bomb began at Los Alamos, Willy became head of the electronics group there. This group designed and constructed all of the electronic equipment used in research at Los Alamos, including that for the Trinity test and the Hiroshima and Nagasaki bombs.

Willy was deeply troubled by the atomic bomb and strongly concerned about its possible future use. He became active in the formation of the Federation of Atomic Scientists, which later became the Federation of American Scientists, and he was the first chairman of that body. He devoted two years immediately after the war to the early politics of atomic energy and was deeply involved in passage of the Atomic Energy Act, which provided for civilian control of atomic energy. Willy remained active in the federation for the rest of his life. He never shirked an opportunity to tell others of the need to control the arms race, even when to do so ran the risk of identification with leftist groups during the McCarthy era.

In 1947 he joined another newborn organization, Brookhaven National Laboratory, where he became head of the instrumentation division. In the 20 years he devoted to that position, his division produced the innovative electronics equipment used at Brookhaven's particle accelerators and research reactors and in addition did pioneering work on digital computers.

Willy was creative and original in designing electronic circuits, usually accomplishing the important function in the simplest possible way. For example, in the days before operational amplifiers and transistor switches, he made a "bootstrap sawtooth generator," a linear sweep (time base) circuit that was widely used in oscilloscopes to observe random pulses, with two vacuum triodes and one diode! The Higinbotham "scale of two" was created simply by adding two diodes as input to the Eccles–Jordan flip-flop circuit, permitting fast and reliable counting of random pulses from radiation detectors. In 1958 Willy also designed what was perhaps the world's first video game. The players were able to control tennis-like action on a 5-inch oscilloscope display. A steady stream of budding electronics engineers flowed to Brookhaven from around the world to work with Willy.

In 1968 Willy joined with several colleagues to found the Technical Support Organization at Brookhaven, a new think tank devoted to nuclear materials safeguards and nuclear nonproliferation. He came to direct the TSO and continued working with it until his retirement.

In his later years, only failing health slowed him in his many interests and activities. Until then his energy had seemed boundless and his determination had no limit.

While at Williams, Willy had learned to play the accordion, and all his life he delighted people with an endless supply of music. This is a memory many of his many friends will cherish. We miss him deeply.

HERBERT KOUTS
Brookhaven, New York

Robert Walder Thompson

Robert Walder Thompson died on 15 April 1994 in Chicago of complications from lung disease.

Thompson was born in Minneapolis, Minnesota, on 28 December 1919. He attended the University of Minnesota, graduating in 1941 with a BA in physics. Thompson began his graduate work at Princeton University in the fall of 1941, but interrupted his studies to join the Manhattan Project at Los Alamos. His work there included assembling a precision mass spectrometer and performing the first isotopic assay of plutonium, as well as the invention of a proportional chamber.

In 1946 Thompson resumed PhD studies at MIT with Bruno Rossi, studying energetic cosmic rays. Thompson completed his doctoral thesis in 1948 and accepted a position as an assistant professor in the physics department at Indiana University.

At Indiana he designed and built a 12-inch Wilson cloud chamber with electromagnetic pole pieces designed to produce a very uniform magnetic field over the chamber's active volume. He took great pains to stabilize the chamber temperature and minimize distortion caused by chamber expansion. The chamber detected record-high momenta.

Thompson's Indiana group photographed thousands of chamber events and studied and cataloged the data. Thompson developed an ingenious geometrical analytical method, the "*Q* surface" technique, for determining particle masses. These efforts led to his discovery of the neutral K meson in 1951–52.

In 1959 he went to the University of Chicago as a full professor, where he embarked on a project to study high-energy cosmic rays with a very large (36-inch) cloud chamber. Thompson retired from Chicago as an emeritus professor in 1976.

Thompson found great pleasure in a rigorous approach to physics and pursued his own research in the same manner. He became highly skilled in the laboratory arts of experimental physics, personally doing

many tasks normally performed by specialists in the shops.

Throughout his life Thompson maintained a great interest in classical music; he was an accomplished flutist and pianist. After he retired, he became a skilled ceramicist. He aimed for perfection—in and out of the laboratory—and he urged his associates, friends and family to do the same. He is missed.

CHARLES STEVENS
Argonne National Laboratory
Argonne, Illinois
NIELS THOMPSON
Hughes Aircraft Co
El Segundo, California

Arthur Adel

Arthur Adel died of cancer on 13 September 1994 in Flagstaff, Arizona, at age 85.

Adel received a bachelor's degree in 1931 at the University of Michigan, Ann Arbor, for a double major in mathematics and physics. In 1933 he earned his PhD at Michigan with a theoretical dissertation on the structure and infrared spectrum of the carbon dioxide molecule. That same year Adel's mentor, Harrison M. Randall, chairman of Michigan's physics department, authorized him to work jointly at the university and Lowell Observatory; it was a major turning point in his career. Earlier, Rupert Wildt had discovered the presence of ammonia and methane in the atmospheres of the major planets. In a series of papers from 1934 to 1935, Adel was able to show that the absorption bands were due to harmonics of the fundamental vibrations of the methane and ammonia molecules.

Adel moved to Flagstaff in 1936 to take residence at Lowell Observatory, where the high and dry climate was a major element in his successful study of the water-vapor-related parameters in Earth's atmosphere. Two of his major results were the discovery of the 20-micron atmospheric window and the measurement of the first definitive emission spectrum of the Moon, which provided evidence that it radiates as a simple blackbody.

From 1942 to 1946 Adel taught physics at the University of Michigan, and during 1946–48 he was an assistant professor of astronomy at the McMath–Hulburt Solar Observatory. In 1948 Adel accepted a professorship at Arizona State College, now Northern Arizona University, in Flagstaff.

With an Air Force contract he established the Atmospheric Research Observatory on campus there. With E. S. Epstein, Adel determined vertical atmospheric ozone distributions and discovered 10- and 18-day temperature periodicities in the stratosphere, with a corresponding 18-day period in the troposphere.

Adel retired as professor emeritus in May 1976. A few weeks before his death we talked about the Comet Shoemaker–Levy impact with the planet Jupiter. He told me that in the 1930s he had mentioned to Vesto M. Slipher that the large white spots on Saturn might be the result of cometary impacts.

In retirement Art attended many of the numerous scientific lectures held in the Flagstaff community. Visitors were always impressed with the questions from the dapper gentleman with impeccable manners. Art's persistent, probing mind was a stimulation to his students, colleagues and vast number of friends. We miss him.

RICHARD L. WALKER
US Naval Observatory
Flagstaff, Arizona

Adriano Gozzini

Adriano Gozzini died on 24 September 1994 at his home in Pisa, Italy, at the age of 77, after a brief illness. He was professor emeritus at Pisa University.

Gozzini was a student at the Scuola Normale Superiore in Pisa, and he received his PhD in 1940 at Pisa University. Five years of military service interrupted his otherwise lifelong dedication to physics. At the end of World War II he assisted in the reconstruction of the heavily damaged Institute of Physics in Pisa. He set up a laboratory of microwave spectroscopy that became the foremost research institute in that field in Italy. Gozzini demonstrated the Faraday effect in the microwave region and the Corbino effect on paramagnetic resonance absorption lines. He discovered two-photon transitions in the rotational spectrum of the molecule OCS and demonstrated the transfer of angular momentum to the sample in paramagnetic resonance absorption. His laboratory also introduced laser techniques that led to novel results. Then and later, I felt a kinship with his approach of studying basic physics problems with quite modest experimental equipment.

Gozzini was a gifted scientist with a modest and kind personality. He was a unique teacher, equally helpful to his students and to his colleagues. He had a strong influence on the development of microwave and optical spectroscopy in Europe, especially France. Those of us who had the