develop the definitive kinetic model of XeCl lasers, which had potentially important defense applications.

The Science Research Laboratory at West Point, which Tom directed, comprised four separate laboratories in which 17 faculty members worked in physical, engineering, and social and behavioral sciences. Under Tom's leadership the research activities at the Science Research Laboratory were substantially expanded and strengthened, for example, by the addition of the interdisciplinary Photonics Research Center. As the associate dean for academic research, Tom was responsible for the establishment and development of faculty research programs in all of the academy's departments. He was an uncompromising advocate of academic excellence.

The extraordinary diversity of the courses that Tom taught at West Point evidences the breadth and depth of his scholarly activities. Beyond the more-or-less standard fare of electricity and magnetism, laser physics, physical chemistry and the like, Tom offered courses in philosophy and literature (including a T. S. Eliot colloquium), tradition and innovation in modern American poetry, film analysis and criticism, technology and strategy in the nuclear age and the influence of science and technology on American culture. (In recent years, as an adjunct professor at Columbia University, he offered a popular graduate course on modern military technologies.)

Tom wrote as well as taught *belles lettres*. A protégé of the late Archibald MacLeish, Tom was the author of a number of essays and numerous poems, four of which were published in *Poetry*, the *Sewanee Review*, *The Southern Review*, *The American Scholar*, *The New Republic*, *Harvard Magazine* and *The Georgia Review*. Four new poems of Tom's were published in the fall 1990 issue of the *Sewanee Review*, which was dedicated to his memory.

And, as if this were not enough to fill a busy life, it is difficult to find an important issue of science policy or national security that did not benefit from Tom's wise counsel during the past decade. Tom's unique value was his breadth of knowledge of international affairs, arms control and military technology, as well as of pure science. He served as a personal adviser to many officials and also chaired or was a member of more than a dozen boards convened by the Army, the Department of Defense, the Department of Energy or the National Academy of Sciences on technical issues ranging from free-electron lasers and magnetic-fusion energy to ballistic-missile defense and low-observable (Stealth) technologies.

Tom played a major role in the preparation of the American Physical Society's influential study "The Science and Technology of Directed-Energy Weapons" (Rev. Mod. Phys. **59**, No. 3, Part II, S1, 1987), written under the chairmanship of Nicolaas Bloembergen and Kumar Patel.

For more than a year during 1981–82 Tom served as deputy to the President's science adviser and as deputy director of the White House Office of Science and Technology Policy. From 1981 to 1983, as the executive director of the White House Science Council, Tom was in charge of the council's technical and administrative support and served on the council for a number of major studies. During these years Tom advised the House Armed Services Committee, the National Security Council, the Central Intelligence Agency, the Strategic Defense Initiative Office and the Los Alamos and Lawrence Livermore National Laboratories. As scientific adviser to the DOE director of energy research he undertook special studies in subjects ranging from magnetic fusion to biomedical research to the Superconducting Super Collider.

For his many services to the country, the US Army awarded Tom the Legion of Merit in the spring of 1990.

As an active and valuable member of the Stanford Center for International Security and Arms Control, Tom presented technical seminars and helped direct studies on strategic defense and on technical trends and strategic policy, which led to publications in *Foreign Affairs* and elsewhere and to many invited talks at conferences in both the US and the Soviet Union. At the time of his death Tom was also a member of the international board of editors of a new journal, *Science and Global Security*.

During Tom's last year, even while battling cancer, he worked to ensure that the US would deal decisively and in a timely fashion with the safety of its nuclear weapons arsenal. The country owes him a great debt of gratitude for this public service, for without Tom's intervention this problem would still be only partially recognized and addressed.

Tom Johnson was a scientist of quality; a scholar with broad cultural interests and accomplishments; a public servant who earned the full respect of his colleagues and his government by adhering to the highest standards of integrity and objectivity in his advice and service; and a truly fine human being whom we shall miss very sadly.

SIDNEY DRELL
Stanford University
Palo Alto, California

WILL HAPPER
Princeton University
Princeton, New Jersey

ROBERT HUNTER JR
Litel Instruments
San Diego, California

RICHARD OSGOOD
Columbia University
New York, New York

Miguel Awschalom

Miguel Awschalom, who did important work in particle accelerators and medical physics, died on 11 August 1989.

Awschalom was born in 1927 in Buenos Aires and completed his elementary and secondary education in Argentina. He came to the US and got his bachelor's degree from Rutgers University in 1950. He received his PhD in physics from the University of Rochester in 1955. After two years as a research associate in nuclear physics at Louisiana State University, he became a staff member at the Princeton–Pennsylvania Accelerator, where he worked on accelerator design and began his career in radiation physics and health physics.

In 1968 Awschalom joined the newly formed National Accelerator Laboratory, which is now Fermilab. He made major contributions to the radiation physics needed to build the accelerator and to the design of the shielding—especially the shielding in the access tunnels, which were curved for neutron attenuation.

Awschalom, Robert Wilson and Donald Young began to consider therapy facilities at Fermilab soon after the original construction was completed in 1972. They initially intended to make a proton therapy facility, but physicians were far more interested in neutron therapy. The Fermilab Neutron Therapy Facility was completed in 1975, and Awschalom was its chief physicist for the next decade. FNTF was the first therapy facility to make use of high-energy neutrons, and in his years there Awschalom did pioneering work in target design, beam delivery, collimation, patient alignment, dosimetry and treatment planning. He designed and built an isocentric treatment facility for the fixed horizontal beam that rivals later, gantry-based designs for flexibility

and efficiency. His collaboration with the physicians Lionel Cohen and Frank Hendrickson broke new ground in particle-beam therapy.

After finishing his work with Cohen and Hendrickson, Awschalom returned to the problem of proton therapy. He stimulated a series of national and international workshops on the topic, inviting to Fermilab people interested in furthering proton therapy. Those workshops spawned the concept of the Loma Linda Proton Therapy Facility, which recently began operation. Awschalom played a leading role in the Fermilab work on that accelerator, developing or inventing a number of devices that are part of the Loma Linda Facility. He worked with great intensity on the Loma Linda project until his illness became critical in 1988.

Miguel Awschalom

Miguel Awschalom's dedication to excellence and to physics was evident in everything he did. He will be remembered through his family, through the Fermilab Neutron Therapy Facility, and through the Loma Linda Proton Therapy Facility.

FRANCIS COLE
ARLENE LENNOX
Fermi National Accelerator Laboratory
Batavia, Illinois

LIONEL COHEN
IVAN ROSENBERG
Michael Reese Hospital
Chicago, Illinois

FRANCA KUCHNIR
University of Chicago
Chicago, Illinois

PAUL DELUCA
University of Wisconsin
Madison, Wisconsin ■