promising integrity, his intense sense of justice and responsibility, his endless store of puns and his love for science will be greatly missed by his students and colleagues.

ALLEN P. MILLS JR
AT&T Bell Laboratories
Murray Hill, New Jersey
KARL F. CANTER
Brandeis University
Waltham, Massachusetts

Robert N. Thorn

Robert N. Thorn, former deputy director of the Los Alamos National Laboratory and a theoretical physicist who devoted his professional career to the development of a credible nuclear deterrent, died on 25 October 1990 after a long and courageous fight with cancer. He was 66 years old.

Thorn earned his bachelor's degree (1948), master's degree (1949) and PhD (1953) in physics from Harvard University. During World War II he was a member of the Alpine Mountain Troops and was wounded in Europe. Thorn joined the theoretical physics division at Los Alamos in 1953 and became group leader of the thermonuclear design team in 1964. He was appointed a division leader in 1970, and shortly thereafter he was made an associate director, responsible for the entire nuclear weapons program at Los Alamos. He was the deputy director of the lab from 1979 to 1985. Twice during this period—in 1979 and again in 1985—Thorn was acting director of Los Alamos.

A prolific weapons designer and innovator, Thorn played a significant role in designing nuclear weapons and in searching for ways to diminish the nuclear threat through arms-control negotiations and constraints on the proliferation of nuclear weapons and nuclear materials. He served on many national and international boards and commissions chartered to explore ways to reduce the nuclear danger. His expertise in nuclear technology and his experience in weapons design were invaluable in the arms-control arena.

Thorn was especially interested in international cooperation on basic science. He was responsible for the lab's extensive collaboration with France, on a wide array of scientific and engineering programs.

In addition to his professional activities, Thorn made many contributions to the Los Alamos community. He was active in the county government and in the development of the extensive Pajarito ski area. In his final years, he worked long hours on

the construction of the new ski lodge that now bears his name.

Thorn was an inspirational leader who will be missed by friends and colleagues both in the US and abroad.

JOHN C. HOPKINS
NANETTE MOORE
Los Alamos National Laboratory
Los Alamos, New Mexico

Albert Rose

Albert Rose, a pioneer in the development of electronic imaging and in the physics of photoconductivity, of electron transport in solids and of human vision, died in Princeton, New Jersey, on 26 July 1990, at the age of 80.

A native of New York City, Al received an AB (1931) and a PhD (1935) in physics, both from Cornell University. Shortly after finishing graduate school, he joined the technical staff at the Radio Corporation of America, where he continued to work until 1975. Upon retiring from RCA, he was appointed Fairchild Distinguished Scholar at Caltech. Later he served as a visiting professor at a number of universities both in the US and abroad, and as a visiting scientist at several industrial labs.

Al Rose has been called the father of electronic imaging because he invented the orthicon and image-orthicon camera tubes and produced landmark papers on the performance limits of electronic imaging devices, the human eye and photographic film. Originally developed for military purposes by Al and two of his colleagues during World War II, the image orthicon served for 20 years as the electronic eye of television. After the war Al led a small group of scientists at RCA Lab in developing the first of the solid-state camera tubes—the photoconductive vidicon, which is still in use today.

Al took a broad view of electronic imaging. When working on the practical development of imaging tubes, he looked into every corner of the fundamental physics of imaging, from the basic mechanisms of photoconductivity to the physics of vision. His early papers on photoconductivity laid the groundwork for the field as we know it today. His analyses of the gain–bandwidth product and of the effect on photoconductivity of traps and recombination centers form the basis for our understanding of the subject. His analysis of space-charge-limited currents in the presence of charge trapping was the basis for much of the later work in this area. Al's approach to these problems illustrates his characteristic, deceptively simple style. He always focused on the fundamental physics of a problem and tended to defer mathematical analysis until the basic concepts were clear.

In addition to his many papers, Al was the author of three books: *Concepts in Photoconductivity and Allied Problems* (Interscience, 1963), *Vision, Human and Electronic* (Plenum, 1973), and *Electron–Phonon Interactions* (World Scientific, 1989).

In recent years Al took an intense interest in the possibility of using solar energy to supply a considerable portion of the world's energy needs. Al's efforts were motivated by a deep concern for the future of humanity and by his desire to find a clean, lasting solution to the long-range energy problem.

Those who worked with Al Rose felt his profound influence on their work and in their personal lives. His many published works tell only part of the story. To an extraordinary degree he put his time and effort into helping younger colleagues and guiding their work. And to all his acquaintances he was an unfailing source of encouragement and good advice. Physicist and humanist, Al Rose was an inspiration to his friends and associates.

WALTER JOHNSON
PAUL K. WEIMER
RICHARD WILLIAMS
David Sarnoff Research Center
Princeton, New Jersey

Paul A. Anderson

Paul A. Anderson, past chairman of the physics department at Washington State University, died on 12 October 1990 in Carmel, California.

Anderson received his BS in physics from the University of Illinois in 1920 and his PhD from Harvard in 1923. Early in his career, he worked at Eastman Kodak Research Laboratories and at Yenching University in Beijing, China, and was a National Research Council Fellow at Harvard with Percy W. Bridgman. In 1931 he came to the State College of Washington (later Washington State University) as professor and physics department chairman. He headed the physics department until 1960 and retired in 1963.

At WSU Anderson initiated a program of research on electronic work functions that greatly extended the scope of existing methods of measurement and established a number of the work function values now accepted as standard. Techniques originated in this program have played a significant part in the development of surface physics and ultrahigh-vacuum production.

During World War II Anderson, working with his WSU colleagues S. Town Stephenson, Kenneth Fitzsimmons and Charles Barker, did radar research under the auspices of the Office of Scientific Research and Development. The four obtained results of fundamental importance to microwave propagation, and the application of these results took the WSU team to the Pacific war theaters in 1944–45. The work earned Anderson a Presidential Certificate of Merit with Citation.

After the war, Anderson became increasingly interested in biophysics. He developed methods for automatically recording the growth rates of microorganisms, for synchronizing division in microorganisms and for studying the effects of radiation on the synchronized cells.

Anderson was an admirable teacher. His students remember his enthusiasm for physics and his lectures in thermodynamics and modern physics, which were jewels of clarity.

PHILIP H. ABELSON
American Association for the Advancement of Science
Washington, DC
EDWARD E. DONALDSON
Washington State University
Pullman, Washington

Clarence E. Bennett

Clarence Edwin Bennett, professor emeritus of physics at the University of Maine, died in his sleep on 19 December 1990 at his home in Orono, Maine. He was 88 years old.

Bennett earned bachelor's (1923), MS (1924) and PhD (1930) degrees in physics from Brown University. He was an instructor at MIT from 1931 until 1934, when he came to the University of Maine as an assistant professor of physics. Bennett became department head in 1937 and a professor of physics in 1940. He remained head of the department until his retirement in 1967. In his retirement Bennett served as the department's alumni secretary and wrote a carefully researched department history.

While at MIT, Bennett helped develop the recording spectrophotometer, but his long-term research interests centered around measurements of the optical properties of gases at high pressures using absolute interferometric techniques.

Bennett was a founding member of the physics division of the American