

WE HEAR THAT

ber. As Weber had done, Fairbank used a massive aluminum bar as an antenna, but Fairbank's bar, unlike Weber's, was cooled to 2 K and equipped with superconducting detectors to sense its vibration. The gravitational-wave search started by Fairbank has grown into an active collaboration including Stanford, LSU and the University of Rome. Leading the work at Stanford, Peter Michelson is currently operating a bar that will be cooled to 10 mK, making it sensitive enough to detect the gravitational collapse of a star anywhere in the Milky Way or other nearby galaxies.

Fairbank's most controversial project was his search for free fractional charge in matter. In this experiment, a superconducting niobium microsphere is levitated in a magnetic field between capacitor plates, and the sphere's charge is measured by observing its motion in an oscillating electric field. Reports in 1977, 1981 and 1986 on the results of this experiment all indicate strong statistical evidence for charges with magnitude $\frac{1}{3} e$. The apparatus and technique were continually improved over the years. On the night before his death Bill and his students were taking new data.

For Fairbank's 65th birthday, his students and colleagues organized a three-day conference in his honor, which was attended by some 200 people. Fifty-six papers written by participants in this meeting were woven into a remarkably coherent book, *Near Zero: New Frontiers of Physics* (J. D. Fairbank, B. S. Deaver, C. W. F. Everitt, P. F. Michelson, eds., Freeman, New York, 1988), which, in the words of a reviewer, reveals the "astonishing scope and breadth" of Bill's contributions.

Bill has had an enormous impact on physics and physicists. The excitement and delight he found in physics infected the many students and colleagues who worked with him. We will all miss his incredible enthusiasm, integrity and intuition, and most of all, his friendship.

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Thomas H. Johnson

Thomas H. Johnson died on 26 June 1990 at the Walter Reed Army Medical Center in Washington, DC, after a year-long battle with cancer. He was 46 years old and had recently retired

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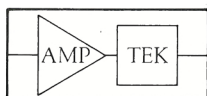
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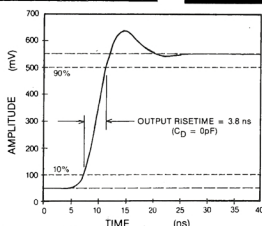
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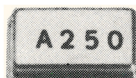


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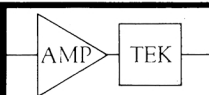
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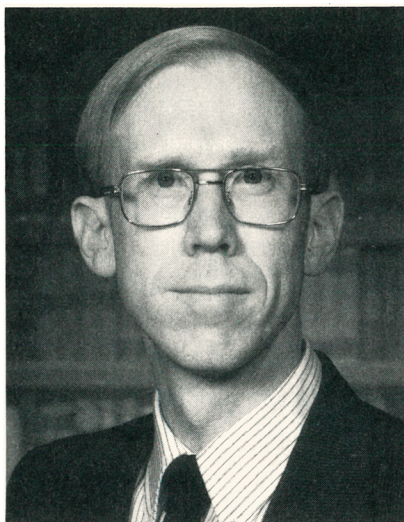


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Thomas H. Johnson

from the United States Army with the rank of colonel—serving at the Military Academy in West Point, New York, as a professor of applied physics, director of the Scientific Research Laboratory and the associate dean for academic research. At the time of his death he was preparing to assume his new position as a professor of engineering and public policy at Carnegie Mellon University.

Tom's tragically truncated career was marked by high distinction as a military officer, research scientist, poet, academician, and trusted adviser on science and defense policy and on arms-control issues at the highest levels of government. A bare listing of his professional titles and activities cannot begin to convey Tom's very special value as a gifted individual and a national treasure.

In tribute to Tom, Secretary of Defense Dick Cheney said:

Tom was an exceptional person who gave of himself without reservation in the service of his country. His personal contributions in working with the Defense Science Board and on studies and projects that spanned all the diversity and technical depth of this department were great. Whether it was the Strategic Defense Initiative, high-energy lasers or nuclear weapons safety, Tom's leadership, keen scientific insight and ability to cut away bureaucratic impediments to progress truly made a difference for his country.

Those of us in the Department, including myself, who benefitted directly from Tom's contributions and who worked closely with him, are all struck by the tragedy of this loss.

This and other tributes, in particu-

lar that from Army Chief of Staff General Carl Vuono, attest to the value placed on Tom's work and advice by many civilian and military leaders. Through his judgment, commitment and especially his integrity, Tom earned the attention and respect of a generation of government leaders.

Following his graduation from West Point and his commissioning as a second lieutenant in 1965, Tom worked as a physicist at the Air Force Weapons Laboratory at Kirtland Air Force Base in New Mexico and at the Defense Atomic Support Agency (later called the Defense Nuclear Agency) in Washington, DC, studying nuclear weapons and their effects.

Subsequently he entered graduate school at the University of California, Davis, where he received his PhD in applied physics in 1974. His dissertation in computational plasma physics was written under the supervision of John Killeen at the Lawrence Livermore National Laboratory. As part of his thesis project he invented rapid computational techniques for determining magnetohydrodynamic equilibria in toroidal geometries. These techniques were used to design the Tokamak Fusion Test Reactor.

Following the receipt of his PhD Tom returned to Kirtland Air Force Base for two years as chief of the physics section of the weapons laboratory. His own research dealt with satellite communications and high-power gas lasers. He developed computational techniques for the solution of radiative transport coupled to multidimensional fluid motion. This work was applied to nuclear weapons effects related to anti-ballistic-missile defense and communications phenomena. He also developed new fast-running kinetic codes for gas lasers, and as a result he formulated what today remains the standard successful theoretical model of the kinetics of high-power krypton-fluoride lasers.

Tom returned to the US Military Academy in 1977, initially as a faculty member in the English department. West Point was to serve as his home base for teaching, writing and research for the next 13 years, though his residence there was punctuated by frequent calls to service in Washington.

Tom's research during these years largely concerned the physics of high-power excimer lasers. His work in 1982–84 on rare-gas halide-laser models led to the scaling laws for and design of KrF lasers at the megajoule level for inertial-confinement fusion. Tom's analysis of the full range of existing experimental data led him to

Different Stars

There was something mathematical
The way the stars were fixed on the
flat sky,
Something that presumed a certainty.

Even between the blowing leaves
he saw
A greater order certainly revealed
To mind alone, unscattering the stars.

He walked into the wind. There was
A simple inference connecting
Wind with stars which he refused
to make;

Yet in his academic monologue
He felt the hidden inferences, one by
one,
Propelling him, the leaves that made
the wind.

The road crossed over the hilltop.
Below, beyond, the stars he had not
seen
Grew deep into the darkness and
destroyed

What wind and mind had made; the
different stars
Distorted the night sky so all the
universe
Became, in the synthetic reality,

Less real. What frightened him was
not
The moonless wind, the road
becoming
No road amidst the clear dark all
ahead;

It was a new lack of certainty.
In the middle of the road he had
arrived;
Within his mind, the possible
geometries

Bloomed silently like snowflakes,
each complete
And carefully itself, millions of them—
And no way of knowing, no way at all,

Why only one was real, or whether
Real was a concept relating space
and stars.
It was not. What seemed real was
wind

Over the lost road and dark beyond,
Where the only order was his, an
arbitrary
Apprehension, wind between the
certain stars.

—TOM JOHNSON

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
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Palo Alto, California

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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. FNFTF 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