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George Edward Pake

George Edward Pake, a distinguished condensed matter physicist and past president of the American Physical Society (APS), died on 4 March 2004 in Tucson, Arizona, from multiple system failure. He also was founder of the Xerox Palo Alto Research Center (now the Palo Alto Research Center, or PARC) and of the Institute for Research on Learning, both in Palo Alto, California.

George was born on 1 April 1924 in Jeffersonville, Ohio. He received a BS and an MS in physics from the Carnegie Institute of Technology (now Carnegie Mellon University) in 1945 and his PhD in physics from Harvard University in 1948. George was the second thesis student of Edward Purcell. He undertook a study of the proton resonance of water of hydration in a single crystal of gypsum. To his surprise, he found that the absorption line was a doublet rather than the narrow single lines of liquids.

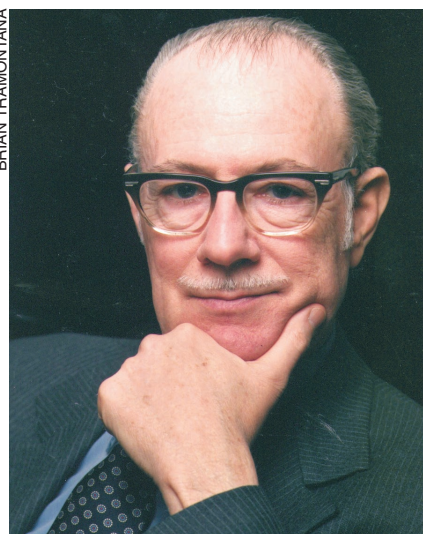
It was not long before George showed that the doublet arose because each proton in the water molecule experienced not only the magnetic field of the laboratory magnet, but a magnetic field arising from the other hydrogen atom in the molecule. Because the proton has a spin- $1/2$, its orientations are quantized into two

directions, up or down, in the external laboratory magnetic field. Thus the field of the neighbor either aided or opposed the laboratory field. George further showed that he could use nuclear magnetic resonance to measure the relative positions of the two protons (hence the spatial orientation of the water molecule) and the distance between the protons. That work attracted the interest of Herbert Gutowsky, a chemistry graduate student at Harvard, to learn NMR. The two men collaborated to characterize NMR absorption line shapes of singles, pairs, and triples of protons and to show that, at some temperatures, NMR revealed the presence of molecular rotations in the solid phase. Their research launched Gutowsky's career in NMR.

Between 1948 and 1956, George served in the physics department of Washington University in St. Louis, Missouri. In 1956, he was lured to Stanford University to replace Nobel laureate Willis Lamb, who had just left for Oxford University. During his time at Washington and Stanford, George wrote several important books, including *Notes on the Quantum Theory of Angular Momentum* (Stanford U. Press, 1953) with coauthor Eugene Feenberg; *Paramagnetic Resonance* (W. A. Benjamin, 1962); and, with Thomas Estle, *The Physical Principles of Electron Paramagnetic Resonance* (W. A. Benjamin, 1973). He began service as executive vice chancellor and provost, and professor of physics at Washington University in 1967. In 1969, the university named him Edward Mallinckrodt Distinguished University Professor of Physics.

From 1965 to 1969, George was a member of the US president's scientific advisory committee under Presidents Lyndon B. Johnson and Richard M. Nixon. He was active on panels of the National Academy of Sciences and NSF. As the chairman of the physics survey committee, which produced the so-called Pake Report, he directed the first of the NAS studies on the status of fields of science. In 1976, George was elected vice president and, in 1977, became president of APS. In 1983, APS established the George E. Pake Prize, an award that recognizes and encourages outstanding work by physicists who have combined accomplishments in original research and leadership in managing research or development in industry.

George is perhaps best known for leading PARC from its inception in 1970 until 1978 and for overseeing Xerox corporate research from 1978 to 1986. Under his leadership, PARC



George Edward Pake



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gave birth to such innovations as laser printing, Ethernet, the graphical user interface, client-server architecture, object-oriented programming, bit-mapped displays, and many other ideas that define modern computing. Under George's leadership, PARC became a major architect of the information age.

After retiring from Xerox in 1986, George founded the Institute for Research on Learning. In 1987, President Ronald Reagan awarded him the National Medal of Science.

George was a great person as well as a great scientist. In the words of one PARC technologist, Gary Starkweather, "Getting to know George Pake was one of the great experiences of my life. . . . PARC, as well as I, would not have been successful were it not for George's capable leadership and guidance. I always admired his friendly and gentlemanly manner and will always remember him fondly." George will be remembered as much for who he was as for what he did.

Charles B. Duke

*Xerox Wilson Center for Research and
Technology
Rochester, New York*

Charles P. Slichter

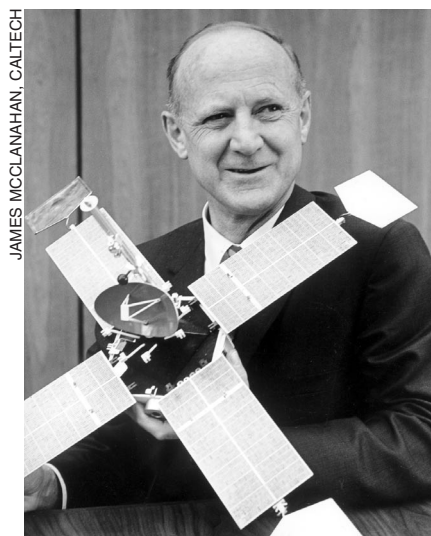
University of Illinois, Urbana-Champaign

William Hayward Pickering

William Hayward Pickering, director of NASA's Jet Propulsion Laboratory from 1954 to 1976 and an emeritus professor of electrical engineering at Caltech, died of pneumonia on 15 March 2004 at his home in La Cañada Flintridge, California. His leadership, vision, and passion earned him the nickname "Mr. JPL."

Pickering was born in Wellington, New Zealand, on Christmas Eve in 1910. He attended Havelock School—as had Ernest Rutherford three decades earlier—where he was encouraged to explore his interest in electricity. At his next school, Wellington College, Charles Gifford, Pickering's mathematics professor, inspired him to study the heavens.

After a year at the University of Canterbury, Pickering moved to the US, where he earned his BS (1932) and MS (1933) in physics at Caltech. Unable to find suitable work in New Zealand, he returned to Caltech as a research student. Robert A. Millikan (1923 Nobel laureate in physics) had organized three groups at Caltech to study cosmic radiation: Carl Anderson handled cloud chamber investigations, H. Victor Neher developed elec-



William Hayward Pickering

troscopes, and Pickering was responsible for Geiger counters. Pickering earned his PhD in experimental physics in 1936 with the thesis "A Geiger Counter Study of Cosmic Radiation." He joined the Caltech faculty and, in 1941, became a US citizen.

From 1934 to 1944, Pickering continued to work with Neher and Millikan on cosmic-ray research, including cosmic-ray counter techniques, hypotheses on the origin of cosmic rays, and detection of cosmic-ray showers at different latitudes and at various ocean depths around the world. He developed and flew radiosondes carried by balloons into the stratosphere to survey cosmic rays near Earth's magnetic equator.

Pickering began his long and distinguished career at JPL, then a division of Caltech, in 1944. His first JPL role was chief of the remote control section, which developed guidance and control, telemetry, radio, and radar tracking instrumentation for rockets and missiles. Three years later, his frequency modulation telemetry system for transmitting data from rockets was adopted as the standard. In 1949, he was project manager for the Corporal missile, which evolved into the first US operational radio-inertial-guided missile. By 1954, Pickering was the director of JPL.

As director, Pickering managed a growing laboratory that supported R&D projects involving the US Army's all-inertial-guided Sergeant missile and other rocket-launched payloads. When the Soviet Union launched *Sputnik* in 1957, Pickering led the team that, in 83 days, developed and launched the first US satellite, *Explorer 1*. When JPL was transferred to