

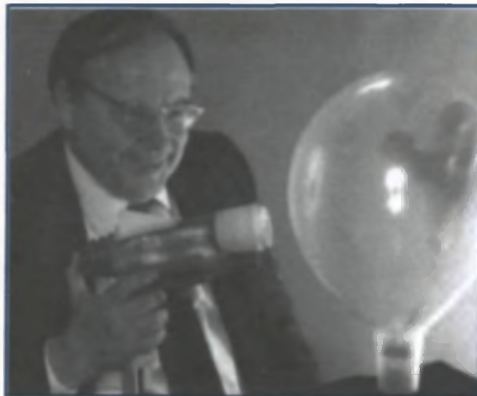
ARTHUR LEONARD SCHAWLOW, 1921 - 1999

The many contributions to science of Arthur Leonard Schawlow as a teacher, creative physicist and science writer, have won for him a renowned national and international reputation, highlighted by the award of a Nobel Prize in Physics in 1981, and the National Medal of Science in 1991.

Two prestigious Arthur L. Schawlow Awards, given annually, honour him as one of the laser pioneers: a Prize of the American Physical Society for contributions to laser science, and a Medal of the Institute of America for laser applications. On a more personal note has been the adulation of his students, co-workers, and the many people whom he had touched with his friendship and joy and wonder of science, experiences recounted in the volume "Laser, Spectroscopy and New Ideas: A Tribute to Arthur L. Schawlow" published by his students on his 65th birthday.

Schawlow was born in Mt. Vernon, New York, in 1921, but his family moved to Toronto when he was three years old, and he took his primary, secondary, and university education there. He obtained a scholarship to enroll in the demanding program of Mathematics and Physics at the University of Toronto and so began his career in science. He continued with graduate studies and obtained a Ph.D. degree in atomic physics in 1949, under the supervision of Malcolm F. Crawford. His research in hyperfine structure using atomic beam spectroscopy was carried out with co-workers Fred Kelly and Mack Gray and led to one of the first determinations of nuclear size. They designed and built almost all of their equipment, one part being a Fabry-Perot interferometer which later turned out to be Schawlow's basic contribution to the laser, namely the two parallel end-mirrors which form the resonator. Schawlow also enjoyed Dixieland jazz; he played the clarinet, helped to organize the Delta Jazz Band, and had an enviable collection of jazz records.

Schawlow carried out most of his scientific research in the U.S.A. - at Columbia University, the Bell Telephone Laboratories, and Stanford University. In 1949 he received a postdoctoral fellowship to work at Columbia University and there began his long and fruitful association with Charles H. Townes, a pioneer of microwave spectroscopy. Schawlow started with research on the diatomic molecule OH using microwave spectroscopy and, having difficulty in finding its



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spectrum, coined the memorable line "a diatomic molecule is a system with one atom too many". His early research contributed to the measurement of nuclear moments and properties. He also co-authored, with Townes, the book titled "Microwave Spectroscopy", published in 1955.

In 1951 Schawlow married Aurelia, Charles Townes' youngest sister, a fine musician and vocalist, and they raised a family of a son and two daughters. That year he joined Bell Labs at Murray Hill, and started

research in superconductivity and spectroscopy. He collaborated with Townes on the possibility of extending the range of the maser into the visible region and published the famous paper of 1958 "Infrared and Optical Masers" establishing the principles of the laser. Within two years the first working devices were announced, launching the laser era, and spawning a flourishing new field of "Quantum Optics", and a huge industry, "Photonics and Electro-Optics". Schawlow was one of the most imaginative contributors to the use of lasers in science, communications, engineering, and medicine.

With his appointment as Professor of Physics at Stanford University in 1961, Schawlow became a major influence in the lives of many young scientists. Students enjoyed his fatherly advice given with his usual charm and sense of humour: "To do successful research, you don't need to know everything, - you just need to know of one thing that isn't known"; and "Anything worth doing is worth doing twice - once quick and dirty, and the second time the best way you can." They also loved his amusing demonstrations of popping one balloon inside another with a laser beam, and making an edible laser of Jell-O.

The Schawlow Lab became one of the outstanding contributors in laser spectroscopy, producing new ideas and techniques, many of which became standards in the field. Of his many remarkable contributions in science, Schawlow chose as his most important papers the determination of nuclear size with his colleagues at Toronto, the laser idea with Townes, and the slowing down of atoms and molecules with laser beams published with Theodor Hânsch at Stanford.

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