the U.S. Capitol, where one can see Congress in action, and the U. S. Naval Observatory, where the official time for the western hemisphere is kept by an atomic clock.

The group will visit the Paul E. Garber Preservation, Restoration, and Storage Facility, where spacecraft and aircraft earmarked for the National Air and Space Museum are stored and prepared for display. Col. James Miller, secretary of the board of the METRO Authority, will discuss the METRO, Washington's underground rail system, and take alumni on a tour of the excavation site for the METRO extension.

Local Caltech alumni will be invited to join the group for dinner on the waterfront and for a performance at the Kennedy Center. An evening of dining, entertainment, and dancing while cruising down the Potomac River will enhance the tour, as well as a tour of illuminated monuments.

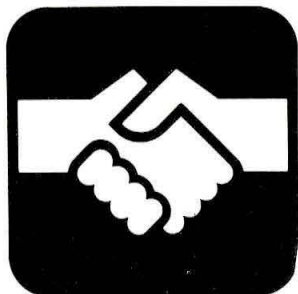
The group will assemble in Washington at Loew's L'Enfant Plaza Hotel on Sunday, April 30, 1989, and disperse on Friday morning, May 5, 1989. The cost is \$1,000 per person, double occupancy, and \$1,250, single occupancy. The price includes transportation, meals, lodging, reading materials, and tours.

Those who want to reserve a space should return the coupon below with a \$150 per person deposit to the Alumni Association, 1-97, Pasadena, California 91125. For additional information, contact Kathy Harris at the Alumni Association, 818/356-6593.

From the alumni president

The Alumni Association is off to a great start this year and I would like to tell you about the activities and projects of several of our committees and introduce their chairmen.

The Undergraduate Admissions Support Committee (UAS) organizes a network of alumni volunteers from around



the country who assist by representing Caltech at college nights and by talking to potential student applicants in their areas. The program now encompasses 150 volunteers, with a goal to increase the number to 400 by 1993. Through these volunteers, the committee has helped to increase Caltech's visibility among high schools and students, and to create a larger pool of qualified applicants to the Institute. The UAS Committee works under the guidance of the Caltech Admissions Office to accomplish their tasks.

Lynette Schneider, who has chaired the committee since she joined the Alumni Association Board in 1986, received her BS in biology in 1981 and currently works as a senior scientist for Beckman Instruments in Brea, California. Her decision to apply to Caltech was influenced by a talk she had with an alumnus, so her involvement with this committee is easy to understand. Under Schneider's direction, the committee has become an effective mechanism for successful high school recruiting and one of the most dynamic and successful Alumni Association programs. It involves alumni in all parts of the country and provides a valuable service to

the Institute. Schneider's committee has written and distributed a volunteer handbook, tripled the volunteer network from about 50 three years ago to 150 today, and improved communication with volunteers through newsletters, phone contacts, and training materials. If you are interested in participating as a volunteer in the program, please contact Karen Carlson, staff coordinator of the UAS program.

The Program Committee is responsible for planning social, cultural, and alumni travel programs for Caltech alumni. This year the committee is co-chaired by Bill Pence (BS '65, MS '67), and Don Wilkinson (BS '48). Pence, senior vice president, marketing and sales, for Local Data in Torrance, has served on the Alumni Association Board since 1986. Wilkinson, past president of the Alumni Association (1985-86), is retired from Hughes Aircraft Corporation in Redondo Beach.



Alumni travel programs featuring Caltech faculty and alumni trip leaders are always popular, and several upcoming trips still have openings. The Washington, D.C., trip in late spring of 1989 has a related article and registration information in the alumni section of this issue. For information on the Antarctica trip in February 1989, please contact the Alumni Association. The committee is also investigating future travel programs to San Francisco, North Carolina, and Yellowstone National Park.

Other events planned by the Program Committee include a very special event

next year—an opportunity to see "The Phantom of the Opera" in Los Angeles. The 2 p.m. matinee on Sunday, October 8, 1989, will be followed by dinner and a chance to meet socially and



Charles H. Holland, Jr.

discuss the play. Tickets for the event will be \$50 per person plus the cost for dinner. We have reserved outstanding seats for this performance and look forward to a delightful event. Although the total cost of the program has not yet been determined, tentative reservations may now be made through the Alumni Association.

In addition to programs managed by the Association, alumni chapters are active around the country. On September 25, over fifty San Diego area alumni and guests enjoyed an informative, educational tour of Palomar Observatory. Seattle and Portland alumni are each holding events in early December featuring reports on the SURF (Summer Undergraduate Research Fellowship) program at Caltech.

Victor Veysey (BS '36) is chairman of the Chapter Affairs Committee, a position he has held for two years. Veysey, director emeritus of Caltech's Industrial Relations Center and a former U.S. Congressman, has steered the Association's efforts over the last two years to revitalize and expand Caltech's chapter program.

The Chapter Affairs Committee hopes to expand into cities where there are significant concentrations of alumni. They will be sending exploratory questionnaires to alumni in Orange County, Houston, Denver, Chicago, and Santa Fe/Albuquerque to assess the feasibility of forming chapters in those areas.

We appreciate feedback from alumni concerning any Association issue, comment, or query. Please contact us by mail or phone:

CALTECH ALUMNI ASSOCIATION
MAIL CODE 1-97
PASADENA, CA 91125
818/356-6592

CALTECH ALUMNI ASSOCIATION WASHINGTON, D.C. TRIP, April 30 - May 5, 1989

Please make _____ reservations for the alumni trip to Washington, D.C.
Enclosed is my deposit check for \$_____ (\$150 per person) made payable to
Caltech Alumni Association.

Name(s) _____ Class Year _____

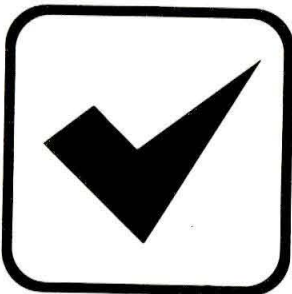
Address _____

Phone _____

Return to: CALTECH ALUMNI ASSOCIATION
Mail Code 1-97
Pasadena, CA 91125



ALUMNI ACTIVITIES



Dec. 2 *Seattle chapter meeting* at Tri-
ples on Lake Union, featuring Caltech's
SURF (Summer Undergraduate
Research Fellowships) program.

Portland chapter meeting, featuring
Caltech's SURF Program.

Jan. 2 *Rose Parade viewing*, Alumni
Association and The Associates. Regis-
tration information has been mailed to
Alumni Association members in Califor-
nia, Arizona, and Nevada.

Feb. 9-24 *Antarctica travel program*,
co-sponsored by the Caltech and Har-
vard Alumni Associations. Barclay
Kamb, vice president and provost, and
professor of geology and geophysics, will
accompany the trip.

April 30-May 5 *Washington, D.C.*
alumni travel program. See related arti-
cle in this section.

May 5 *Reunion, class of 1979*, in the
Athenaeum.

May 6 *Reunions, classes of 1944 and*
1954, in the Athenaeum.

May 19 *Reunion, class of 1964*, in the
Athenaeum.

May 20 *52nd Annual Seminar Day*,
on the campus.

June 3-4 *Reunion, class of 1939*.

June 3 *Half Century Club luncheon*, in
the Athenaeum.

June 22 *Alumni Association annual*
meeting and honorary alumni dinner, in
the Athenaeum.

June 23-July 2 *Alaska alumni*
travel program, with Robert P. Sharp,
the Sharp Professor for Geology, Emer-
itus, and Leon T. Silver, the W. M.
Keck Foundation Professor of Resource
Geology.

Oct. 8 *"The Phantom of the Opera,"*
Ahmanson Theatre. See related
information in the president's column.

For more information about any of the
programs, please contact the Caltech
Alumni Association, Caltech 1-97,
Pasadena, California, 91125,
818/356-6592.



Holland entertains board, past presidents

Charles H. Holland, Jr., president of
the Alumni Association, and Mrs. Hol-
land, entertained new alumni board
members and past alumni presidents in
September at a tropical dinner at the
Holland home. President Thomas E.
Everhart and Mrs. Everhart and Theo-
dore P. Hurwitz, vice president for
Institute relations, and Mrs. Hurwitz,
were among the guests, as was Judith
Amis, executive director of the Alumni
Association. Approximately 45 people
attended the gala event.



Chairmen

Continued from page 11

Area 12-560 Southeastern New York, Frank R. John-
son (BS '69); Area 12-565 West New York, Scott
W. Jennings (BS '69); Area 12-570 Central New
York, Robert B. Kjelgaard (BS '77).
Region 13 New England, Robert N. Hall (BS '42
PHD '48); Gary R. Tanigawa (BS '83); Area 13-575
East New York, Clifford Spiro (PHD '81); Area 13-
580 Connecticut, Bernard M. Malofsky (BS '59); Area
13-582 Mass./R.I. Daniela M. Bonafede (BS '84);
Area 13-585 Framingham, Fan-Chia Tao (BS '81);
Area 13-590 Cambridge, Gary R. Tanigawa (BS '83);
Area 13-595 Boston, Alma G. Sorensen (BS '84);
Area 13-600 Upper New England, Paul A. Sand (BS
'73); Area 13-610 East Canada, Donald L. Strange
(PHD '72); Area 13-610 East Canada, Rex V. Gib-
bons (PHD '74).
Region 14 International; Area 14-700 Europe,
Everett W. Van Ness (BS '42).
Fleming House Chair, Cheryl J. Robertson (BS
'83); Fleming '86 Class Chair, Karl R. Clauser (BS
'86).
Dabney House Chair, Joel A. Seely (BS '86).
Ruddock House Chair, Michele C. Walters (BS
'85). Ruddock '83 Class Chair, Michael J. Mettelle
(BS '83); Ruddock '85 Class Chair, Margaret C. Olich
(BS '85); Ruddock '80 Class Chair, Leslie A. Berwick
(BS '80); Ruddock '81 Class Chair, Richard B.
Holmes (BS '81).
Page House Chair, Warren G. Goda (BS '86);
Page '80 Class Chair, Edward M. Chan (BS '80);
Page '81 Class Chair, Mark S. Sheldon (BS '81); Page
'82 Class Chair, '83, Eric J. Korevaar (BS '81); Page
'86 Class Chair, Supriya Ghosh (BS '86); Page '87
Class Chair, Stephen D. Hsu (BS '86).
Lloyd House Chair, Yosufi M. Tyebkhan (BS '86);
Lloyd '85 Class Chair, Christine L. Tiller (BS '85);
Lloyd '86 Class Chair, Michael L. Takayama (BS '86).
Ricketts House Chair, Stanley D. Kuo (BS '85);
Ricketts '87 Class Chair, William A. Craven (BS '87);
Ricketts '80 Class Chair, John R. Stabler (BS '80).
Reunion Chair '79, Bruce R. Hancock (BS '79);
Reunion Chair '64, David Holtz (BS '64); Reunion
Chair '55, Ray L. Newburn (BS '54 MS '55); Reun-
ion Chair '44, Allen E. Wolfe (BS '44); Reunion
Chair '39, Perry H. Brown (BS '39).
Special Gifts II, Richard R. Schmid (BS '55); Hans
D. Linhardt (ENG '60); Stuart A. Krieger (BS '40);
Elliott A. Green (BS '42); Erik P. Debenedictis (BS
'78 PHD '83); Richard L. Ridgway (BS '37); Chan-
dos A. Rypinski (BS '48); Robert T. Herzog (BS '56
MS '63 ENG '64); Kenneth W. Johnson (BS '43);
James W. Schilling (PHD '81); Earl D. Jacobs (BS
'53 MS '54 PHD '61); Bruce A. Worcester (BS '48);
James H. Crabtree (BS '65); James W. Workman (BS
'57 MS '58); John F. McClain (BS '42); Boude C.
Moore (BS '48 MS '49); Clayton H. Englar (BS '49);
Lewis L. Grimm (BS '44); Theodore G. Johnson (BS
'57); Justin L. Bloom (BS '48); Harry J. Moore (BS
'48); Fred W. Morris (BS '44); Richard W. Seed (BS
'44); Jack B. Sturgess (BS '30); Harrison W. Sigworth
(BS '44); Neville S. Long (BS '44 MS '48); Elvin B.
Lien (BS '34); Richard L. Van Kirk (BS '58).

ALUMNI ASSOCIATION FINANCIAL STATEMENTS

ALUMNI ASSOCIATION
CALIFORNIA INSTITUTE OF TECHNOLOGY
Pasadena, California

BALANCE SHEET
June 30, 1988

ASSETS	
Cash on Hand and in Bank	\$ 1,585
Investments:	
C.I.T. Consolidated Portfolio	1,194,628
Money Market Funds	135,890
Investment Income Receivable	16,000
Other Receivables	1,816
Deferred Program Expenses	7,018
Postage Deposit and Other Deferred Expenses	5,569
Computer Equipment	3,339
TOTAL ASSETS	\$1,365,845

LIABILITIES, RESERVES AND SURPLUS	
Accounts Payable	\$ 43,399
Deferred Income:	
Annual Membership Dues Paid in Advance	485
Investment Income from C.I.T. Consolidated Portfolio	48,000
Program Income	6,250
Life Membership Reserve	1,195,953
Reserve for Directory	7,195
Reserve for Legends II	4,574
Reserve for Equipment Purchases	1,661
Surplus	58,328
TOTAL LIABILITIES, RESERVES AND SURPLUS	\$1,365,845

STATEMENT OF INCOME, EXPENSES AND SURPLUS For the Year Ended June 30, 1988

INCOME	
Dues of Annual Members	\$ 70,235
Investment Income:	
C.I.T. Consolidated Portfolio	68,941
Money Market Funds	7,647
Net Income of Programs	8,787
Net Income from Publication of <i>Legends of Caltech</i>	3,090
Other	3,241
TOTAL INCOME	\$161,941

EXPENSES	
Publications	\$ 18,234
Net Expenses of Annual Seminar	645
Net Expenses of Class Reunions	4,083
Net Expenses of Chapter Meetings	1,926
Student Support and Educational Programs	15,962
Undergraduate Admission Support	5,288
Administration	49,592
Publication Development	8,500
Membership	7,001
Allocation for Directory	11,000
Allocation for Legends II	5,000
TOTAL EXPENSES	\$127,231
INCOME IN EXCESS OF EXPENSES	\$ 34,710
Surplus, June 30, 1987	23,618
Surplus, June 30, 1988	\$ 58,328

AUDITOR'S REPORT

Board of Directors
Alumni Association
California Institute of Technology

I have examined the Balance Sheet of the Alumni Association, California Institute of Technology as of June 30, 1988,
and the related Statement of Income, Expenses and Surplus for the year then ended. My examination was made in
accordance with generally accepted auditing standards, and accordingly included such tests of the accounting records and
such other auditing procedures as I considered necessary in the circumstances.

In my opinion, the financial statements referred to above present fairly the financial position of the Alumni
Association, California Institute of Technology at June 30, 1988, and the results of its operations for the year then ended,
in conformity with generally accepted accounting principles applied on a basis consistent with that of the preceding year.

Calvin A. Ames
Certified Public Accountant

October 27, 1988

OBITUARIES

1915

EARLE A. BURT, of Pasadena, California, on October 27. After graduation, he joined the Los Angeles County Road Department, where he worked with mule teams. He was appointed County Road Commissioner after 36 years of service. During his professional life, he was an active member of the Caltech Alumni Association and the American Society of Civil Engineers. He is survived by his sons, Arthur and Gene; daughters-in-law, Alice and Shirley; grandchildren, Lawrence Burt, Janalee Ballantyne, and Christopher Burt; and great-grandchildren, Kristana and Sarabeth Burt, and Amy and Leanna Ballantyne.

1917

JOSEPH A. BEATTIE, of El Segundo, California. According to his widow, Isabell, he passed away three years ago.

1921

ALBERT L. RAYMOND, MS '23, PhD '25, of Northfield, Illinois, on July 17. After graduating from Caltech, he took a job with the Rockefeller Institute for Medical Research. In 1936, he began working for G. D. Searle & Co. in Chicago, retiring as senior vice president, director of research and development in 1966. He then became a consultant. A Life Member of Caltech's Alumni Association, he is survived by his wife.

1924

HUGH B. FREEMAN, of Citrus Heights, California, on December 9, 1987.

HAROLD F. POPE, of West Covina, California, on June 18, 1986. He is survived by his wife, Wanda.

1926

CARL T. CHASE, MS, of Strafford, Pennsylvania, on November 2, 1987. Born in Lewiston, Maine, in 1904, he graduated Phi Beta Kappa from Princeton in 1924. After receiving his MS from Caltech in 1926, he went on to N.Y.U., where he earned his Ph.D. He stayed on at N.Y.U., serving many years as an associate professor. During World War II, he worked in the radar school at M.I.T. His next career move took him to Philadelphia, where he became director of the Franklin Institute Laboratories for Research and Development. Dr. Chase was the author of two books, *Frontiers of Science* and *The Evolution of Modern Physics*. After leaving the Franklin Institute, he taught at Villanova University, until his retirement at age 70. He is survived by his wife, Margaret; son, Richard; granddaughter, Kristen; and sister, Mary Parshall.

1927

CARROLL O. NORDQUIST, of Los Angeles, California, in March of 1985. He is survived by his daughter, Elizabeth.

1928

LUTHER J. EASTMAN, of Sacramento, California, on September 3, 1987. He is survived by his wife, Zelda.

1929

GEORGE F. WEISMANN, of La Mesa, California, on April 17. He is survived by his four sons.

1930

KENNETH L. MILES, of Pacific Grove, California, on September 26, of Alzheimer's disease. A Life Member of the Institute's Alumni Association, he is survived by his wife, Kay.

1931

DE WOLFE MURDOCK, of Highland, California, on October 13, 1987, of a heart attack while vacationing in Churchill, Manitoba, Canada. He is survived by his wife, Marge.

1932

ERIC J. MILES, MS, of Staunton, Virginia, on April 8. He is survived by his wife.

1933

ROBERT C. BARTON, PhD, of Anacortes, Washington, on October 6, 1987. A Life Member of Caltech's Alumni Association, he is survived by his wife.

WILLIAM M. PICKLES, JR., MS, of Danville, California, on May 16, after a long battle with cancer. He was retired from Schlumberger Well Services in Houston, Texas. He is survived by his wife; two sons; grandsons and nephews.

NIKOLAS SKAREDOFF, MS '34, of Port Washington, New York, on May 13, 1985. He is survived by his wife, Eudmia.

1934

DENNIS A. NEWCOMBE, of Los Angeles, California, on June 23. He was a Life Member of the Institute's Alumni Association.

1935

DONALD H. RICKETTS, MS, of Arlington, Texas, on February 14. A Life Member of Caltech's Alumni Association, he worked for American Airlines, retiring in 1971. He is survived by his wife, Marie.

1936

CHARLES W. BEST, MS '37, of Eugene, Oregon, on August 27. A Life Member of the Institute's Alumni Association, he is survived by his wife, Josephine.

ALBERT CREAL, of Virginia Beach, Virginia, on July 23. He is survived by his daughter, Victoria Creal Buckley.

CHAUNCEY W. WATT, JR., of Concord, Massachusetts, on September 6. After graduating from Caltech, he worked as an engineer for various firms in Massachusetts and on the Whirlwind I computer at M.I.T. He retired in 1980 from the U.S. Department of Transportation in Cambridge. He was also active in volunteer work. He is survived by his wife, Helen Theresa; daughters, Katherine Lee and Mirella Contant; and granddaughter, Kimberly Contant.

1937

WILLIAM J. ELLISON, JR., MS, of Fremont, California, in 1988. His career had included 12 years in the Army Corps of Engineers.

1938

MORRIS GERSHZOHN, MS, of Los Angeles, California, on July 29, after a long illness. He is survived by his wife.

LUIS H. TEJADA-FLORES, MS '43, PhD '48, of Pasadena, California, on September 3. He is survived by his wife, Olive; and daughter, Antonia. He had been a senior systems analyst with Systems Development Corporation in Santa Monica.

1940

WILLIAM T. KLUGE, of Dana Point, California, on January 31. A Life Member of Caltech's Alumni Association, he is survived by his wife, Virginia. He had retired as manager of Space Shuttle Quality for Rockwell International.

ERNST C. REDEMANN, PhD, of Monterey Park, California, on September 6, of complications following brain surgery to relieve a subdural hematoma. Formerly the research coordinator for the Purex Corporation, he is survived by his two brothers, Wythe, of Santa Ana, California; and Carl, of Walnut Creek, California.

1941

WOODBURN A. BROWN, of Anacortes, Washington, on May 8. He is survived by his wife, Louise.

EDWARD E. SHELTON, MS, of Setauket, New York, in October of 1986. He is survived by his wife, Edna. He had been an electrical engineer.

1943

DAVID M. MASON, MS '47, PhD '49, of Los Altos, California, on August 10. Active for more than 40 years in teaching, administration, and research, he contributed to advances in fuel cells, photochemical reactors, and liquid rocket fuels, as well as the study of corrosion in rockets and nuclear reactors. His work resulted in two U.S. patents and more than 80 technical papers. He taught at Caltech until 1952, then spent three years as head of the Applied Chemical Group at JPL. Mason's long career at Stanford began in 1955 when he accepted a position as associate professor in the chemistry department's division of chemical engineering (later becoming its chairman), and culminated with his retirement in 1986 as professor emeritus of chemical engineering and chemistry. His numerous awards and honors included Caltech's Alumni Distinguished Service Award, which he received in 1966, and the 1984 Founder's Award of the American Institute of Chemical Engineers, of which he was a fellow. In 1975, Stanford established an endowed lectureship in his name. He is survived by his wife, Honora; and his mother, Mrs. David Mason.

WILLIAM SNYDER, MS '46, of Palo Alto, California, on July 9. A Life Member of the Institute's Alumni Association, he is survived by his sister, Elizabeth Rees. A memorial fund in his name has been established at Caltech. Those wishing to contribute should write to: The William Snyder Memorial Fund, Caltech, 1201 East California Boulevard, 105-40, Pasadena, California 91125.

1944

JAY C. WAYNE, MS, of Westlake Village, California, on October 26, 1987. He is survived by his wife, Alexa.

1947

JERRY DONOHUE, PhD, of La Jolla, California, in 1985. He had served as professor of chemistry at the University of Pennsylvania and as chairman of USC's chemistry department. He is survived by his wife, Patricia.

WILLIAM G. HAMMERLE, of Rochester, Michigan, in July of 1986. He is survived by his wife, Mildred.

ANDREW W. McCOURT, MS, of Severna Park, Maryland, on December 17, 1986. A Life Member of Caltech's Alumni Association, he is survived by his wife, Lexie Jean.

1949

RICHARD A. BEVERNICK, Eng, of Excelsior, Minnesota, in November of 1986. He is survived by his wife, Virginia. He had retired as a captain from the U.S. Navy.

ARMIN J. HILL, MS, PhD '50, of Provo, Utah, in May. He had been dean emeritus at Brigham Young University. He is survived by his wife.

1950

MAX S. KRESTON, of Redlands, California, on September 12, of an aneurysm. He worked as manager of project development for the San Bernardino office of Metcalf & Eddy, Inc. Kreston's ongoing involvement with Caltech included presidency of the Gnomes; membership in the Alumni Association, including a term on its board of directors; and service as an area chairman for the Alumni Fund. He is survived by his wife, Jean.

1951

CARL O. HOLMQUIST, Eng, PhD '53, of La Jolla, California, on October 3. A retired Navy Rear Admiral, he had participated in development of Navy jet fighters and closed his career as chief of Naval Research. In 1943, he graduated from the Naval Academy, and went on to receive the Navy Commendation Medal for destroyer and fighter squadron duty. He served as chief of Naval Research during the last three years of his Navy career and received the Legion of Merit Award. Retiring after 34 years in the Navy, he settled in La Jolla in 1973, where he became involved in community and county organizations. He served on the county Grand Jury in 1982 and 1983 and was a member of the San Diego Kiwanis Club and the La Jolla Country Club. He is survived by his wife, Lavinia; daughter, Kristen Gilbert; sons, Kurt and Gunnar; sister, Mary Butler; and six grandchildren.

JACK M. SWEETMAN, of Monrovia, California, on April 23. He is survived by his mother, Vera.

1952

GILBERT E. STEGALL, MS, of Dallas, Texas, on April 2, 1986. He is survived by his wife, Virginia.

CHESTER W. WEGER, MS, of Pasadena, California, on January 8, 1987. He is survived by his wife, Anna; children, John, Lark, James, and Nancy; two grandchildren; and his aunt, Catherine Abbeloos, of Phoenix, Arizona.

1953

DONALD C. CURRAN, Eng, of Claremont, California, on December 26, 1986. He had been a professor of aerospace engineering at California State Polytechnic University at Pomona. He was a Life Member of the Institute's Alumni Association.

1954

JAMES C. COLLINS, JR., of Hayward, California, on May 29. He was president of Drachma Inc. A Life Member of Caltech's Alumni Association, he is survived by his wife.

JAMES C. TOWNSEND, of Laguna Niguel, California, on March 31. He had been a radiologist at the Veteran's Administration Hospital in Long Beach. A Life Member of the Institute's Alumni Association, he is survived by his son, Scott.

1955

DAVID L. CROWTHER, of Cupertino, California, in October of 1987. He had been a research scientist with Lockheed.

WALTER F. EICHWALD, MS, of Chula Vista, California, on September 4, 1987, of a heart attack. At one time he had been assistant section manager of the flight operations section at JPL.

1956

WILLIAM A. STEYERT, JR., MS, PhD '60, of Los Alamos, New Mexico, on May 2. He had been a staff member of the Los Alamos Scientific Laboratory. He is survived by his wife, Lila.

1957

WALTER L. RAVICZ, Ex, of San Rafael, California, on October 4. A Life Member of Caltech's Alumni Association, he is survived by his brother, Arthur.

1958

LOUIS B. MONTOYA, of Abcoude, Netherlands, on July 18. He had served for a time as account executive for E.F. Hutton International in Madrid, Spain. He is survived by his wife, Sally.

ALEX SHUMKA, MS, PhD '64, of La Canada, California, on December 31, 1987. He had been a member of the technical staff at JPL. He is survived by his wife, Elizabeth.

R. HUGH TAYLOR, JR., MS, Eng '61, of San Francisco, California, on April 13.

1959

DONALD W. RICE, MS, of Ocean, New Jersey, on October 13, 1987, in an automobile accident. He had worked as an engineering supervisor for AT&T Bell Labs Information Systems Division in Middletown, New Jersey. He is survived by his wife, Marie.

1961

DANIEL K. Y. AI, PhD, of New Kensington, Pennsylvania, on September 4, of cancer. After receiving his PhD, he stayed on at Caltech as a research fellow until 1965. He then became a member of the technical staff of TRW Systems until 1967, when he became president of the Geophysical Technology Corporation in Pasadena, a position he held until 1970. In 1970, he became professor of aerospace engineering at Washington University in St. Louis, and in 1972 he became the Alcoa Professor of Mechanical and Aerospace Engineering at the University of Missouri at Rolla. In 1974, he moved to Upper Burrell. Since then, he had been a technical consultant at Alcoa Laboratories of New Kensington. Dr. Ai was a co-founder of the Organization of Chinese Americans. He is survived by his wife, Fiore Belle Wang Ai; and his brother, Thomas K. Y. Ai.

1962

A. WERNER PREUKSCHAT, Eng, of Noordwijk, Netherlands, on April 11, 1983, of a heart attack. A Life Member of the Institute's Alumni Association, he is survived by his wife and daughters. He worked for the European Space Research Organization.

1970

DANIEL H. OLSSON, of Chula Vista, California, on November 3, 1987. He had worked as a manager in the design engineering department of the Rohr Corporation, located in Chula Vista. He is survived by his wife, Doreen.

1973

DAVID H. WHITE, PhD, of Santa Clara, California, on September 25, 1987. He had served as an associate professor of chemistry at the University of Santa Clara in Santa Clara, California. He was a Life Member of the Institute's Alumni Association.

1976

FREDRICK J. ZEIGLER, of Albuquerque, New Mexico, in the spring of 1988. He had worked for Sandia National Labs, also of Albuquerque. He is survived by his two sons, Alex and Max.

PERSONALS

1945

DUANE McRUER, MS '48, president of Systems Technology, Inc., in Hawthorne, California, has been elected to the National Academy of Engineering "for pioneering application of guidance and control theory and to experimental man-machine interactions."

1949

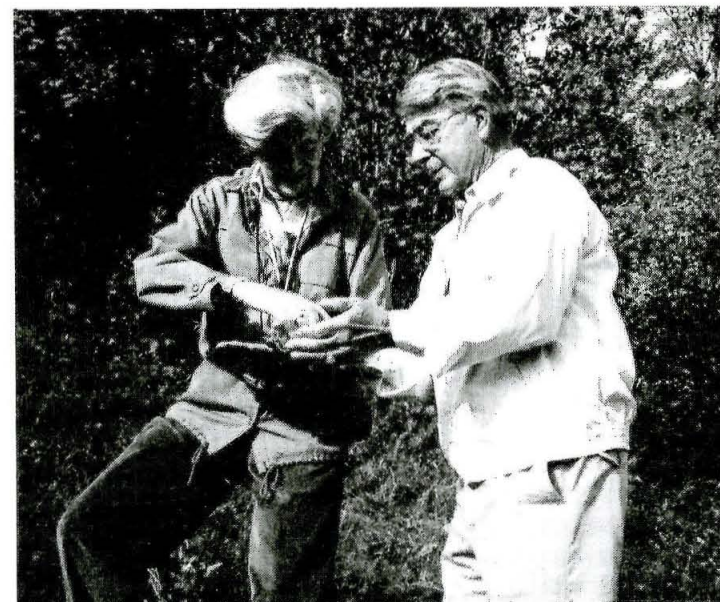
BERNARD D. RUDIN has been appointed program manager of the Application Technology Center in the IBM Center for Numerically Intensive Computing in Kingston, New York. He is responsible for the enablement of strategic applications for IBM's technical computing products and for development of strategic end-user application products. Rudin has been with IBM since 1966.

1953

THOMAS F. TALBOT, MS, writes, "I am presently serving as professor and chairman, Department of Mechanical Engineering, University of Alabama at Birmingham. I have been on the faculty of UAB since 1967. In June of this year, the Alabama Society of Professional Engineers named me the Professional Engineering Educator Engineer of the Year for 1988. I have also served as a member of the State Board of Registration for Professional Engineers and Land Surveyors since April 1985, and served one term as secretary and one term as chairman. In September 1985, I retired from the Air Force Reserve with the rank of brigadier general. My last reserve assignment was mobilization assistant to the commander, Eglin Air Force Base, Florida, from October 1977 through September 1985."

1960

THOMAS K. BJORKLUND reports that he lectured on petroleum geology in Beijing, China, last summer as the guest of the Ministry of Petroleum Industry. He continues to study Chinese and hopes to work again in China. Bjorklund was recently appointed chief geologist for Amoco Trinidad Oil Company and plans to move to Port-of-Spain, Trinidad, in December 1988.



Mary and Jesse B. Graner (BS '43) examine fossils found in the rocks off the Nose of the Skithchewaung Nappe, near Hanover, New Hampshire, on the alumni trip to New England.

HOWARD WEISBERG has accepted a position as a senior physical scientist at the RAND Corporation in Santa Monica, California, and is living in Pacific Palisades. He was previously employed by R&D Associates in Los Angeles, Brookhaven National Laboratory on Long Island, New York, and the University of Pennsylvania in Philadelphia.

1962

GARLAND R. MARSHALL, JR., professor of pharmacology and biological chemistry at Washington University School of Medicine in St. Louis, is the 1988 recipient of the American Chemical Society Award in Medicinal Chemistry. Marshall was recognized for his contributions to the field of computer-aided drug design. He pioneered the development of computer programs that graphically display models of receptors, which are the targets for drugs, and thus streamline the process researchers use to design drugs.

1965

VIRGINIA L. TRIMBLE, MS, PhD '68, has been elected chairman of the Astronomy Section of the American Association for the Advancement of Science for the year 1988-89. She has also recently taken over the coordinating editorship of the journal *Comments on Astrophysics*.

1966

JOHN D. DITMARS, MS, PhD '71, has joined Roy F. Weston, Inc., in West Chester, Pennsylvania, as a project director. He will be responsible for a systems approach for solving environmental management problems for private, industrial, and government clients. Prior to joining Weston, Ditmars managed the engineering geoscience group in the Energy and Environmental Systems Division at the Argonne National Laboratory.

1969

C. B. CROUSE, MS, PhD '74, has joined the Seattle, Washington, office of Dames & Moore, engineering and environmental consultants, as an associate. Specializing in earthquake engineering, seismology, and soil and structural dynamics, Crouse manages a variety of government and private industry projects.

1970

ELDON B. PRIESTLEY, PhD, has been named manager of the Exxon Research and Development Laboratories in Baton Rouge, Louisiana. Previously he was laboratory director of Petroleum Process Development.

1972

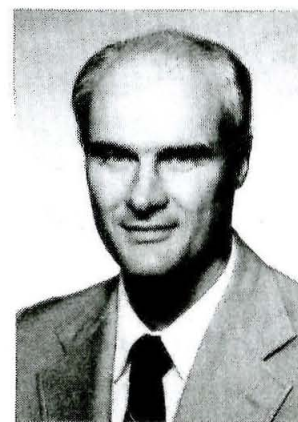
CHRISTOPHER DIAMANTOUKOS, director and associate actuary with CIGNA Corporation, P & C Group, Philadelphia, has been named a Fellow of the Casualty Actuarial Society. Fellowship is awarded after successful completion of ten comprehensive mathematical, statistical, and insurance examinations, sponsored by the Society.

JEFFREY KARL OCHSNER, Ex, has recently joined the faculty of the College of Architecture and Urban Planning at the University of Washington in Seattle. He received a joint appointment from the Department of Architecture and the Department of Urban Design and Planning and will be teaching in the areas of urban design, architectural history, theory and practice.

1974

ROBERT E. JOHNSON, MS, PhD '77, professor of theoretical and applied mechanics at the University of Illinois at Urbana-Champaign, was one of the recipients of the 1988 Bureau Prizes at the International Union of Theoretical and Applied Mechanics Congress in Grenoble. The Bureau Prizes were awarded for outstanding presentations by younger participants. Johnson spoke on "Coating Flows in Rotational Molding."

JIM PETERSON has been appointed director of composition development at Datalogics Inc. in Chicago, Illinois. In this newly created position, he will be responsible for all composition software development at Datalogics. This includes the development of custom programmed systems for yearbook and magazine layout, the Datalogics PAGER batch pagination software, and the graphics database and conversion software product line.



C. B. Crouse

1981

JOHN F. FILL writes from Tempe, Arizona, "I'm enjoying my new job as an over-the-road truck driver for Swift Transportation. Don't be surprised if you see my truck around campus. I try to stop by when I get a load into the L.A. area."

1983

DEBORAH R. HART, PhD, has been named assistant professor of mathematics at Knox College in Galesburg, Illinois.

1984

THOMAS E. HEER has received the degree of Doctor of Medicine from UCLA. He is a member of the Alpha Omega Alpha Honor Medical Society. Heer is now at USC as an intern in orthopedic surgery.

1986

DAVID K. ROLLINS, PhD, and his wife, Zenaida, moved to Orlando, Florida, in August, where he has taken a new position as assistant professor of mathematics at the University of Central Florida.

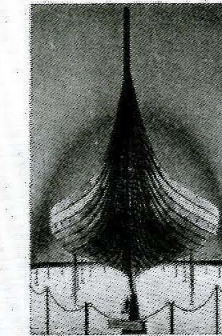
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Eleanor Searle describes the process that made the Normans a mighty power.

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Professor David Smith teaches about initiation, and some alumni may draw a parallel.

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Inner-city kids have a better chance in this school founded by a Caltech alumnus.

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A Caltech professor is keeping his commitment to bringing ice skating to the community.

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