

**JESSE L. GREENSTEIN  
1909–2002**

Jesse L. Greenstein, the DuBridge Professor of Astrophysics, Emeritus, died October 21 at the age of 93. Greenstein came to Caltech in 1948 to organize a new graduate program in optical astronomy in conjunction with the new 200-inch Hale Telescope on Palomar Mountain. The Caltech astronomy program quickly became the premier academic program of its kind in the world, with Greenstein leading it from 1948 to 1972. His research interests largely centered on the physics of astronomical objects. The next issue of *E&S* will carry excerpts of the memorial service, which will be held February 11 at 3:30 in Dabney Lounge.



**WHEELER J. NORTH  
1922–2002**

Wheeler J. North, professor of environmental science, emeritus, died December 20 at the age of 80.

He earned two bachelor's degrees from Caltech, one in electrical engineering in 1944 and another in biology in 1950, and had been a member of the faculty since 1962.

North studied kelp, proving that the ocean's kelp beds are part of a complex marine ecosystem providing food and shelter for hundreds of underwater species. He pioneered scuba diving as a basic tool for marine scientists.

A memorial service, which will be reported in *E&S*, will be held February 22 at Dana Point.



**SATISH DHAWAN  
1920–2002**

*Satish Dhawan, who was director of the Indian Institute of Science (IISc), chairman of the Indian Space Commission and the Indian Space Research Organization (ISRO), and president of the Indian Academy of Sciences, received his engineering degree from Caltech in 1949, his PhD in aeronautics in 1951, and a Distinguished Alumni Award in 1969. He returned to Caltech as a visiting professor in 1971–72, when he reportedly asked to delay Indira Gandhi's summons to return home to head the ISRO until his course was finished. Hans Liepmann, Theodore von Kármán Professor of Aeronautics, Emeritus, was his thesis adviser.*

**REMEMBERING SATISH DHAWAN**

by Hans Liepmann

In January 2002, Satish Dhawan, my friend for more than half a century, whose personality and friendship had an important and lasting effect on me and my understanding of India, died at his home in Bangalore, India. Roddam Narasimha (Caltech PhD '61, Distinguished Alumni Award '86), also a professor at the Indian Institute of Science, has written a complete and beautiful history of Dhawan's life, the man and his contributions to society—a story so well presented and complete that there is little I could have added to it, even at a time when I was a great deal younger and a better writer than now, in my 89th year. All I can add are a few reminiscences of our first meeting and our work together—a time for which there exist now few living witnesses—and glimpses of our contacts over all these years.

I have often mused about the bifurcation points in one's life, the times when a small and sometimes even unwelcome choice of alternatives results in major changes in one's future. One of these bifurcations (in, I believe,

1946) resulted in my meeting Satish Dhawan. I wrote about the occasion a number of years ago in a memoir.

*Ernie Sechler, one of the original members of the GALCIT (Graduate Aeronautical Laboratory of the California Institute of Technology) faculty, was an excellent engineer, but his most outstanding quality in my opinion was an uncanny feeling for the potential of students. Ernie handled the graduate admissions. Looking back now, I realize that on every occasion where we disagreed on potential student behavior and performance, he was right and I was wrong.*

*Sometime in the mid-'40s, I worked with two Indian graduate students (both, I believe, from upper-crust, wealthy backgrounds) with whom I could not work well. They both seemed to have a reluctance to perform the sometimes unpleasant and boring chores necessary in experimental research. I was, of course, not stupid enough to consider this a general characteristic of Indians, but I felt that perhaps the select group that came to Caltech from India had prejudices against manual labor and essential, but not highly intellectual and glamorous, routines. In any case, I told Ernie that I'd like a rest from Indian students.*

*Within days he called me with*

*the news that he had a new student from India who wanted to work with me. At first I wouldn't even agree to come down to the second floor to talk to the student, but Ernie insisted, and knowing him and his instincts about students, I finally did walk downstairs, where I met Satish Dbawan. Later he was to become the director of the Indian Institute of Science in Bangalore, the Indian institution probably closest in scope and aim to Caltech. Ever since then, we in GALCIT have had close contacts with the Indian Institute of Science, and thus a calibration station for admissions, leading to some excellent Indian graduate students at GALCIT.*

Satish did join my research group, and it soon became evident that we had acquired an outstanding new member. From his previous scholastic records, we expected excellence in scholarship and class work, but there was so much more. Satish was immediately accepted and respected by this highly competent and proud group of young scientists. He showed an unusual maturity in judging both scientific and human problems, a characteristic that today is called “leadership quality.” I usually hate using terms like this to pigeonhole a person, but here it fits. Satish could be tough with-

out having to get mad first—a trait that I envy. He was a natural mentor for younger people. Finally, he had a very good sense of humor, a quality that I think is necessary, but not sufficient, to keep one from becoming pompous in old age. I still remember our Ping-Pong games in the lab. When Satish won, he would crack: “See, I am a crafty Asiatic!”

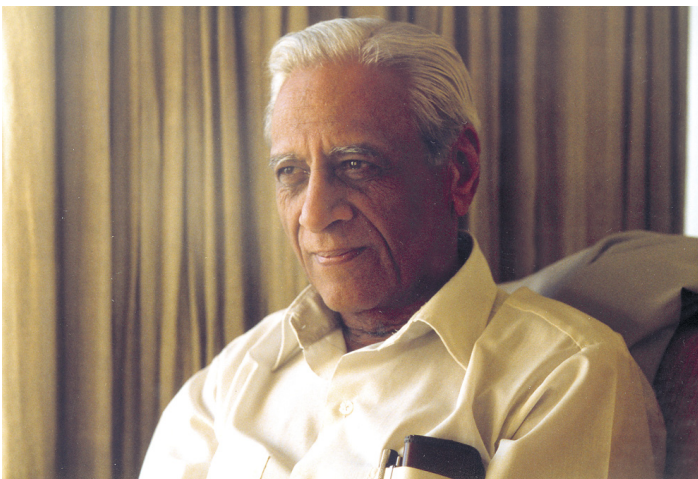
Anatol Roshko (now Theodore von Kármán Professor of Aeronautics, Emeritus), Satish, and I worked together on a problem in shockwave–boundary-layer interaction. This was Satish’s first participation in active research. It was a marvelous time! Almost everything we touched was new and exciting. Our equipment was modest, even for the standards of the time, but with some ingenuity it could be made competitive; this was an additional stimulus. The three of us worked easily and well together and laid the foundation for our lasting friendship over the next half century. After this work was done, Satish started his thesis work on the direct measurement of skin friction. This was actually a classical problem in low-speed flow of both fundamental and direct technical importance. The aim of Satish’s effort was the development of a new technique capable of making similar measurements in supersonic flow possible. It was the beginning of a lasting research effort and a great success. In addition, Satish cooperated with Anatol on the design and construction of an ingenious flexible nozzle for our research in supersonic flows—another example of ingenuity substituting for large amounts of grant money.

Finally bureaucracy intervened, and Satish had to return to India in such a hurry that he could not even finish

the introduction to this thesis, which, like any good researcher, he had left to be done last. So I finished it for him, which led to a funny incident: One faculty member reading the rough draft of the thesis called me up complaining that in the introduction Satish had not acknowledged me as his thesis supervisor. So I had to add a remark to this effect. After the report came out, it happened that the great Sir Geoffrey Taylor visited GALCIT, and I showed him Satish’s work. He happened to have a leaking fountain pen with him and managed to make a spot on the title page. I asked him to sign the spot with his name and send the signed report to Satish. I wonder what became of it.

In 1964, I took my family with me for a term at the Indian Institute of Science. It was certainly no accident that Bangalore was the only place for me to spend a term away from my many years at Caltech. It was not nearly as easy to get there as now. Bangalore had not yet developed into the Silicon Valley of India. We got stranded for a few days in Delhi, and the long-distance telephone worked only sporadically.

At this time Satish had been director of IISc for only a few years, but the place was already humming, full of young, eager students and obviously endowed with a new confidence in the future. We lived on the campus. Some evenings Satish would come to our “hutment,” and the two of us would walk around the campus and talk about anything that we considered a university should do and be. At other times we gathered together in the director’s place for tea in the evening, where we learned much about Indian life and aspirations. Nalini, Satish’s wife, we met there for the first time, and she and their



children became part of our extended family. I know now enough of university life and problems to realize how immensely difficult it was for Satish at his young age to reform time-honored curricula and professor-student interaction, and to instill the self-confidence necessary to reach for new research vistas. That he succeeded beyond all expectations was evident to me on my later, shorter trips to Bangalore.

Many years ago Satish told me that accurate weather prediction could improve India's economy decisively. With the flock of satellites he helped organize, Satish did indeed do something about the weather. Now future geophysical satellites will be launched from the Satish Dhawan Space Center, named in his honor last September. □

## Faculty File



Charles Steidel



Paul Wennberg

## TWO NEW MACARTHURS NAMED

Charles Steidel, professor of astronomy, and Paul Wennberg, professor of atmospheric chemistry and environmental engineering science, have been named MacArthur Fellows, a prestigious honor bestowed each year on innovators in a variety of fields and commonly known as the "genius grants." The John D. and Catherine T. MacArthur Foundation of Chicago named 24 recipients of the award this year, each of whom will receive a \$500,000 "no strings attached" grant over the next five years.

Steidel's expertise is cosmology, a field to which he has made numerous contributions in the ongoing attempt to understand the formation and evolution of galaxies and the development of large-scale structure in the universe. In particular, Steidel is known for the development of a technique that effectively locates early galaxies at prescribed cosmic epochs, allowing for the study of large samples of galaxies in the early universe.

Access to these large samples, which are observed primarily using the Keck telescopes on Hawaii's Mauna Kea, allows for the mapping of the distribution of the galaxies in space and for detailed observations of many

individual galaxies. These are providing insights into the process of galaxy formation when the universe was only 10 to 20 percent of its current age.

Steidel did his undergraduate work at Princeton (BA '84), earned his PhD from Caltech ('90) and has been a faculty member at Caltech since 1995.

Wennberg, who is a specialist in how both natural and human processes affect the atmosphere, is particularly interested in measuring a class of substances known as radicals. These radicals are implicated in processes that govern the health of the ozone layer as well as the presence of greenhouse gases.

Wennberg has earned recognition in the field for developing airborne sensors to study radicals and their chemistry. One of the early scientific results from these measurements demonstrated that conventional thinking was incorrect about how ozone is destroyed in the lower stratosphere, affecting assessments of the environmental impacts of chlorofluorocarbons and stratospheric aircraft.

A graduate of Oberlin College (BA '85) and Harvard University (PhD '94), Wennberg joined the Caltech faculty in 1998. □—RT

## HONORS AND AWARDS

Frances Arnold, the Dickinson Professor of Chemical Engineering and Biochemistry, has been selected by the Delaware Section of the American Chemical Society to receive the 2003 Carothers Award, for her "outstanding contributions and advances in industrial applications of chemistry."

Barry Barish, the Linde Professor of Physics and director of the Laser Interferometer Gravitational-Wave Observatory (LIGO), has been nominated to the National Science Board by President George W. Bush. The National Science Board was created in 1950 to "promote the progress of science; advance the national health, prosperity, and welfare; and secure the national defense."

Jacqueline Barton, the Hanisch Memorial Professor and professor of chemistry, has been chosen by the American Chemical Society to be the 2003 recipient of the Ronald Breslow Award for Achievement in Biomimetic Chemistry. Sponsored by the Breslow Endowment, the award recognizes "outstanding contributions to the field of biomimetic chemistry" and consists of \$5,000 and a certificate.

Pamela Bjorkman, professor of biology at Caltech and investigator of the Howard Hughes Medical Institute, was one of 11 international researchers to be awarded the Max Planck Research Prize by the Max Planck Society in Germany for her work in determining how the human immune system fights disease at the molecular level. She has also been elected a member of the American Philosophical Society.

Noel Corngold, professor of