physics of television projection systems, magnetohydrodynamic methods, and eventually strategic planning and technology forecasting. After retiring from GE in 1986, Alpher taught at Union College in Schenectady, New York, until 2004. Colleagues remember Alpher as a warm, thoughtful man with a strong social conscience, who often took a lead in addressing community issues.

Following the discovery of the background radiation in 1965 and the consequent demise of the steady-state theory, Alpher and Herman expected their contributions of 1948 and 1953 to be recognized. But their papers apparently were not read, and their work was often misattributed to Gamow, who certainly had first proposed a hot early universe but had not identified or quantitatively predicted the critical observations that would later confirm the hypothesis.

Recognition came late and in puzzling patterns. Alpher and Herman received many high honors from leading scientific societies before Herman's death in 1997, all the more emphasizing two remarkable anomalies. The Nobel Prize has twice been awarded for work on the background radiation, but neither Alpher nor Herman was included. The Gruber Foundation, which inaugurated a munificent annual prize for cosmology in 2000, never recognized Alpher's contributions during any of the eight years he was eligible.

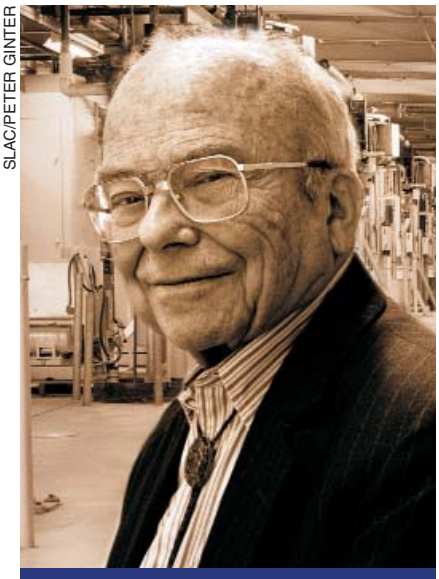
Such statistics, however, should not mislead us. Alpher and Herman answered questions raised since antiquity. We still have far to search, but they showed us where and how to look. History will remember their contributions.

Two weeks before his death, Alpher's son Victor represented him at the White House, where President Bush awarded Ralph Alpher the National Medal of Science, the highest scientific honor the US bestows.

**Martin Harwit**
*Cornell University*
*Washington, DC*

# Wolfgang Kurt Hermann Panofsky

Wolfgang Kurt Hermann Panofsky, a legendary and beloved figure of modern physics, died of a heart attack on 24 September 2007 at his home in Los Altos, California. Known widely as Pief, he was renowned worldwide as a particle physicist, the founding director of SLAC, and a man of integrity who fought throughout his life for arms control in a world heavily armed with nuclear weapons. Never one to avoid a challenge, he was in his office on the day of his death, writing on arms control, questioning technical details of the Linear Coherent Light Source (a free-electron laser being built at SLAC), and looking forward to the impending publication of his autobiography, *Panofsky on Physics, Politics, and Peace: Pief Remembers* (Springer, 2007).


SLAC/PETER GINTER

**Wolfgang Kurt Hermann Panofsky**

Pief was born on 24 April 1919 in Berlin, Germany, and grew up in Hamburg, where his father, eminent historian Erwin Panofsky, was a professor at the University of Hamburg until he was dismissed in 1934 because he was Jewish. Realizing that their lives and their careers were at risk if they remained in Germany, the Panofsky family emigrated to the US and settled in Princeton, New Jersey. Pief entered Princeton University, graduated summa cum laude with a major in physics in 1938, and went to Caltech for graduate work.

Pief's thesis research, under the supervision of Jesse Dumond, was a precision measurement of the ratio of Planck's constant $h$ to the electron charge $e$. In 1942 he received his PhD and married Dumond's daughter, Adele, a marriage that lasted for 65 years. Although classified as an enemy alien, he was granted citizenship and clearances to work on military projects, including an improved firing-error indicator for bullets and a shock-wave detection device used to measure the yields of nuclear explosions, including the Hiroshima bomb.

Pief accepted a research position at the Radiation Laboratory at the University of California, Berkeley, in 1945, during a period there of productive research using the accelerators. Most notably, he and his colleagues studied

properties of pi mesons, including their masses, and confirmed the existence of the neutral pion and its decay into two gamma rays.

In 1951 Pief moved to Stanford University as a protest against a loyalty oath to the US Constitution that was imposed on the faculty and other employees at the University of California. Although he signed it—and had already demonstrated loyalty by working on classified projects for the military during the war—he believed the oath to be wrong in principle and viewed the resulting climate of mistrust at Berkeley as intolerable. Courts subsequently ruled the oath to be illegal and threw it out.

As a professor of physics at Stanford, Pief became popular for his lectures, patience, and accessibility. He created the same open, collegial relationship with students that he nurtured later as director of the university's high-energy physics laboratory, and he developed its 61-meter-long, 1-GeV electron accelerator into an exceedingly productive research tool. Subsequently, he joined forces with Stanford colleagues to develop the concept and begin the design and construction of SLAC. Authorized in 1962, SLAC has flourished for more than four decades. Under Pief's leadership of more than 20 years, landmark experiments led to discoveries of the quark structure of protons and neutrons, the $J/\psi$ meson and its constituent charmed quarks, and the tau lepton. He also encouraged the evolution of technology, from accelerating electrons impinging on fixed targets to electron–positron storage rings and colliders.

Pief became heavily involved in advising the Eisenhower administration on arms control and science policy as a member of the President's Science Advisory Committee. He headed the technical working group that dealt with methods for detecting nuclear explosions in outer space. Agreements with the Soviet Union based on that work represented the first step toward the 1963 Limited Test Ban Treaty, which restricted to underground sites all nuclear explosive testing, thereby eliminating dangerous radioactive fallout from explosions in the atmosphere. Throughout his life Pief continued to work toward a comprehensive treaty banning all nuclear weapons tests. During the 1970s and 1980s, he also was a leader in the fight against the building of ballistic missile defenses, arguing on sound technical grounds that achieving an effective defense against nuclear warheads was impractical.

Pief was intensely engaged as a member—and chairman from 1985 to 1993—of the Committee on International Security and Arms Control of the National Academy of Sciences from its inception in 1981. The committee produced influential studies on technical national security issues and policies and met frequently with scientists from other nations, most particularly the Soviet Union and China, to raise the level of mutual understanding and trust on important nuclear issues.

In recognition of his wisdom, his devotion to both science and peace, and his stature as a national treasure, Pief received just about every conceivable award that science, academia, and the US government can give. The honors include the National Medal of Science in 1969 and the Enrico Fermi Award in 1978. Major foreign academies of sciences—including those in China, Russia, France, and Italy—accorded him the distinguished status of an honorary foreign member, and he provided their scientific programs with valuable advice.

Tributes to Pief have universally emphasized both his enormous impact on particle physics and his integrity, humanity, and deep commitment to fighting for principles in which he believed deeply. He became a greatly admired citizen of the world.

**Sidney D. Drell**
*Stanford University*
*Stanford, California* ■