

sound and discovered that, under certain conditions, diagnostic ultrasound machines could produce acoustic cavitation. That work was important enough for the US Food & Drug Administration to require that every diagnostic ultrasound machine used in clinical practice have an output label describing its "mechanical index," or its capacity for producing cavitation. He also studied the oscillations of drops in microgravity.

Bob's creativity was not limited to pure scientific research. While giving a lecture on relativity to undergraduates at Yale, he discovered a unique method for deriving Albert Einstein's time-dilation formulas, and subsequently wrote "Inferences from Considering the Twin Paradox," published in 1985 in the *American Journal of Physics*. And, after a dinner at which he had demonstrated how to make a wine glass sing and his fellow acousticians had challenged him to explain how it had happened, he wrote another article entitled "Whispering Waves in a Wine Glass" for the journal. Although he taught in the mechanical engineering department at Yale, he also delivered lectures to architects and wrote a primer called *Deaf Architects and Blind Acousticians* (self-published). He ed-

ited Hunt's book on *The Origins of Acoustics* (Yale U. Press, 1978) and worked together with Hunt's son, Tom, to establish the Hunt Fellowship of the ASA. Bob also wrote a screenplay, books on creativity, works on the nature of our humanity, and poetry.

At Yale, Bob served in a number of leadership roles: several times as chair of the mechanical engineering department, as chair of the Council of Engineering, and as director of external affairs for the faculty of engineering. He also developed innovative undergraduate and graduate programs by forging links between industry and academia.

An active participant in the ASA, Bob chaired the society's technical committee on physical acoustics during the late 1970s, served on the original long-range planning committee, and in 1996 completed a term as president. Perhaps his greatest accomplishment in the society was the creation, in 2000, of a fully electronic journal, *ARLO (Acoustics Research Letters Online)*. For his continued leadership in the ASA, he was awarded the society's highest honor, the Gold Medal, two months before he died. Although weakened by cancer and a recent operation, he attended the meeting in person and delivered a moving acceptance speech.

Active beyond academia, Bob raised money from industry and Yale for the New Haven public schools' science fairs and for classroom computers. He also studied voice and was an amateur baritone. Every few years, he gave concerts whose programs included lieder by Franz Schubert, French love songs, English ballads, and songs by Leonard Bernstein and Aaron Copland. His periodic efforts to enlist fellow acousticians to sing during social hours at ASA meetings were a continued source of delight to many.

Although Bob most often considered himself an acoustician, those of us who knew him thought of him as an extremely gifted scientist and talented leader who would have brought distinction to any field he chose. Thus we acousticians are privileged to have had him as a colleague.

Lawrence A. Crum
University of Washington
Seattle

Karl Leslie Brown

Karl Leslie Brown, a versatile applied physicist at SLAC, died of heart failure on 29 August 2002 at a hospital in Stanford, California.

Karl was born in Coalville, Utah, on 30 September 1925 and was awarded all his degrees in physics by

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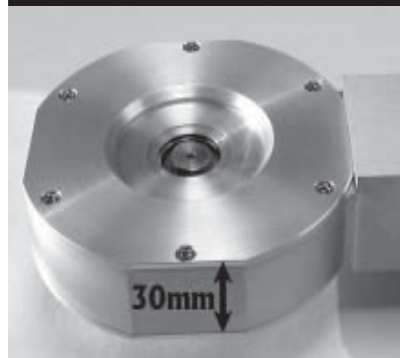
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Karl Leslie Brown

Stanford University: a BS in 1947, an MS in 1949, and a PhD in 1953. Joining the team of Bill Hansen, Edward Ginzton, and Marvin Chodorow, Karl began his work at Stanford on high-power klystrons and linear accelerators. His master's thesis addressed the beam dynamics of the first high-power klystron and his doctoral thesis dealt with the commissioning of the 30-MeV Mark II linear accelerator at Stanford.

After his PhD, Karl contributed to the solution of diverse problems through the commissioning, with the team led by Robert Kyhl, of the 1-GeV linear accelerator, the Mark III, at what is now the High Energy Physics Laboratory, part of the Hansen Laboratories at Stanford. Because that work was so successful, he was invited to join the planning group that prepared the proposal for the two-mile accelerator laboratory, which has now become SLAC.

In the late 1950s, in parallel with his work in high-energy particle physics, he joined a team led by Ginzton of Stanford's physics department and Henry Kaplan of the Stanford Medical School to build the first linear accelerator in the US to be used for cancer therapy. A few years later, he became president and chief scientist of Spectromagnetics, a small accelerator magnet design and manufacturing company in Palo Alto, California, that was later sold to Varian Associates. Subsequently, Karl served two years as senior scientist and director of research in Varian's radiation division. That division developed a family of linear accelerators for the radiation treatment of cancer. It is a remarkable coincidence that, in 2001, Karl himself was successfully

treated for prostate cancer by one of these machines.

Karl's best known contribution was his work on charged-particle beam dynamics in magnet transport systems. He developed a code that was called TRANSPORT and is widely used internationally to design beam transport systems, spectrometers, and accelerator-focusing systems that range in energy from less than 1 MeV up to 1 TeV. Karl contributed directly to accelerator design at many organizations—as a consultant, visiting scientist, and staff member.

In 1958–59, as a consultant to the newly founded Linear Accelerator Laboratory at Orsay, France, he shared his in-depth knowledge of linear accelerators. He also served as a consultant for CERN, where linear accelerators were used in the design of the secondary beam lines for the large Super Proton Synchrotron and the Large Electron–Proton Collider lattice. In the 1960s, while scientists were already using colliding beams in circular machines, Karl proposed that two linear accelerators shoot beams at one another. His informal suggestion has formed the basis for the next stage in high-energy accelerator programs: the electron–positron linear collider.

Karl designed achromatic beam-transfer systems for the Stanford Linear Collider in the late 1980s, which enabled the collider to focus beams to extremely small dimensions. From 1992 to 1994, he worked on the layout and design of the beam-transfer lines and injection systems for the various booster accelerators at the Superconducting Super Collider.

Karl was a very inventive individual whose ideas were applied in many fields. He was recognized worldwide as an expert in magnetic transport systems, and his contributions in numerous areas will long be remembered by his friends and colleagues at Stanford and elsewhere.

Wolfgang Panofsky
SLAC
Menlo Park, California

Philip Gerald Drazin

Philip Drazin, a leading international expert in fluid mechanics, died of cancer at his home in Bristol, England, on 10 January 2002.

Philip, born on 25 May 1934, was sent from wartime London to board at St. Christopher's School, Letchworth. In 1955, he gained first-class honors in the Mathematical Tripos at the University of Cambridge. He stayed on at Cambridge to pursue his PhD,