

obituaries

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Ralph Asher Alpher

Ralph Asher Alpher, who first predicted the microwave-background signature of a hot early universe, died on 12 August 2007 in Austin, Texas, after a long illness.

Our understanding of the origins of the universe rests on three fundamental observations. The first is that the universe is expanding; the second is that thermal radiation at 3 K pervades all space. The third observation involves the makeup of the universe: three-quarters of all visible matter is hydrogen; most of the remaining one-quarter is helium-4; the other light elements, deuterium and ^3He , are found at levels of merely 10 parts per million, with lithium-7 at a few parts in 10 billion; heavier elements account for roughly 1% of the mass density. These data are the firmest now in hand.

Edwin Hubble documented the cosmic expansion in the 1920s. During five inspired years, between 1948 and 1953, Alpher and his long-time friend and colleague Robert Herman showed that the chemical abundances observed today implied that the temperature of the universe was once in the billion-degree range for a few minutes after the birth of the cosmos. They also predicted that a faint remnant of the intense radiation permeating the early universe must still persist today at a temperature "of order 5°K... to be interpreted as the background temperature from the universal expansion alone." In 1965 Arno Penzias and Robert Wilson discovered that radiation. Its temperature was a remarkably close 3 K.

Alpher was born in Washington, DC, on 3 February 1921, the youngest of four children. His father, a building contractor, had immigrated from Russia; his mother, from Latvia. Starting at age 14, during the Depression, Alpher was always working—as a typist, secretary, or theater stagehand—at times contributing as much as his father did to the family's support. At 16 he began working his way through night school at George Washington University, where Edward Teller was his freshman physics professor. During the day Alpher was a full-time secretary in the Department of Terrestrial Magnetism at the Carnegie Institution of

UNION COLLEGE



Ralph Asher Alpher

Washington. In free moments he worked analyzing cosmic-ray data as an apprentice to Carnegie's Scott Forbush.

During World War II, Alpher worked in the Navy Department under John Bardeen to protect ships against magnetic mines. In 1944 he joined the Johns Hopkins Applied Physics Laboratory; he also applied for a navy commission but was rejected because of poor eyesight. He stayed at Hopkins and worked on supersonic aerodynamics.

At George Washington, Alpher took a course in relativity from George Gamow, was captivated by Gamow's enthusiasm, and wrote a master's thesis under his direction. Gamow had suggested that all chemical elements could have been formed in an early, hot relativistically expanding universe, and he recommended that Alpher do the actual calculations as a PhD project to see whether the idea made physical sense. Today we know that only the light chemical elements formed at those early times.

At Hopkins, Alpher met Herman,

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Gerard John Bunick
27 May 1947 – 19 September 2007
Vlad Milin
24 February 1959 – 2 September 2007
John Michael (Mike) White
26 November 1938 – 31 August 2007
Roy Wallace
7 July 1927 – 18 August 2007
John Dropkin
22 February 1910 – 5 August 2007
Albert Wattenberg
13 April 1917 – 27 June 2007

who was also working on wartime projects. Herman, who had studied relativity with H. P. Robertson at Princeton University, became intrigued in the spring of 1948 with Alpher's thesis work. New cosmological questions were arising, and the two agreed to pursue them jointly. They soon solved the thermal cosmic background problem and communicated their findings to Gamow, who was at the Los Alamos laboratory at the time.

Gamow apparently was unenthusiastic, but Alpher and Herman published a note in *Nature* in 1948 and a more detailed paper in the *Physical Review* in 1949. Those articles led to invitations to give talks at technical laboratories. Most experts at the time felt that an isotropic 5-K flux was undetectable. Cooled detectors unavailable until much later eventually did enable the background detection in 1965. But over the intervening 17 years, Alpher and Herman's striking prediction was forgotten.

The calculations they had started on the chemical abundances culminated in their now-classic *Physical Review* paper published in 1953 with Johns Hopkins colleague James Follin Jr. That effort also fared badly, coming under immediate attack by supporters of the steady-state theory of cosmology, who claimed that the abundances of all elements could be explained by nucleosynthesis in stars; they considered the "Big Bang" a fiction.

The year 1953 marked the end of Alpher and Herman's most creative period. Alpher moved to the General Electric Research Laboratory in 1955. There he worked on high-speed aerodynamics, theoretical problems involving the

we hear that

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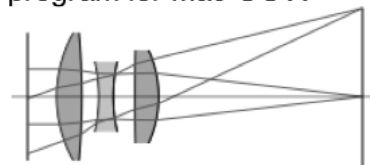
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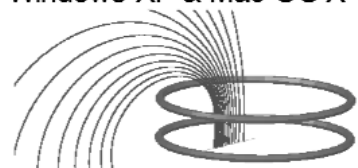


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physics of television projection systems, magnetohydrodynamic methods, and eventually strategic planning and technology forecasting. After retiring from GE in 1986, Alpher taught at Union College in Schenectady, New York, until 2004. Colleagues remember 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.

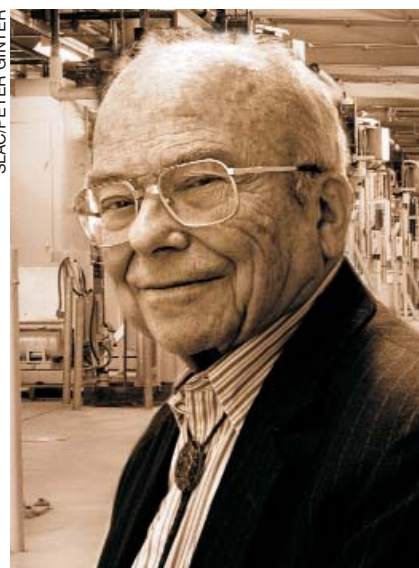
Such statistics, however, should not mislead us. Alpher and Herman answered questions raised since antiquity. We still have far to search, but they showed us where and how to look. History will remember their contributions.

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



Wolfgang Kurt Hermann Panofsky

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).

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