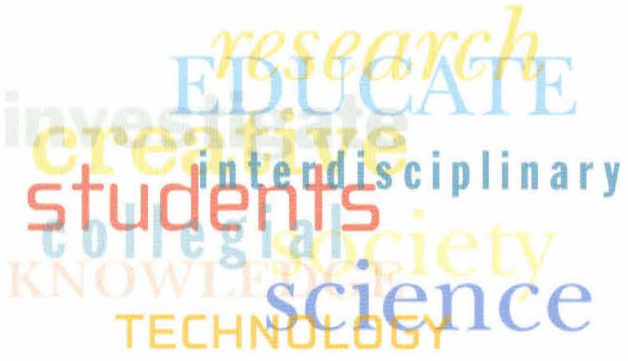
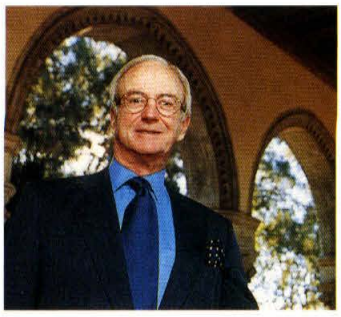
Annual Report 2000–2001



California Institute of Technology

Letter from the Chairman of the Board



Benjamin Rosen

Fifty-one years ago I matriculated as a freshman at Caltech. Then, as now, many world-famous luminaries populated the campus. Inconspicuous among them at the time was a young teaching assistant whom I was lucky enough to have had assigned to my introductory chemistry section. His name was Gordon Moore.

Gordon, of course, didn't remain inconspicuous for long. Indeed, his record of achievements after receiving his PhD in 1954 is the stuff of legend: cofounder of Fairchild Semiconductor, where the integrated circuit was developed; cofounder and CEO of Intel, birthplace of the microprocessor; and formulator of "Moore's Law," the definitive characterization of semiconductor performance growth.

While these industrial and technological achievements would more than stack up as the capstone of any ordinary (or even extraordinary) person's contributions to society, I believe that Gordon has just outdone himself. In October 2001, Gordon and Betty Moore (in conjunction with their family foundation) announced that they would make a combined gift to Caltech of $600 million. This remarkable gift is by far the largest ever given to any academic institution.

The effect on Caltech will be enormous. It will help us continue to fulfill our mission of excellence in education and research, to lead in science and technology, and to stay competitive with much better-endowed universities in attracting and retaining faculty.

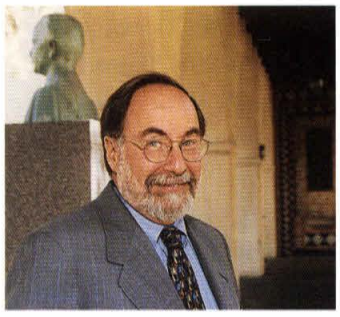
In the half-century since I arrived in Pasadena, much has changed at Caltech. The physical plant is at least twice the size, and there are many new state-of-the-art buildings, auditoriums, laboratories, and athletic facilities. And the landscaping is so much more beautiful.

But much has stayed the same. Fortunately. The school remains small in its faculty and student body, and still chooses its areas of research focus judiciously. Its commitment to excellence remains as strong as ever. Many other features of Caltech's unique culture—among them the honor system and the student house system—are also much as they were in 1950.

In January 2001, the latest chapter in my relationship with Caltech commenced when I succeeded Gordon Moore as Chairman. Since then, I have had the pleasure of welcoming to the Board our newest trustee, Philip M. Neal, chairman and CEO of Avery Dennison. I have also discovered that following Gordon's act is no small feat. Fortunately, after a seven-year tenure, he left Caltech a stronger, more vital institution, making my job easier. I shall endeavor, together with the inspired leadership of President David Baltimore, to maintain that momentum in the years ahead.

Benjamin M. Rosen
Chairman, Caltech Board of Trustees

Letter from the President



David Baltimore

The year 2001 will be forever marked by the September 11 terrorist attacks that left horror in our hearts. The Caltech community found solace in the thought that we work for something terrorism cannot touch: the enlightenment produced by discovery and learning. We were profoundly reminded that it is our charge to serve humanity by expanding the knowledge that conquers ignorance.

Given that it was a year of suffering for many of our fellow Americans, it is with special gratitude that I report that the academic year 2000–2001 was a propitious one for Caltech. In January 2001 we honored retiring Board Chairman Gordon E. Moore (PhD '54) and installed his successor, Benjamin M. Rosen ('54), reminding me once more how fortunate we are to have such eminent and dedicated alumni at the helm of our Board of Trustees. We had another occasion to be proud of our alumni in October, when we learned that Leland H. Hartwell ('61) had won the Nobel Prize in physiology or medicine, bringing to 29 the number of prizes awarded to Institute alumni or faculty since Robert A. Millikan was honored for physics in 1923. But most notably, in October Dr. Moore again gave us cause to celebrate, when he and his wife, Betty, and the Gordon and Betty Moore Foundation gave Caltech an astonishingly generous $600 million—the largest sum ever donated to a university.

It is impossible to overstate how important this gift will be to Caltech, how much more nimbly it will allow us to operate at the ever-shifting frontiers of scientific inquiry. It will certainly ensure the continuing quality of the research for which we are best known, work that has produced scientific discoveries and technological innovations that profoundly affect how we understand and interact with our world. But it will also bolster our ventures into less-traditional areas, which also have great potential to serve the public interest. A case in point is the joint Caltech–MIT investigation of the American voting system, the preliminary results of which were published in July 2001, and which aims to keep technical problems from ever again disrupting a national election. Another example is the public symposium about biodefense organized by Provost Steve Koonin in response to the events of September 11, as well as our involvement in the national security studies being undertaken in the wake of the attacks.

The Moores' gift is an unequivocal statement of their belief in the importance of Caltech and in the necessity of preserving its unique culture. Their commitment to Caltech led me to look for a succinct description of the special nature of our institution. I was surprised to discover that no such description existed.

This experience was mirrored by a colleague's receiving an unusual number of inquiries about Caltech's mission statement, something she also found was lacking. It seemed odd that we did not have one. Had the Institute always had such a good sense of itself that it had not needed to formally articulate it? Could distilling our identity into a concise statement help the public understand us better? I decided to try my hand at drafting such a statement.

For background, I reviewed a document produced by Caltech's 1921 Board of Trustees, "Educational Policies of the Institute," which is probably the nearest thing to a formal mission statement the Institute has ever had. The first words to catch my attention were "...the policy pursued from the beginning of the Institute of undertaking only a few lines of work and doing these well." This phrase is often cited even today to describe the Institute's approach to research, to make the case that we still operate in much the same way our founders envisioned.

While I might concede that the general focus of our research hasn't changed much since 1921, I think the *scope* of our research is clearly wider. We still want to conduct "extensive scientific researches of the greatest importance," but we now undertake *many* lines of work and try to do them *all* well. Our six academic divisions, in principle, cover all of human knowledge. We do not, for instance, have a medical school; but we do have a strong biology division which now undertakes to educate MD/PhD students. Neither do we have a law school; but our humanities and social sciences faculty includes scholars who study and teach about the law, and for a few years we have had an innovative program in law and technology. Further, our geological and planetary sciences division recently added global environmental studies to seismology, planetary astronomy, tectonics, and the many other subfields for which it is world renowned. We try to be at the forefront of any exciting area of science, engineering, social science, and technology (although our coverage of the humanities is thinner).

I also realized that this often-quoted line about research had to be understood in the context of the entire document. "Educational Policies," as its name suggests, was more concerned with how the new California Institute of Technology ought to make the transition from a primarily educational institution (as its predecessor, Throop College of Technology, had been) to a university that both trained students and conducted world-class scientific investigations. The trustees advised "undertaking only a few lines of research" in part to prevent the Institute from spreading its resources too thin before all the existing educational departments were "brought to the highest efficiency and until the needs of student life [were] more fully provided for."

Although we've expanded the 1921 trustees' ideas about research, many of their phrases still describe our educational mission rather well. They thought it was important to "train the creative type of scientist and engineer urgently needed in our educational, governmental, and industrial development," and that "every effort [should] be made to develop the ideals, breadth of view, general culture, and physical well-being of the students of the Institute." Now, as then, we are deeply committed to preparing "a select body of students of more than ordinary ability" to become not just outstanding scientists and engineers, but also thoughtful, well-rounded, productive members of society. Our strategy for doing this is to limit our student body to approximately 900 undergraduates and 1,000 graduate students, which allows us to offer them matchless opportunities for research and interaction with faculty. Our students bring some of the world's finest minds to enrich our scholarly community; we in turn guide them to become the next generation of creative thinkers.

After reviewing "Educational Policies," I was persuaded that, despite some shifts in focus and scope, our mission is fundamentally the same as it was in 1921: research and education. Clearly, those activities had to form the core of any mission statement we might adopt. But many institutions can claim to be engaged in the same two undertakings; what distinguishes us?

In a word: size. Over the years, we have accomplished a major broadening of our research focus with only modest growth in our faculty, which still comprises fewer than 300 full-time, professorial members. We do this by being highly selective in the faculty we hire, so that we stay lean in our coverage of research fields. Our investigators tend to be engaged in a wider range of activities, typically across several disciplines, than their peers at other universities.

Being a "steady state" institution, rather than one that innovates by growing, poses certain operational constraints. It means making tough choices each time we hire a new faculty member, so that we are as sure as we can be that each hire is that rare individual of world-class potential. But staying small also has a number of beneficial effects. It promotes close working relationships, because it makes it relatively easy for faculty to get to know colleagues beyond their own discipline, and for students to get to know their instructors. While cross-disciplinary research is certainly not new at Caltech, this way of working is becoming increasingly prevalent on campus as its benefits become ever more obvious. Bringing biologists, geologists, engineers, and chemists together, for example, as our new global environmental science program does, is likely to yield wider perspectives, deeper discoveries, and more rapid progress than could be expected from any of those disciplines alone.

Staying small also means that resources are shared among a smaller constituency, so faculty can be well-supported as they reach out in new directions. Rather than use our resources for continual growth, we are able to respond to the need for new instrumentation to strengthen and extend an exisiting program, or to seed daring new projects before the federal government understands their potential. It

means that we can take care of the personal and professional needs of our faculty and students in concrete ways that free them to pursue their dreams and realize their creativity.

With these elements in mind, and with much input from a number of colleagues, including Provost Steve Koonin and Executive Vice President for Administration Bill Jenkins, I arrived at the following statement:

The mission of the California Institute of Technology is to expand human knowledge and benefit society through research integrated with education. We investigate the most challenging, fundamental problems in science and technology in a singularly collegial, interdisciplinary atmosphere, while educating outstanding students to become creative members of society.

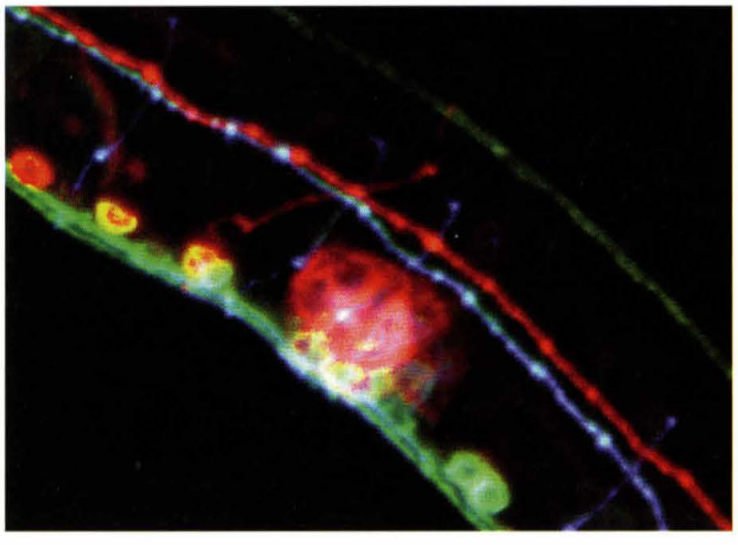
Having pondered every word, indeed every punctuation mark, at length, we learned that it is not a trivial matter to distill a complex institution's endeavors into two sentences (not to mention trying to avoid the overwhelming gravitational pull of cliché). It took time to decide that the problems we investigate are best described as challenging *and* fundamental, rather than, say, "complex." It was difficult to settle for describing our scope as "science and technology"—indisputably our chief foci—when it seemed to ignore our excellent and productive humanities scholars. Possibly hardest of all was choosing the right words to describe our students and the unique education we offer them. We hoped to convey that our strong focus on research sets us apart from other small schools that cater to the finest students.

While the precise wording of the statement could be debated endlessly, as it stands it is a useful working description of how Caltech sees itself today. It in effect updates the 1921 trustees' document to the 21st century by acknowledging the enduring values of our past and affirming the broader goals of the present. It also answers the question of why Caltech is worthy of the extraordinary trust that Gordon and Betty Moore have shown with their unprecedented gift. Just as importantly, the process of self-examination and reflection my colleagues and I went through to draft this mission statement has caused us to think more clearly about Caltech's identity and direction and to rededicate ourselves to the ideals of the Institute's founders. It should also help our efforts at clear communication with our various audiences, both internal and external. The Moores' gift, enormous as it is, is but a part of the resources that Caltech requires to fulfill its mission. Getting that message heard will be a continuing challenge.

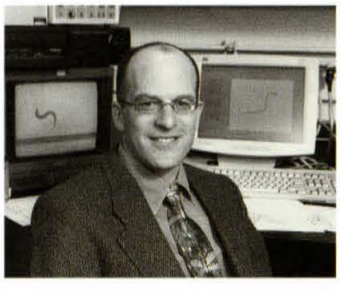
Let me end on a personal note. In the four years that I have had the honor and pleasure of leading this remarkable institution, I have gone from admiration to veneration. No school dedicated to science and technology has enunciated so clearly its aims and hewed so closely to its founding vision. Caltech is an unabashed ivory tower—but not one that eschews the difficult problems of society. Rather, it is an institution that is dedicated to finding imaginative solutions, that thrives on the non-obvious, and that inventively communicates creative visions to interested communities. To me, that truly makes us a National Treasure.

David Baltimore
President

Research Highlights



[top] Side view of the tail of a C. elegans *male showing the many specialized nerve and muscle cells involved in mating behavior. The distinct shapes and positions of the cells allow each to be recognized and thus studied in molecular detail. [bottom] Middle section of a* C. elegans *hermaphrodite showing the developing egg-laying system, which has been studied to understand the role of oncogenes in development.*



Paul Sternberg

The Future of Genomics: an *elegans* solution

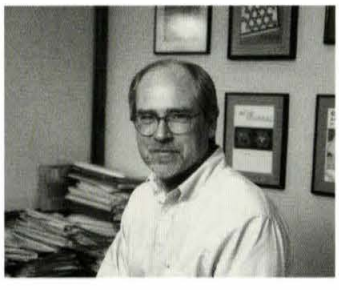
As animals go, *C. elegans* is unassuming: one millimeter long; 1,000 cells; 19,000 genes. But in the world of genomics, the tiny roundworm is a heavyweight—especially since 1998, when it became the first animal to have its entire genome sequenced. It's been particularly influential in the career of Professor of Biology Paul W. Sternberg, leading him both to new insights about human genes and to a new avocation as database guru.

C. elegans, like the fruit fly *Drosophila* and the weed *Arabidopsis*, has long been a favorite experimental organism in biology labs. Its relative simplicity lets researchers easily observe which of its genes are expressed in which cells. Sternberg uses the worm in two distinct lines of research—one about the role of cancer-causing genes (oncogenes) in development, the second about how genes control behavior. The first project has demonstrated that four *C. elegans* genes that work together to tell cells to grow are the worm equivalent of four human oncogenes with a similar, but previously unknown, cooperative relationship. The second has revealed that the genes that control the male roundworm's ability to mate correspond to the human genes that transmit autosomal dominant polycystic kidney disease, a condition that affects about 1 in 1,000 adults. Because these kinds of correspondences can shed light on the almost-completely sequenced human genome, worm genomics has become a hot topic in the biomedical community.

Enter Sternberg in his latest role as curator of WormBase, the repository of *C. elegans* information whose development will likely influence the future design of a human genome database. Why send a biologist to head up a database project? Mostly, says Sternberg, because he understands WormBase's main user community—other biologists—and because years of worm research have prepared him and his colleagues to sift through the *C. elegans* literature, extract the important data, and archive it. He also seems philosophically suited to the task, asking himself questions like, "What does having the complete genome of an organism *mean*?"

It means, in part, that a huge body of information exists whose ultimate usefulness will be determined by how well it is organized. Part of that organization will require "translating" worm-research concepts and terms into a common vocabulary that will make sense to biologists of all stripes—no small feat. Sternberg welcomes the challenge. "Databases have become the future of genomics," he says; "that's where the action is. When we look back 20 years from now at the big events of this time, [one of them is] going to be this movement that's just starting."

This image reveals the presence of DNA (labeled yellow) inside human cells. All the cells are still healthy, indicating nontoxic delivery of the DNA by Davis's system.



Mark Davis

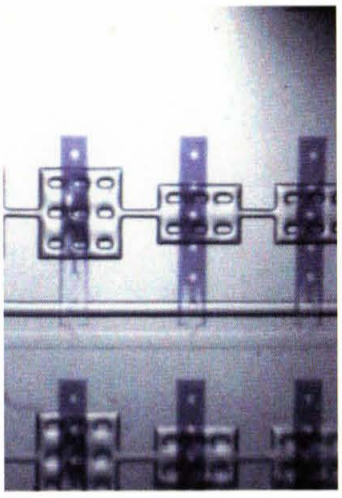
Molecular Stealth Bombers

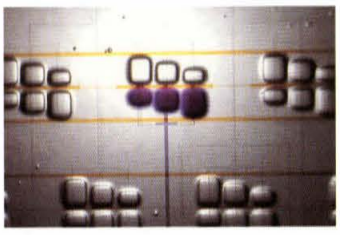
Today's drugs and vaccines, while often very effective at combating illness, are not the most discriminating of weapons. They are frequently toxic to healthy cells as well as malignant ones, and can produce a spectrum of undesirable side effects. What cancer patient wouldn't welcome chemotherapy drugs that would kill tumors without harming other tissue? And what parent wouldn't be grateful for a vaccine that would not make a child ill in the name of protection?

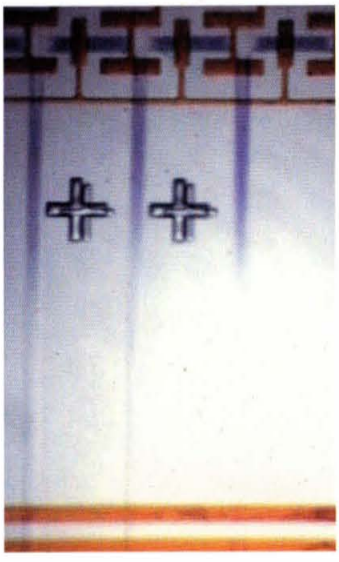
These kinds of improvements in disease treatment and prevention could well result from the research of Mark Davis, Caltech's Warren and Katharine Schlinger Professor of Chemical Engineering. His efforts to design "intelligent" drugs that act in a highly selective manner could potentially help sufferers of a variety of illnesses, among them cancer, AIDS, hepatitis C, hemophilia, Crohn's disease, and cystic fibrosis.

Historically, most drugs have been derived from plants and other natural compounds, frequently improved by trial and error. "Innovation" in drug design and delivery has often meant nothing more than combining known substances in new ways, or slowing the rate at which a compound is released throughout the body. Recent advances in understanding of the human genome, however, have provided researchers with a new approach to drug design: the use of nucleic acids—DNA and RNA—as drugs to combat diseases at the genetic level. Davis and his collaborators (at both Caltech and various California-based hospitals and medical research facilities) are working to develop ways to deliver nucleic acid drugs in humans. To deliver these genetic therapies to specific locations inside particular types of cells, the chemical engineers build complex new materials that are capable of carrying the nucleic acids through the body undetected by the immune system and bringing them to their sites of action without unwanted toxicity.

Davis's molecular stealth bombers are potentially effective treatments for both hereditary and acquired diseases, since they can be used against an inherited genetic defect as well as the genetic structure of a disease-causing pathogen. They could also be employed as vaccines that potentially are safer than those that involve viruses.







From the Quake lab: a variety of devices that meter and mix fluids. Biologists' current tools allow them to manipulate microliters of fluid; these chips control much smaller volumes—nanoliters and even picoliters.

Stephen Quake

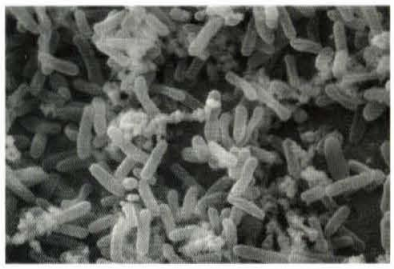
Frontiers in Biophysics

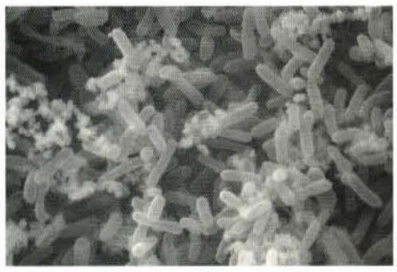
Associate Professor of Applied Physics Stephen R. Quake works in a place that many people don't know even exists: the scientific frontier where physics and biology meet. Each of the various projects he and his coworkers conduct can be thought of as attempting to answer one of two basic questions: "What can physics do for biology?" or "What can biology do for physics?"

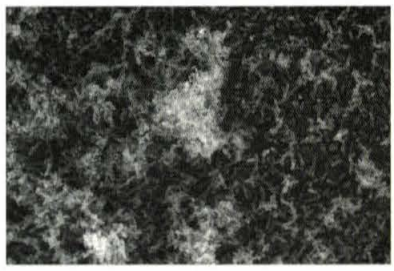
Quake has attacked the first question by adapting some of the techniques of solid-state physics and the semiconductor industry to build a microfluidic "lab on a chip" with valves as small as 20 x 20 microns, and other features that measure a mere 2 microns. (In comparison, a human hair is about 50 microns wide.) Unlike computer chips, which manage electron flow, Quake's chip is intended to control the flow of real fluids—water, blood, or biochemical reagents—and thus requires plumbing components that are difficult to make out of rigid materials like silicon or glass. He and his colleagues have overcome this difficulty by fabricating the tiny valves and pumps from soft silicone elastomers. The chip technology has promising applications in a number of research areas, among them structural genomics, medical screening and diagnostics, drug discovery and delivery, ecology (including emerging diseases), and protein design.

In this same "what physics can teach biology" category, Quake's lab also pursues research in single-molecule biophysics and biochemistry to try to understand selected proteins as molecular machines. Toward this end, he and his associates are developing precision methods to measure force production by molecular motors and to study molecular "photocopiers," such as DNA polymerase.

In the pursuit of what biology can do for physics, Quake uses DNA as an experimental system. "DNA is just fantastic," he says. "It allows you to ask very fundamental, physics-type questions about how large molecules behave. Do they vibrate like violin strings? How can you analyze what happens as you put them under tension?" To answer these questions, his research group has borrowed powerful tools from the genetic engineering community and combined them with some of their own optics tricks. They're also exploring ways to use DNA as a fabrication tool for making new small devices—both as a template for metallic wires 5 to 8 nanometers in width and as a backbone for the world's smallest optical wave guide.







[color images] Biofilms on a recovered piece of carbon steel that was suspended in the waters off Caltech's Kerckhoff Marine Laboratory. [b/w images] Scanning electron micrographs of Shewanella oneidensis *strain MR-1 in a biofilm attached to the surface of carbon steel.*

Dianne Newman *and colleagues: grad students Davin Malasarn and Mariu Hernandez and postdoc Dr. Anthea Lee.*

It sounds at first like a riddle out of *Alice in Wonderland*: How is the rusting of a ship's hull related to cancer therapy? But it's not; it's a legitimate question, one that derives from some surprising discoveries in the lab of Dianne K. Newman, the Clare Boothe Luce Assistant Professor of Geobiology and Environmental Science and Engineering.

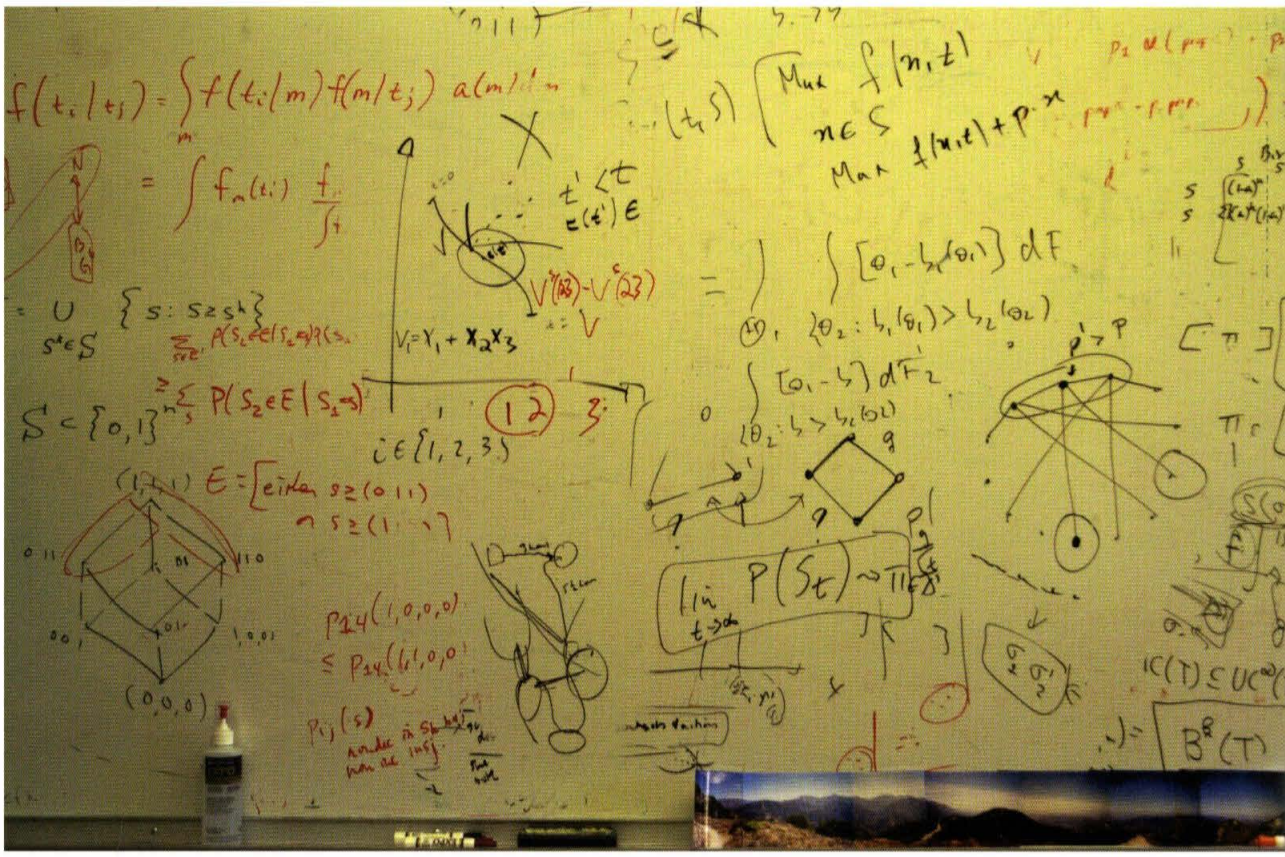
Newman studies biofilms, the communities that develop when microorganisms attach to any solid surface—teeth, for instance, or rocks in a stream, or the hulls of ships corroding in a harbor. (Not surprisingly, the Office of Naval Research finds her work worthy of support.) She is particularly interested in how bacteria interact with mineral surfaces and how their interaction changes the chemistry of their environment—a process that turns out to be relevant to a variety of real-world questions.

Because natural biofilms are too complex to study in mechanistic detail, Newman and her coworkers create their own simplified versions in the lab, using model organisms they manipulate with the techniques of molecular genetics. One of their current projects involves observing on a molecular level how *Shewanella oneidensis*—a bacterium that's related to *E. coli*—creates, and survives within, a biofilm. *Shewanella* has the impressive ability to "breathe" iron oxides, as well as oxygen and a variety of other substances; a current model that the lab is testing is that each individual *Shewanella* adopts a different respiratory strategy according to whether it lives at the top, middle, or bottom of its environment.

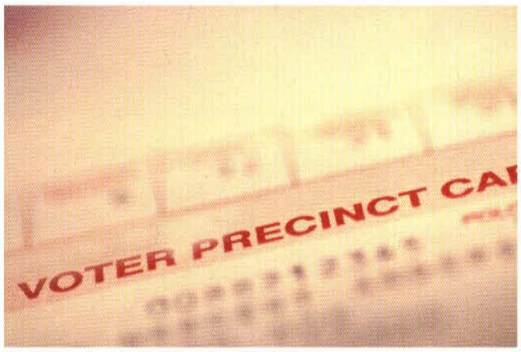
While studying the genes that help *Shewanella* respire minerals, Newman observed that those genes were producing small molecules that were essential to the bacteria's ability to respire. It turns out that these molecules are related to compounds (the anticancer drug Bleomycin, for instance) that are already well known to medical science as antibiotics—but *only* as antibiotics. These findings suggest that the molecules' original role may have been ecological and physiological, the response to an ancient need of organisms to survive in a specific environment. The Newman lab is currently working to test this intriguing hypothesis.

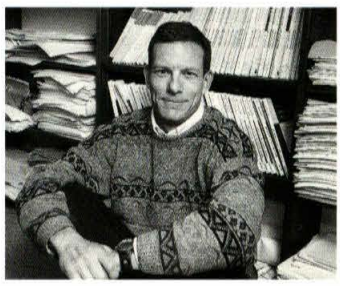
Besides their potential relevance to ship maintenance and cancer therapy, the Newman lab's discoveries could make it possible to engineer biofilms that would act as "reporters" of foreign substances entering an environment—a very useful tool in a world newly sensitized to the possibility of biological and chemical warfare.

Film School, Caltech-Style



Social-choice theory in progress: the whiteboard in Matt Jackson's office.





Matthew Jackson

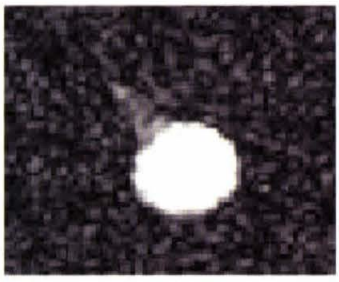
See How They Run

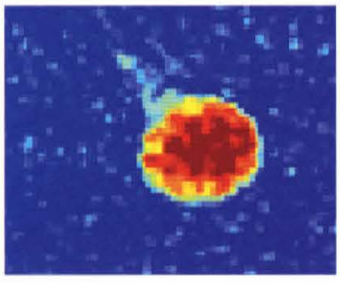
If Ralph Nader had not run in the 2000 presidential election, the United States might have a different president today. It's possible that Ross Perot's candidacy similarly affected the 1992 election. Would these outcomes have been the same if the United States had different rules for selecting its leaders? What would those contests have looked like if we had, say, a plurality-with-runoff voting system like Israel's or France's?

Professor of Economics Matthew O. Jackson (in collaboration with Bhaskar Dutta of the Indian Statistical Institute and Michel Le Breton of L'Université d'Aix-Marseille) uses mathematical tools to investigate such social-choice issues. He is particularly interested in how different voting systems affect candidates' incentives to participate in elections. Jackson begins by modeling how candidates are chosen under different voting systems as a function of the preferences of the voters in a society. Based on the resulting mathematical functions, he can study the incentives that candidates have to enter or exit an election by seeing how the outcome varies as a result of their choices. This gives a prediction of how susceptible different voting systems are to candidate manipulation. His conclusion? "No matter what system you use, candidates can manipulate outcomes by entering and exiting. There's no foolproof system. Nevertheless, we can understand the differences in voting systems, and determine which ones fare better in particular situations."

Jackson uses similar methods to study an even more complex voting situation: the process by which bills become law. Unlike candidates, who can choose only to enter or withdraw from an election, legislators have multiple strategies at hand. They can introduce legislation themselves, or have someone else do it for them; they can back a bill they don't like in order to block one they like even less. Adding to the complexity is that rules about voting on bills also vary: some bills are introduced into the legislature and are then open to amendment, while others are finalized in committee and come to the floor only for a yes-or-no vote. Jackson uses game theory to characterize how different rules affect legislators' incentives and strategies in moving bills through a legislature.

The methods Jackson employs to understand the decisions of candidates and legislators also figure in his research in other arenas of social choice—auction design, the properties of markets, even the influence of social networks on hiring and wage discrimination.





Photographic [above] and MRI [left] images of a glass cell containing low-field polarized noble gas.

Emlyn Hughes

A New Spin on Lung Imaging

A faultless method for taking pictures of the human lung doesn't currently exist. X rays are fairly clear, but expose patients to radiation (a side effect that is especially undesirable for children). CT scans reveal an impressive amount of detail, but are expensive, and also use radiation. Conventional magnetic resonance imaging (MRI) can't get a fix on the lungs' combination of assorted tissue types and empty space. A lung-imaging technique with no downside may soon be available, however, thanks to research in ... high-energy physics.

Unexpected, but true. Little did Professor of Physics Emlyn W. Hughes imagine, back when he headed up a large nuclear and high-energy physics lab, that he would one day find himself collaborating with electrical engineers and physicians to develop just such a technique. How he got there is a story that exemplifies Caltech's special aptitude for encouraging and promoting cross-disciplinary work.

Some years ago, while investigating the spin of protons and neutrons in noble gases, Hughes and his colleagues discovered a way to control the spin of the helium-3 nucleus. This capability became especially intriguing when they considered it in the light of three facts: (1) Helium is not harmful to human health; (2) MRI captures its images by changing the spin of protons in the body; and (3) MRI has never produced useful pictures of the lungs because the lungs are mostly empty of protons. The scientists theorized that if a person inhaled some of their "spin-doctored" helium-3 and then underwent MRI, the magnet would be able to use the helium protons in the lungs to produce a viable image. They were right.

Hughes has since established a collaboration with investigators in Stanford's electrical engineering department and medical school—who have much experience using MRI to image the heart—to help translate what is still an experimental technique into practical application. To make the inhaled-helium method more portable than conventional MRI, the Stanford team is developing low-cost, nonsuperconducting magnets. Meanwhile, back at Caltech, the Hughes lab continues to work at getting better polarization of helium-3. Last spring, using a new low-field scanner of their devising, the two groups produced a clear picture of the polarized gas in a small glass cell; they plan to try imaging live subjects in the near future.


The Year in Review 2000–2001

Notable Events

October 10, 2000: The new Center for Student Services invites the campus community to its open house. Formerly the Keck graduate student residence, the Holliston Avenue structure now houses the offices of the Caltech Y; Residence Life and Master of Student Houses; the Caltech Women's Center; Minority Student Affairs; International Student Programs; and the Career Development Center.

May 9, 2001: The Caltech Associates celebrates its 75th anniversary with a black tie dinner at the Athenaeum. The event features three Caltech presidents—David Baltimore, Thomas Everhart, and Harold Brown—in a panel discussion moderated by Beckman Professor of Chemistry Harry Gray.

June 13, 2001: The traditional "topping off" ceremony is conducted for the Broad Center for the Biological Sciences. The new building is expected to be finished in June 2002.

October 8, 2001: Caltech alumnus Leland H. Hartwell ('61, Biology) is awarded the Nobel Prize in physiology or medicine. Twenty-nine prizes have been awarded to 28 Institute alumni or faculty since 1923.

October 22, 2001: The Science Center for the Space Infrared Telescope Facility (SIRTF), NASA's newest window on the universe, is formally dedicated. The center will be responsible for all aspects of the science operation of the observatory. After its launch (scheduled for July 2002), SIRTF will comb the cosmos for thermal infrared wavelengths that elude ground-based observatories. Such infrared traces may indicate the presence of brown dwarfs, super planets, and newborn planetary systems around other stars in the Milky Way.

October 24, 2001: Programs commemorating the 100th anniversary of the Nobel Prize take place at Caltech and UCLA. "The Next Generation of Science and Scientists" is the topic for the afternoon session, held in Caltech's Beckman Auditorium.

Caltech President and Nobel Laureate David Baltimore (physiology or medicine, 1975) opens the program; Caltech laureates Ed Lewis (physiology or medicine, 1995) and Rudy Marcus (chemistry, 1992), and USC laureate George Olah (chemistry, 1994) introduce the symposium presenters.

Administrative Changes

November 2000: Professor of Applied and Computational Mathematics and Computer Science Daniel I. Meiron is named the Institute's first associate provost for information and information technology.

January 2001: Alumnus Benjamin M. Rosen ('54) assumes the chairmanship of Caltech's Board of Trustees, succeeding Gordon E. Moore, who stepped down after seven years in that position.

January 31, 2001: Alumnus Charles Elachi (PhD '71) is named the new director of the Jet Propulsion Laboratory (and a Caltech vice president). Elachi is also a lecturer in electrical engineering and planetary science at the Institute. He succeeds Edward C. Stone, who after 10 years at JPL's helm returns to his former position as Caltech's Morrisroe Professor of Physics.

May 2001: The Board of Trustees approves title changes for two senior administrators and promotions for two key business and finance managers.

To better reflect Steven E. Koonin's responsibilities—bringing the academic perspective to every key administrative decision and acting as president in the president's absence—the Board simplifies his title from vice president and provost to provost.

To acknowledge the expansion of William A. Jenkins's duties, his title is changed from vice president for business and finance to executive vice president for administration.

Associate Vice President for Finance and Controller Albert G. Horvath is promoted to vice president for business and finance, and Associate Controller Sharon Patterson is promoted to associate vice president for finance and controller.

June 2001: Philip M. Neal, Avery Dennison Chairman and CEO, is elected to the Caltech Board of Trustees.

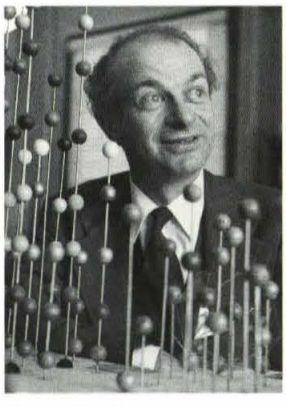
October 1, 2001: Robert L. O'Rourke is named Caltech's first vice president for public relations. He has served as head of public relations at the Institute since 1986, most recently as associate vice president for institute relations, a title he held since 1996.

Caltech and the Community

November 2000: The Caltech Y launches the second Social Activism Speaker Series, with appearances throughout the year by Amy Goodman, a journalist, radio host, and award-winning documentary producer; Mike Dolan, deputy director of the Global Trade Watch team at Ralph Nader's Public Citizen organization; and Michelle Mascarenhas, director of the Community Food Security Project at Occidental College.

December 2000: Adam Schiff, the newly elected U.S. representative for California's 27th district, is honored at a campus reception.

January 2001: Caltech joins eight of the country's top universities (MIT, Yale, Stanford, Princeton, Harvard, University of Pennsylvania, University of Michigan, and University of California) in an effort to identify the barriers that women face in the academic fields of science and engineering, and to take steps to eradicate those roadblocks. The investigating committee invites female faculty to analyze annual reports on the salaries, resources, and hiring practices of their respective institutions, with the goal of achieving "equity and full participation" of female faculty.



Linus Pauling

March 2, 2001: Caltech's Division of Chemistry and Chemical Engineering presents a day-long symposium, "Frontiers in Science: A Centennial Celebration of Linus Pauling," in honor of the 100th anniversary of Pauling's birth.

March 22, 2001: *QED*, a play about the Nobel Prize–winning physicist Richard Feynman, opens at the Mark Taper Forum in downtown Los Angeles. Alan Alda plays the brilliant physicist-cum-Renaissance man who was a Caltech faculty member from 1949 until his death in 1988.

April 20, 2001: The 2001 Biology Forum, "Autism: Deciphering the Puzzle," is held on campus. Comprising the panel are four of the nation's top autism researchers: Eric Courchesne, UC San Diego School of Medicine; Edwin H. Cook Jr., University of Chicago; Catherine Lord, University of Chicago; and Karin B. Nelson, National Institutes of Health. The moderator is *Los Angeles Times* science writer Robert Lee Hotz. Biology forums have been held annually on campus since 1995, and have covered such topics as AIDS research, Alzheimer's disease, and mental illness.

June 25–30, 2001: For the third summer in a row, 25 journalists from around the world converge on campus for the Jack R. Howard Science Reporting Institute. Presented jointly by Caltech and the Pasadena-based Foundation for American Communications, and funded by the Scripps Howard Foundation, the conference aims to improve the quality of science and technology reporting by enhancing mutual understanding between scientists and journalists.

Supporting Caltech

The Institute received a total of $86,510,339 in cash from private donors in fiscal year 2001. Caltech gratefully acknowledges the following individuals and organizations for their generous support. *[Note: donors whose names are followed by an asterisk are members of the Associates of the California Institute of Technology.]*

- Bequests totaling more than $23 million from the estates of 33 individuals. Particularly notable among these were gifts from

  The estate of Milton E. Mohr* — $5 million to establish the Milton and Jane Mohr Student Aid Endowment.

  The estate of Mary C. Brown — $1.78 million designated for the F. Barton Brown Engineering Scholarship.

  The estate of Evelyn Bray* — $1.5 million designated for the Evelyn and Ulric Bray Fellowship Fund in the Division of Chemistry and Chemical Engineering.

  The estate of Howard H. Alden — $1.24 million to establish the Howard and Marjorie Alden Fund for student financial aid in the biological and applied sciences.

  The estate of Patricia B. Conklin — $953,298 to endow the Patricia B. Conklin Scholarship Fund.

  The estate of Bonnie Cashin — $600,000 to endow the James Michelin Distinguished Visitors Program.

  The estate of Marcella Bonsall* — $593,201 to establish the Joel and Marcella Bonsall Scholarship Fund for Biology and the Marcella Bonsall SURF Scholarship Fund.

- Forty gifts in the form of charitable trusts, annuities, and other life income agreements with a total value in excess of $6 million. A number of significant charitable trust gifts were made by our alumni and friends. **Dr. Nicholas Begovich*** ['43, MS '44, PhD '48] established a charitable trust with a value of $1 million. Loyal life-income donor **Dr. Horace W. Davenport** ['35, PhD '39] continues to make generous additions to the Caltech Pooled Income Fund. **Richard Parker*** ['34] joined Caltech's planned giving program by funding a charitable gift annuity in excess of $500,000.

- **Benjamin M. Rosen** ['54] — a pledge of $20 million to the Benjamin M. Rosen Fund.

- **Gordon** [PhD '54] **and Betty Moore*** — $6.9 million to the Gordon and Betty Moore Presidential Discovery Fund.

- **Ronald** [MS '62, PhD '64] **and Maxine Linde*** — a pledge of $5 million to the Ronald K. Linde Fund.

- **William** ['59] **and Sonja Davidow*** — a gift of $5 million to establish the Davidow Endowment Fund.

- **Warren** ('44, MS '46, PhD '49) and **Katharine Schlinger*** — a pledge of $3 million, $500,000 of which is to support the Broad Center for the Biological Sciences.

- **Richard and Barbara Rosenberg*** — a pledge of $2 million to establish the Richard and Barbara Rosenberg Professorship.

- **Donald L. Bren** — $2 million toward the Bren Scholars Program.

- **Charles Trimble*** ('63, MS '64) — stock valued at $1,516,875 for the Charles Trimble Fund.

- **Eric** ('68) **and Nancy Garen*** — $1,089,063 to endow two scholarships and to fund the Garen Interactive Computer Science Classroom.

- **Alfred I. Switzer** ('34) — a gift of undeveloped coastal land valued in excess of $800,000. Proceeds of the property are directed to establish the Alfred I., Catharine J., and Eleanor G. Switzer Graduate Fellowship Fund.

- **Henry C. Yuen** ('73) — gifts totaling $757,500 to support research and the Law and Technology Program, a collaboration with Loyola Law School.

- **Joseph Charyk** (MS '43, PhD '46) — $750,000 to name the Charyk Biomechanics Laboratory.

- **Amnon and Frances Yariv*** — a pledge of $700,000 to endow the Amnon Yariv Graduate Fellowship in Applied Physics and, along with Diane and Robert Lang ('82, PhD '86), pledges totaling $600,000 to establish the Robert J. Lang/Amnon Yariv Fellowship in Applied Physics.

- **Richard Dickinson*** — gifts totaling $613,658 to establish the Dick and Barbara Dickinson Endowed Graduate Fellowship in Chemical Engineering.

- **Henry** (PhD '83) **and Caroline Blauvelt*** — a pledge of $600,000 to endow a graduate fellowship in applied physics.

- **Shang-Li Huang** (MS '69, PhD '76) — a pledge of $500,000 to create the Allan Acosta Endowed Graduate Fellowship.

IBM awarded more than $1 million in equipment to Stephen Mayo, associate professor of biology and chemistry and associate investigator, Howard Hughes Medical Institute, and to William Goddard, the Charles and Mary Ferkel Professor of Chemistry, Materials Science, and Applied Physics. This gift, given through IBM's Shared University Research Program, supports IBM Research's "Blue Gene" project to explore the intersection of high performance computing and biomolecular simulation.

The **Intel Corporation** contributed more than $1 million in cash and equipment to support a wide variety of research, academic, and scholarship programs. Major equipment contributions were made to the computer science and electrical engineering departments, and scholarship assistance was given to women and minority students pursuing master's and doctoral degrees.

The **Microsoft Corporation** contributed approximately $800,000 in equipment to support the centralized student computer laboratory, as well as various departments and centers across campus.

The **Sherman Fairchild Foundation** pledged $10 million to endow the Sherman Fairchild Prize Postdoctoral Scholars Program in Theoretical Physics, Theoretical Astrophysics, and Mathematics.

The **James Irvine Foundation** pledged $2.2 million for support of a variety of diversity programming at Caltech for a three-year period.

The **Annenberg Foundation** pledged $1 million to support both the Caltech Precollege Science Initiative and the Chemistry Animation Project.

The **Ellison Medical Foundation** awarded its Senior Scholar Award (with a pledged prize of $935,584) to Giuseppe Attardi, the Grace C. Steele Professor of Molecular Biology.

The **Henry Luce Foundation** pledged to award Caltech $700,000 over five years to establish a new laboratory experience in marine research for undergraduate and graduate students at the Kerckhoff Lab.

The **David and Lucile Packard Foundation** awarded a $625,000 Packard Fellowship in Science and Engineering to Assistant Professor of Geochemistry John Eiler.

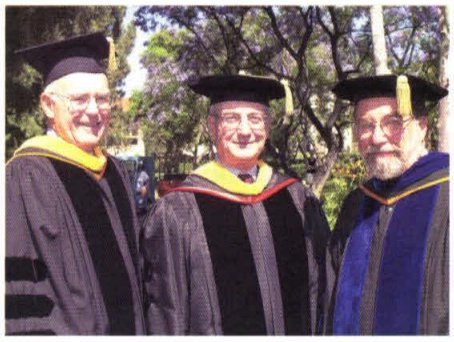
The **Alfred P. Sloan Foundation** and the **Swartz Foundation** each pledged $400,000 to support the Sloan-Swartz Center for Theoretical Neurobiology at Caltech.

The Alumni Fund — Through the Alumni Fund, Caltech alumni donated more than $3.6 million to the Institute in fiscal year 2001. An additional $217,841 was received in corporate matching gifts. Forty-one percent of undergraduate alumni and 29 percent of graduate alumni currently donate to the Alumni Fund.

One important success for the Alumni Fund this year was the completion of the Linde Challenge in May 2001. In all, more than 5,500 Caltech alumni made gifts to the challenge over a three-year period, for a total of $1,331,329. In fiscal year 2001 alone, 1,998 alumni gave more than $440,000. Caltech trustee Ronald Linde* (MS '62, PhD '64) and his wife Maxine* matched gifts donated to the challenge on a one-to-one basis, up to a total of $1.25 million. All donations will be used to construct the Ronald and Maxine Linde and Caltech Alumni Laboratories in the new Broad Center for the Biological Sciences.

Members of the Caltech Associates — $11.9 million in restricted and unrestricted gifts in fiscal year 2001. These contributions, when added to gifts over $1 million and the present value of trusts, resulted in total Associates donations of more than $25.8 million for the same period.

April 2001: *The Caltech Undergraduate Research Journal (CURJ)* debuts. A collaboration between students at Caltech and Art Center College of Design, *CURJ* offers students a professional-quality publication in which to showcase their research. The journal is available both in print and online at www.curj.caltech.edu/.



2001 Commencement speaker Gordon E. Moore, left, with Caltech Board Chairman Benjamin Rosen and President David Baltimore.

June 15, 2001: Caltech's 107th Commencement. Degrees awarded: 204 bachelor's; 120 master's; 1 engineer's; 159 doctoral.

Plans of BS graduates:

Eighty-two members of the class of 2001 decided to attend graduate or professional school. Ten of those had received job offers, but declined those offers to continue their education. (One rejected offer was a $117,000-per-year finance position in New York City.) Medical schools who accepted Caltech graduates this year include UC San Francisco, UC Berkeley (joint MD/MS program), USC (two students), UC San Diego, UC Irvine, University of Chicago, and Finch University of Health Sciences, Chicago.

As in past years, Caltech graduates had considerable success in competing for fellowships.

2001 Fellowship Winners

(members of the class of 2001, unless otherwise noted)

National Science Foundation Fellowships: Ron Alterovitz, Xiaoyan Robert Bao '00, Jeffrey Barrick, Gabriel Alan Miller '99, Michael Schein, John Russel Teifel '00; *graduate students:* Kjerstin Easton '00, Eric Matthew Ferreira, Megan A. Knight, Connie Chih Lu, Alan Bowers Northrup, David Lawrence Shuster, Soonjin Son, Chia-Jean Wang, Lauren Webb

Amasa Bishop Fellowships: Elisa Ka Yee Chan (class of 2002), Steven Thrasher (class of 2002)

Fulbright Fellowships: Jeffrey Lindhardt (graduate student), Yuki Takahashi

Hertz Fellowships: Joel Austin (graduate student), Douglas Behenna (graduate student)

Marshall Scholar: Eric Tuttle

NDSEG (Department of Defense) Fellowships: Ron Alterovitz, Mark Arnesen, David Fang, Michael Schein, Kathryn Todd; *graduate students:* Theodore Betley, Parsa Bonderson, Neil Garg, Christopher Lee, Connie Lu, Alexander Papandrew, Julie Park, Uttam Tambar

Soros Fellowships for New Americans: Vladimir Fedorov

Strauss Scholarship: Florian Merkel (class of 2002)

Thomas J. Watson Fellowship: Francis Macdonald

Of the bachelor's degree recipients who chose not to attend graduate school, 48 accepted job offers (three received more than one offer). Starting salaries for these positions ranged from $25,000 to $95,000. Other graduates chose less-traditional paths. Two joined the military (one in the U.S. and the other in his native Singapore); two others have started their own businesses; one is working on a novel; another will spend a year in Australia studying meteor impact craters before beginning graduate studies.

Plans of PhD graduates: Fifty-eight PhD recipients found academic employment—eight as tenure-track faculty and 50 as postdoctoral scholars. An additional 57 accepted positions in industry or government. (One chemical engineering PhD received *eight* job offers.) Probably this year's least-traditional career decision was made by the new physics PhD who became an Eastern Orthodox priest.

Rankings

Caltech's undergraduate program placed fourth in *U. S. News & World Report's* Fall 2001 ranking of the top public and private national universities. In an earlier *U.S. News* report (published in April 2001), the Institute's graduate engineering programs received an overall ranking of seventh in the nation (despite the fact that Caltech is considerably smaller than the more highly ranked institutions). The programs in aerospace engineering, chemical engineering, civil engineering, electrical engineering, environmental engineering, mechanical engineering, and applied mathematics all placed in the top 10.

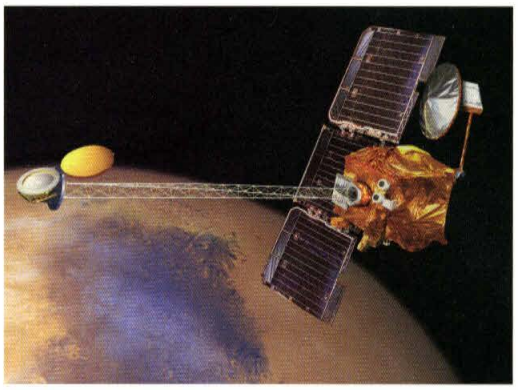
Paying homage to the book and film named after the year, JPL launched an orbiter named 2001 Mars Odyssey to study the red planet. It joined two other JPL missions that were lofted into space during the year—Genesis, which will collect particles of the sun and return them to Earth, and Jason 1, a U.S.–French mission to observe Earth's oceans.

Deep Space 1 achieved one of the year's greatest successes when it pulled off a high-risk flyby of a comet in September. The spacecraft had already completed its prime mission of flight-testing advanced technologies, including an ion engine, as part of NASA's New Millennium program, so the comet encounter was a bonus.

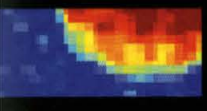
The ocean-observing satellite Jason 1 joined an orbiting cousin, Topex/Poseidon, which spent the year delivering a picture of sea surface heights around the globe every ten days. Based on Topex/Poseidon data, oceanographers noted a pattern called the Pacific Decadal Oscillation continuing to dominate the entire Pacific basin in 2001.

Volcanoes were another focus for JPL Earth researchers. Instruments developed at the Laboratory, including radiometers, spectrometers, and interferometers, were used to make detailed studies of the approximately 500 active volcanoes around the world.

As the Hubble Space Telescope celebrated its eleventh birthday, its main camera, JPL's Wide Field and Planetary Camera 2, added image number 100,000 to its bulging photo album. First starlight was gathered by the Keck Interferometer, a pair of 10-meter telescopes atop Hawaii's Mauna Kea that were successfully linked to work in unison.

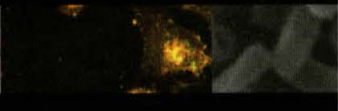


2001 Mars Odyssey




Awards and Honors





National Awards and Honors

National Academy of Sciences, Member:
Pamela J. Bjorkman, *Professor of and Executive Officer for Biology, and Full Investigator, Howard Hughes Medical Institute*

National Aeronautics and Space Administration, Distinguished Service Medal:
Edward C. Stone, *David Morrisroe Professor of Physics*

National Science and Technology Council, Presidential Early Career Award for Scientists and Engineers:
Richard W. Roberts, *Assistant Professor of Chemistry*
Eric Winfree, *Assistant Professor of Computer Science and Computation and Neural Systems*

National Science Foundation, Faculty Early Career Development (CAREER) Award:
Steven R. Quartz, *Assistant Professor of Philosophy*
Ersan Üstündag, *Assistant Professor of Materials Science*

International Awards and Honors

Academy of Athens, Corresponding Member:
Tom M. Apostol, *Professor of Mathematics, Emeritus*

Walter and Eva Andrejewski Foundation, Andrejewski Lecturer:
John P. Preskill, *Professor of Theoretical Physics*

Canadian Association of Physicists, Inaugural Herzberg Memorial Lecturer:
Kip S. Thorne, *Richard P. Feynman Professor of Theoretical Physics*

European Physical Society, Gribov Medal:
Steven S. Gubser, *Professor of Theoretical Physics*

German Geological Society, Leopold von Buch Medal:
Peter J. Wyllie, *Professor of Geology, Emeritus*

Royal Astronomical Society, Associate:
Anneila I. Sargent, *Professor of Astronomy; Director, Owens Valley Radio Observatory; and Director, Interferometry Science Center*

Royal Astronomical Society, George Darwin Lecturer:
Kip S. Thorne, *Richard P. Feynman Professor of Theoretical Physics*

Royal Society, Foreign Member:
Shrinivas R. Kulkarni, *John D. and Catherine T. MacArthur Professor of Astronomy and Planetary Science*
Ahmed H. Zewail, *Linus Pauling Professor of Chemical Physics and Professor of Physics*

Carl Friedrich von Siemens Foundation, Siemens Lecturer:
Roger D. Blandford, *Richard Chace Tolman Professor of Theoretical Astrophysics*

Awards and Honors from Professional Societies

American Astronomical Society, 2001 Henry Norris Russell Lecturer:
Wallace L. W. Sargent, *Ira S. Bowen Professor of Astronomy*

American Ceramic Society, 2001 Robert L. Coble Award for Young Scholars:
Sossina M. Haile, *Assistant Professor of Materials Science*

American Chemical Society, 2001 Award for Creative Invention:
John D. Baldeschwieler, *J. Stanley Johnson Professor and Professor of Chemistry, Emeritus*

American Chemical Society, Southern California Section, Richard C. Tolman Medal:
William A. Goddard III, *Charles and Mary Ferkel Professor of Chemistry, Materials Science, and Applied Physics*

American Institute for Medical and Biological Engineering, Fellow:
Frances H. Arnold, *Dick and Barbara Dickinson Professor of Chemical Engineering and Biochemistry*

American Philosophical Society, Member:
John N. Abelson, *George Beadle Professor of Biology*
Alexander J. Varshavsky, *Howard and Gwen Laurie Smits Professor of Cell Biology*

American Physical Society, 2002 Dannie Heineman Prize for Mathematical Physics:
John H. Schwarz, *Harold Brown Professor of Theoretical Physics*

American Society for Microbiology Committee on the Status of Women in Microbiology, 2001 Alice C. Evans Award:
Alice S. Huang, *Faculty Associate in Biology*

ASME International (The American Society of Mechanical Engineers), Warner T. Koiter Medal:
Wolfgang G. Knauss, *Theodore von Kármán Professor of Aeronautics and Applied Mechanics*

Astronomical Society of the Pacific, 2001 Maria and Eric Muhlmann Award:
Keith Taylor, *Member of the Professional Staff, Astronomy*

Chinese-American Faculty Association of Southern California, 2001 Achievement Award:
Nai-Chang Yeh, *Professor of Physics*

Earthquake Engineering Research Institute, 2001 George W. Housner Medal:
Clarence Allen, *Professor of Geology and Geophysics, Emeritus*

Economic History Association, Gyorgi Ranki Prize:
Philip T. Hoffman, *Professor of History and Social Science*

Forest History Society, Ralph W. Hidy Award:
Benjamin H. Johnson, *Instructor in History*

Institute of Physics, Fellow and Chartered Physicist:
Nai-Chang Yeh, *Professor of Physics*

Mineralogical Society of America, Dana Medal:
George R. Rossman, *Professor of Mineralogy and Divisional Academic Officer*

Roebling Medal:
Peter J. Wyllie, *Professor of Geology, Emeritus*

Society for Industrial and Applied Mathematics, Wilkinson Prize:
Yizhao T. Hou, *Professor of and Executive Officer for Applied and Computational Mathematics*

Society for Social Choice and Welfare, Social Choice and Welfare Prize:
Matthew O. Jackson, *Professor of Economics*

Foundation Awards

Rita Allen Foundation, Rita Allen Foundation Scholar:
David C. Chan, *Assistant Professor of Biology and Bren Scholar*

Warren Alpert Foundation, 2000 Warren Alpert Foundation Prize, Corecipient:
David Baltimore, *President of Caltech and Professor of Biology*

Arnold and Mabel Beckman Foundation, 2001 Beckman Young Investigator Award:
Linda C. Hsieh-Wilson, *Assistant Professor of Chemistry*

Camille and Henry Dreyfus Foundation, 2000 New Faculty Award:
Brian M. Stoltz, *Assistant Professor of Chemistry*

Dudley Observatory, Albany, New York, Fullam Award:
Judith G. Cohen, *Professor of Astronomy*

John Simon Guggenheim Memorial Foundation, Fellow:
Philip T. Hoffman, *Professor of History and Social Science*

Okawa Foundation for Information and Telecommunications, Okawa Award:
Jason J. Hickey, *Assistant Professor of Computer Science*

Alfred P. Sloan Foundation, Research Fellow:
Richard W. Roberts, *Assistant Professor of Chemistry*
Emmanuel Candes, *Assistant Professor of Applied and Computational Mathematics*

University Honors

Desert Research Institute, 2001 Nevada Medal:
John H. Seinfeld, *Louis E. Nohl Professor and Professor of Chemical Engineering*

Princeton University, Department of Physics, Sackler Lecturer:
Shrinivas R. Kulkarni, *John D. and Catherine T. MacArthur Professor of Astronomy and Planetary Science*

University of Illinois at Urbana-Champaign, Department of Astronomy, Fourth Icko Iben Jr. Distinguished Lecturer:
Wallace L. W. Sargent, *Ira S. Bowen Professor of Astronomy*

University of Leiden, 2002 Lorentz Chair:
John P. Preskill, *Professor of Theoretical Physics*

University of Pennsylvania, Selove Lecturer:
Anneila I. Sargent, *Professor of Astronomy; Director, Owens Valley Radio Observatory; and Director, Interferometry Science Center*

University of Victoria, Landsdowne Lecturer:
Richard S. Ellis, *Professor of Astronomy and Director, Palomar Observatory*

Washington University in St. Louis, Arthur Holly Compton Memorial Lecturer:

Kip S. Thorne, *Richard P. Feynman Professor of Theoretical Physics*

Yale University, Wilbur Lucius Cross Medal:

Elliot M. Meyerowitz, *Professor of Biology and Chair of the Division of Biology*

Yale University, 2001 Tetelman Fellow:

Roger D. Blandford, *Richard Chace Tolman Professor of Theoretical Astrophysics*

Institute Honors

Endowed Professorships:

Marianne Bronner-Fraser, *Albert Billings Ruddock Professor of Biology*

Jehoshua Bruck, *Gordon and Betty Moore Professor of Computation and Neural Systems and Electrical Engineering*

Wolfgang G. Knauss, *Theodore von Kármán Professor of Aeronautics and Applied Mechanics*

Shrinivas R. Kulkarni, *John D. and Catherine T. MacArthur Professor of Astronomy and Planetary Science*

Andrew E. Lange, *Marvin L. Goldberger Professor of Physics*

Anthony C. S. Readhead, *Barbara and Stanley R. Rawn, Jr., Professor of Astronomy*

David B. Rutledge, *Kiyo and Eiko Tomiyasu Professor of Electrical Engineering*

Brian P. Wernicke, *Chandler Family Professor of Geology*

James F. Woodward, *J. O. and Juliette Koepfli Professor of the Humanities*

Associated Students of the California Institute of Technology (ASCIT), 2001 Teaching Awards:

Oscar P. Bruno, *Professor of Applied and Computational Mathematics*

Dirk Hundertmark, *Olga Taussky and John Todd Instructor in Mathematics*

Edward J. McCaffery, *Visiting Professor of Law*

Thomas A. Neenan, *Lecturer in Music*

Charles W. Peck, *Professor of Physics*

Lifetime Achievement Awards:

George Cheron, *Lecturer in Russian*

Glen A. George, *Lecturer in Computer Science and Electrical Engineering*

Graduate Student Council, 2001 Teaching Awards:

Agustin J. Colussi, *Senior Research Fellow in Environmental Science and Engineering*

Hans G. Hornung, *C. L. "Kelly" Johnson Professor of Aeronautics and Director, Graduate Aeronautical Laboratories*

Julia A. Kornfield, *Professor of Chemical Engineering*

Brian M. Stoltz, *Assistant Professor of Chemistry*

Richard P. Feynman Prize for Excellence in Teaching, Recipient:

David J. Stevenson, *George Van Osdol Professor of Planetary Science*

Financial Report Letter

Fiscal Year 2001

Fiscal year 2001 was challenging for institutions across the nation. Caltech's experience was no different. However, despite stock market declines and general economic downturns, Caltech weathered this storm and continued to build upon its international leadership in science and engineering research and education.

The Balance Sheet remains strong despite a challenging economic climate

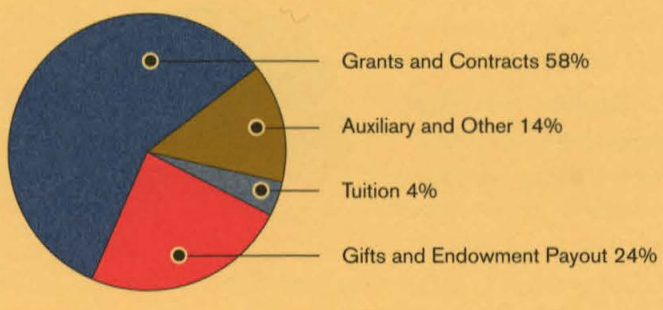
In spite of the volatility in the financial markets, Caltech's balance sheet remains strong. With a September 30 value of more than $1.2 billion, Caltech's endowment still comprises the largest single component of total net assets. It provides an annual stream of income for current programs and needs. This annual payout is balanced against the desire to preserve the future value of the endowment. The Institute's Board of Trustees closely monitors both the spending allocation and the investment strategy to help ensure that both these requirements are adequately fulfilled.

While Caltech's total net assets decreased by 18% to $1.8 billion, virtually all of this decline is attributable to unrealized losses in the September 30, 2001, market value of the endowment portfolio. Despite this, Caltech's strength has been recognized by major credit rating agencies in the form of Aaa/AAA debt ratings (the top rankings). Only a few private research universities have earned this elite standing.

Revenues and expenses remain steady

Sponsored research dollars are the primary financial fuel for the Institute's operations. Caltech has been extremely successful at maintaining a strong and steady flow of sponsored research funding, both through the Jet Propulsion Lab (JPL) and campus-based research. JPL's budget is completely funded by Federal resources, while 58% of the campus operating budget is funded by external sponsors, including the Federal government, foundations, and corporations. Campus sponsored research revenues grew by 6.8% in fiscal year 2001. These revenues have more than doubled in the past decade, thanks to our extremely productive faculty.

Campus Operating Revenues by Source
Fiscal Year 2001



Gifts and payout from our endowment form the Institute's second major source of operating revenue. For the third consecutive year, new gifts (cash and pledges) topped the $100 million mark. This extraordinary level of support from our alumni and friends is critical to Caltech's ability to remain at the leading edge of research and education.

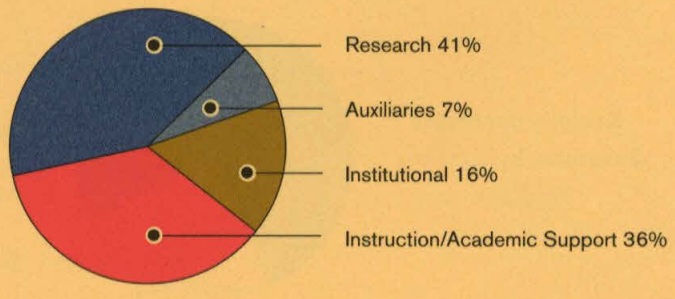
Tuition revenue is a far less significant component of the financial picture at Caltech than at our peer institutions. This reflects both our deliberately small enrollment and our comparatively low tuition rate. While these strategies may constrain revenue, they have successfully maintained our ability to attract the highest caliber students in the world.

While Caltech's revenue sources are limited, they are stable and strong. Current events and market conditions have combined to produce some short-term volatility in the endowment portfolio, but it is important to remember that the Institute's investment horizon is perpetuity. The creativity and productivity of our faculty have ensured a steady flow of sponsored research revenues, despite the complexities of the Federal budget. The strength of our mission has resulted in significant increases in gifts received. The wisdom of the Board's investment strategy has resulted in significant investment growth and additional support to annual operations. In spite of these positives, we will aggressively seek to grow our traditional sources of revenue and to tap new sources around the activities that we do best.

Complementing sponsored research revenues, organized research remains the most significant expense category. Consistent with prior years, research represents 41% of campus operating expenses. In total, Institute expenses grew by 6% to $452 million. Most expense categories grew by an average rate of 3.5%. Utility costs were the primary exception, increasing by 72% over the prior year. This was the result of the volatile energy situation that was experienced throughout California.

Recognizing that our mission is a costly one to achieve, we manage our expenses closely to ensure that research and instructional activities are appropriately supported. The chart below demonstrates that more than 80% of our operating expenses relate to research, instruction and academic support, and auxiliaries (primarily student housing and dining operations). We work diligently to keep our administrative costs reasonable, ensuring that the maximum funding possible will be channeled to our mission-critical activities.

Campus Operating Expenses by Function
Fiscal Year 2001

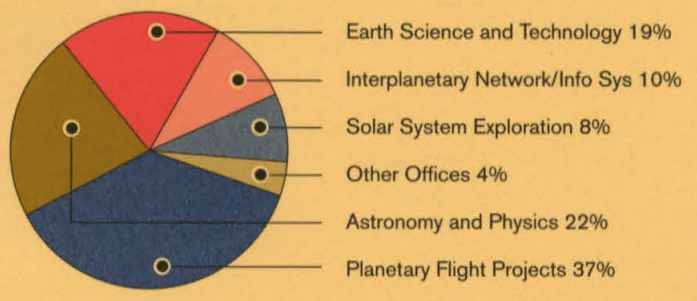


JPL remains a key component of our uniqueness

JPL is a Federally Funded Research and Development Center (FFRDC), sponsored by the National Aeronautics and Space Administration and operated as a division of Caltech.

JPL is responsible for a broad spectrum of space science missions and instruments and is the nation's lead center for the robotic exploration of space and deep space systems. A summary of JPL's $1.4B budget for fiscal year 2001 is provided below. The planetary flight projects program accounts for most of JPL funding, followed by the astronomy and physics, earth and science technology, interplanetary network and information systems, and solar system exploration programs. Despite increasing pressure on the NASA budget, JPL's portfolio of missions remains strong.

JPL Program Office Distribution
Fiscal Year 2001

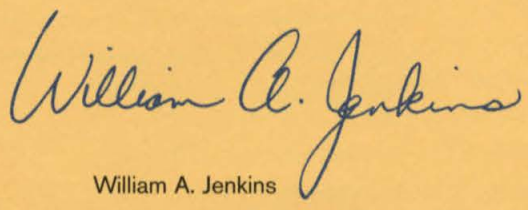


Building on our past and looking to our future

In President Baltimore's annual report letter he details a historical discussion about Caltech's mission and synthesizes past documents and today's thoughts into a single mission statement. One concludes that size and focus are two of our strategic advantages of both yesterday and today. While our university peers grow in size, the number and quality of Caltech faculty and students have remained constant, providing distinguished intellectual quality. While almost all other universities expand the types and shapes of new academic programs, Caltech has maintained, and even strengthened, its clear focus on science and technology.

The success of our focused strategy is demonstrated in a variety of tangible ways. Sponsored research revenue has grown steadily and consistently year after year because we have the best and most productive faculty in the country. In fact, research contributes a much greater percentage of our total revenues than at any other institution of higher education. This has been done, amazingly, with a faculty count that has remained steady for years. We attract the top researchers and graduate students in the world. We provide our small, talented student body with the attention that only a student-to-faculty ratio of 3:1 can offer. We leverage our capabilities through the unique relationship between the campus and the Jet Propulsion Laboratory.

While Caltech's success is impressive and satisfying, we constantly look to the future. The recently announced $600 million commitment by Gordon and Betty Moore is an affirmation of our past and a major step into the future. Our ability to attract faculty at the top of their field, to recruit the best students, and to build and maintain state-of-the-art facilities requires significant financial investment. President Baltimore's mission statement brings further clarification to our future direction. Through the effective management of our resources, the continued generosity of our donors, and prudent investments, Caltech's achievements and contributions to society will be extraordinary.



William A. Jenkins
Executive Vice President for Administration

Balance Sheets

At September 30, 2001 and 2000
(dollars in thousands)

	2001	2000
ASSETS		
Cash and cash equivalents	$ 602	$ 867
Advances on grants and contracts	5,102	6,809
Accounts and notes receivable, net of allowance for doubtful accounts of $14,604 and $17,686, respectively:		
United States government	198,910	197,890
Other	18,151	20,953
Contributions receivable, net (Note C)	76,170	52,813
Investments (Note D)	1,411,082	1,780,695
Deferred United States government billings (Note E)	180,746	163,611
Prepaid expenses and other assets	102,135	107,255
Property, plant, and equipment, net (Note F)	547,991	571,440
Total assets	$2,540,889	$2,902,333
LIABILITIES AND NET ASSETS		
Liabilities:		
Accounts payable and accrued expenses	$ 288,508	$ 281,829
Deferred revenue and refundable advances	28,452	31,085
Annuities, trust agreements and agency funds	77,333	87,574
Long-term debt (Note G)	159,526	143,291
Accumulated postretirement benefit obligations (Note J)	190,368	168,022
Total liabilities	$ 744,187	$ 711,801
Net Assets (Notes B and H):		
Unrestricted	$1,190,815	$1,596,653
Temporarily restricted	125,109	157,883
Permanently restricted	480,778	435,996
Total net assets	$ 1,796,702	$2,190,532
Total liabilities and net assets	$2,540,889	$2,902,333

The accompanying notes are an integral part of these financial statements.

Statements of Activities

For the Years Ended September 30, 2001 and 2000
(dollars in thousands)

	2001	2000
CHANGES IN UNRESTRICTED NET ASSETS:		
Revenues:		
Tuition and fees (net of student financial aid of $22,567 and $19,710, respectively)	$ 15,032	$ 15,723
Investment (loss) return	(296,203)	346,382
Gifts	24,302	42,440
Grants and contracts:		
Jet Propulsion Laboratory – direct	1,365,579	1,243,932
Other United States government – direct	158,168	152,773
Non-United States government – direct	9,854	7,255
Indirect cost recovery and management allowance	84,155	75,936
Auxiliary enterprises	24,261	21,454
Other	18,631	39,673
Net assets released from restrictions	41,042	11,659
Total unrestricted revenues	$1,444,821	$1,957,227
Expenses:		
Instruction and academic support	$ 164,088	$ 144,677
Organized research:		
Jet Propulsion Laboratory	1,365,579	1,243,932
Other Institute research	184,158	185,980
Institutional support	73,977	71,044
Auxiliary enterprises	30,105	25,831
Loss on write-off of property, plant, and equipment	0	51,434
Total unrestricted expenses	$ 1,817,907	$1,722,898
(Decrease) increase in unrestricted net assets before a cumulative effect of an accounting change and redesignations of net assets	$ (373,086)	$ 234,329
Cumulative effect of an accounting change (Note B)	(40,317)	0
Redesignations and reclassifications of net assets	7,565	0
(Decrease) increase in unrestricted net assets	$ (405,838)	$ 234,329
CHANGES IN TEMPORARILY RESTRICTED NET ASSETS:		
Gifts	$ 21,168	$ 35,237
Investment (loss) return	(13,251)	10,900
Net assets released from restrictions	(41,042)	(11,659)
Redesignations and reclassifications of net assets	351	0
(Decrease) increase in temporarily restricted net assets	$ (32,774)	$ 34,478
CHANGES IN PERMANENTLY RESTRICTED NET ASSETS:		
Gifts	$ 62,392	$ 32,049
Investment (loss) return	(9,747)	7,424
Other income	53	0
Redesignations and reclassifications of net assets	(7,916)	0
Increase in permanently restricted net assets	$ 44,782	$ 39,473
(Decrease) increase in total net assets	$ (393,830)	$ 308,280
Net assets at beginning of year	2,190,532	1,882,252
Total net assets at end of year	$ 1,796,702	$2,190,532

The accompanying notes are an integral part of these financial statements.

Statements of Cash Flows

For the Years Ended September 30, 2001 and 2000
(dollars in thousands)

	2001	2000
Cash flows from operating activities:		
(Decrease) increase in net assets	$ (393,830)	$ 308,280
Adjustments to reconcile (decrease) increase in net assets to net cash (used in) provided by operating activities:		
Cumulative effect of an accounting change	40,317	0
Depreciation and amortization	43,919	57,499
Loss on write-off of property, plant, and equipment	0	51,434
Contributions restricted for long-term investment	(62,392)	(32,049)
Realized and unrealized losses (gains) on investments	358,133	(316,663)
Changes in assets and liabilities:		
Accounts and notes receivable, net	1,782	2,772
Contributions receivable, net	(23,357)	(8,944)
Deferred United States government billings	(17,135)	(13,089)
Prepaid expenses and other assets	5,120	(5,594)
Accounts payable and accrued expenses	4,956	(6,358)
Deferred revenue and refundable advances	(2,633)	5,355
Agency funds	1,038	1,094
Accumulated postretirement benefit obligations	22,346	19,080
Net cash (used in) provided by operating activities	$ (21,736)	$ 62,817
Cash flows from investing activities:		
Purchases of investments	$(1,481,898)	$(1,139,587)
Proceeds from sale of investments	1,490,770	1,108,765
Purchases of property, plant, and equipment	(58,829)	(55,407)
Net cash used in investing activities	$ (49,957)	$ (86,229)
Cash flows from financing activities:		
Change in advances on grants and contracts	$ 1,707	$ (2,607)
Contributions restricted for long-term investment	62,392	32,049
Net borrowings (repayments) on line of credit	16,000	(6,000)
Contributions received for split-interest agreements	2,539	12,686
Payments made under split-interest agreements	(11,210)	(12,494)
Net cash provided by financing activities	$ 71,428	$ 23,634
Net (decrease) increase in cash and cash equivalents	$ (265)	$ 222
Cash and cash equivalents at beginning of year	867	645
Cash and cash equivalents at end of year	$ 602	$ 867
Supplemental disclosures of cash flow information:		
Cash paid during the year for interest	$ 6,716	$ 7,875

The accompanying notes are an integral part of these financial statements.

For the Years Ended September 30, 2001 and 2000

Note A. DESCRIPTION OF THE CALIFORNIA INSTITUTE OF TECHNOLOGY

The California Institute of Technology (the Institute) is a private, not-for-profit institution of higher education based in Pasadena, California. Founded in 1891, the Institute provides education and training services, primarily for students at the undergraduate, graduate, and postdoctoral levels. In addition, the Institute performs research, training, and other services under grants, contracts, and similar agreements with sponsoring organizations, primarily departments and agencies of the government of the United States of America.

Note B. SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

Basis of Presentation. The accompanying financial statements include the accounts of the Institute and the Jet Propulsion Laboratory (JPL), a Federally Funded Research and Development Center managed by the Institute for the National Aeronautics and Space Administration (NASA).

The Institute manages JPL under a cost-reimbursable contract with NASA. JPL's land, buildings, and equipment are owned by the United States government and are excluded from the Institute's financial statements. Receivables and liabilities arising from JPL's operating activities are reflected in the Institute's financial statements. The direct costs of organized research and the related reimbursement of the costs arising from JPL's activities are segregated in the statements of activities. The management allowances earned under this contract also are included in the statements of activities.

The Institute (including JPL) is exempt from federal income taxes under the provisions of Internal Revenue Code Section 501(c)[3]. The Institute is also generally exempt from payment of California state income, gift, estate, and inheritance taxes.

The financial statements of the Institute have been prepared on the accrual basis of accounting, in accordance with accounting principles generally accepted in the United States of America and with the provisions of the American Institute of Certified Public Accountants' Audit and Accounting Guide, "Not-for-Profit Organizations," which requires the Institute to classify its net assets into three categories according to donor-imposed restrictions or provisions of law: permanently restricted, temporarily restricted, and unrestricted.

Permanently restricted net assets include gifts, charitable remainder unitrusts, pooled income funds, gift annuities, other split-interest agreements, and contributions receivable in which donors have stipulated that the principal be invested in perpetuity. Generally, donors permit the unrestricted use of all or part of the investment return on these assets. Capital gains or losses, both realized and unrealized, related to permanently restricted investments are reported as unrestricted revenue unless their use is restricted by donor-imposed stipulations.

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 contributions receivable on which the donor has placed certain restrictions. These restrictions are removed either through the passage of time or when certain actions are taken by the Institute to fulfill the restrictions. Expirations of temporary restrictions on net assets due to the fulfillment of donor-imposed restrictions and/or the passage of time are reported as reclassifications from temporarily restricted to unrestricted net assets in the statements of activities. Donor-restricted gifts that are received and either spent, or deemed spent, within the same fiscal year are reported as unrestricted revenues.

Unrestricted net assets are those not subject to donor-imposed restrictions.

Use of Estimates. The preparation of financial statements in conformity with accounting principles generally accepted in the United States of America requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements and the reported amounts of revenues and expenses during the reporting period. Actual results could differ from those estimates.

Reclassifications. Certain balances at September 30, 2000, and for the year then ended have been reclassified to conform to the current year presentation.

Redesignations. Certain amounts previously received from donors have been transferred among net asset categories due to changes in donor designations made during the year ended September 30, 2001.

Cash and Cash Equivalents. Cash and cash equivalents include resources invested in money market funds and short-term investments with original maturities of three months or less, when purchased. Any such investments held by external investment managers, which are classified as investments, are not included in cash and cash equivalents.

Under the Institute's cash management system, checks issued but not presented to banks frequently result in overdraft balances for accounting purposes and are included in accounts payable and accrued expenses in the balance sheets. The balances at September 30, 2001 and 2000, were $15,614 and $27,775, respectively.

Advances on Grants and Contracts. Certain cash balances, totaling $5,102 and $6,809 at September 30, 2001 and 2000, respectively, are restricted for use in connection with United States government research.

Investments. Investments are stated at fair value. The fair value of marketable securities and short-term investments is based on quoted market prices. When the quoted market value is not readily determinable, quoted market prices of similar financial instruments are used. The fair value of alternative investments, including limited partnerships and similar interests, is based on information provided by external investment managers at the most recent valuation date prior to year-end. The fair value of real estate and other investments is estimated by professional appraisers or Institute management. Mortgages and notes receivable are carried at cost, which approximates fair value. Purchases and sales of securities are recorded on trade dates, and realized gains and losses are determined based on the average cost of securities sold.

The Institute engages a number of outside parties to manage its investment portfolio. The Institute's investment strategy incorporates certain financial instruments, which involve, to varying degrees, elements of market and credit risk in excess of amounts recorded in the financial statements. Some of the Institute's money managers use interest-rate futures contracts to modify the interest-rate sensitivity of investments in fixed income securities. Management believes that the risk associated with these derivatives is not material to the Institute at September 30, 2001.

All investments of endowment and similar funds are carried in an investment pool unless special considerations or donor stipulations require that 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.

Property, Plant, and Equipment. Campus property, plant, and equipment are recorded at the cost of construction or acquisition, or at the appraised value at the date of the gift. Depreciation on assets other than campus buildings used in sponsored research is calculated over the estimated useful life of each class of depreciable asset, which ranges from three to fifty years, and is computed using the straight-line method. The Institute provides for the renewal and replacement of campus assets from various sources set aside for this purpose. Property, plant, and equipment acquired under both federal and nonfederal grants in which title does not ultimately transfer to the Institute is not recorded in the Institute's financial statements.

The Institute reviews long-lived assets for impairment whenever events or changes in circumstances indicate that the carrying amount of an asset may not be recoverable. An impairment charge would be recognized when the fair value of the asset or group of assets is less than the carrying value.

Effective October 1, 2000, the Institute changed its method of accounting for depreciation of campus buildings used in sponsored research. The use of an overall useful life of forty years was replaced by use of distinct useful lives for each major building component, ranging from ten to fifty years. The change was made to more accurately reflect the useful lives of building components. The total amount reported as a cumulative effect of an accounting change in the statements of activities was $40,317 for the year ended September 30, 2001. In addition, the change increased depreciation expense by $2,578 for the same period. The pro-forma effect of the change would have increased depreciation expense by $2,554 for the year ended September 30, 2000.

Split-Interest Agreements. The Institute's split-interest agreements with donors consist primarily of charitable gift annuities and irrevocable charitable remainder trusts for which the Institute serves as trustee. Assets held in these trusts are included in investments in the balance sheets at their fair value. Contribution revenue is recognized at the dates each trust is established after recording liabilities for the actuarially determined present value of the estimated future payments to be made to the beneficiaries. The actuarial liability is based on the present value of future payments discounted at a rate of 6.0% and 7.6% for the years ended September 30, 2001 and 2000, respectively, and the 1990 Group Annuity Mortality Tables. The liabilities are adjusted during the term of the trusts for changes in the fair value of the assets, accretion of discounts, and other changes in the estimates of future benefits.

The Institute is also the beneficiary of certain trusts held and administered by others. The present values of the estimated future cash receipts from the trusts are included in prepaid expenses and other assets in the balance sheets. 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.

Revenue Recognition. The Institute's revenue recognition policies are as follows:

- *Tuition and Fees* – Student tuition and fees are recorded as revenues during the year the related academic services are rendered. Student tuition and fees received in advance of services to be rendered are recorded as deferred revenues.

- *Investment Return (Loss)* – Investment income and realized and unrealized gains and losses are recorded on the trade date and reported as increases or decreases to the appropriate net asset category.

- *Gifts* – Gifts from donors, including contributions receivable (unconditional promises to give), are recorded as revenues in the year received. Contributions receivable are reported at their discounted present values, and an allowance for amounts estimated to be uncollectable is provided. Donor-restricted gifts, which are received and either spent, or deemed spent, within the same year are reported as unrestricted revenue. Gifts of long-lived assets with no donor-imposed time restrictions are reported as unrestricted revenue in the 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 to unrestricted net assets when the donor-imposed restrictions are fulfilled.

- *Grants and Contracts* – Revenues from grants and contracts are reported as increases in unrestricted net assets, as allowable expenditures under such agreements are incurred.

Expenses. Expenses are generally reported as decreases in unrestricted net assets. The statements of activities present expenses by functional classification in accordance with the overall educational and research mission of the Institute.

Depreciation and plant operation expenses are allocated to functional classifications based on square footage occupancy of Institute facilities.

Interest expense on external debt is allocated to the functional categories that have benefited from the proceeds of such debt.

Fair Value of Financial Instruments. For those financial instruments for which it is practical, the following methods and assumptions are used to estimate fair value:

- *Cash and cash equivalents* – Cost approximates fair value.

- *Accounts and notes receivable* – Amounts receivable under contracts and grants are carried at cost, which approximates fair value. Student accounts and notes receivable are carried at cost, less an allowance for doubtful accounts. Determination of the fair value of student accounts and notes receivable could not be made without incurring excessive costs.

- *Long-term debt* – The fair value of bonds payable is estimated based on quoted market prices for the bonds or similar financial instruments and was approximately $127,167 and $116,031 at September 30, 2001 and 2000, respectively. The revolving bank credit facility is carried at cost, which approximates fair value.

Note C. CONTRIBUTIONS RECEIVABLE

Contributions receivable consists of unconditional promises to give to the Institute in the future and are recorded after discounting the present value of the future cash flows at the risk-free rate appropriate for the pledge at the date of the gift. Discount rates ranging from 4.5% to 5.8% are used for the years ended September 30, 2001 and 2000.

Contributions receivable consisted of the following at September 30, 2001 and 2000:

	2001	2000
Contributions receivable at beginning of year, net	$ 52,813	$ 43,869
Discount at beginning of year	5,133	2,746
Allowance for doubtful accounts at beginning of year	1,633	1,387
Contributions receivable at beginning of year, gross	59,579	48,002
New contributions received	57,346	43,365
Contribution payments received	(22,473)	(30,201)
Less: write-offs and other adjustments	(4,396)	(1,587)
Contributions receivable at end of year, gross	90,056	59,579
Discount at end of year	(11,530)	(5,133)
Allowance for doubtful accounts at end of year	(2,356)	(1,633)
Contributions receivable at end of year, net	$ 76,170	$ 52,813

Gross contributions receivable have the following restrictions at September 30, 2001 and 2000:

	2001	2000
Endowment for programs, activities and scholarships	$ 51,933	$ 17,413
Building construction	23,762	27,637
Education and general	14,361	14,529
Total contributions receivable, gross	$ 90,056	$ 59,579

Gross contributions receivable are expected to be realized as follows at September 30, 2001 and 2000:

	2001	2000
Within one year	$ 25,523	$ 21,201
Between one year and five years	32,878	27,904
More than five years	31,655	10,474
Total contributions receivable, gross	$ 90,056	$ 59,579

Note D. INVESTMENTS

Investments consisted of the following at September 30, 2001 and 2000:

	2001	2000
Short-term investments	$ 74,660	$ 116,348
Government fixed income securities	163,370	141,654
Corporate fixed income securities	197,101	185,055
Domestic equity securities	571,053	840,151
International equity securities	160,763	216,281
Limited partnerships and alternative investments	221,383	255,985
Real estate mortgages, notes and other investments	22,752	25,221
Total investments	$ 1,411,082	$1,780,695

Investments were categorized as follows at September 30, 2001 and 2000:

	2001	2000
Consolidated endowment pool	$ 1,173,837	$1,504,971
Separately invested endowments	60,204	66,585
Subtotal endowment investments	1,234,041	1,571,556
Trusts, annuities and other	177,041	209,139
Total investments	$ 1,411,082	$1,780,695

Investment (loss) return consisted of the following for the years ended September 30, 2001 and 2000:

	2001	2000
Interest and dividend income	$ 38,932	$ 48,043
Net realized gains	10,647	199,884
Net unrealized (depreciation) appreciation	(364,884)	119,826
Less: management fee	(3,896)	(3,047)
Total investment (loss) return	$ (319,201)	$ 364,706

At September 30, 2001 and 2000, the Institute had committed to invest $133,930 and $131,280, respectively, with alternative investment managers and/or limited partnerships over the next ten years.

Note E. DEFERRED UNITED STATES GOVERNMENT BILLINGS

Deferred United States government billings consisted of the following at September 30, 2001 and 2000:

	2001	2000
Accumulated benefit obligation – JPL	$ 149,963	$ 133,545
Prepaid benefit cost – JPL	(2,377)	(2,199)
Accrued vacation benefits – JPL	33,160	32,265
Total deferred United States government billings	$ 180,746	$ 163,611

The Institute's contract with NASA provides for the reimbursement of certain employee benefit costs should the Institute's contract ever be terminated. Therefore, the Institute has recorded a deferred United States government billing related to JPL's accumulated postretirement benefit obligation, which is offset by JPL's prepaid benefit cost as the Institute expects to recover the net of these amounts through future charges to United States government grants and contracts. The Institute has also recorded a deferred United States government billing related to JPL's accrued vacation benefits, which are also 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.

Note F. PROPERTY, PLANT, AND EQUIPMENT

Property, plant, and equipment consisted of the following at September 30, 2001 and 2000:

	2001	2000
Land and land improvements	$ 41,076	$ 40,560
Buildings and building improvements	384,333	368,622
Equipment	453,758	444,410
Total	879,167	853,592
Less: accumulated depreciation	(385,861)	(310,788)
Total	493,306	542,804
Construction in progress	54,685	28,636
Property, plant, and equipment, net	$547,991	$571,440

Depreciation expense for the years ended September 30, 2001 and 2000, amounted to approximately $43,684 and $57,030, respectively.

During the year ended September 30, 2000, the Institute completed a physical inventory of certain equipment used in research activities. The physical inventory indicated a difference between the amounts recorded in the financial statements and the inventory records. Accordingly, the Institute wrote off approximately $51,434 in equipment, net of accumulated depreciation, which is recorded in the statement of activities.

Note G. LONG-TERM DEBT

Long-term debt consisted of the following at September 30, 2001 and 2000:

	2001	2000
California Educational Facilities Authority (CEFA) Series 1994 revenue bonds, due in full in January 2024, with variable interest rates that are reset weekly. The interest rates were 1.95% and 4.15% at September 30, 2001 and 2000, respectively.	$ 30,000	$ 30,000
CEFA Series 1998 revenue bonds, due in full in October 2028, net of issue discount of $6,339 and $6,574, respectively, bearing interest ranging from 4.25% to 4.50%.	97,526	97,291
Bank of America uncollateralized revolving bank credit facility carrying a limit of $50,000, expiring June 2004, and bearing a variable interest rate at LIBOR + .2%. The interest rates were 2.92% and 6.87% at September 30, 2001 and 2000, respectively.	32,000	16,000
Total long-term debt	$159,526	$143,291

The CEFA Series 1998 revenue bonds are subject to an early redemption premium if redeemed prior to October 1, 2010.

Scheduled principal repayments on long-term debt follows:

Year Ending September 30	Amount
2002	$ 0
2003	0
2004	32,000
2005	0
2006	0
Thereafter	127,526
Total	$ 159,526

Note H. COMPONENTS OF NET ASSETS

The following tables present the net asset categories by purpose at September 30, 2001 and 2000:

	2001			
	Unrestricted	Temporarily Restricted	Permanently Restricted	Total
Operating funds	$ 49,349	$ 0	$ 0	$ 49,349
Contributions receivable	0	33,329	42,841	76,170
Student loan funds	0	0	13,039	13,039
Invested in plant	350,134	0	0	350,134
Unexpended plant funds	0	19,829	0	19,829
Life income and annuity funds	0	27,851	31,949	59,800
Endowment and other funds functioning as endowment	791,332	44,100	392,949	1,228,381
Total net assets	$ 1,190,815	$125,109	$ 480,778	$ 1,796,702

	2000			
	Unrestricted	Temporarily Restricted	Permanently Restricted	Total
Operating funds	$ 52,658	$ 0	$ 0	$ 52,658
Contributions receivable	0	36,802	16,011	52,813
Student loan funds	0	0	12,229	12,229
Invested in plant	409,010	0	0	409,010
Unexpended plant funds	0	25,362	0	25,362
Life income and annuity funds	0	36,797	36,359	73,156
Endowment and other funds functioning as endowment	1,134,985	58,922	371,397	1,565,304
Total net assets	$ 1,596,653	$ 157,883	$ 435,996	$ 2,190,532

Note I. RETIREMENT PLANS

The Institute's retirement plans cover substantially all of its employees and 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 other plans effective January 1, 1994, for employees who were participants in the terminated defined benefit pension plan: (1) a successor defined benefit pension plan, which 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 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 the retirement plan assets at levels adequate to cover all accrued benefit obligations.

During the current year, the measurement date of the successor defined benefit plan was changed from September 30 to June 30. The effect of this change is not material to the plan's pension benefit obligation or funded status.

Certain financial information regarding the successor defined benefit plan was as follows for the years ended September 30, 2001 and 2000:

	2001	2000
Change in the benefit obligation:		
Benefit obligation at beginning of year	$ 38,168	$ 33,276
Service cost	211	200
Interest cost	2,846	2,698
Benefits paid	(1,925)	(2,387)
Actuarial (gain) loss	(3,452)	4,381
Benefit obligation at end of year	$ 35,848	$ 38,168
Change in the fair value of plan assets:		
Fair value of plan assets at beginning of year	$ 42,008	$ 38,220
Actual return on plan assets	(1,892)	6,175
Benefits paid	(1,925)	(2,387)
Fair value of plan assets at end of year	$ 38,191	$ 42,008
Reconciliation of funded status:		
Funded status	$ 2,343	$ 3,840
Unrecognized net actuarial loss (gain)	237	(1,448)
Net amount recognized at end of year	$ 2,580	$ 2,392
Components of net periodic benefit:		
Service cost	$ 211	$ 200
Interest cost	2,846	2,698
Expected return on plan assets	(3,245)	(3,266)
Recognized actuarial loss	0	304
Net periodic benefit	$ (188)	$ (64)

The following weighted-average assumptions were used to determine the Institute's obligation under the successor defined benefit plan at September 30, 2001 and 2000:

	2001	2000
Discount rate	7.50%	7.75%
Expected return on plan assets	8.00%	8.00%
Long-term rate of compensation increase	4.75%	4.75%

Pension costs for the defined contribution plans for the years ended September 30, 2001 and 2000, were $13,471 and $12,176, respectively for the campus and $39,581 and $36,377, respectively, for JPL.

Note J. POSTRETIREMENT AND POSTEMPLOYMENT BENEFITS OTHER THAN PENSIONS

The Institute provides certain postretirement health and life insurance benefits. The Institute's policy is to amortize any actuarial deferrals resulting from changes in the accumulated postretirement benefit obligation over the average future working lifetime of its employees.

During the current year, the measurement date of this plan was changed from September 30 to June 30. The effect of this change is not material to the plan's pension benefit obligation or funded status.

Certain financial information regarding the plan was as follows for the years ended September 30, 2001 and 2000:

	2001	2000
Change in the accumulated postretirment benefit obligation:		
Accumulated postretirement benefit obligation at beginning of year	$ 254,258	$ 226,090
Service cost	9,047	7,487
Interest cost	19,291	16,559
Participant contributions	856	1,654
Benefits paid	(10,522)	(9,867)
Actuarial (gain) loss	(46,138)	12,335
Benefit obligation at end of year	$ 226,792	$ 254,258
Change in the fair value of plan assets:		
Fair value of plan assets at beginning of year	$ 0	$ 0
Employer contributions	9,666	8,213
Participant contributions	856	1,654
Benefits paid	(10,522)	(9,867)
Fair value of plan assets at end of year	$ 0	$ 0
Reconciliation of funded status:		
Funded status	$(226,792)	$(254,258)
Unrecognized actuarial loss	36,424	86,236
Net amount recognized at end of year	$(190,368)	$(168,022)
Components of net periodic benefit cost:		
Service cost	$ 9,047	$ 7,487
Interest cost	19,291	16,559
Amortization of loss	3,674	3,247
Net periodic benefit cost	$ 32,012	$ 27,293

The following weighted-average assumptions were used to determine the Institute's obligation under the plan at September 30, 2001 and 2000:

	2001	2000
Discount rate	7.50%	7.75%
Health care cost trend rate	9.00%	9.00%

The health care cost trend rate for subsequent years is as follows:

Year Ending September 30	Health Care Cost Trend Rate
2002	7.50%
2003	7.00%
2004	6.50%
2005	6.00%
2006 and thereafter	5.50%

A one-percentage-point change in assumed health care cost trend rates would have the following effects:

	1% Increase	1% Decrease
Effect on the total of service and interest cost components	$ 5,843	$ (4,525)
Effect on accumulated postretirement benefit obligation	$ 32,746	$ (26,776)

Note K. COMMITMENTS AND CONTINGENCIES

Contingencies. The Institute receives funding or reimbursement from agencies of the United States government for various activities, which are subject to audit, and is a defendant in various legal actions incident to the conduct of its activities. Except as specifically discussed below, management does not expect that liabilities, if any, related to these audits or legal actions will have a material impact on the Institute's financial position.

In February 1997, the Office of Inspector General of NASA issued a subpoena for a large number of financial records relating to the operation of JPL. The Institute has provided the requested financial records and Institute representatives have had ongoing discussions with appropriate government officials. Government officials have made no claims against the Institute, but their investigation of the financial records has not been concluded. The Institute is unable to predict whether any claims may be made, or if made, the ultimate resolution thereof.

The Institute is also a defendant in a civil lawsuit seeking to recover damages arising out of the alleged discharge of toxic materials at or near JPL. The Institute has denied all of the plaintiff's material allegations, has asserted various affirmative defenses, and has asserted claims against the United States government for indemnification. The Institute intends to defend this case vigorously and to press its indemnification claims.

The Institute has been named as a potentially responsible party (PRP) by NASA under the Comprehensive Environment Response, Compensation and Liability Act, as amended. As a PRP, the Institute may be jointly liable for contribution towards clean-up costs, estimated to be in excess of $100 million, of the NASA/JPL Superfund site. The Institute believes that it will have recourse to the United States government for any liabilities it may incur in connection with being named a PRP for that site.

Officials of the Institute presently are not able to predict the impact, if any, that final resolution of the matters discussed in the preceding three paragraphs will have on the Institute's financial position or operating results.

Commitments. As of September 30, 2001, the Institute is committed under certain construction contracts in the amount of approximately $27 million.

PRICEWATERHOUSECOOPERS

PricewaterhouseCoopers LLP
400 South Hope Street
Suite 2300
Los Angeles CA 90071-2889
Telephone (213) 236 3000
Facsimile (213) 622 9062

REPORT OF INDEPENDENT ACCOUNTANTS

To the Board of Trustees of
California Institute of Technology

In our opinion, the accompanying balance sheets and the related statements of activities and cash flows present fairly, in all material respects, the financial position of the California Institute of Technology (the Institute) at September 30, 2001 and 2000, and the changes in its net assets and its cash flows for the years then ended in conformity with accounting principles generally accepted in the United States of America. These financial statements are the responsibility of the Institute's management; our responsibility is to express an opinion on these financial statements based on our audits. We conducted our audits of these statements in accordance with auditing standards generally accepted in the United States of America, which require that we plan and perform the audits 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 audits provide a reasonable basis for our opinion.

As discussed in Note B to the financial statements, effective October 1, 2000, the Institute changed its method of depreciating buildings used in sponsored research.

PricewaterhouseCoopers LLP

November 15, 2001

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California Institute of Technology
Pasadena, California 91125