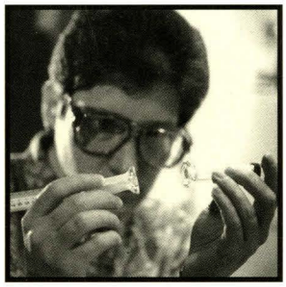
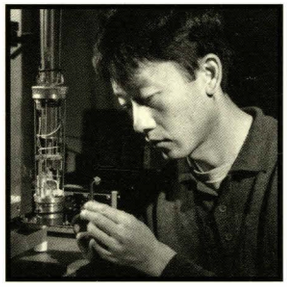
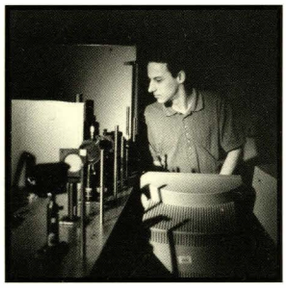
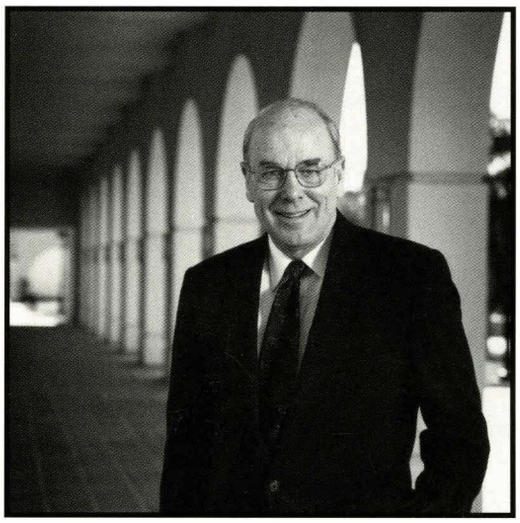
California Institute of Technology

ANNUAL REPORT 1995-96

The Everhart Decade



Thomas E. Everhart

It is with mixed emotions that I write my final letter for a Caltech annual report. Last spring I announced my intention to step down from the presidency on or after September 1, 1997, by which time I will have held office for 10 years. During that decade, we have added excellent people to the trustees, the faculty, and the staff. We will have graduated almost 5,000 new alumni, about 27 percent of our current living alumni. We have also lost outstanding members of the Caltech community—Lee DuBridge and Richard Feynman, to name but two of many. While leading the Institute has been both challenging and rewarding, I feel it is time for a change. Institutions and individuals alike need periodic renewal—new ideas, new vigor, and possibly new directions. An excellent faculty presidential search committee and trustee selection committee have spent the past year searching for a person well qualified to guide Caltech through its next phase of development.

challenges and rewards

It has been both a privilege and an honor to be president of Caltech. The Institute is more dedicated to quality than any other university I know. Because of its small size, it can and does value individuals. Despite its small size, it dares to take on projects of immense complexity and innovation. Its research style, which both focuses on a few, carefully chosen scientific fields and promotes extensive

cross-disciplinary investigation, is also unusual. Because it is such a singular place, even an experienced administrator may feel somewhat unprepared to stand at Caltech's helm, as I discovered when I first arrived. My response was to try to be both a steward—preserving the successful traditions and strategies of the past—and a builder, modifying and adding policies as needed to guide the Institute toward an equally successful future. I also hoped to use the influence of the office not to dictate how people should accomplish tasks, but rather to bring them together for mutual problem solving.

It has been an exhilarating, and sometimes formidable, job. During my tenure, I have been fortunate to be able to support and encourage some of the boldest undertakings in Caltech's history. When the Keck telescopes—each of which comprises an array of 36 hexagonal mirrors—were first conceived, it was widely believed that they would be impossible to build; they are still the only such telescopes in operation. By making the "impossible" work, Caltech and the University of California assumed world leadership in the field of astronomical observation. The Laser Interferometer Gravitational-Wave Observatory (LIGO) is another cutting-edge project. When the two LIGO sites become operational, the information about gravitational waves they yield may radically alter our understanding of the universe. Yet a third example of research innovation is the Computation and Neural Systems Program, which has combined investigations in computer science, electrical engineering, physics, and neurobiology in an unprecedented way. Of course, much pioneering research has also been accomplished by individuals and small groups.

making the "impossible" work

While its research programs are undeniably important, an institution is only as great as its people. As president, I have been fortunate to get to know and work with the excellent people who make up the Caltech community. The Board of Trustees, chaired by two outstanding Caltech alumni, Ruben Mettler (1985–1993)

and Gordon Moore (1994–present), has shown consistent dedication to supporting the Institute's mission. I have also benefited greatly from the counsel of two chairmen emeriti, Arnold Beckman and Stan Avery. Without the invaluable involvement of these and many other individuals, Caltech would not have been able to develop in the many positive ways it has over the past decade.

Institute faculty—some of the brightest, hardest-working people I have ever met—have also been stimulating colleagues, whether we are discussing their latest research projects over lunch at the Athenaeum or debating policy at faculty meetings. Dinners and other events at the president's residence, for trustees, faculty, students, alumni, and the Associates, have helped me both to broaden my own acquaintance and to bring together people from different parts of the campus community. Anniversary symposia and memorial programs have provided still other opportunities to learn more about the careers of distinguished senior professors. In a variety of settings, I have been impressed by faculty members' readiness to acknowledge the contributions of graduate students and other collaborators to their research. I discovered long ago that great things can be accomplished if one isn't concerned with who gets credit for them; I have repeatedly watched Caltech faculty demonstrate, and Caltech benefit from, that principle.

Caltech students arguably are the best in the country. Before starting classes, they attend frosh camp on Catalina Island. Here, isolated from distractions, they learn a good deal about the Institute, including the importance of the Honor System, and they get acquainted with each other and with upperclass counselors, faculty, and staff who attend. (I found frosh camp so informative my first year as president that I have taken the boat to Catalina most years since.) A few days later, lectures, laboratories, seminars, and a host of individual interactions begin, providing a most stimulating and demanding educational environment. Meeting students in a variety of settings, including annual dinners with undergraduate and graduate student

officers, has deepened my appreciation for their quality and ability. At commencement, they join the ranks of our alumni, who are participating in ever greater numbers in supporting the Institute.

Our staff have been selected carefully, and provide the continuity that keeps the Institute's operations running smoothly. Some staff have served Caltech for 30, 35, even 40 years. I have always looked forward to the annual Staff Service Awards ceremony, which honors employees who have served the Institute for 10 or more years. I always consider it a privilege to shake hands with people who have dedicated a significant portion of their life to realizing Caltech's vision.

No worthwhile endeavor is without its challenges, and the Caltech presidency has been no exception. It has sometimes been difficult to find the best way to implement new ideas while leaving intact essential elements of Institute culture, such as the Honor System and the focus on excellence. I have aimed for evolutionary, rather than revolutionary, change whenever possible. A Quality of Life survey conducted early in my tenure revealed that many members of the Caltech community were concerned about issues of diversity and community. Thanks to the combined efforts of faculty, administrative staff, and students, we have made gradual progress toward creating a true community whose members come from a wide variety of backgrounds and experience. Continuing to build such a community will ultimately enrich the lives of all who belong to it.

I have worked to leave the Institute in a good position to cope with the economic uncertainties that loom on the horizon. Because approximately one-half the campus budget comes from the federal government, the Institute is vulnerable to future reductions in federal funding for basic scientific research. Educating the makers of public policy about the critical role such research plays in maintaining our country's prosperity and world leadership has therefore been, and will

continue to be, vitally important in countering these uncertainties. The generosity of our trustees, alumni, faculty, foundation and corporate donors, and many other friends, and the energy of our development staff, have also provided a substantial bulwark against future vicissitudes. More than $609 million has been raised for the Institute over the last nine years, and at the start of 1997 the endowment is more than double what it was in 1987. Our technology transfer and patent and licensing operations are becoming more active, and have the potential to contribute increasing royalty and equity revenues as time goes on. An initiative focused on directing the future of the biological sciences at Caltech is in its initial stages, and has broad institutional support. And to ensure that Caltech runs as efficiently and cost-effectively as possible, administrative process engineering teams are working hard, with the goal of having new management systems and software in place campuswide by October 1999.

Changes are in store for us all—individuals and institutions alike. Some will resist change, becoming rigid or obsolete; others will accommodate, risking conformity or mediocrity. Based on my nearly 10 years of living and working in this community, however, I predict that Caltech will not be satisfied merely to adapt to the future's challenges. This great institution will seize them, shape them, and use them to proceed stronger than ever into its second century of discovery. I look forward to watching that happen.

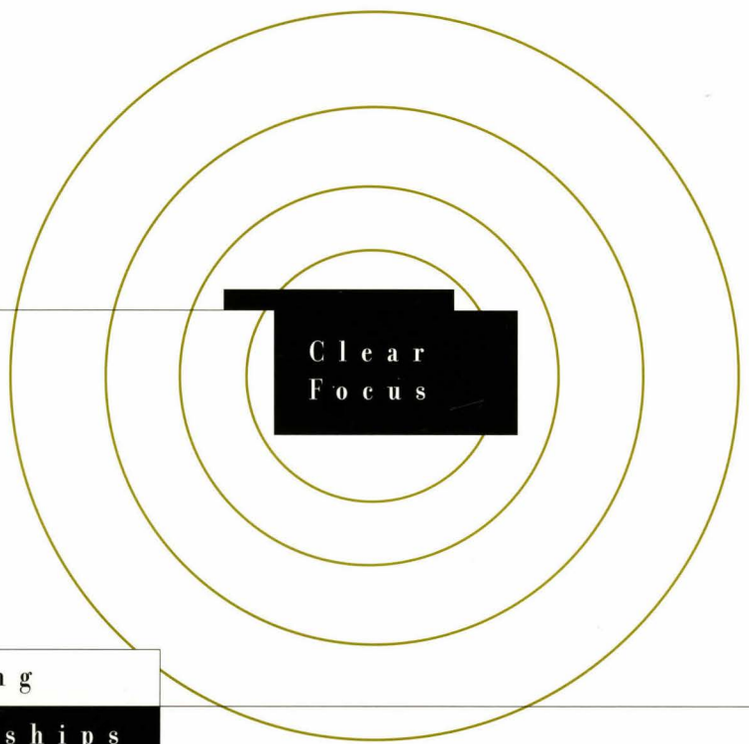
... proceeding stronger than ever into Caltech's second century.

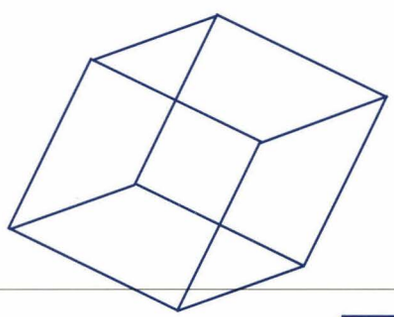
Thomas E. Everhart

President, California Institute of Technology

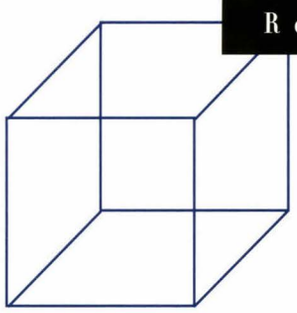
1987–1997

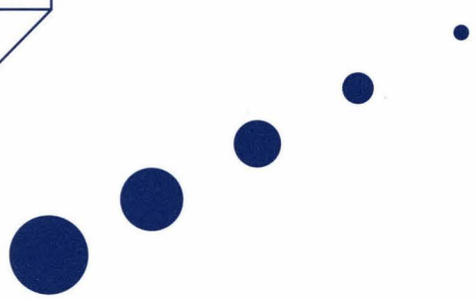
The Year in Review 1995-96





Strong
Relationships





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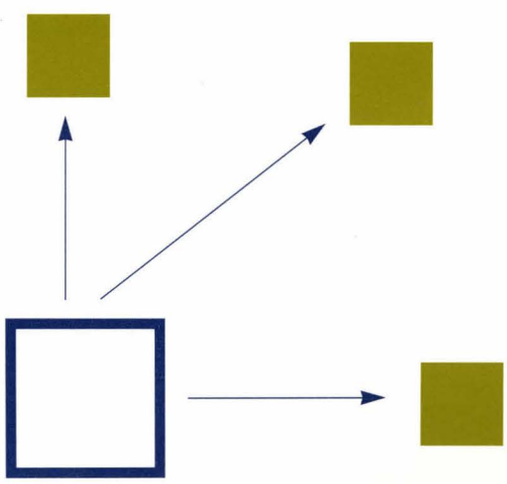


Wise Use of Resources

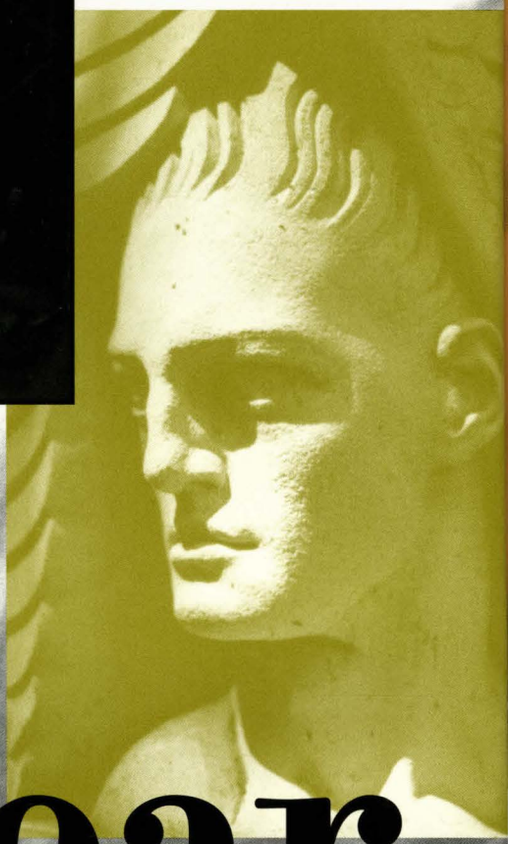
In September 1996, *Money* magazine's annual college-guide issue named Caltech "America's best buy in college education today." While receiving such an accolade is gratifying, it also prompts self-scrutiny. How *has* Caltech come to be regarded as one of the nation's foremost institutions of scientific education and research? And how can the Institute ensure that such status endures?

Magazine rankings aside, reflecting on the characteristics that have made Caltech so successful is also appropriate on the eve of a change in administration. The process of selecting the best person to succeed Dr. Thomas E. Everhart as president has naturally raised many questions. Where should Caltech go in the next decade? Which strategies that have been successful in the past will continue to work in the new century? What new approaches will be needed? It is an exciting time, with the energy and opportunity of change in the air.

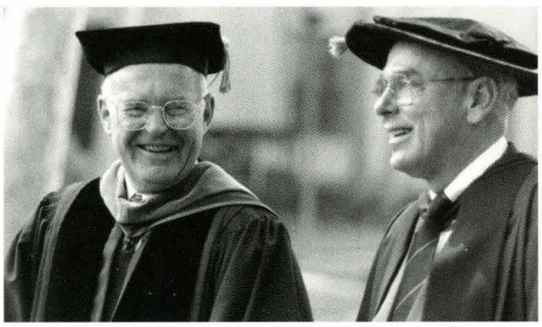
In this spirit of reflection, the *1995–96 Annual Report* takes a look at the highlights of the past year within the larger context of the decade Dr. Everhart has served as Caltech's president. During his tenure, the campus has changed both obviously and subtly, both in appearance and in policy, in ways that are at once pioneering and faithful to its founders' original vision. This report salutes his legacy of leadership and recalls his many lasting contributions to making Caltech the premier institution it is today.

Even casual visitors can sense that the Institute is not a typical university. From the most superficial observation ("Where are all the students?") to the most fundamental policy ("No member of the Caltech community shall take unfair advantage of any other member"), it is clear that this is a special place.

The qualities that make Caltech unique—characteristics the Institute has embodied from its early years and continues to demonstrate today—can be grouped into four broad categories: *clear focus, strong relationships, controlled size,* and *wise use of resources.* The seeds of these characteristics were planted by the Institute's first visionaries—Millikan, Hale, and Noyes—and have flourished under presidents DuBridge, Brown, Goldberger, and Everhart.



Clear



Focus

I HAD THE PRIVILEGE OF ATTENDING CALTECH *as a graduate student in the 1950s, and have had the further privilege of serving on the Board of Trustees since 1983, for the last few years as chair. From the perspective of both an alumnus and a trustee, it has been a pleasure to work with Tom Everhart during his tenure as president of Caltech. While the organization he joined in 1987 was strong, I am convinced that the one he will leave to his successor is much stronger.*

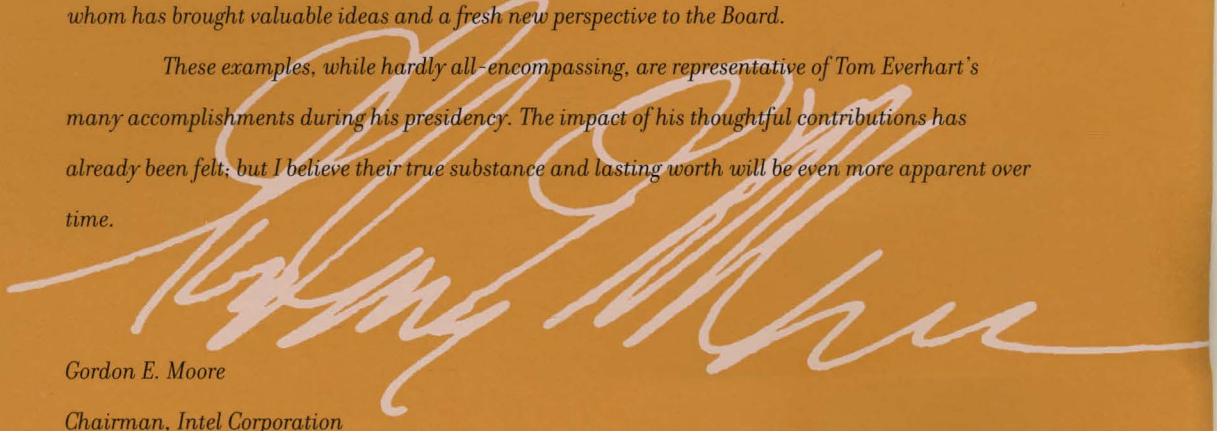
Caltech's unique combination of high quality and small size allows it to play an important and unusual role in the world of science and technology. Because it is small, it can move rapidly. This ability, combined with a tradition of hiring outstanding faculty who can work across disciplines, has allowed Caltech to play a far bigger role than its small size might otherwise have dictated. Intellectual agility and flexibility have been the driving forces behind cooperative efforts like the Neuromorphic Systems Engineering Center and the planned initiative for the biological sciences—and from the beginning, Tom Everhart has focused on these forces. He has encouraged and supported interdisciplinary collaborations, recognizing that they give the Institute greater access to new research areas where significant progress can be made.

Tom has also focused his leadership on improving the Institute's already excellent facilities. During the Campaign for Caltech, he gave priority to the need of the engineering and applied science division to accommodate the growing number of undergraduates studying under its aegis. As a result, the campus today has both a new engineering laboratory and classroom building and a new engineering library. Tom's vision and energetic advocacy were key in both of these additions.

The president's job entails more than overseeing the academic portions of the Institute. Tom introduced several key staffing changes that have made the administrative and financial controls at Caltech stronger than ever, without expanding the bureaucracy. These refinements will make it easier for Tom's successor to focus on the important fiscal challenges that lie ahead.

When the idea of expanding the Board of Trustees to include "Young Alumni Trustees" was proposed, Tom embraced it enthusiastically and identified candidates who were active technologists, researchers, and entrepreneurs in exciting, innovative fields. At the October 1994 meeting, when the new category was created, William T. Gross was elected the first trustee in that category. He has since been joined by Philip M. Neches, Louise Kirkbride, and Edward M. Lambert—each of whom has brought valuable ideas and a fresh new perspective to the Board.

These examples, while hardly all-encompassing, are representative of Tom Everhart's many accomplishments during his presidency. The impact of his thoughtful contributions has already been felt; but I believe their true substance and lasting worth will be even more apparent over time.



Gordon E. Moore

Chairman, Intel Corporation

"Caltech's research style both focuses on a few, carefully chosen scientific fields and promotes extensive cross-disciplinary investigation."

Thomas E. Everhart

The 1921 Board of Trustees knew exactly what they wanted the modern Caltech to offer: "A combination of a fundamental scientific training with a broad cultural outlook, which will afford students with scientific interests a type of collegiate education which avoids the narrowness common with students in technical schools and the superficiality and the lack of purpose of many of those taking academic college courses." Because they felt that physics, chemistry, and mathematics were the fundamentals of a scientific education, they resolved first to establish strong departments in those disciplines. They also decided to limit the branches of engineering taught "until all the existing departments are brought to the highest efficiency...in accordance with the policy pursued from the beginning...of undertaking only a few lines of work and doing these well." At the same time, they acknowledged the importance of the humanities and of "the basic sciences of geology and biology...because of the relation of these sciences to the cultural, professional, and research work of the Institute as a whole." Seventy-five years later, much of Caltech's work can be seen to have followed this original vision, which is as appropriate in today's climate of uncertainty and competition for resources as it was then.

Throughout its history, Caltech has managed simultaneously to maintain a

1987

■ **The occurrence of a supernova in the Large Magellanic Cloud gives Caltech's high-energy astrophysicists their first chance to study a bright, nearby core-collapse supernova with modern instrumentation. Observing the supernova twice in 1987 with a balloon-borne gamma-ray detector, the investigators are among the first to see direct evidence for the decay of radioactive elements, allowing them to estimate the nucleosynthetic yield of the supernova.**

■ **Research in the Division of Biology demonstrates how DNA in the cells of the immune system reorganizes to direct the manufacture of new types of antibodies. This data is fundamental to explaining how the immune system recognizes and combats the huge variety of substances that are foreign to the body.**

■ **For the fourth consecutive year, the Division of Geological and Planetary Sciences sponsors Project Pahoehoe, an eight-day student trip to the Hawaiian Islands to study hot-spot volcanism. The project, which is supported by the H. Dudley Wright Foundation, becomes a recurring feature of the division's instructional program.**

■ **Geophysicists estimate the temperature at Earth's center based on new shock-wave temperature data for iron.**

clear idea of its research priorities and to refine that idea to keep pace with significant discoveries and emerging fields of knowledge. (The research highlights timeline that appears throughout the *Annual Report* shows this principle in action over the past 10 years.) The Institute's organization into six broadly defined academic divisions, rather than a multitude of small departments, also helps it maintain an optimum research focus. This organizational scheme is at once traditional—because it recalls the founders' original vision—and forward looking. Its inclusiveness and flexibility give investigators the scope to pursue new ideas unhampered by traditional disciplinary constraints.

Caltech's affinity for interdisciplinary work has already produced a number of innovative programs and research groups. Computation and Neural Systems, now more than a decade old, was the first program in the nation to combine studies in neurobiology, computation, information theory, very large scale integration technology, and materials science. Another recently established interdisciplinary program, Control and Dynamical Systems, deals with problems at the intersection of mathematics and a variety of engineering disciplines. Yet a third program, Science, Ethics, and Society, offers students the chance to study the politics, history, and philosophy of science, providing an invaluable supplement to a technical education.

Although interdisciplinary collaboration is already an important part of Caltech's culture, it is likely to figure even more prominently in coming years. By integrating many different perspectives on a common topic, scientists will be better able to attack the highly complex, multifaceted scientific problems the new

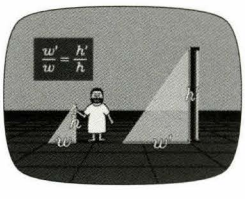
■ **For the first time, chemists observe molecules at the instant of their creation. As a result, it is possible to record the fastest chemical reactions known, those with the resolution of a femtosecond (a millionth of a billionth of a second).**

■ **The recently established program in Computation and Neural Systems (CNS) receives a grant from AT&T to help set up a network simulation lab and to fund equipment and space renovation. CNS is the first program in the nation to combine studies in neurobiology, computation, information theory, very large scale integration technology, and materials science. Its faculty and students, drawn from the divisions of Engineering and Applied Science, Biology, and Physics, Mathematics and Astronomy, aim to develop computers and computational schemes patterned on neural networks like the brain, and to understand better the computational aspects of biological brains.**

■ **A grant from the Bradley Foundation provides major support for the establishment of the Experimental Economics Laboratory (later renamed the Laboratory for Experimental Economics and Political Science). The innovative lab is designed to investigate aspects of economic and political behavior—how voters behave when given varying amounts of information about electoral issues, for example—through simulations in controlled settings. Data from the lab has since been applied to projects like the allocation of resources on NASA spacecraft and the determination of environmental damage costs.**

1988

■ **In collaboration with educators across the nation, Caltech mathematicians launch Project MATHEMATICS! Its purpose is to produce computer animation videotapes that teach basic math concepts in innovative ways. The project's pilot video, "The Theorem of Pythagoras," wins a major international award, the first of numerous honors the project will receive in coming years.**



century holds. Not surprisingly, several of the "research initiatives of the future," as identified by Institute administration and faculty, combine research from several fields. One of these initiatives, global environmental science, for example, draws upon the expertise of Institute engineers, geologists, chemists, and physicists to study the dynamics of changes in Earth's climate system, oceans, and atmosphere. Other areas that will be important to Caltech's future include the biological sciences; materials science; astronomical observation, including efforts to detect gravitational waves; and high performance computing.

Keeping pace with the Institute's evolving research focus, classroom instruction has also changed in the past year. The first phase of modifications to the undergraduate core curriculum is now in place, reflecting the Institute's commitment to prepare students to work in emerging scientific fields by exposing them to a wider range of scientific basics. Effective fall 1996, students reduced their required class load by nine units in physics and mathematics and by three units in chemistry. The units thus released are now devoted to a new required course in biology, to be taken in the freshman year, and a new "menu" course in either astronomy or earth and environment, taken freshman or sophomore year. The Core Curriculum Steering Committee is also considering a proposal to add required courses in written and oral science communication. These changes enhance the already very solid and extensive science, math, and engineering education that Caltech undergraduates receive.

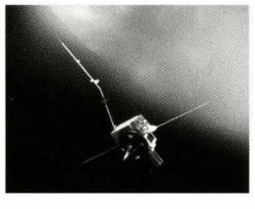
1989

■ **Research by geophysicists suggests that the massive and rapid extinction of plants and animals, including dinosaurs, that occurred 65 million years ago might have been caused by global warming rather than by an ice age. This prehistoric greenhouse effect is thought to have occurred as the result of an asteroid or comet striking Earth and releasing a large quantity of carbon dioxide into the atmosphere.**

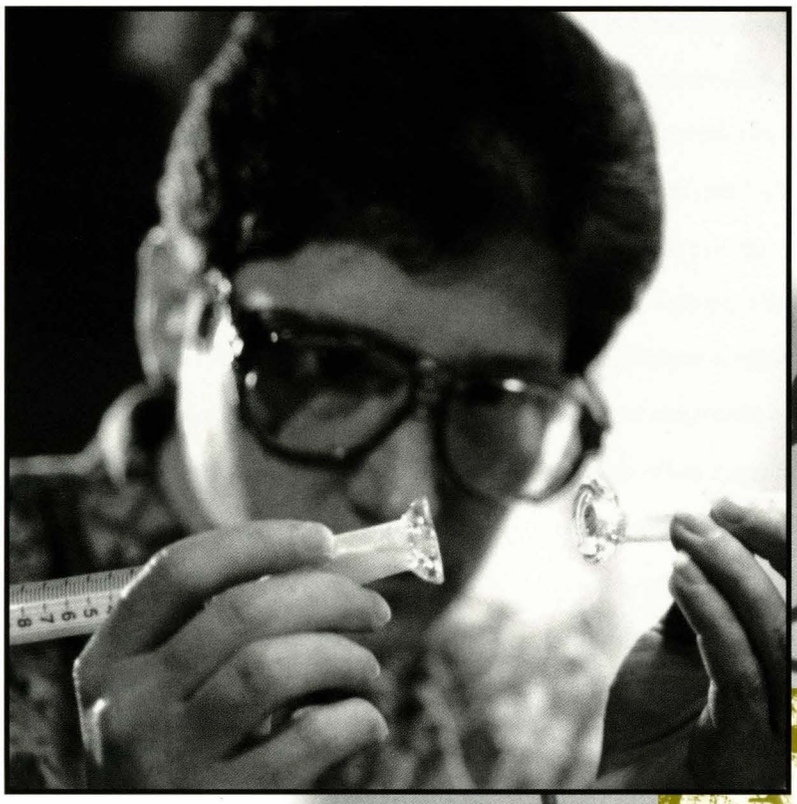
■ **TERRAscope, a project to install a network of modern, very broadband (10 Hz to DC) seismographic stations in Southern California, is begun. The TERRAscope seismometers have a dynamic range about 10,000 times wider than ordinary seismometers and can record both large and small earthquakes on scale. Because of its realtime capability and location in a populous, earthquake-prone area, it can also provide timely data about earthquakes and tectonic motions.**

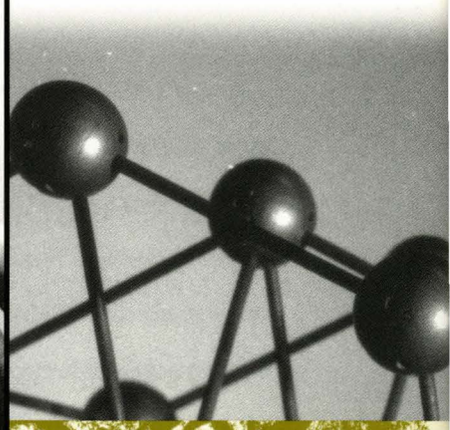
■ **Caltech biologists and their off-campus research partners identify a specific binding site on the cell-surface protein that the HIV-1 virus must latch onto before infecting a cell. The discovery marks the first time a binding site for any virus has been identified so precisely, and may lead to better weapons against AIDS.**

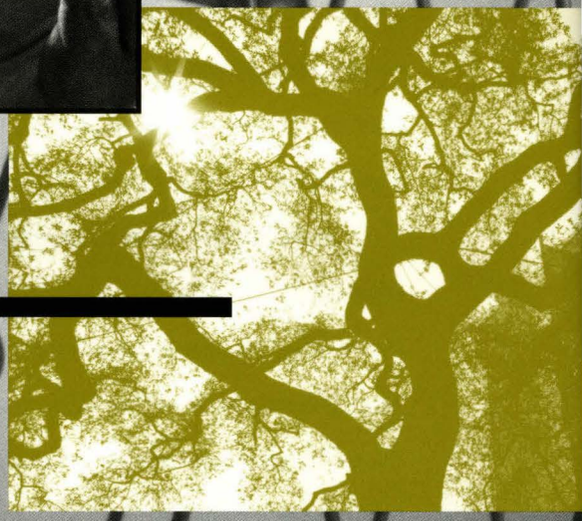
■ **JPL launches two major missions. Magellan, the first JPL planetary spacecraft to leave Earth since Voyager 1 in 1977, will reach Venus after a 15-month journey, whereupon it will scan the planet and map 99 percent of its surface. Galileo will reach Jupiter by 1995—after flybys of Venus, Earth, and two asteroids—and will study the Jovian system from 1995 to 1997.**

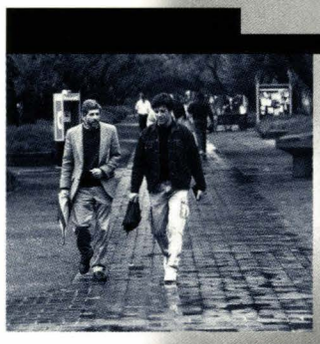


■ **The Caltech Submillimeter Observatory (CSO), located on Mauna Kea, Hawaii, begins regular operations. Its 10.4-meter telescope will be used for studying such phenomena as the very early stages of star formation in the interstellar medium and the composition of the gases from which stars are formed. The National Science Foundation and the Kresge Foundation supported the construction of CSO.**

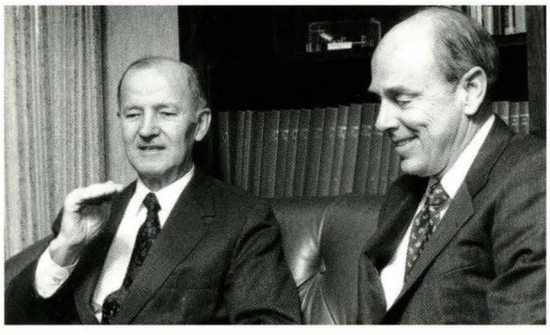


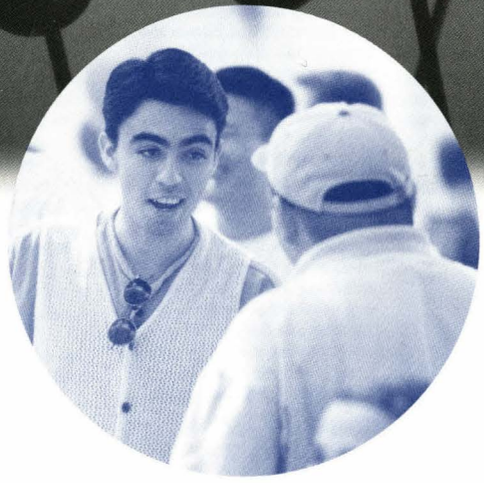


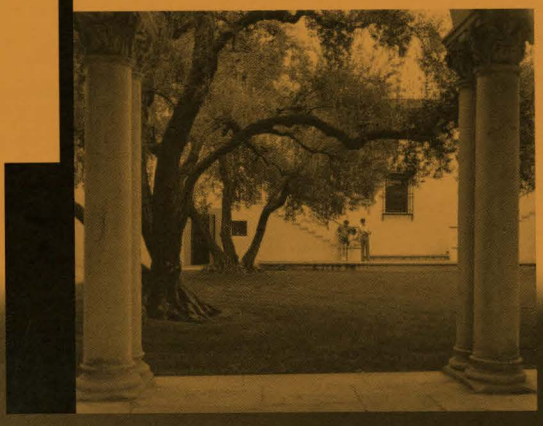




Strong







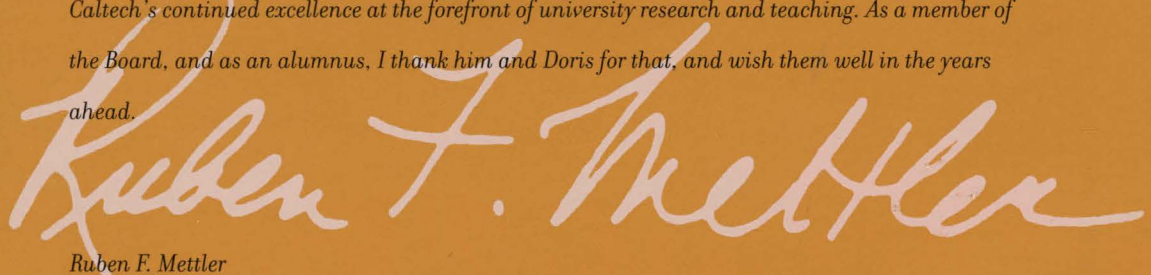
Relationships

As Dr. Thomas Everhart comes to the end of his term as Caltech's president, *I reflect back to 1987, when, as chair of the Board of Trustees, I began a long period of collaboration with him. While working together in trustee board and committee meetings, Tom and I soon developed a close and easy working relationship. We conferred informally and frequently on a broad range of topics, in person or by phone.*

Tom's time as the president of Caltech has been especially fruitful for the Institute. Early in his administration, he initiated an aims and needs study to solicit a wide range of ideas from faculty and trustees regarding Caltech's future research and teaching directions. This study became the underlying rationale for the Campaign for Caltech, which was conducted between October 1989 and December 1993. Thanks to Tom's leadership, and to the outstanding efforts of the entire campus community—trustees, administration, faculty, alumni, the Associates, and many friends—the Campaign was immensely successful, ultimately raising more than $394 million, 13 percent more than its original goal. Campaign-related gifts to Caltech have made possible, in addition to many smaller projects, the construction of the Beckman Institute, the Braun Athletic Center, the Moore Laboratory of Engineering, the Keck II Telescope, Avery House, and the Sherman Fairchild Library of Engineering and Applied Science, as well as the funding of 50 undergraduate scholarships, seven postdoctoral and 12 graduate fellowships, and 18 new endowed professorships.

I have also been gratified to see Tom expand his leadership role beyond the Caltech campus as a spokesman for science and engineering at the national level. He was elected to the board of councilors of the National Academy of Engineering and was appointed chairman of the scientific advisory board for the secretary of the Department of Energy. He has also served as vice chairman of the Council on Competitiveness—a private, nonprofit group of prominent leaders that addresses public policies related to science, technology, and management, policies that enhance economic growth and the competitive position of U.S. corporations in global markets. He has also conducted continuing dialogues with federal agencies concerning their support of research and teaching on campus, and with NASA in support of JPL. His work in these capacities has helped government officials and the public to understand better the important contributions of research and teaching institutions to our society, and has raised Caltech's visibility throughout the country.

Tom Everhart's 10 years of dedicated service to the Institute have done much to ensure Caltech's continued excellence at the forefront of university research and teaching. As a member of the Board, and as an alumnus, I thank him and Doris for that, and wish them well in the years ahead.



Ruben F. Mettler

Retired Chairman and Chief Executive Officer

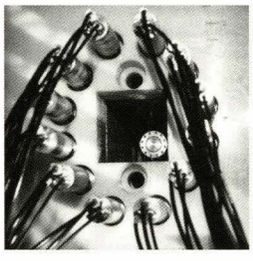
TRW Inc.

An important element in Caltech's success has been its ability to cultivate beneficial relationships both on and off campus.

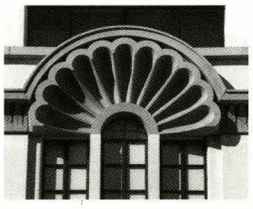
Another important element in Caltech's success over the last decade has been its ability to cultivate beneficial relationships both on and off campus. The many educational lectures, seminars, and other programs that the Institute sponsors help educate both campus and public audiences about new scientific discoveries, the work of scientists, and the value of such work in our daily lives. Forging strong bonds with the business community, alumni, trustees, and other friends has built a broad base of support for the Institute's goals.

It goes without saying that providing its own students with a first-class education has always been an Institute priority; but there is also a well-established tradition of sharing Caltech's resources with students at other institutions. Programs like the Minority Undergraduate Research Fellowships (MURF) program, begun in 1991, help cultivate future scientists and engineers among students who might not otherwise be exposed to the possibility of a scientific career. Another educational outreach program, the Caltech Precollege Science Initiative (CAPSI)—which is an outgrowth of the Science for Early Educational Development (SEED) program begun in 1984—last year expanded into six additional California school districts. In giving students opportunities to experience firsthand the excitement of scientific research, these programs help

■ **In 1989 an interdisciplinary group, headed by a Caltech chemist, publishes findings that cast serious doubt on the validity of cold fusion. After exhaustive research, the group concludes that cold-fusion claims had resulted from flaws in the design and execution of the original experiments with the process.**



■ **After reviewing more than 50 competing proposals, NASA decides to build the Advanced Composition Explorer (ACE), a spacecraft designed to measure the composition of energetic nuclei from the sun and the galaxy. Over the next several years, researchers in Caltech's Space Radiation Laboratory will construct two new isotope spectrometers and oversee the development of seven other instruments that NASA will launch on ACE in August 1997. The project marks a new way of doing business between campus scientists and JPL.**



■ **The Beckman Institute, a center for cross-disciplinary research in the chemical and biological sciences, opens. The 160,000-square-foot facility, constructed with funds from the Arnold and Mabel Beckman Foundation, will house investigators in such areas as biomolecular design, laser and mass spectroscopy, and genome research.**

■ **The Mellon Foundation gives a three-year grant in support of the recently established program in Science, Ethics, and Public Policy (SEPP). Conducted by historians and philosophers in the Division of the Humanities and Social Sciences, SEPP comprises research, instruction, and seminars about the social, economic, ethical, and political problems that have accompanied the advance of science and technology. The topic of the first SEPP seminar is the Human Genome Project.**

not only the students themselves, but also the institutions and individuals who may one day benefit from their work.

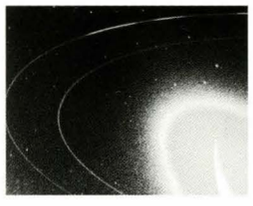
Maintaining close relationships with alumni is also of paramount importance to the Institute's continued success. A particularly impressive demonstration of the continuing dedication of alumni to Caltech's goals has occurred since September 1994, when Dr. Everhart issued a challenge to alumni to increase their financial support of the Institute. More than 1,800 new donors responded, increasing alumni participation in the Annual Fund from 30.7 percent to 41 percent. It is hoped that by September 1997, the end of the three-year challenge period, alumni giving will have returned to 50 percent, its level during 1984–85.

Caltech has also given considerable thought recently to the lifelong relationships between the Institute and its alumni. To assess the current state of those relationships and identify ways to enhance them, Dr. Everhart in 1995 convened the Alumni Relations Task Force. Based on the responses of the more than 800 alumni surveyed, the task force has recommended ways the Institute can improve communication with alumni and expand programs that offer continuing educational and vocational support.

Facilitating relationships between campus and the business and industrial communities is the aim of the Office of Technology Transfer (OTT), established in late 1994. OTT helps Caltech researchers license and patent their inventions and form start-up companies, with the goal of bringing additional revenue to the Institute from royalties or equity in those new companies. In 1995–96, OTT licensed 27 companies, 13 of which were start-up companies. The book value of Caltech's

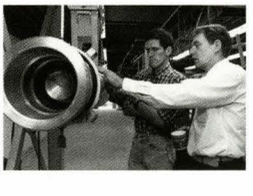
1990

■ **Voyager 2 encounters Neptune and its moon Triton. Data from the spacecraft reveals that Neptune's ring arcs are unique, and that, despite the planet's great distance from the sun, its winds are ten times stronger than Earth's. Voyager also finds that Triton's surface is geologically active.**



■ **Caltech and the Howard Hughes Medical Institute announce a long-term collaboration agreement to conduct biomedical research at Caltech, with the goal of applying research findings to the prevention and alleviation of disease. The joint research program will initially explore how nerve cells develop and how the development of other cells is determined.**

■ **The T5 hypervelocity shock tunnel is installed on the roof of Guggenheim Laboratory. The T5 is a nationally unique facility that produces extreme velocities and pressures, allowing aeronautics researchers to simulate the airflow conditions aircraft encounter during, for example, entry into a planetary atmosphere. Many fundamental questions associated with such flows are resolved by experiments in the T5.**



■ **Gifts from several foundations and private donors make it possible for Caltech to receive a Mellon Foundation challenge grant. The grant is used to establish an endowment fund to support humanities postdoctoral appointments in perpetuity.**

■ **Biologists develop a series of techniques called "reverse pharmacology" that can be used to formulate drugs with fewer unintended side effects. Researchers begin by identifying the molecule targeted to receive the drug, then work backwards to design a pharmacological "key" that will fit only that molecular "lock."**

equity share of start-ups from 1994 through March 1996 equaled $2 million.

Relationship building with the greater Southern California community also continued in 1995–96. In June 1996, the public was invited to attend the Institute's third annual Biology Forum, entitled "Images of Mental Illness: Science Looks Inside the Brain." A panel of distinguished biomedical researchers and clinicians discussed how various methods of brain imaging may be used to study and treat mental illnesses. Past biology symposia have dealt with research on Alzheimer's disease and cancer. In October, the public was also welcomed to Caltech's third Media and Science Symposium, which this year examined "Science and Journalism: A Marriage of Opposites." For the first time, the symposium was broadcast by satellite, allowing

A random sampling of noteworthy visitors to Caltech since 1987.

1987: Media mogul Ted Turner; novelist Joseph Wambaugh

1988: *Los Angeles Times* columnist Jack Smith

1989: Bill Gates, Microsoft chairman and CEO; George Deukmejian, Governor of California

1990: Archbishop Desmond Tutu of South Africa

1991: President George Bush (as Centennial commencement speaker); theoretical physicist Stephen Hawking (one of many visits); congresswoman Barbara Boxer

1992: Harrison Schmitt (BS '57), former U.S. Senator and one of 12 astronauts who have walked on the moon

1993: Artist David Hockney; Gloria Molina, first female member of the Los Angeles County Board of Supervisors

1994: Playwright Tom Stoppard; Los Angeles city councilman and mayoral candidate Michael Woo

1995: Writer Maxine Hong Kingston; astronaut Mae Jemison; architect Frank Gehry

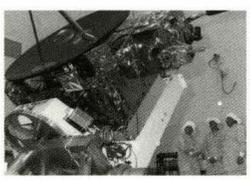
1996: Admiral (ret.) Bobby Ray Inman, former deputy director, Central Intelligence Agency

■ A grant from the Japan Foundation funds a three-year pilot program of Japanese language instruction. Students' response is enthusiastic, and Japanese becomes a regular humanities course offering.

■ The Division of the Humanities and Social Sciences hires new faculty, including a chaired professor, in business economics and management, marking a serious commitment to expand its presence in that field.

■ LIGO (the Laser Interferometer Gravitational-Wave Observatory) is approved by the National Science Board, paving the way for the initial allocation of federal funds for the project. Planned as two cooperating observatories in different parts of the country, LIGO will be the first facility designed to confirm experimentally the existence of the gravitational waves posited by Einstein's general relativity theory. LIGO is a collaborative effort of Caltech and MIT.

■ JPL launches Ulysses, a joint NASA/European Space Agency spacecraft designed to study the poles of the sun. It will head first to Jupiter, where the giant planet's gravity will boost it into the desired solar orbit. By the end of 1995 it will have completed its first circumnavigation of the sun, becoming the first spacecraft to survey solar phenomena at all latitudes.



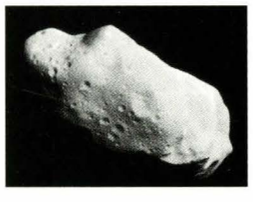
1991

■ Caltech geologists date the first appearance of diverse animal fossils using a combination of chemical and magnetic testing techniques on 500-million-year-old rock strata in Siberia, Morocco, and China.

22 universities across the country to participate in the event. A third noteworthy public program took place in November, when Walter Cronkite visited the campus as Caltech's first DuBridge Distinguished Lecturer. This lecture series was established in 1996 as a memorial to Lee A. DuBridge, the late president emeritus of Caltech, with the purpose of bringing to campus prominent speakers of national or international importance.

The academic year 1995–1996 was also marked by two programs aimed at helping disparate segments of the campus community get to know each other better. Beginning in April 1996, faculty from the Division of Biology presented a series of weekly lectures designed to make the newest discoveries in the biological sciences understandable—and exciting—to nonbiologists. The lectures were extremely well attended by a broad spectrum of campus personnel. Also in April, the Institute invited students, faculty, and staff to a party to "shake hands with Ed and Rudy." The celebration was prompted by the realization that, even though all members of the campus community support and take pride in the achievements of resident Nobel Laureates Ed Lewis and Rudy Marcus, relatively few had ever met them. The event, which included music by Caltech's jazz band and box lunches on the Athenaeum lawn, was attended by close to 3,000 people.

Caltech's Board of Trustees has always been an invaluable resource; the Board's support and understanding is essential to the continued smooth functioning of the institution. In 1995–96 the Board welcomed three new trustees: Virginia V. Weldon, William H. Davidow,



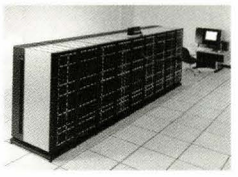
■ The Galileo spacecraft executes the first-ever flyby of an asteroid when it encounters Gaspra in October. It will pass a second asteroid, Ida, in August 1993.

■ Computer graphics begins to emerge as a key focus of computer science at Caltech, helping investigators in a variety of disciplines render realistic three-dimensional images of their research.

■ Researchers in the Division of Geological and Planetary Sciences discover that nominally anhydrous, or water-free, minerals are a globally important repository of bound water. In our planet's mantle, the volume of bound water in minerals like olivine, garnet, and pyroxene may approximate the amount of liquid water in all Earth's oceans.

■ The Parsons Foundation awards a grant to the Biology division to support research into how the gene regulatory system transforms an egg into an embryo. Another grant, from the Seaver Institute, funds research into autoimmune disorders.

■ As a result of discussions with visiting Russian academics, Caltech political scientists begin a study of political and economic reform in the recently fragmented Soviet Union. They later make contact with Russian scholars who are trying to write a constitution, and the Russians ask them to read and comment on various drafts. When it begins to seem that most of their advice is falling on deaf ears, the Caltech faculty write a Russian constitution of their own.



■ An Intel Touchstone Delta supercomputer, faster and more powerful than any computer yet designed, is installed at Caltech. The Delta will support the work of the Concurrent Supercomputing Consortium, a group of investigators from some of the nation's most prominent research institutions. It will also help Caltech researchers tackle projects like the modeling and simulation of global climate changes, the visualization of scientific data returned from space missions, and pattern recognition of DNA sequences within the human genome.

■ Chemists establish the atomic structures of the nitrogenase proteins and define the novel metal centers that enable nitrogen-fixing organisms to synthesize ammonia under mild conditions.

and Edward M. Lambert. Elected to the Board in May 1996, Virginia Weldon is senior vice president for public policy at the Monsanto Company, St. Louis, Missouri. William Davidow, who joined the Board in September 1996, is an executive and venture investor with Mohr, Davidow Ventures. The newest of the Board's Young Alumni Trustees, Edward Lambert (BS '82, chemical engineering) is the founder and managing director of Meridian Ventures, Inc., a venture management and consulting firm focusing on the aerospace, high-technology, and retail industries.

Much thought and attention have been given over the past 10 years to improving the quality of campus life for Caltech students, staff, and faculty. The following are some of the many developments that have made Caltech a more fulfilling and hospitable place in which to live, learn, and work.

1988–91: **The Caltech Children's Center expands into two additional buildings, allowing the center's staff to care for more and younger children.**

1988: **The dependent-care spending account is established, allowing employees to set aside pretax dollars for dependent care.**

1988: **The employee tax savings plan becomes available, allowing employees to deduct medical and dental insurance premiums from pretax earnings.**

1989: **The Staff Quality of Life Survey is conducted to identify how Caltech might help enhance its employees' professional lives.**

1989: **The Staff and Faculty Consultation Center is established.**

1992: **The Braun Athletic Center opens.**

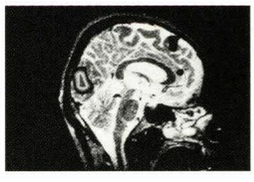
1993: **The Caltech Women's Center opens.**

1994: **The TIAA-CREF retirement account, already established as a faculty benefit, becomes available to staff as well.**

1996: **The health-care spending account becomes available as a payroll deduction, allowing employees to set aside pretax dollars for medical, dental, and vision expenses not covered by insurance.**

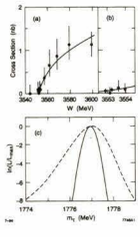
1996: **Avery House opens.**

1992



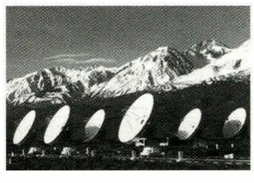
■ A grant from the Fletcher Jones Foundation helps establish the Biological Imaging Center for Teaching and Research, an innovative facility devoted to the development of new technologies for imaging biological structures and processes. Located in the Beckman Institute, the Imaging Center aims to design methods and tools for the investigation of biological phenomena like the invasiveness of cancer cells and the embryonic development of the nervous system.

■ Caltech physicists, working with U.S. and Chinese collaborators at the electron-positron colliding beam storage ring in Beijing, China, make the first precision measurement of the mass of the heaviest lepton, the tau. The masses of the charged leptons—the electron, the muon, and the tau—are fundamental natural parameters. Scientists' knowledge of these constants is crucial in tests of their understanding of the basic physical laws.

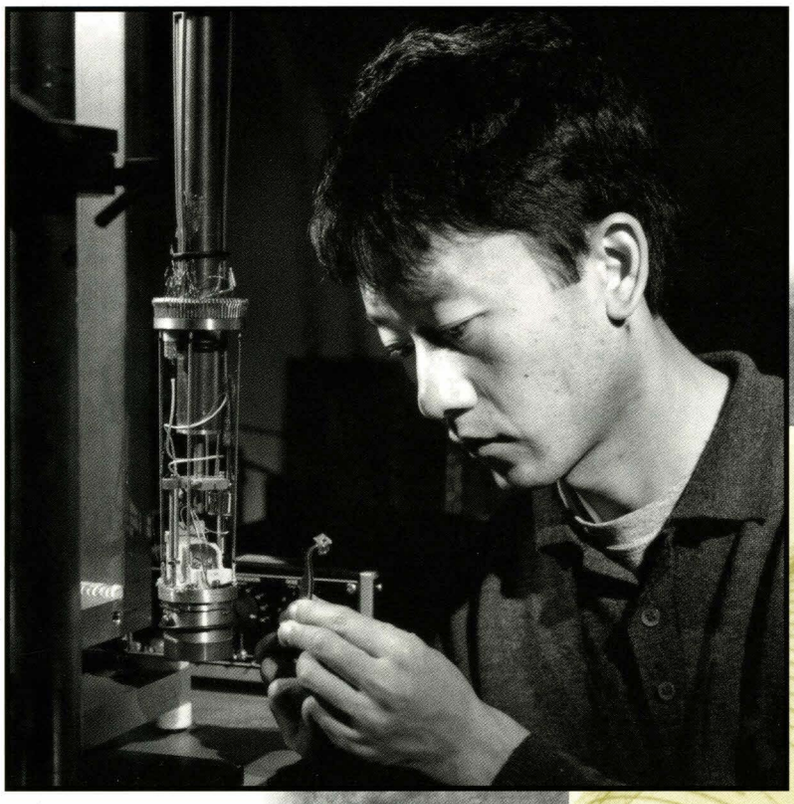


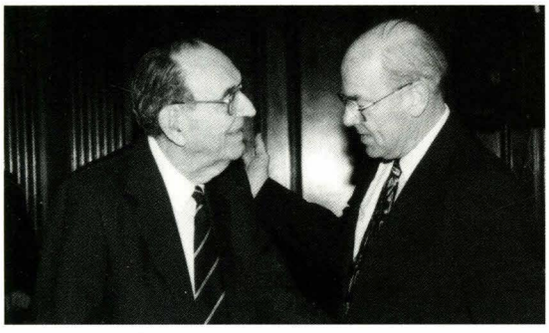
■ The National Institute of Mental Health awards a grant to the Division of Biology to establish the Silvio Conte Center for Neuroscience Research, further strengthening molecular neuroscience at Caltech. Investigations in this group will focus on "the molecules of thought"—how neurons send and receive information in the brain and nervous system.

■ NASA's first small explorer mission, SAMPEX, is launched into low Earth orbit carrying two Caltech instruments. Built and launched in only three years, SAMPEX illustrates NASA's new "faster, better, cheaper" policy.



■ A grant is received from the Norris Foundation for construction of a sixth 10-meter millimeter-wave telescope at the Owens Valley Radio Observatory (OVRO). Dedicated in 1994, the new instrument increases the power of OVRO's telescope array fivefold, permitting faster, more detailed imaging of the regions where astronomers think planetary systems are being born.





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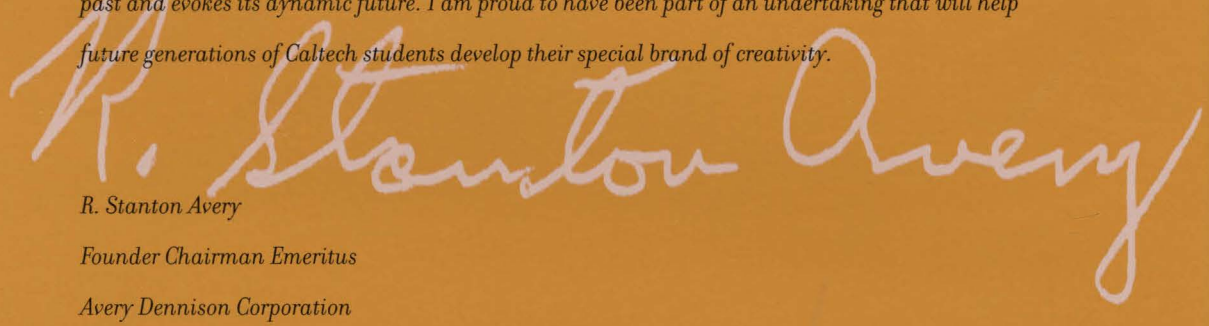
I HAVE LONG FELT THAT CALTECH EMBODIES THE SPIRIT OF INTELLECTUAL CURIOSITY, *and that its faculty and students continually demonstrate the creativity and innovation such curiosity produces. Since joining the Institute's Board of Trustees in 1971, and especially since serving as Board chair from 1974 to 1984, I have felt a special kinship with the Institute, because the pursuit of creativity and innovation has also been important in my own professional life.*

Because of my entrepreneurial background, I wanted to make a contribution to Caltech that would strengthen the connections between scientific research and entrepreneurship already established by such campus organizations as the student-run Entrepreneur Club and the Office of Technology Transfer. When Tom Everhart and his colleagues first proposed that my contribution take the form of a campus residence, it was not immediately clear to me how such a place might promote the entrepreneurial spirit. But Tom had an exciting vision for a structure that would be as unique as the Institute itself. Avery House was designed to build on one of Caltech's traditional strengths—the way its small size encourages close personal and professional relationships—in a new way. The permanent occupants—Institute undergraduates, graduate students, and faculty—would live side by side with visiting entrepreneurs whose expertise in a variety of high-tech ventures might inspire the young engineers or scientists to apply their technical training in groundbreaking ways. The interactions between these various groups would therefore be a valuable supplement to classroom education, adding practical lessons from the business world to students' usual curriculum. In addition, the public areas of Avery House—its café, patio, library, and conference rooms—would provide comfortable gathering places where all members of the campus community could become better acquainted with each other.

The careful planning and attention to detail Tom Everhart and his staff brought to the Avery House project have resulted in a beautiful building that both echoes the Institute's illustrious past and evokes its dynamic future. I am proud to have been part of an undertaking that will help future generations of Caltech students develop their special brand of creativity.



R. Stanton Avery
Founder Chairman Emeritus
Avery Dennison Corporation

"Because of its small size, Caltech can and does value individuals. Despite its small size, it dares to take on projects of immense complexity and innovation."

Thomas E. Everhart

The registration of students at any period shall be strictly limited to . . . a select body of students of more than ordinary ability . . . which can be satisfactorily provided for with the facilities and funds available . . . ."

CALTECH BOARD OF TRUSTEES, 1921

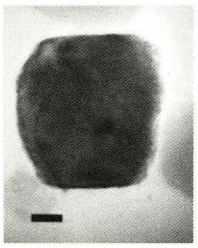
Caltech's culture, while not entirely determined by its size, would probably have evolved quite differently had the student population increased in proportion to other campus features. In 1946, the total number of graduate and undergraduate students was 1,391; by fall 1996, that population had increased by only about 500 students. In the same 50 years, however, the campus itself grew from 30 to 124 acres; the number of faculty quadrupled; and the market value of the endowment increased from $17 million to $837 million.

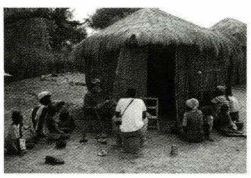
One consequence of controlling growth in this manner is that Caltech has a student-professorial faculty ratio of 6:1. This ratio has many benefits for students, such as small classes, close relationships with faculty, and readily available opportunities to do real scientific research (aided by the several hundred additional postdoctoral members of the academic staff). It is not uncommon for undergraduates to work in faculty labs and other research facilities during the academic year. In addition, an ever-increasing number of Caltech students—182 in the summer of 1996—

■ **In 1992, the joint U.S.-French TOPEX/Poseidon satellite is launched into Earth's orbit from French Guiana. The goal of the satellite's three- to five-year mission is to map oceanic topography by measuring sea levels relative to Earth's center. This data is expected to increase scientific understanding of ocean circulation and of climatic phenomena like El Niño.**

■ **The two LIGO sites are selected. The first observatory will be built in southern Washington State and the second in Livingston Parish, Louisiana, both areas that can accommodate each structure's two 2.5-mile-long "arms."**

■ **Geobiologists isolate microscopic crystals of the magnetic mineral magnetite in samples of human brain tissue. Although "biological magnets" have been found in organisms like honeybees, pigeons, and salmon, this is the first time such material has been found to be a component of human tissue. The discovery may add to scientific understanding of how electromagnetic fields affect human health and behavior.**





■ **As the leader of an interdisciplinary team of 13 scientists, a Caltech anthropologist conducts a detailed study of the Government of Botswana's Southern Okavango Integrated Water Development Project. His assessment leads to the project's cancellation and the presentation of alternative plans.**

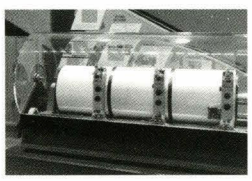
participate in the Summer Undergraduate Research Fellowships program begun in 1979.

The Institute's high admission standards mean that only about 500 freshmen—last fall, about 26 percent of the applicant pool—are admitted to Caltech each year. The 152 men and 67 women who enrolled in fall 1996 had mean SAT scores of 725 verbal and 767 math. Thirty-nine percent of them were high school valedictorians, and 98 percent were in the top 10 percent of their class.

Not unexpectedly, Caltech competes vigorously for students of this caliber. Highly qualified underrepresented minority students are in especially great demand: they have their choice of the nation's top universities, all of which are eager to benefit from the variety of viewpoints and

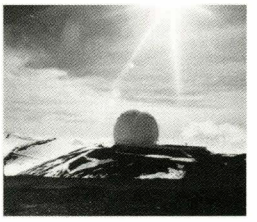
1993

■ **The Earthquake Media and Exhibit Center opens. The most advanced facility of its kind in the United States, it is designed specifically to help the media keep the public informed during earthquake emergencies. The center is funded by a grant from the *Los Angeles Times*.**



■ **A major research thrust in micromachines, microdevices, and nanostructures is established in the Division of Engineering and Applied Science.**

■ **Research in the CNS program to date has yielded —to name one example— silicon retinas of various designs that can detect edges, light, or motion. Related work in pattern recognition has resulted in machines that can authenticate signatures and fingerprints.**



■ **The Keck I Telescope becomes operational. The first of two 10-meter telescopes planned for the W. M. Keck Observatory on Mauna Kea, Hawaii, its 36 hexagonal mirror segments make Keck I the most powerful optical telescope on Earth. The Keck Observatory was established with a grant from the W. M. Keck Foundation, and is jointly operated by Caltech and the University of California.**

experience these students can contribute to an institution's intellectual life. Recruiting adequate numbers of underrepresented minority students has posed a particular challenge to the Institute over the past decade.

After reaching a high point in 1991, enrollment of underrepresented minorities began to decline steadily. In response, Dr. Everhart in July 1995 appointed the Committee on Minority Admissions and Retention, which made several recommendations for reversing the enrollment trend. In 1996, faculty representatives began traveling around the country to meet with high-school seniors who had been admitted to Caltech. A President's Scholars award was created, 10 of which were offered to admitted students—not exclusively minorities—who the committee thought would contribute to the "quality and breadth" of the campus community.

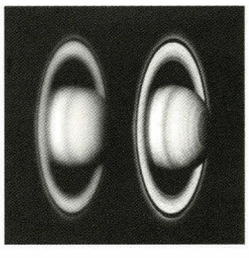
Cheryll Hawthorne, formerly an assistant dean at Stanford, was recruited for the newly upgraded position of associate dean/director of Minority Student Affairs to develop undergraduate support programs and student outreach. As a result of these efforts, the number of underrepresented minority students entering Caltech in fall 1996 was nearly double that of fall 1995.

Caltech students continue to excel after they leave the Institute. Of the 226 students receiving BS degrees in 1996, 51 percent planned to pursue graduate study—a number quite consistent with the 1987–96 average of 53 percent. Their top choices for graduate school were Stanford, UC Berkeley, MIT, Caltech, and UCLA. Five students received National Science Foundation fellowships, and others received fellowships from AT&T, the

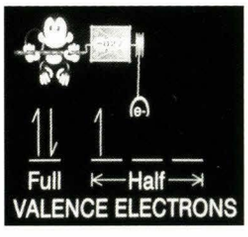
■ **The Division of Physics, Mathematics and Astronomy strengthens its condensed matter physics group by hiring new faculty and adding laboratory space. Researchers in this group build extremely tiny devices—mere nanometers in size—that become, in effect, miniature labs on a chip. The devices help them study quantum-mechanical phenomena in materials at very low temperatures and extremely small distance scales.**

■ **Seismologists reevaluate Southern California earthquake records for the period 1932–1990 using modern methods and conclude that magnitudes were consistently overestimated during the early part of that period. New figures indicate that changes in earthquake rates over the past 60 years are within the normal range of random variation.**

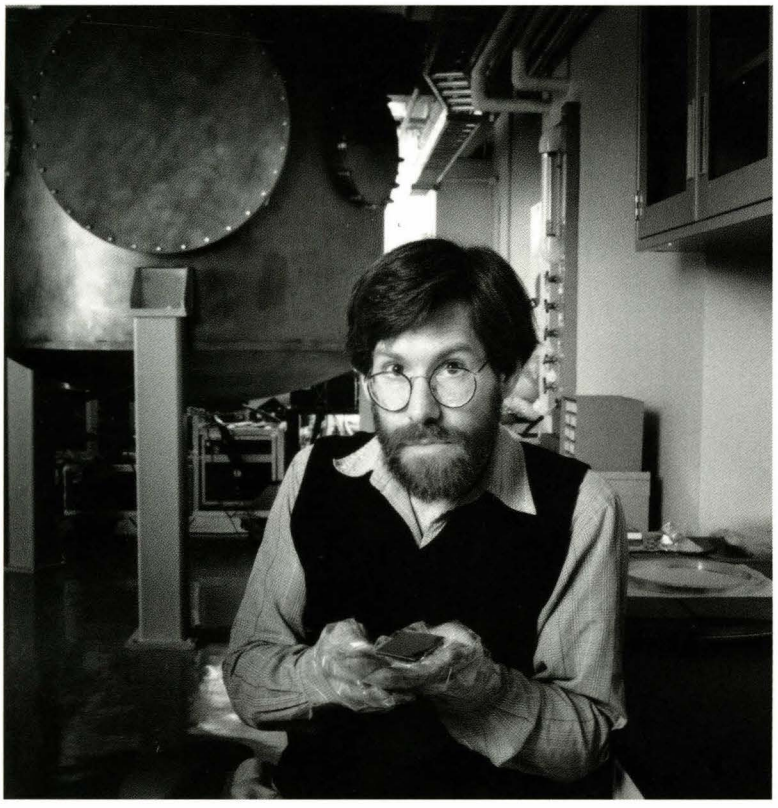
■ **The Hubble Space Telescope Wide-Field and Planetary Camera investigation definition team uses image deconvolution techniques to partially alleviate the effects of the spherical aberration in the telescope's main mirror. The team's efforts salvage the entire mission by allowing recovery of images that are almost as sharp as those from a properly manufactured mirror.**



■ **Several grants from the National Science Foundation support Caltech economists who work on "quantal choice," a behavioral model of their invention that combines theoretical, experimental, and statistical methods. Unlike previous models, quantal choice takes into account the errors people often commit when making choices in strategic situations, moving the study of economics and political science closer to that of psychology.**



■ **The Chemistry Animation Project receives an award from the Dreyfus Foundation to support production of a series of broadcast-quality videotapes that illustrate central concepts of the basic chemistry curriculum. The Caltech students and faculty who create the three-dimensional animation sequences hope to revolutionize the way students view the chemical world.**



Department of Defense, the Howard Hughes Medical Institute, and the National Institutes of Health. Twenty-nine percent of the graduates accepted employment with such organizations as Applied Materials, Allied Signal, Oracle, Intel, JPL, and GNP Computers. Several graduates took industrial internships with companies in Japan. One joined the Air Force as a pilot, and two plan to start their own companies.

Most of the 164 students receiving doctorates in 1996 sought either academic or industrial employment. Eighty-eight found positions as assistant professors or postdoctoral scholars, while 54 went to work for such corporations as GE, Eli Lilly, TRW, Rockwell, and Dow Chemical. Several PhDs were hired by consulting or financial firms, and a few others chose to join national labs or not-for-profit organizations like Argonne, Sandia, and NASA.

1994

- **Biologists isolate the first stem cells—primitive, undifferentiated cells that have the dual potential either to create different types of specialized cells or to make copies of themselves—from an embryonic mammalian nervous system. The discovery may lead to strategies for regenerating damaged nerves.**
- **The Division of the Humanities and Social Sciences launches the Race, Politics, and Region (RPR) program. Consisting of three main components—research, education, and community interaction—RPR plans initially to use Southern California as a social research laboratory to study race relations and ethnic politics, as well as to track broad social and political trends in modern America.**
- **Chemists discover a new family of metal catalysts that can be used for the synthesis of polymers with controlled structure and for the synthesis of drugs and insect pheromones.**
- **Communications and signal processing begins to develop as a major area of emphasis within electrical engineering.**
- **JPL's Spaceborne Imaging Radar-C/X-B and Synthetic Aperture Radar (SIR-C/X-SAR) instrument flies twice on NASA's space shuttle. A joint project with the German and Italian space agencies, SIR-C/X-SAR provides data to scientists in a variety of disciplines and figures in such projects as the study of gorilla habitats in Central Africa and the precise location of China's fabled Silk Road.**

Three PhD recipients will go on to medical school, and one will attend law school.

The Institute tradition of limiting growth does not apply to the student body alone. Caltech also carefully controls the size of its permanent faculty. As of June 1996, full-time professorial faculty numbered only 282 (although this group was augmented by some 500 visiting and research faculty). A small, select faculty, organized into multispecialty divisions, is ideally suited to conduct the kind of interdisciplinary research that is Caltech's specialty. The social structure of the Institute—in particular, the daily mix of scholars at the lunch tables of the Athenaeum—further encourages fruitful professional collaboration. One result is that scientific questions tend to get answered more quickly, and research tends to find its way from lab to application in record time.

Caltech has produced one of the most decorated groups of scholars of any American university, regardless of size. Selected highlights:

- **Sixty-three current faculty members have been elected to the National Academy of Sciences.**
- **Twenty-nine current faculty have been elected to the National Academy of Engineering.**
- **Since Caltech's founding, 24 Nobel Prizes have been awarded to faculty and alumni. (Most recently, Douglas Osheroff, BS '67, shared the 1996 prize in physics.)**
- **Two faculty currently in residence have become Nobel laureates within the past 10 years: Rudolph A. Marcus, who was honored in 1992 for his work in chemistry, and Edward B. Lewis, who received the 1995 prize in physiology or medicine.**
- **Three faculty or alumni have been awarded the Crafoord Prize of the Royal Swedish Academy of Sciences: Gerald J. Wasserburg (geochemistry, 1986); Allan R. Sandage (astronomy, 1991); and Seymour Benzer (biosciences, 1993).**
- **Since 1962, 39 faculty and alumni have received the National Medal of Science.**
- **Thirteen faculty have been named California Scientist of the Year since 1958.**

A complete listing of the honors and awards Caltech faculty received in 1995–96 begins on page 38.

■ **Caltech chemists synthesize a new class of solid catalysts and show them to be useful for the preparation of chiral drug molecules. The high efficiency and generality of the catalyst system suggest broad commercial viability.**

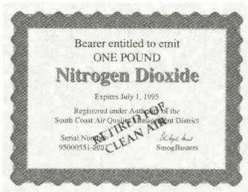
■ ***U. S. News & World Report* ranks Caltech first in the nation for its graduate program in physics.**

■ **The Caltech Precollege Science Initiative program (CAPSI) receives a six-year National Science Foundation grant to expand its innovative approach to teaching elementary school science into selected school districts throughout California. The grant is among the first the foundation has made to promote and improve science education for public school students.**

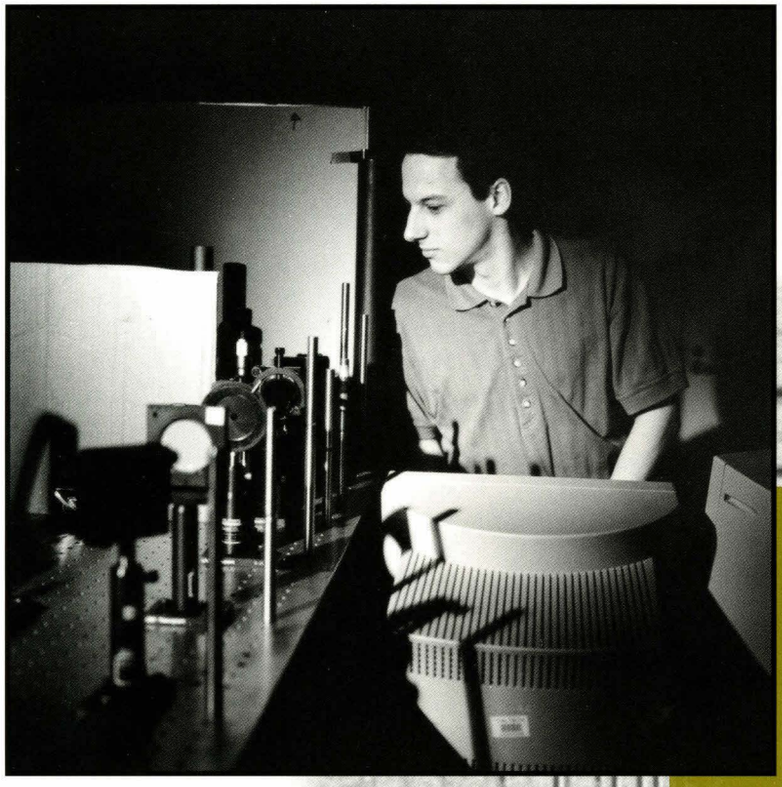
■ **The Caltech Submillimeter Observatory, by means of a link to the nearby James Clerk Maxwell telescope, functions as an interferometer to measure the size of preplanetary disks around young stars.**

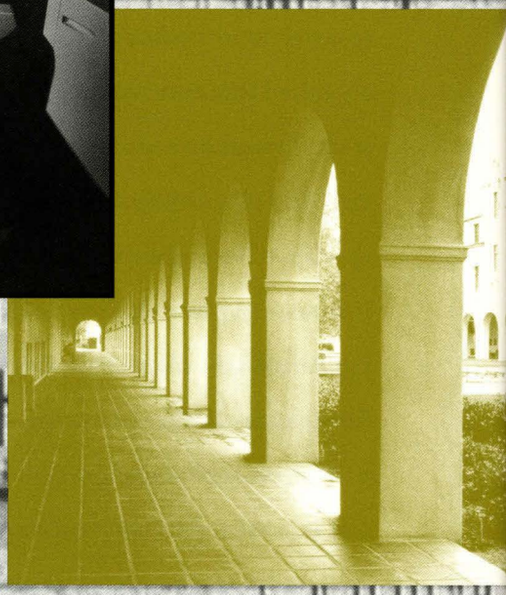
■ **Caltech neuroscience research is ranked second in the world for its impact on the field, as measured by the number of times work by Institute neuroscientists is cited in scholarly publications.**

■ **RECLAIM (the Regional Clean Air Market) gets under way. Designed with the help of Caltech economists and adopted by the South Coast Air Quality Management District, this groundbreaking regulatory program aims to use market forces to reduce smog in the Los Angeles basin. RECLAIM allots tradable credits to the area's largest polluters. Companies that reduce their emission of pollutants can save credits and sell them to companies that find it too difficult or expensive to meet emission standards.**

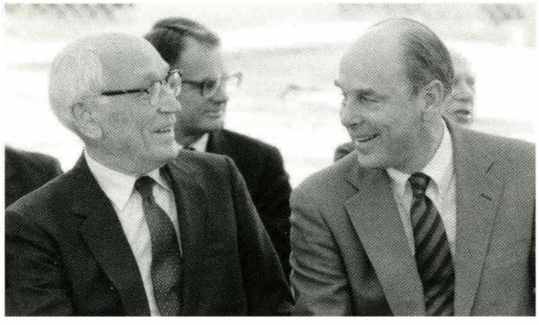


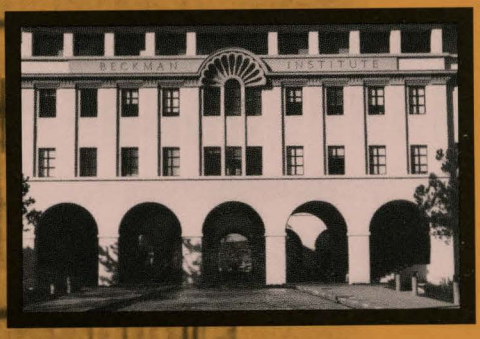
■ **A Sloan Foundation grant helps establish the Center for Theoretical Neurobiology, a facility devoted to studying the senses of sight, hearing, and smell. Students, postdocs, and faculty will investigate, both theoretically and experimentally, how sensory input to the brain is transformed into eye and body movements and will examine the physical processes involved in learning and memory.**



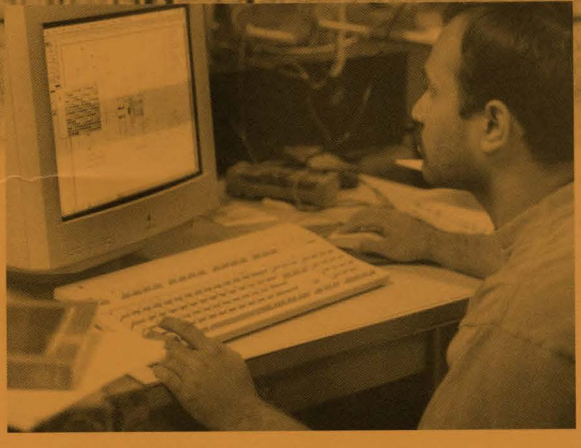


Wise Use of





Resources



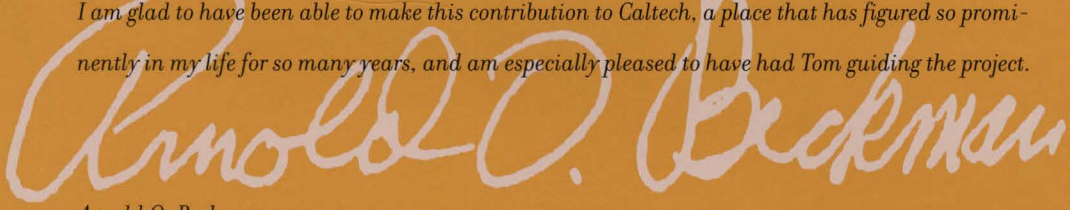
Although I had completed my term as Institute board chair some years before Tom Everhart became president, I still had the opportunity to work with him closely on the establishment of the Beckman Institute at Caltech.

After Tom's arrival, plans for the research center moved ahead rapidly. On April 11, 1988, ground was broken for the building. Construction was completed the following year, and the Beckman Institute was dedicated on October 26, 1989.

The facility now houses seven major resource centers that address critical problems at the interface of the chemical and biological sciences. The Beckman Institute program comprises the Biological Imaging Center; the Biomolecular Design Center; the Laser Spectroscopy Center; the Mass Spectroscopy Center; the Materials Simulation Center; the Materials Center; and the Computational Biology Center. The program also encompasses the genome research group; the biopolymer synthesis and analysis group; the transcription factor research group; and an X-ray crystallography lab.

The Beckman Institute has allowed Caltech to use its superlative resources fully by removing many of the traditional barriers between scientists and technologists. It has put people who design and build molecules under the same roof with people who design and build instruments, encouraging them to interact continuously and giving them access to sophisticated tools that would be too complex or expensive to house in individual laboratories. The result has been a new kind of synergism: Institute chemists now look more and more like biologists, and biologists are doing more and more chemistry. Together, they are addressing some of the major scientific challenges of our time, such as understanding the structure of genetic material and simulating photosynthesis.

The work of outstanding investigators, supported by Tom Everhart's dynamic leadership, has already made the Beckman Institute a world-renowned center for interdisciplinary research. I am glad to have been able to make this contribution to Caltech, a place that has figured so prominently in my life for so many years, and am especially pleased to have had Tom guiding the project.

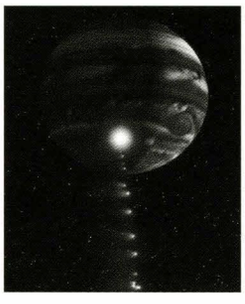


Arnold O. Beckman
Founder Chairman
Beckman Instruments, Inc.

Caltech has a reputation for using its resources—whether human or financial—wisely, another of the reasons for its success over the years. This characteristic finds expression in various ways—in, for example, how the Institute "runs lean" administratively, how it carefully plans capital investments to support emerging research trends, and how it tailors development efforts to carefully selected fields of research.

One of Dr. Everhart's first priorities after assuming office was to ask faculty and trustees what they thought Caltech's future research, teaching, and community emphases ought to be. Their responses to this survey determined many of the administrative and fund-raising goals of his tenure. Over the past 10 years, several of those goals have been realized in the tangible form of new campus buildings. The Beckman Institute, the construction of which was supported by a gift from the Arnold and Mabel Beckman Foundation, opened in October 1989. It houses researchers who pursue interdisciplinary work in biology and chemistry, with particular emphasis on instrumentation and potential applications. The Braun Athletic Center, made possible by a gift from the Carl F Braun Trust, was completed in late 1992. It has become one of the most popular venues on campus by promoting fitness and recreation for all members of the Caltech community.

Caltech has a reputation for using its resources—whether human or financial—wisely.

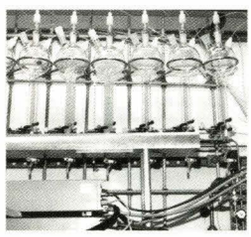


■ Fragments of comet Shoemaker-Levy 9 plunge into Jupiter's atmosphere. The prediction that the fragments' impact would produce plumes rising 3,000 kilometers above Jupiter's surface is verified by Hubble Space Telescope observations made July 16–19, 1994.

■ The Galileo orbiter begins its two-year mission. The spacecraft discovers a magnetic field on Ganymede and suggestions of liquid water beneath Europa's icy crust; it also finds that Jupiter's winds increase with depth and that water abundance is low.

■ Science, Ethics, and Society (SES) is first offered as an undergraduate option and as both an undergraduate and graduate minor at Caltech. SES courses are taught by philosophy and history faculty in the Division of the Humanities and Social Sciences and cover topics like the politics of research and development, the social uses of biological knowledge, and the evolution of theories of cognition. The SES option provides advantageous preparation for students planning careers in law, business, public policy, or the history or philosophy of science; the minor offers a valuable supplement to a technical degree.

■ The engineering component of the CNS program—called the Center for Neuromorphic Systems Engineering—is named one of only 21 National Science Foundation engineering research centers in the nation. Its researchers focus on developing and integrating machines that can see, hear, touch, or smell, to be used as enabling technologies for industry.



In 1996, four additional capital projects came to completion. January saw the dedication of the Moore Laboratory of Engineering, a gift of Caltech Board Chair Gordon Moore and his wife, Betty. Moore Laboratory has provided new classroom, laboratory, and office space for investigators in the electrical engineering group and the Center for Neuromorphic Systems Engineering. In May, the Keck II Telescope was dedicated on Mauna Kea, Hawaii. It joins Keck I, which was dedicated in 1991, and brings the W.M. Keck Observatory into full operation. The facility, which was funded by a grant from the W. M. Keck Foundation, is jointly administered by Caltech and the University of California.

In September 1996, Avery House was dedicated. Construction of the 80,000-square-foot residence for Caltech students and faculty was made possible by a gift from R. Stanton Avery, founder of the Avery Dennison Corporation. The most recent new structure to grace the Caltech campus is the Sherman Fairchild Library of Engineering and Applied Science, completed in late 1996 and dedicated in January 1997. The library will facilitate research at Caltech by collecting under one roof engineering texts previously housed in various locations, as well as by providing state-of-the-art electronic access to off-campus reference materials. Each of these projects illustrates how the Institute judiciously allocates its financial resources toward a carefully considered goal, be it strengthening a particular research area, promoting the health and recreation of the campus community, or enhancing residential life.

Making the best use of Caltech's considerable human resources is the goal of Administrative Process Engineering (APE). Begun in early 1995, APE has made

1995

■ **Astronomers identify the first brown dwarf—a celestial object more massive than any of our planets, but not massive enough to burn hydrogen like a star—ever to be detected, an important first step in the search for planetary systems beyond our own. Discovered using the 60-inch telescope at Caltech's Palomar Observatory, the brown dwarf is subsequently studied with the 200-inch Hale Telescope (also at Palomar), the Hubble Space Telescope, and the Keck telescopes.**

■ **Humanities and Social Sciences receives a grant from the National Science Foundation to support the expansion of the Laboratory for Experimental Economics and Political Science. The foundation's first major equipment grant to any university's social science department, it signifies the "arrival" of Caltech experimental economics as a viable methodology in the social sciences.**

■ **Biologists discover that certain proteins in the adult rat brain can strongly enhance the strength of connections between neurons for up to an hour, an effect never before demonstrated in adult brains. This finding may lead to increased understanding of how memories are formed, and possibly to the development of therapies for disease-induced memory loss.**

■ **Geologists use a dating technique based on the radioactive decay of uranium and thorium to helium-4 to study mountain-range uplift, a key topic in the investigation of regional tectonic patterns and potential seismic hazards.**

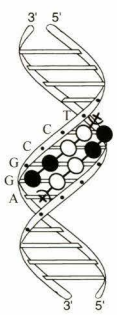
■ **Galileo arrives at Jupiter after a voyage of more than six years and 2.35 billion miles. The spacecraft's descent probe relays 57 minutes of data before vaporizing in Jupiter's atmosphere, marking the first time that scientists have obtained in situ measurements of an outer planet. Galileo then embarks on a two-year mission in orbit around Jupiter, making a number of flybys of the giant planet's major moons.**

significant progress during the past year. Its first phase, in which three teams of Caltech employees examined and reported on processes in several key administrative areas, was completed in mid-1996. At that time it was decided that, rather than simply updating existing practices, a completely new campuswide system needed to be designed and installed. The process, likened to the method JPL uses to design a spacecraft, will analyze 13 different business areas, beginning with financial management, acquisition, and human resources. Once detailed descriptions of the policies and procedures in each area have been compiled, it should be possible to redesign jobs to increase staff members' satisfaction and efficiency. This close analysis of existing work practices will also enable the administration to pursue another item on the APE agenda: purchasing the software that will be most suited to the Institute's needs and that can evolve as new applications and technology emerge. APE is slated for completion by October 1999.

Wise use of resources at Caltech also means identifying and appointing eminently qualified people to key administrative positions. In the summer of 1996, when Thomas W. Anderson stepped down as vice president for Institute relations, J. Ernest Nunnally, assistant vice president and director of development and alumni relations since October 1993, was promoted to that post. In September 1996, Jean-Paul Revel, the Albert Billings Ruddock Professor of Biology, began a three-year term as dean of students, succeeding D. Roderick Kiewiet, who returned to his regular duties as professor of political science. And in October 1996, Philip Halpern joined the Institute as treasurer and chief

1996

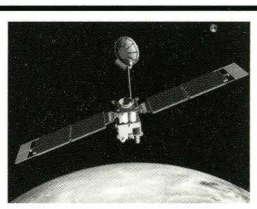
■ **Caltech chemists design powerful new synthetic agents that bind to specific segments of the genetic material DNA. This work may provide a new approach toward human therapeutics that target viral diseases.**



■ **SURFSat, a student-built science payload developed as part of Caltech's Summer Undergraduate Research Fellowships program, is launched from California's Vandenberg Air Force Base. The payload, originally designed to test deep-space communications in the Ka-band, will also be used to monitor a new set of Earth-orbit tracking stations.**

■ **The National Research Council survey ranks Caltech first in the nation for research-doctorate programs in astronomy, astrophysics, and geosciences.**

■ **Construction of the Moore Laboratory of Engineering is completed. The building will provide a state-of-the-art home for the Computation and Neural Systems program, the Center for Neuromorphic Systems Engineering, and the electrical engineering research group. It also contains lecture halls and instructional labs. A gift from alumnus and Board Chair Gordon E. Moore and his wife, Betty, funded the 90,000-square-foot structure.**



■ **Mars Global Surveyor begins its 10-month flight to the red planet. On arrival, it will conduct global mapping from a polar orbit for two years, and then remain for another three years as a relay station for future spacecraft. Its launch is soon followed by that of a second spacecraft, Mars Pathfinder, which carries a lander and rover robot to the planet for touchdown on July 4, 1997.**

investment officer. He previously had been chief investment officer for the Washington State Investment Board.

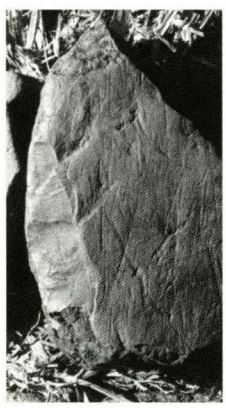
The Institute has also been fortunate in the past year to be able to enlist a group of its trustees, longtime supporters, professors, and administrators to serve on the Biological Sciences Advisory Council, which will help plan the future of the biological sciences at Caltech. Over the next two decades, the Institute's biosciences research will focus techniques and expertise from a broad range of scientific and engineering fields on fundamental unanswered questions in biology. Part of the council's mission is to help ensure that work to answer those questions will not only be—as Dr. Everhart expressed it—"exciting science, but will also serve the interests of society." The council will advise on various issues related to the success of bioscience teaching and research programs and will provide feedback about how potential supporters and the public perceive those programs.

In 1995–96, the Institute's financial resources were greatly enhanced by the generosity of many organizations and individuals. Gifts totaling more than $5 million endowed seven new undergraduate scholarships. Both individuals and foundations contributed some $5.45 million toward graduate and postdoctoral fellowships, and $5.8 million was given for the establishment of three new named professorships. The SURF program also received a $100,000 endowment.

Several corporations and foundations made generous contributions in support of specific research projects at Caltech. Bank of America pledged funds for the enhancement of the Environmental Analysis Center. Redox Pharmaceutical Corporation supported magnetic resonance imaging research being conducted in the Division

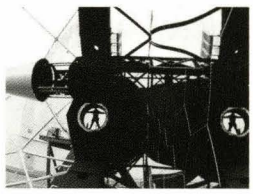
■ **Chemists at the Beckman Institute report that submicrosecond electron transfer can be used to initiate protein folding, opening the way for the study of the first events in the folding process.**

■ **Caltech geologists discover 2.2 billion-year-old glacial rocks that were deposited near the equator, evidence of Earth's climatic resilience.**



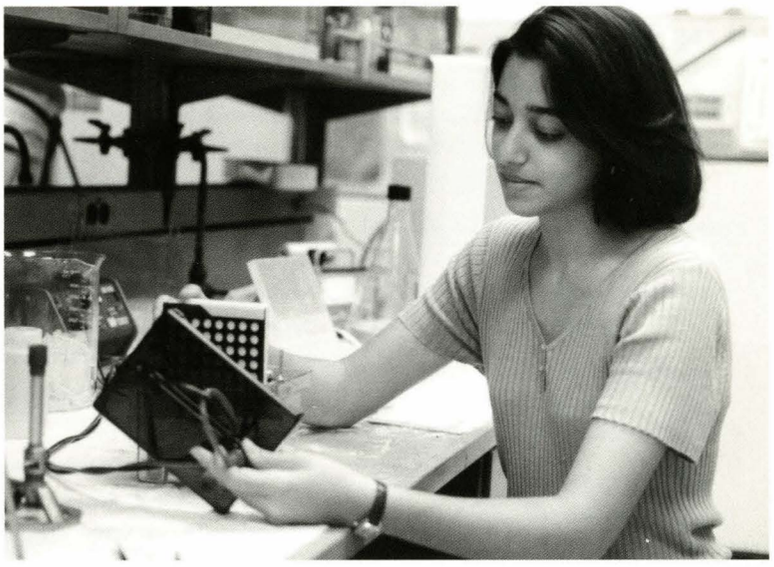
■ **Chemists discover that the DNA double helix can mediate chemistry at a distance. This novel characteristic of DNA is important for understanding how DNA is damaged and repaired and how mutations and cancers form, as well as for developing new diagnostic agents targeted to DNA.**

■ **A major new research thrust, Quantum Information and Computing (QUIC), takes off. A group of theoretical and experimental physicists, in collaboration with colleagues at UCLA and MIT, aim to find out if it is possible to design and build a quantum computer—one that calculates according to the principles of quantum mechanics, rather than with traditional bits and bytes. Their work had some of its origins in related research conducted in Caltech's quantum optics lab, operational since 1989.**



■ **The Keck II Telescope is dedicated and begins operation. When used in conjunction with Keck I, it has the angular resolution of a telescope with a mirror 85 meters in diameter—the distance between the two instruments—and can bring into view objects too distant or too faint to be seen by any other optical telescope.**

of Biology. A gift from the Kenneth T. and Eileen L. Norris Foundation will make information from the Palomar/Norris Northern Sky Survey available to the astronomical community in digitized form and will also provide for enhancement of the Norris Planetary Origins Telescope at the Owens Valley Radio Observatory. The Richard M. Lucas Foundation contributed to the construction of the John W. Lucas Wind Tunnel, a new facility that will replace the 10-foot wind tunnel in Guggenheim Laboratory. And both the Intel Corporation and the Wavefront Division of Silicon Graphics gave generous gifts-in-kind of computer hardware and software. These contributions reaffirm what the Institute has known for many years: that it is extremely fortunate to have trustees, alumni, and many other friends who make sustaining Caltech's excellence one of their priorities.



■ **The Sherman Fairchild Library of Engineering and Applied Science, under construction since 1994, is completed. Designed to act as a bridge between the all-paper libraries of the past and the electronic facilities of the future, the building features resources like the World Wide Web, electronic databases, scanners, and CD-ROMs, in addition to the more traditional books and bound journals. (The library officially opens in January 1997.)**

■ **Two MD/PhD programs are established in cooperation with UCLA. The Specialty Training and Advanced Research program allows students who have already completed an MD program at UCLA to pursue a PhD in any of Caltech's graduate programs. The Medical Scientist Training Program is designed for students who wish to obtain an MD from UCLA and a PhD from Caltech simultaneously.**

■ **The Division of the Humanities and Social Sciences begins to offer Spanish language courses.**

■ **LIGO shows major construction progress. Buildings at the Washington facility should be ready for occupancy by the summer of 1997. At the Louisiana site, major earth moving has been completed and is in a settling phase, in preparation for the pouring of the concrete pads that will support subsequent construction.**

■ **The Division of the Humanities and Social Sciences marks the 25th anniversary of its social science graduate programs. Nationally unranked at their inception, economics at Caltech now ranks eighth and political science ranks sixth, as measured by per capita research citations.**

■ **Astronomers discover collections of primordial galaxies—that is, galaxies dating back to the first 10 to 20 percent of the present lifetime of the universe. The very "ordinariness" of these galaxies—there is nothing odd or atypical about them—is one of their most important features: the data they yield about galactic evolution may apply to a wide range of investigations.**

Honors and Awards

National Awards and Honors

Achievement Rewards for College Scientists, Scientist of the Year:
Edward B. Lewis, *Thomas Hunt Morgan Professor of Biology, Emeritus*

Electronic Design Automation Companies (EDAC), 1996 Phil Kaufman Award:
Carver A. Mead, *Gordon and Betty Moore Professor of Engineering and Applied Science*

National Academy of Sciences, Award in Chemical Sciences:
Ahmed H. Zewail, *Linus Pauling Professor of Chemical Physics and Professor of Physics*

National Medal of Science, Recipient:
Norman R. Davidson, *Norman Chandler Professor of Chemical Biology, Emeritus, and Executive Officer for Biology*

Office of Naval Research, Young Investigator:
Richard M. Murray, *Assistant Professor of Mechanical Engineering*

Presidential Early Career Award for Scientists and Engineers, Recipient:
Erick M. Carreira, *Associate Professor of Chemistry*

International Awards and Honors

Academica Europaea, Earth and Cosmic Science Section, Foreign Member:
Peter J. Wyllie, *Professor of Geology and Divisional Academic Officer*

Chemical Institute of Canada, 1996 Cross Canada Lecture Tour:
Mark E. Davis, *Warren and Katharine Schlinger Professor of Chemical Engineering*

Chinese Academy of Sciences, Foreign Member:
Peter J. Wyllie, *Professor of Geology and Divisional Academic Officer*

European Union of Geosciences, Arthur Holmes Medal, Corecipient:
Edward M. Stolper, *William E. Leonhard Professor of Geology and Chair of the Division of Geological and Planetary Sciences*

Film-Historia, 1995 Best Book on Film Award:
Robert A. Rosenstone, *Professor of History*

Fondation de la Maison de la Chimie, 1996 Grand Prix, Corecipient:
Peter B. Dervan, *Bren Professor of Chemistry and Chair of the Division of Chemistry and Chemical Engineering*

German Astronomical Society, Karl Schwarzschild Medal:
Kip S. Thorne, *Richard P. Feynman Professor of Theoretical Physics*

German Ministry for Development, Science, Research, and Technology, Heinz-Maier-Leibnitz Prize:
Matthias Flach, *Associate Professor of Mathematics*

International Academy of Engineering, Member:
Wolfgang G. Knauss, *Professor of Aeronautics and Applied Mechanics*

Kuratorium der Stiftung für die Paul Karrer-Vorlesung, Universität Zürich, Paul Karrer Gold Medal and Memorial Lecture:
Jacqueline K. Barton, *Professor of Chemistry*

LVMH—Moët Hennessy·Louis Vuitton, "Science pour l'Art" Science Prize, Corecipient:
Elliot M. Meyerowitz, *Professor of and Executive Officer for Biology*

Local Awards

Central City Association, Treasure of Los Angeles Award, 1995:
Rudolph A. Marcus, *Arthur Amos Noyes Professor of Chemistry*
Treasure of Los Angeles Award, 1996:
Katherine Hutton, *Member of the Professional Staff, Division of Geological and Planetary Sciences*

San Gabriel Valley Council of the Boy Scouts of America, Good Scout Award:
Edward C. Stone, *Vice President, Director of the Jet Propulsion Laboratory, and David Morrisroe Professor of Physics*

Awards and Honors from Professional Societies

American Astronomical Society, 1996
Henry Norris Russell Lectureship:
Gerry Neugebauer, *Robert Andrews Millikan Professor of Physics*

American Chemical Society, 1996
Arthur C. Cope Scholar Award:
Barbara Imperiali, *Associate Professor of Chemistry*
Erick M. Carreira, *Associate Professor of Chemistry*

Award for Distinguished Service in the Advancement of Inorganic Chemistry:
John E. Bercaw, *Centennial Professor of Chemistry*

Award in Pure Chemistry:
Erick M. Carreira, *Associate Professor of Chemistry*

Award in Theoretical Chemistry:
Rudolph A. Marcus, *Arthur Amos Noyes Professor of Chemistry*

Sierra Nevada Distinguished Chemist Award:
Harry B. Gray, *Arnold O. Beckman Professor of Chemistry and Director of the Beckman Institute*

American Chemical Society, New Haven Section, 1996 John Gamble Kirkwood Award:
Ahmed H. Zewail, *Linus Pauling Professor of Chemical Physics and Professor of Physics*

American Chemical Society, New York Section, and the Nichols Medal Jury, 1997 William H. Nichols Medal:
Jacqueline K. Barton, *Professor of Chemistry*

American Council of Learned Societies, 1996–97 Arnold L. and Lois P. Graves Award in the Humanities:
Kevin M. Gilmartin, *Assistant Professor of Literature*

American Geophysical Union, 1996
Walter H. Bucher Medal:
Hiroo Kanamori, *John E. and Hazel S. Smits Professor of Geophysics and Director of the Seismological Laboratory*
Harry E. Hess Medal:
Thomas J. Ahrens, *W. M. Keck Foundation Professor of Earth Sciences*

American Institute of Chemical Engineers, Fellow:
John H. Seinfeld, *Louis E. Nohl Professor and Professor of Chemical Engineering, and Chair of the Division of Engineering and Applied Science*

Separations Division Graduate Research Paper Award:
Frances H. Arnold, *Professor of Chemical Engineering*

American Mathematical Society, Vice President:
Michael Aschbacher, *Shaler Arthur Hanisch Professor of Mathematics*

American Philosophical Society, Member:
Daniel J. Kevles, *J. O. and Juliette Koepfli Professor of the Humanities*
Nelson J. Leonard, *Faculty Associate in Chemistry*

American Physical Society, 1996 John N. Dillon Medal for Research in Polymer Physics:
Julia A. Kornfield, *Associate Professor of Chemical Engineering*

1996 Otto Laporte Award:
Donald E. Coles, *Professor of Aeronautics, Emeritus*

American Society of Civil Engineering, Honorary Member:
Norman H. Brooks, *James Irvine Professor of Environmental and Civil Engineering, Emeritus*

American Society of Mechanical Engineers, Fellow:
Morteza Gharib, *Professor of Aeronautics*

Econometric Society, Fellow:
Thomas R. Palfrey, *Professor of Economics and Political Science*

Genetics Society of America, 1996 Medal:
Elliot M. Meyerowitz, *Professor of and Executive Officer for Biology*

Geological Society of America, Planetary Geology Division, G. K. Gilbert Award:
Robert P. Sharp, *Robert P. Sharp Professor of Geology, Emeritus*

Geological Society of America, Quaternary Geology and Geomorphology Division, Distinguished Career Award:
Robert P. Sharp, *Robert P. Sharp Professor of Geology, Emeritus*

Institute of Electrical and Electronics Engineers, Fellow:
Slobodan M. Cuk, *Associate Professor of Electrical Engineering*

1996 Koji Kobayashi Computers and Communications Award:
K. Mani Chandy, *Professor of Computer Science*

1996 IEEE John Von Neumann Medal:
Carver A. Mead, *Gordon and Betty Moore Professor of Engineering and Applied Science*

Meteoritical Society, 1997 Barringer Award:
Thomas J. Ahrens, *W. M. Keck Foundation Professor of Earth Sciences*

Midwest Political Science Association, Sprague Award:
R. Michael Alvarez, *Associate Professor of Political Science*

Minerals, Metals and Materials Society, 1996 William Hume-Rochery Award:
William L. Johnson, *Ruben F. and Donna Mettler Professor of Engineering and Applied Science*

Society for Biomaterial, Clemson Award:
Jeffrey A. Hubbell, *Professor of Chemical Engineering*

Society for Experimental Mechanics, B. J. Lazan Award:
Ares J. Rosakis, *Professor of Aeronautics and Applied Mechanics*

Foundation awards

Arnold and Mabel Beckman Foundation, 1996 Beckman Young Investigator Award:
Erin M. Schuman, *Assistant Professor of Biology*

California Museum of Science and Industry Foundation, International von Kármán Wings Award:
Edward C. Stone, *Vice President, Director of the Jet Propulsion Laboratory, and David Morrisroe Professor of Physics*

The Camille and Henry Dreyfus Foundation, 1996 Camille Dreyfus Teacher-Scholar Award:
Erick M. Carreira, *Associate Professor of Chemistry*

The John Randolph Haynes and Dora Haynes Foundation, 1996 Faculty Fellowship for Science and Engineering:
Jonathan N. Katz, *Assistant Professor of Political Science*

The David and Lucile Packard Foundation, Packard Fellowship for Science and Engineering:
Kenneth A. Farley, *Associate Professor of Geochemistry*

Alfred P. Sloan Foundation, Research Fellow:
Erick M. Carreira, *Associate Professor of Chemistry*
Matthias Flach, *Associate Professor of Mathematics*
Peter Schröder, *Assistant Professor of Computer Science*
Zhen-Gang Wang, *Assistant Professor of Chemical Engineering*

University honors

China University of Geosciences, Honorary Professor of Geology:
Peter J. Wyllie, *Professor of Geology and Divisional Academic Officer*

Hebrew University, Jerusalem, Distinguished Lecturer in Environmental Chemistry:
Michael R. Hoffmann, *James Irvine Professor of Environmental Science*

Indian Institute of Technology, Delhi, 1996 Distinguished Alumni Award:
Shrinivas R. Kulkarni, *Professor of Astronomy and Planetary Science*

University of Rochester, Rochester Distinguished Scholar Medal:
Richard D. McKelvey, *Professor of Political Science and Executive Officer for the Social Sciences*

University of São Paulo, Distinguished Lecturer in Environmental Chemistry:
Michael R. Hoffmann, *James Irvine Professor of Environmental Science*

Institute honors

Distinguished Alumni Awards:
William J. Carroll, BS '48, MS '49
Ray W. Clough, MS '43
San Chiun Shen, PhD '51
Vernon L. Smith, BS '49
Nicholas J. Turro, PhD '63

Endowed Professorships:
Thomas J. Ahrens, *W. M. Keck Foundation Professor of Earth Sciences*
Michael Aschbacher, *Shaler Arthur Hanisch Professor of Mathematics*
John D. Baldeschwieler, *J. Stanley Johnson Professor of Chemistry*
Michael R. Hoffmann, *James Irvine Professor of Environmental Science*
Gerry Neugebauer, *Robert Andrews Millikan Professor of Physics*
Demetri Psaltis, *Thomas G. Myers Professor of Electrical Engineering*
Nicholas Z. Scoville, *Francis L. Moseley Professor of Astronomy*
Thomas A. Tombrello, *William R. Kenan, Jr., Professor*
Amnon Yariv, *Martin and Eileen Summerfield Professor of Applied Physics*

Associated Students of the California Institute of Technology (ASCIT), Award for Teaching Excellence:
John D. Baldeschwieler, *J. Stanley Johnson Professor of Chemistry*
Christopher E. Brennen, *Professor of and Executive Officer for Mechanical Engineering*
H. Peter Hofstee, *Instructor in Computer Science*
Michael S. Shumate, *Lecturer in Applied Physics*
David J. Stevenson, *George Van Osdol Professor of Planetary Science*

Division of Biology, Lawrence L. and Audrey W. Ferguson Award for Biology Education:
David J. Anderson, *Professor of Biology and Associate Investigator, Howard Hughes Medical Institute*

Lawrence L. and Audrey W. Ferguson Faculty Teaching Award:
Erin M. Schuman, *Assistant Professor of Biology*

Lawrence L. and Audrey W. Ferguson Graduate Teaching Assistant Award:
Roian Egnor, *Graduate Student in Biology*

Lawrence L. and Audrey W. Ferguson Prize for Outstanding Biology PhD Thesis:
Christopher J. Schoenherr, *Graduate Student in Biology*

Richard P. Feynman Prize for Excellence in Teaching, Recipient:
Yaser S. Abu-Mostafa, *Professor of Electrical Engineering and Computer Science*

Graduate Student Council, 1996 GSC Teaching Awards:
Pamela Bjorkman, *Associate Professor of Biology and Associate Investigator, Howard Hughes Medical Institute*
Joel W. Burdick, *Associate Professor of Mechanical Engineering*
Joel N. Franklin, *Professor of Applied Mathematics*
Steven C. Frautschi, *Professor of Theoretical Physics and Executive Officer for Physics*
Robert J. McEliece, *Professor of and Executive Officer for Electrical Engineering*
Theodore Y.-T. Wu, *Professor of Engineering Science*

Outstanding Teaching Assistant Awards:
David A. Barksdale, *Senior in Engineering and Applied Science*
Carlos D. Brody-Pellicer, *Graduate Student in Computation and Neural Systems*
Christopher A. Eckett, *Graduate Student in Aeronautics*
Thomas R. Tsao, *Graduate Student in Electrical Engineering*
Jin Zhang, *Graduate Student in Engineering Science*

The California Institute of Technology enjoyed banner performance in 1996. A surge in federally sponsored research led revenue growth, while a buoyant equity market raised the endowment to a record high. Net assets increased $187.0 million, or 14.7 percent, between 1995 and 1996.

In fiscal 1996, Caltech adopted three new accounting standards promulgated by the Financial Accounting Standards Board:

- Statement No. 116, which requires that pledges (unconditional promises to give) from donors be recorded as receivables and revenues in the fiscal year such pledges are received, and that the Institute's remainder interest in living trust agreements be recorded at actuarial present value.
- Statement No. 117, which establishes standards for external financial reporting by not-for-profit organizations that change both format and content of financial statements (and eliminates the multiple fund groups that formerly characterized such statements).
- Statement No. 124, which requires investments in equity securities with readily determinable fair market values and all debt securities be reported at fair value. (Note A provides further details on these new standards.)

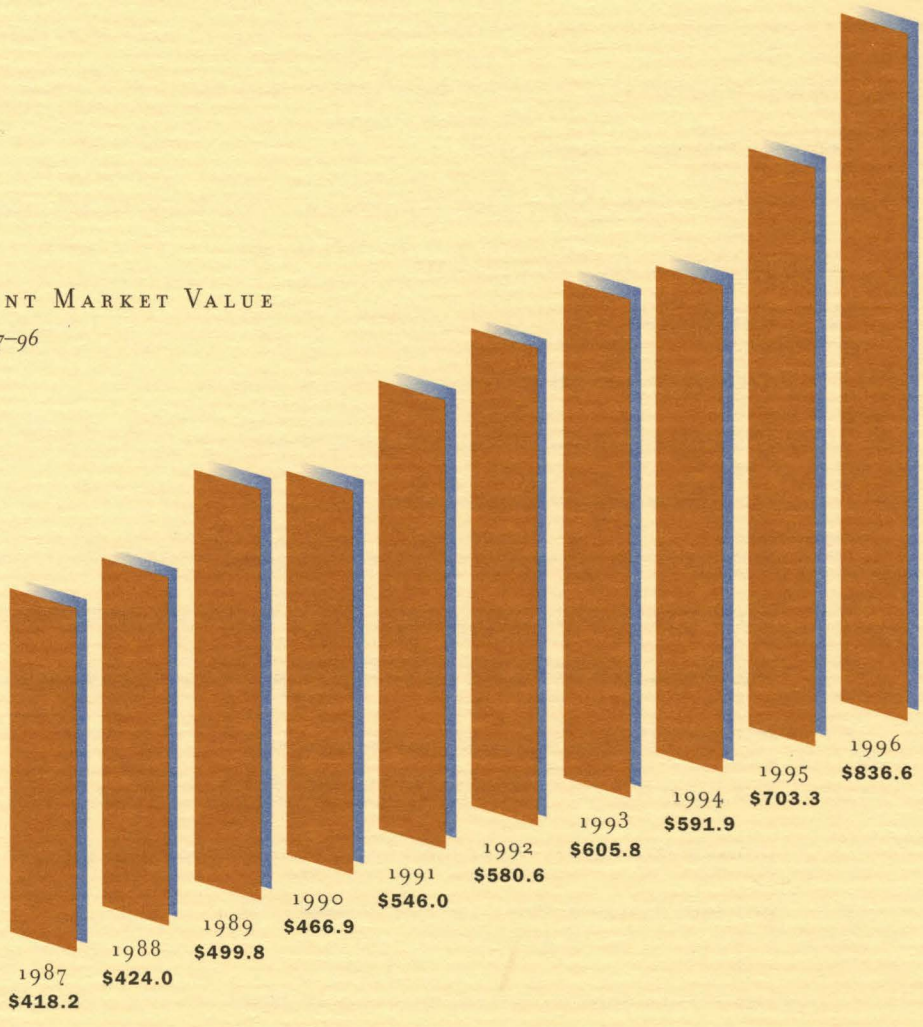
For purposes of comparison, fiscal year 1995 has been restated in accordance with these new standards, as have total net assets for 1994.

Statement of Financial Position

The Statement of Financial Position, formerly the Balance Sheet, reflects this year's strong investment returns and significant growth in campus properties: the sum of these two categories increased assets by $161.2 million. In particular, Caltech's endowment increased 19.0 percent: from $703.3 million to $836.6 million between 1995 and 1996 (see Note B for details). Liabilities decreased marginally.

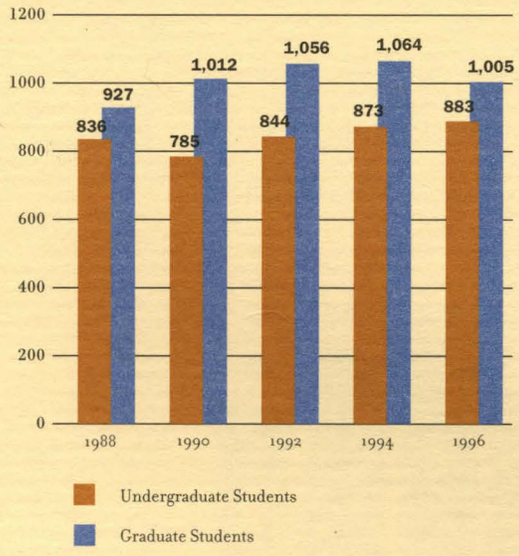
Endowment Market Value

Fiscal years 1987–96
(in millions)



Undergraduate and Graduate Student Enrollment

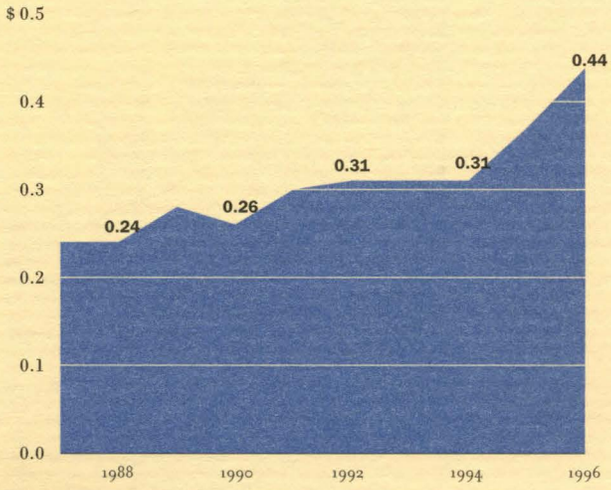
Fiscal years 1988–96



Endowment Per Student

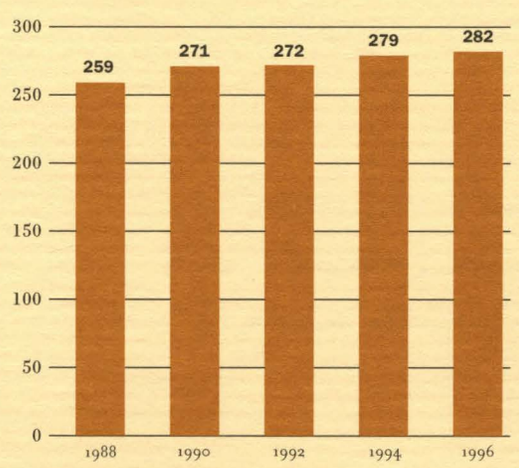
Fiscal years 1987–96

(in millions)



Professorial Faculty

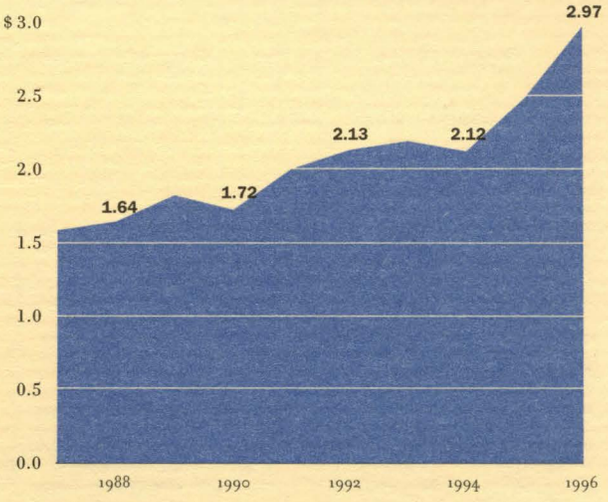
Fiscal years 1988–96



Endowment Per Professorial Faculty

Fiscal years 1987–96

(in millions)



The Statement of Activities replaces our previous Statement of Changes in Fund Balances. The activities are reported in three categories: (1) unrestricted, (2) temporarily restricted, and (3) permanently restricted.

1. **Unrestricted Net Assets** are used to support the Institute's core missions of teaching and research. Under FASB Statement No. 117, the majority of Institute revenues and gains on endowment are reported as unrestricted, even though the Institute complies with donors' wishes in managing its resources.

   The primary contributors to unrestricted net asset growth were gains on investments and a dramatic increase in reimbursements of direct costs in federally sponsored research—the latter primarily a function of the flow through of National Science Foundation funds to construct and equip the Laser Interferometer Gravitational-Wave Observatory (LIGO). Indeed, $36.9 million of this increase, due to LIGO, manifests itself in the increase in Campus Properties in the Statement of Position. The realized gains and unrealized appreciation on investments, after application of a portion of gains to support current operations, were the primary contributors to growth in Investment Assets noted above.

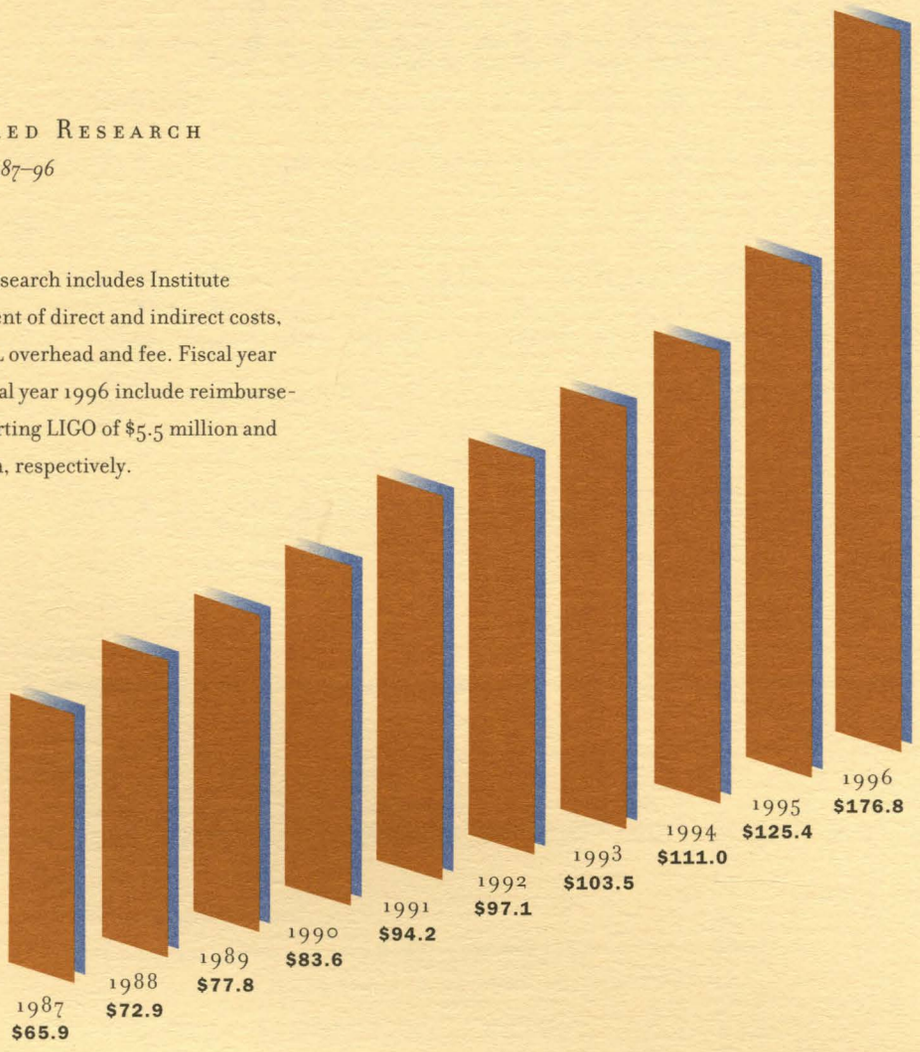
   On the expense side, we note a growth in organized research of 7.0 percent ("underlying" research activities, excluding capitalizable equipment and construction due to LIGO), and a drop in Instruction and Departmental Research due to a credit in accrued postretirement benefits (see Note I).

2. **Temporarily Restricted Net Assets** changed only marginally, increasing as a consequence of donor contributions and investment appreciation, and decreasing as a consequence of Institute actions which relieved restrictions (such as the expenditure of gifts for capital projects).

Sponsored Research

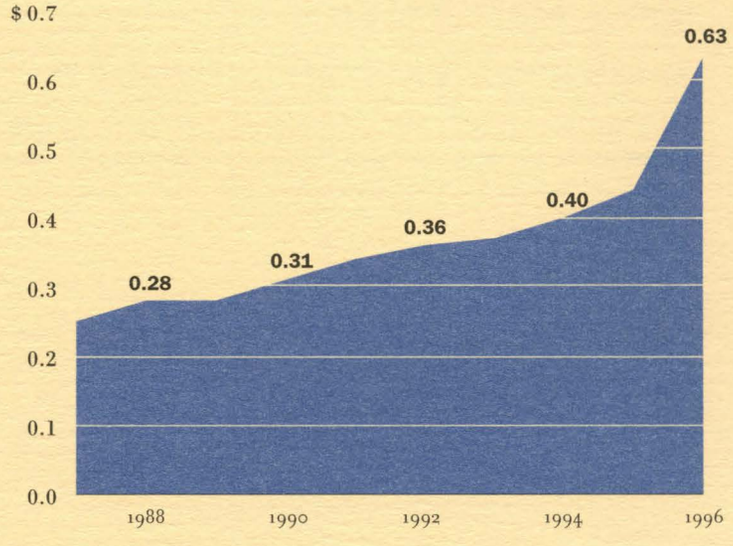
Fiscal years 1987–96
(in millions)

Sponsored research includes Institute reimbursement of direct and indirect costs, excluding JPL overhead and fee. Fiscal year 1995 and fiscal year 1996 include reimbursements supporting LIGO of $5.5 million and $36.9 million, respectively.



Sponsored Research Per Faculty

Fiscal years 1987–96
(in millions)



3. **Permanently Restricted Net Assets** are those which may never be spent by the Institute. This category increased by $28.1 million, primarily as a consequence of unrealized investment appreciation and donor contributions.

Total Revenue, Gains, and Other Support were $488.9 million, and Total Expenses $301.9 million for 1996. The difference is the aforementioned $187.0 increase in Net Assets. Note F provides greater detail for total operating expenses of $289.8 million for 1996.

The Jet Propulsion Laboratory incurred and was reimbursed for direct costs of $1,063.5 million for 1996.

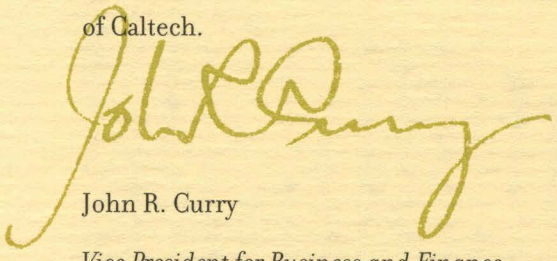
Statement of Cash Flows

A Statement of Cash Flows follows the Statement of Activities and is required by FASB Statement No. 117.

Commentary

Both cursory and careful study of Caltech's Financial Statements reveal the same salient characteristics. Caltech is contract and grant (research) and capital (endowment and facilities) intensive. Intensity is more a function of relative than absolute values. Thus, sponsored research per professorial faculty, and endowment per professorial faculty and per student, are among the most relevant measures of financial vitality.

The accompanying charts reveal the relatively large numerators, relatively small denominators, and consequent large ratios that capture some of the extraordinary essence of Caltech.



John R. Curry

Vice President for Business and Finance

Statement of Financial Position

September 30, 1996 and 1995
(in thousands)

	1996	1995
Assets		
Cash	$ 2,515	$ 2,054
Accounts Receivable		
United States Government	166,510	173,979
Pledges	41,145	43,192
Other	3,223	2,058
Student and Employee Accounts	16,939	16,107
Investments	954,513	866,139
Deferred United States Government Billings	108,702	105,377
Prepaid Expenses and Other Assets	96,511	76,776
Campus Properties	567,425	494,626
Total Assets	$1,957,483	$1,780,308
Liabilities		
Accounts Payable and Accrued Expenses		
United States Government	$ 288,499	$ 278,971
Other	11,474	32,059
Deferred Compensation	33,054	31,231
Deferred Student Revenue and Refundable Advances	19,879	18,903
Revocable Trust Funds and Agency Funds	15,446	16,551
Annuities Payable and Trust Agreement Liabilities	54,234	53,661
Revenue Bonds Payable	76,000	77,050
Total Liabilities	$ 498,586	$ 508,426
Net Assets		
Unrestricted	$1,109,682	$ 953,978
Temporarily Restricted	88,848	85,594
Permanently Restricted	260,367	232,310
Total Net Assets	$1,458,897	$1,271,882
Total Liabilities and Net Assets	$1,957,483	$1,780,308

See accompanying notes to financial statements.

Statement of Activities

Fiscal Year Ended September 30, 1996, with Summarized Information for the Fiscal Year Ended September 30, 1995
(in thousands)

	1996				1995
	Unrestricted	*Temporarily Restricted*	*Permanently Restricted*	*Total*	*Total*
GENERAL CAMPUS OPERATIONS					
Revenues, Gains, and Other Support					
Student Tuition and Fees	$ 32,889			$ 32,889	$ 31,971
Investment Income	28,145	$ 112	$ 510	28,767	31,568
Realized Gain on Disposal of Investments	67,132	3,085	1,137	71,354	35,547
Unrealized Appreciation in Investments	41,651	14,562	7,525	63,738	86,160
Contributions	21,418	10,720	18,692	50,830	50,006
United States Government Grants and Contracts					
Reimbursement of Direct Costs	139,190			139,190	91,198
Recovery of Indirect Costs and Management Allowance	64,739			64,739	60,680
Other Grants and Contracts	7,007			7,007	7,100
Auxiliary Enterprises	11,947			11,947	11,758
Other	18,445			18,445	25,193
Total Revenues and Gains	$ 432,563	$ 28,479	$ 27,864	$ 488,906	$ 431,181
Net Assets Released from Restrictions	25,032	(25,225)	193		
Total Revenues, Gains, and Other Support	$ 457,595	$ 3,254	$ 28,057	$ 488,906	$ 431,181
Expenses					
Campus Operating Expenses					
Instruction and Departmental Research	$ 91,559			$ 91,559	$ 98,965
Organized Research	104,447			104,447	97,581
Scholarships and Fellowships	15,870			15,870	15,637
Institutional and Student Support	44,445			44,445	43,673
Plant Operation, Maintenance, and Utilities	22,260			22,260	21,985
Auxiliary Enterprises	11,170			11,170	10,977
Total Campus Operating Expenses	$ 289,751			$ 289,751	$ 288,818
Interest on Revenue Bonds Payable	3,774			3,774	3,799
Other	8,366			8,366	10,651
Total Expenses	$ 301,891			$ 301,891	$ 303,268
JET PROPULSION LABORATORY					
Reimbursement of Direct Costs	$1,063,482			$1,063,482	$1,054,394
Direct Costs of Organized Research	$1,063,482			$1,063,482	$1,054,394
Total Increase in Net Assets	$ 155,704	$ 3,254	$ 28,057	$ 187,015	$ 127,913
Net Assets at Beginning of Fiscal Year	953,978	85,594	232,310	1,271,882	1,143,969
Net Assets at End of Fiscal Year	$1,109,682	$ 88,848	$260,367	$1,458,897	$1,271,882

See accompanying notes to financial statements.

Statement of Cash Flows

Fiscal Year Ended September 30, 1996 and 1995
(in thousands)

	1996	1995
Cash Flows from Operating Activities		
Total Increase in Net Assets	$ 187,015	$127,913
Adjustments to Reconcile Total Increase in Net Assets to Net Cash Provided By Operating Activities		
Depreciation	34,530	37,424
Decrease in Accounts Receivable	8,351	36,420
Decrease in Accounts Payable and Accrued Expenses	(11,057)	(15,643)
Contributions Restricted for Long-Term Investment	(18,692)	(16,883)
Realized Gain on Disposal of Investments	(71,354)	(35,547)
Unrealized Appreciation in Investments	(63,738)	(86,160)
Other	(21,625)	(11,200)
Net Cash Provided By Operating Activities	$ 43,430	$ 36,324
Cash Flows from Investing Activities		
Proceeds From Disposal of Investments	$ 530,756	$327,508
Purchases of Investments	(484,038)	(337,500)
Purchases of Campus Properties	(107,329)	(71,361)
Net Cash Used For Investing Activities	$ (60,611)	$ (81,353)
Cash Flows from Financing Activities		
Contributions Restricted for Long-Term Investment	$ 18,692	$ 16,883
Repayment of Revenue Bonds	(1,050)	(1,050)
Issuance of Revenue Bonds		30,000
Net Cash Provided By Financing Activities	$ 17,642	$ 45,833
Net Increase in Cash	$ 461	$ 804
Cash at Beginning of Fiscal Year	2,054	1,250
Cash at End of Fiscal Year	$ 2,515	$ 2,054

See accompanying notes to financial statements.

NOTE A
Summary of Significant Accounting Policies

GENERAL — The California Institute of Technology (the Institute) is a private, not-for-profit institution of higher education based in Pasadena, California. The Institute provides education and training services, primarily for students at the undergraduate, graduate, and postdoctoral levels, and performs research, training, and other services under grants, contracts, and similar agreements with sponsoring organizations, primarily departments and agencies of the United States government. The Institute is a tax-exempt organization under federal and state income, gift, estate, and inheritance tax laws.

BASIS OF ACCOUNTING AND REPORTING — The financial statements of the Institute have been prepared on the accrual basis of accounting. In fiscal 1996, the Institute adopted three new accounting standards promulgated by the Financial Accounting Standards Board: Statement No. 116, "Accounting for Contributions Received and Contributions Made"; Statement No. 117, "Financial Statements of Not-for-Profit Organizations"; and Statement No. 124, "Accounting for Certain Investments Held by Not-for-Profit Organizations." The provisions of these statements were retroactively applied, resulting in a restatement of fiscal 1995 financial information for comparative purposes.

Statement No. 116 requires pledges (unconditional promises to give) from donors be recorded as receivables and revenues in the fiscal year such pledges are received. Statement No. 117 establishes standards for external financial reporting by not-for-profit organizations that changes the format and content of the financial statements. It also requires that net assets be classified for accounting and reporting purposes into three categories according to donor-imposed restrictions: permanently restricted, temporarily restricted, and unrestricted. Statement No. 124 requires investments in equity securities with readily determinable fair values and all debt securities be reported at fair value.

Adoption of these accounting standards resulted in the restatement of total fund balances at September 30, 1994, previously reported and audited, as follows (in thousands):

Total fund balances at September 30, 1994	$ 1,074,950
Net unrealized appreciation in investments	80,855
Pledges receivable	43,683
Trusts and other liabilities	(55,519)
Total net assets, as restated, at September 30, 1994	$ 1,143,969

Permanently restricted net assets include gifts, charitable remainder unitrusts, pooled income funds, gift annuities, other split-interest agreements, and pledges receivable which require by donor restriction that the corpus be invested in perpetuity. Income generated from these assets may be used in accordance with donor restrictions.

Temporarily restricted net assets include gifts for which donor-imposed restrictions have not been met (primarily for future capital projects), charitable remainder unitrusts, pooled income funds, gift annuities, other split-interest agreements, and pledges receivable for which the ultimate purpose of the proceeds is not permanently restricted.

Unrestricted net assets are those not subject to donor-imposed restrictions. Gains and losses on investments are reported as unrestricted revenue unless their use is restricted by donor-imposed stipulations or by law.

Donor-restricted gifts which are received and utilized within the same fiscal year are reported as unrestricted revenue. Gifts of long-lived assets with no donor-imposed time restrictions are reported as unrestricted revenue in the fiscal year received. Gifts restricted to the acquisition or construction of long-lived assets are reported as temporarily restricted revenue. The temporarily restricted net assets resulting from these gifts are reclassified as unrestricted when the donor-imposed restrictions are fulfilled.

The preparation of financial statements in conformity with generally accepted accounting principles requires management to make estimates and judgments that affect the reported amounts of assets and liabilities and disclosures of contingencies as of the date of the financial statements and revenues and expenses recognized during the reporting period. Actual results could differ from those estimates.

The Statement of Activities includes certain prior-year summarized comparative information that has not been detailed as to net asset category. Such information does not include sufficient detail to constitute a presentation in conformity with generally accepted accounting principles. Fiscal 1995 summarized financial information has been restated from that previously reported to reflect the noted changes in accounting principles.

INVESTMENTS — Investments are stated at market value except for real estate and mortgages (note B) which are stated at cost. Purchases and sales of securities are recorded on trade dates, and realized gains and losses are determined on the basis of the average cost of securities sold.

All investments of endowment and similar funds are carried in an investment pool unless special considerations or donor stipulations require they be held separately. Pooled endowment and similar funds are invested on a total return basis to provide both income and investment appreciation. The Institute utilizes a pooled endowment spending policy that establishes allocations for current spending, consistent with an annual budget plan approved by the Board of Trustees. The spending policy allows the expenditure of a prudent amount of the total investment return over a period of time that preserves the future purchasing power of endowment principal.

CAMPUS PROPERTIES — Campus properties are recorded at cost of construction or acquisition, or at appraisal value at date of gift, less accumulated depreciation computed on a straight-line basis over the estimated useful lives (note C). The Institute provides for the renewal and replacement of its campus properties from funds designated for this purpose.

SPLIT-INTEREST AGREEMENTS AND PERPETUAL TRUSTS — The Institute's split-interest agreements with donors consist primarily of irrevocable charitable remainder trusts for which the Institute serves as trustee. Assets held in these trusts are included in investments. Contribution revenues are recognized at the dates the trusts are established after recording liabilities for the present value of the estimated future payments to be made to the beneficiaries. The liabilities are adjusted during the term of the trusts for changes in the value of the assets, accretion of the discount, and other changes in the estimates of future benefits.

The Institute is also the beneficiary of certain perpetual trusts held and administered by others. The present values of the estimated future cash receipts from the trusts are included in assets. Contribution revenues are recognized at the dates the trusts are established. Distributions from the trusts are recorded as investment income and the carrying value of the assets is adjusted for changes in the estimates of future receipts.

JET PROPULSION LABORATORY — The Institute manages and operates the Jet Propulsion Laboratory (JPL) under a cost reimbursable contract which includes a management allowance with the National Aeronautics and Space Administration (NASA). JPL land, buildings, and equipment are owned by the United States government and excluded from the Institute's financial statements. However, receivables and liabilities arising from JPL operating activities are those of the Institute and reflected in its financial statements. The direct costs of organized research and the related reimbursement of these costs arising from JPL activities are segregated in the Statement of Activities.

NOTE B
Investments

Institute investments consisted of the following (in thousands), stated at market, except for real estate, mortgages, notes, and other investments which are stated at cost:

	September 30, 1996	September 30, 1995
Marketable securities		
Debt securities	$ 155,623	$ 246,067
Equity securities	702,953	503,120
Total marketable securities	$ 858,576	$ 749,187
Short-term commercial obligations	44,882	64,949
Real estate, mortgages, notes, and other	51,055	52,003
Total investments	$ 954,513	$ 866,139

Investments shown above include endowments as follows (in thousands):

	September 30, 1996	September 30, 1995
Consolidated endowment pool	$ 762,257	$ 624,092
Separately invested endowments	74,375	79,225
Total	$ 836,632	$ 703,317

NOTE C
Campus Properties

Campus properties consist of the following (in thousands):

	September 30, 1996	1995
Land and land improvements	$ 21,804	$ 21,600
Buildings, including construction in progress	419,930	345,598
Equipment	419,617	395,185
Campus Properties—cost	$ 861,351	$ 762,383
Less accumulated depreciation	(293,926)	(267,757)
Campus Properties—net	$ 567,425	$ 494,626

Depreciation has been calculated, using the straight-line method, with life years of 20, 40, and a range of 3 to 15 for land improvements, buildings, and equipment, respectively.

NOTE D
Pledges Receivable

Pledges receivable consist of unconditional promises to contribute to the Institute in the future and are recorded after discounting the present value of the future cash flows.

At September 30, 1996, pledges receivable are expected to be realized in the following periods (in thousands):

Within one year	$ 15,652
Between one year and five years	28,873
More than five years	250
Subtotal	$ 44,775
Less allowance for uncollectable pledges	(416)
Less discount	(3,214)
Total	$ 41,145

NOTE E
Revenue Bonds Payable

On May 29, 1991, the Institute issued $50 million in California Educational Facilities Authority Revenue Bonds for the purpose of financing and refinancing the acquisition, construction, and completion of certain educational facilities, and to defease the outstanding principal amount of the Institute's Series 1985 bonds. The Series 1991 bonds are repayable with interest from the general revenues of the Institute over a 30-year period. Interest rates are fixed and range from 4.8% to 6.4% per annum. Required principal and interest payments are approximately $4 million per year for the fiscal years 1992 through 2005, approximately $3 million per year for fiscal years 2006 through 2016, and approximately $2 million per year thereafter until 2021, when the bonds will be fully redeemed.

On October 27, 1994, the Institute issued $30 million in California Educational Facilities Authority Revenue Bonds for the purpose of financing and refinancing the acquisition, construction, and completion of additional educational facilities. The Series 1994 bonds are variable rate bonds maturing on January 1, 2024, repayable with interest from the general revenues of the Institute. Principal and premium, if any, on the bonds is payable upon presentation. The applicable interest rate on these bonds is adjusted weekly by the trustee, and as of September 30, 1996, was 3.50%. The rates are determined by the Remarketing Agent.

NOTE F
Campus Operating Expenses

Campus operating expenses for the fiscal years ended September 30, 1996 and 1995, consisted of the following (in thousands):

	1996							1995
	Instruction and Departmental Research	*Organized Research*	*Scholarships and Fellowships*	*Institutional and Student Support*	*Plant Operation, Maintenance, and Utilities*	*Auxiliary Enterprises*	*Total*	*Total*
Salaries	$ 55,496	$ 39,857		$ 19,387	$ 7,785	$ 3,120	$ 125,645	$ 119,983
Staff Benefits	17,156	12,836		6,384	2,581	1,013	39,970	38,958
Supplies and Expense	6,917	39,008		15,992	2,175	6,466	70,558	73,281
Travel	3,693	2,327		664	18	25	6,727	5,221
Student Aid			$ 15,870				15,870	15,637
Utilities					6,853		6,853	7,087
Depreciation	8,297	20,821		2,018	2,848	546	34,530	37,424
JPL Direct Costs		(10,402)					(10,402)	(8,773)
Total	$ 91,559	$ 104,447	$15,870	$ 44,445	$ 22,260	$11,170	$ 289,751	$ 288,818

JPL direct costs represent work performed on behalf of, and reimbursed by, JPL.

NOTE G

Components of Net Assets

The following presents the net asset categories by purpose as of September 30, 1996 and 1995 (in thousands):

	1996				1995
	Unrestricted	*Temporarily Restricted*	*Permanently Restricted*	*Total*	*Total*
Operating Funds	$ 29,293			$ 29,293	$ 38,849
Pledges Receivable	439	$ 29,762	$ 10,944	41,145	43,192
Student Loan Funds			9,514	9,514	8,810
Invested in Plant	492,029	915		492,944	440,981
Life Income and Annuity Funds		29,589	15,290	44,879	32,409
Endowment and Other Funds Functioning as Endowment	587,921	28,582	224,619	841,122	707,641
Total	$ 1,109,682	$ 88,848	$ 260,367	$ 1,458,897	$ 1,271,882

NOTE H

Retirement Plans

Institute retirement plans, covering substantially all of its employees, are funded by periodic transfers to the respective insurance companies. Academic and senior administrative staff are covered by a defined contribution pension plan. Non-academic staff were covered by a defined benefit pension plan that was terminated effective December 31, 1993. The Institute provided two plans effective January 1, 1994, for employees who were participants in the terminated defined benefit pension plan: (1) a successor defined benefit pension plan could be elected by participants who attained age 55 and had 10 or more years of service and (2) the defined contribution plan for all other employees. Substantially all of the participants in the terminated defined benefit pension plan irrevocably elected to participate in the defined contribution pension plan.

Retirement benefits under the terminated defined benefit pension plan and the successor defined benefit plan are based on years of service and career average compensation, and accrued partially on a fixed dollar basis and partially on a variable dollar basis. The Institute's defined benefit plan funding policy is to contribute amounts sufficient to maintain retirement plan assets at levels adequate to cover all accrued benefit liabilities.

The net pension cost for the successor defined benefit plan for the fiscal year ended September 30, 1996, was $277,000. The funded status and projected benefit obligation of the plan at September 30, 1996, was approximately $31.9 million.

Pension costs for the defined contribution plan for the fiscal year ended September 30, 1996, were $9.0 million ($8.3 million in fiscal 1995) for the Campus and $31.0 million ($31.5 million in fiscal 1995) for JPL.

NOTE I
Postretirement and Postemployment Benefits Other Than Pensions

The Institute provides certain postretirement health and life insurance benefits. The Institute's policy is to recognize immediately any gains and losses resulting from changes in the accumulated postretirement benefit obligation.

Costs and gains included in the Statement of Activities are summarized as follows (in thousands):

Service cost—benefits attributed to service during the year	$ 4,846
Interest cost on accumulated benefit obligation	3,020
Gain due to assumption changes	(22,736)
Net	$ (14,870)

The accumulated postretirement benefit obligation as of September 30, 1996, was as follows (in thousands):

	Campus	*JPL*
Retirees	$ 11,841	$ 30,187
Fully eligible employees	5,672	26,924
Other active employees	5,385	21,293
Total	$ 22,898	$ 78,404

The Institute expects to recover approximately one-half for the Campus and all for JPL of this post-retirement obligation through future charges to United States government grants and contracts. The unfunded JPL amount of $78.4 million is included in the Statement of Financial Position as part of accounts payable and accrued expenses. A deferred United States government billing of the same amount has been recorded because certain provisions set forth in the Institute's contract with NASA provide for reimbursement of such costs if the contract should ever be terminated. The Institute also has recorded a deferred United States government billing of approximately $27.7 million relating to accrued vacation benefits that are covered by similar contract provisions. Although these deferred billing amounts may not be currently funded, and therefore may need to be funded as part of future NASA budgets, the Institute believes it has the contractual right to insist that such funding be made available.

An annual discount rate of 7.75% (7.25% in 1995) and an 8% (10% in 1995) annual rate of increase in the per capita cost of covered health care benefits for retirees were assumed for 1996. This cost trend rate is assumed to decrease at a rate of 1% per year leveling off at a rate of 5% in 1999 and thereafter. The health care cost trend rate has a significant effect on the amounts reported. As of September 30, 1996, a 1% increase in the assumed cost trend rates in each year would increase the accumulated post retirement benefit obligation by $3.2 million and $11.9 million, and the net periodic postretirement benefit cost for the year by $0.9 million and $2.3 million for the Campus and JPL, respectively.

NOTE J

Disclosures About Fair Value of Financial Instruments

For those financial instruments for which it is practical, the following methods and assumptions were used to estimate fair value:

CASH AND ACCOUNTS RECEIVABLE – The carrying value approximates fair value.

STUDENT AND EMPLOYEE ACCOUNTS – Due to the nature and terms of these financial instruments, which can be subject to significant restrictions, it is not practical to estimate their fair value.

INVESTMENTS – The fair value of marketable securities and short-term commercial obligations is estimated based on quoted market prices for those or similar financial instruments. The fair value of real estate, mortgages, notes, and other investments is estimated by professional appraisers or Institute management to be $52.1 million at September 30, 1996.

REVENUE BONDS PAYABLE – The fair value of revenue bonds payable is estimated based on the quoted market prices for the bonds or similar financial instruments and approximates the carrying value.

NOTE K

Contingencies

The Institute is a defendant in various legal actions incident to the conduct of its operations. The Institutes management does not expect liabilities, if any, for these legal actions will have a material effect on the Institute's financial position.

The Institute receives funding or reimbursement from governmental agencies for various activities, which are subject to audit. There are recent changes to federal reimbursement of indirect costs which, when implemented, are not expected to have a significant effect on the sponsored research programs of the Institute.

Report of Independent Accountants

Price Waterhouse LLP

To the Board of Trustees of the
California Institute of Technology

In our opinion, the accompanying statement of financial position and the related statements of activities and of cash flows present fairly, in all material respects, the financial position of the California Institute of Technology (the "Institute") at September 30, 1996, and the changes in its net assets and its cash flows for the year then ended in conformity with generally accepted accounting principles. These financial statements are the responsibility of the Institute's management; our responsibility is to express an opinion on these statements based on our audit. We conducted our audit of these statements in accordance with generally accepted auditing standards which require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements, assessing the accounting principles used and significant estimates made by management, and evaluating the overall financial statement presentation. We believe that our audit provides a reasonable basis for the opinion expressed above.

As discussed in Note A to the financial statements, the Institute adopted the provisions of Statement of Financial Accounting Standard ("Statement") No. 116, "Accounting for Contributions Received and Contributions Made," Statement No. 117, "Financial Statements of Not-for-Profit Organizations," and Statement No. 124, "Accounting for Certain Investments Held by Not-for-Profit Organizations" in fiscal 1996. These Statements were adopted on a retroactive basis, and accordingly, the beginning balances for fiscal 1996 have been restated.

Price Waterhouse LLP

Los Angeles, California
February 11, 1997

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