ery of quasars by Rudolph Minkowski, Maarten Schmidt, and others. Most of the research was done by students and postdoctoral staff, who would later become distinguished members of the astronomical community.

Stanley did not enjoy the administrative responsibilities associated with being the director of a major government-funded university facility. Facing the ever-increasing levels of bureaucratic interference from the Caltech administration and NSF, he retired from Caltech in 1975 to return to his true love—radio engineering. Following several years with the Honeywell Corp, he started his own microwave company, where he developed a variety of novel instruments for the US and other governments.

Stanley, whose career was long and varied, had a strong work ethic, yet he remained modest about his own achievements. Throughout his tenure as director of the OVRO, he did not put his name on any publication of work done with the students or staff of the observatory.

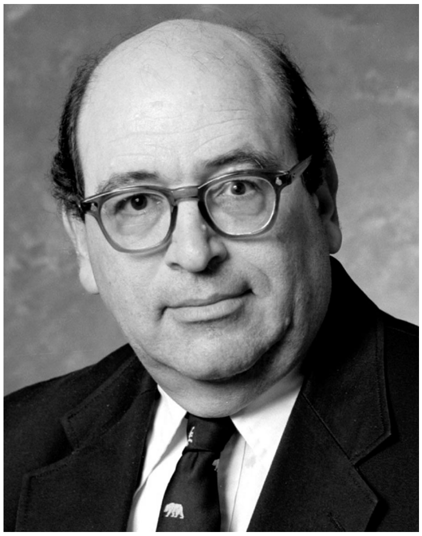
In addition to science and electronics, Stanley enjoyed literature, poetry, art, and politics. He loved music, could quote at length from Shakespeare, and balanced all those interests with a lifelong love of sports.

Kenneth Kellermann
National Radio Astronomy Observatory
Charlottesville, Virginia

Gilbert Shapiro

Gilbert Shapiro, a faculty member in the physics department of the University of California, Berkeley, for almost 40 years, died at his home in Moraga, California, on 5 December 2001. He first came to Berkeley in 1961 as a staff member at the Lawrence Radiation Laboratory (now Lawrence Berkeley National Laboratory) to engage in research in elementary particle physics. His interests and style fit well into the heady, exciting time for particle physics as old concepts were being overtaken by surprising new experimental results. His productive career came to an end while he was still vigorously active in teaching and research, when he succumbed to the cancer that had been first diagnosed two years earlier.

Shapiro was born 19 March 1934 in Philadelphia, Pennsylvania. Following his introduction to science at the Franklin Institute, he began its serious study at Central High School, a long-established Philadelphia public school with extraordinarily de-



Gilbert Shapiro

manding entrance criteria. In 1955, having received a BA from the University of Pennsylvania, he started graduate study in physics at Columbia University.

At that time, Columbia was a leading institute for high-energy physics, and its Nevis Cyclotron Laboratory facility in the Hudson River valley north of New York City was the site of a number of major discoveries. Shapiro was naturally attracted there to pursue research in high-energy physics at Columbia. His PhD thesis advisers were Allan Sachs and Richard Garwin. Results based on his thesis, "Accurate Determination of the μ^+ Magnetic Moment," were published in volume 2 of *Physical Review Letters* in 1959. Most important about that work was its determination of the vacuum dynamic contribution to the magnetic moment of the μ^+ particle, which had been predicted by quantum electrodynamics. He and Leon Lederman refined and expanded measurements of muon mass and magnetic moment in 1960 and 1961.

Upon his arrival in Berkeley, he joined Owen Chamberlain and Carson Jeffries to build the first polarized target for high-energy physics. Its initial use was in a pion–proton scattering experiment in 1963 at the Rad Lab's 184-inch synchrocyclotron. The target was an application of the basic ideas of dynamic nuclear polarization that had been developed by Jeffries and independently by Anatole Abragam. During the following 15 years, Shapiro was a senior member of a research group that carried out numerous experiments with polarized targets at the synchrocyclotron and the Bevatron at the Rad Lab. Later, he continued that work at Fermi National Accelerator Laboratory and at SLAC. In 1965, he and his colleagues at Berkeley used the polarized-target technique to determine the intrinsic parity of strange particles. A few years later at SLAC, he used it to search for evidence of time reversal invariance in the scattering of electrons. The polarized target work pioneered by Chamberlain and Shapiro at Berkeley spawned similar developments at nearly all the major high-energy physics facilities in the world, and a whole industry of polarized-target research soon evolved at accelerator facilities in England, France, Japan, the Soviet Union, and Switzerland.

In the 1980s, Shapiro worked with the Time Projection Chamber group that produced important results on high-energy electron–positron and photon–photon interactions at the SLAC storage ring SPEAR. The following decade, he joined the SLAC Large Detector group to determine the properties of the Z boson at the SLAC Linear Collider. This experiment also produced an accurate determination of the weak mixing angle, and thereby a sensitive test of the standard model. In another experiment at SLAC, he and collaborators studied deep-inelastic scattering of polarized electrons to obtain information on the spin structure of the neutron. His last research effort, begun in the late 1990s, was the planning of an imaginative use of cosmic-ray neutrinos to map Earth's density through its mantle and core, in effect a computerized tomography scan of our planet.

Shapiro devoted most of his formal teaching efforts to sharing with a wide lay public his passion for physics and developing in them an appreciation for basic scientific fact and methodology. His characterization of the descriptive Physics 10 courses that he taught as "Physics for Football Players" indicates the kind of audience he wanted to reach. He penned *Physics without Math* (Prentice Hall, 1979) as a descriptive text for this kind of course. He followed that work with *A Skeleton in the Darkroom: Stories of Serendipity in Science* (Harper & Row, 1986), an entertaining account of serendipitous observations. He used that book as the basis for a freshman seminar he taught in the 1990s. Shapiro had no patience for charlatans and others who misinterpreted science, and he delighted in debunking false and misleading claims.

Shapiro savored simple California pleasures, most often with his family, to whom he was devoted. He enjoyed strolling through the redwoods at the Muir Woods National Monument near

Mill Valley, California. A lover of classical music and an avid sports fan, he held season tickets for the opera, followed the local baseball and football teams, and attended World Cup soccer matches in the San Francisco Bay Area.

It was a pleasure to work with Shapiro. We miss his unpretentious personality, his deep insight into physics, and his willingness to help whenever he was asked.

Owen Chamberlain
William Chinowsky
Herbert Steiner
University of California
Berkeley

Leonid Yakovlevich Margolin

Leonid Yakovlevich Margolin

Leonid Yakovlevich Margolin died senselessly under questionable circumstances on 1 August 2002 while on his summer vacation outside Moscow.

Margolin was born on 22 November 1949 in Moscow. He graduated in 1972 from the Moscow Physics and Technology Institute with an MS in physics and started his scientific career at the Institute of Solid State Physics of the Russian Academy of Sciences. After one year, he joined the academy's Institute for High Temperatures, where, for almost 30 years, he worked in the pulsed plasmas department headed by Lev Pyatnitsky, who had been his scientific teacher and adviser.

During 1973–78, Margolin developed a new method for measuring dense anisotropic plasmas based on the polarization characteristics of scattered laser radiation. His research became the basis for his PhD thesis, which he successfully defended in 1979. For several years afterward, he was dedicated to refining his method and testing it on different plasma objects, including gas discharges, products of electrode erosion, and magnetohydrodynamic generators.

In 1985, he joined his friend Leonid Polonskiy, also in the pulsed plasmas department, in a project to study continuous extended laser sparks (CELS), a novel optical discharge created with high-intensity optical Bessel beams. The unique property of Bessel beams is the use of a side supply of power to automatically compensate for intensity reduction by diffraction. As result, the beam has a constant caustic diameter and seems "diffraction-free," although, of course, diffraction still occurs. Compared to other types of laser-driven discharges, Bessel beams form very long, continuous plasma channels that can be used in fast electrical switching, plasma-based lasers, the transport of charged particle and light beams, and other applications. CELS up to 1 m long were generated in many gases and liquids.

In 1991, Margolin became the leader of that project and expanded the research to Bessel beams of high orders (tubular laser beams) to allow for the generation of tubular plasma channels. He pioneered the development of special kinoform lenses to generate those beams. During the summers of 1998 and 2000 at the University of Maryland, College Park, in a productive research collaboration that also involved Pyatnitsky, he produced rapidly evolving tubular plasma channels and measured them using picosecond and femtosecond diagnostic laser pulses. Margolin's laboratory skill, energy, and infectious enthusiasm made a lasting impression on all who worked with him at Maryland.

Margolin's studies of high-order Bessel beams and their application to the generation of tubular plasma channels allowed him to prepare for submission a thesis for the Doctor of Science, which, in Russia, is the next level after the PhD. He had planned to submit it in early 2003. Despite difficult times for Russian science and a constant scramble to make ends meet, Margolin maintained energetic devotion to his research. He had begun to work on a complex theory of optical breakdown in high-order Bessel beams, but that work was interrupted by his tragic death.

Margolin's father, a veteran of World War II, raised his children to be honest, hard working, and persistent. Strong and optimistic despite numerous difficulties and obstacles, Margolin was an unusually warm and empathetic person who had many friends. He was an enthusiastic outdoorsman and loved long, difficult hiking trips. He built a wonderful country house for his wife and two children and grew vegetables and fruits, which the family ate to tide them over during the winter months in Moscow. His death is an irreplaceable loss not only for his relatives and friends, but also for Russian science.

Howard Milchberg
University of Maryland, College Park ■