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Randolph A. Nanna, Publisher

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
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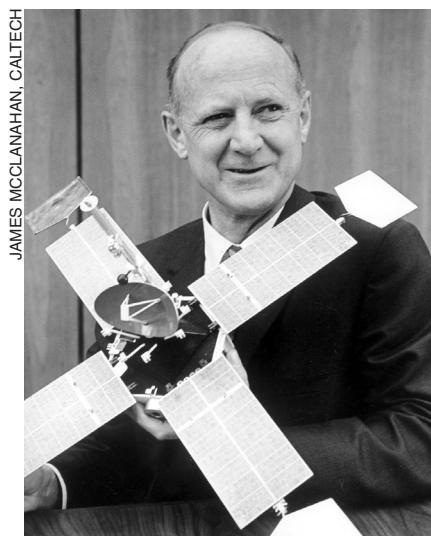
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William Hayward Pickering

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

NASA in 1958, Pickering selected robotic space exploration—over Earth satellites or manned exploration—as JPL's role, charting the course that still defines JPL's mission.

Pickering brought to JPL strong leadership, sound management, and solid engineering. He inspired loyalty and was always ready to make the difficult decisions. Current JPL Director Charles Elachi says of Pickering, "He was unflappable. . . . He ran the lab with a steady hand." And, I add, a sense of humor. Pickering once described JPL as "a graduate student project that got out of hand," whose main task in the mid-1930s under Theodore von Kármán was to figure out "how to make a rocket that won't blow up."

NASA's JPL work under Pickering continued apace with the *Ranger* and *Surveyor* missions to the Moon, the *Mariner* missions to the inner planets, and the development of *Voyager* to tour the outer planets. The worldwide Deep Space Network was built in 1963 to track and telecommunicate with the spacecraft. However, Eberhardt "Eb" Rechtin, chief architect of the Deep Space Network, says that Pickering actually devised the first international network in 1958 to ensure the success of *Explorer 1*. When the army declared

a tracking system unnecessary for *Explorer 1*, Pickering had the foresight and diplomacy to send his tracking stations to British Commonwealth friends around the world. ("All we needed was a suitcase full of stuff and we could do anything," he said.) The Nigerian station, the first to hear the signals from *Explorer 1*, revealed the existence of what became known as the Van Allen ionization belts.

At Caltech, he was everyone's favorite professor. Rechtin recalls that Pickering "taught by example; he taught us discipline; he taught us precision; he taught us about humility." And, says Rechtin, Pickering taught his students "how important it was that things had to work, not just be." With the substantial monetary prize that accompanied his 1993 François-Xavier Bagnoud Aerospace Award, he established a Caltech graduate fellowship for New Zealand students.

Pickering retired from JPL and Caltech in 1976. For two years, he directed the Saudi Arabia University of Petroleum and Minerals. In 1983, he founded Lignetics Inc, a wood-pellet fuel manufacturer that provides a clean energy alternative for home heating.

Pickering's extensive honors in-

cluded the NASA Distinguished Service Medal (1965), the President's National Medal of Science (1976), and the Japan Prize (1994), given by the Science and Technology Foundation of Japan. In 1975, Queen Elizabeth II gave him an honorary knighthood and, in 2003, he became an honorary member of the Order of New Zealand. He was twice on the cover of *Time* magazine in recognition of the *Mariner* missions to Venus (1963) and Mars (1965).

Even at 93, Pickering was vibrant and visionary; and even at 93, his death seemed untimely. As former Caltech President Thomas Everhart said when Pickering was named a Japan Prize laureate, "More than any other individual, Bill Pickering was responsible for America's success in exploring the planets—an endeavor that demanded vision, courage, dedication, expertise, and the ability to inspire two generations of scientists and engineers at the Jet Propulsion Laboratory." What good fortune for us that his legacy in science, engineering, and deep space exploration lives on.

John R. Casani

*Jet Propulsion Laboratory
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