OBITUARY

Chauncey Starr (1912–2007)

Physicist, engineer and leader in the development of nuclear power.

Chauncey Starr — veteran of the Manhattan District Project, pioneer of the peaceful uses of atomic energy and founder of EPRI, the Electric Power Research Institute — died on 17 April. The previous day, we had held a celebration of his recent 95th birthday at EPRI, with Chauncey holding forth on his life experiences and lessons learned. He was in fine fettle. The following morning, before leaving for his office at EPRI, as he had been doing ever since his official retirement 30 years previously, he took his usual short nap after breakfast. But this time, he didn't wake up. It is hard to conceive of a more graceful way to end a long and fulfilling career.

Starr was born in Newark, New Jersey, the second son of Jewish–Russian immigrants. Educated in the local public-school system, he went on to earn degrees in engineering and physics at Rensselaer Polytechnic Institute, New York. His 1935 PhD thesis examined the thermal and electrical properties of rectifying copper-oxide junctions. I used to kid him that if he had accidentally introduced some calcium impurities into his samples, he might have discovered today's family of high-temperature cuprate superconductors.

He then joined Percy Bridgman's group at Harvard University to work on the thermal transport properties of metals at high pressure. This is one of the most difficult of condensed-matter experiments to carry out, given the confounding background of containment vessel and thermometry. Starr, however, devised a differential method that could much more accurately determine the thermal diffusivity (thermal conductivity and specific heat) of metals in such a situation. This was an especially notable advance at the time: Bridgman had published work suggesting that the Wiedemann–Franz law, which links the thermal and electrical conductivities of metals, and was one of the lynchpins of the then emerging quantum theory of solids, may not apply to metals under pressure.

With his new technique, Starr was able to show that this conclusion resulted from systematic errors in Bridgman's previous experiments. To claim that he saved Bridgman from not receiving his future Nobel prize may be a stretch, but he certainly rescued his boss from major embarrassment. Twenty-five years later, in 1962, I undertook my doctoral work in that same group at Harvard. At that time, several of my fellow students were still using the methods Starr had pioneered.

From Harvard, Starr went on to a

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postgraduate position in the Magnet Lab at the Massachusetts Institute of Technology, where he added cryogenics and magnetic measurements to his portfolio of experimental skills. In 1940, he took a post with the US Navy's Bureau of Mines, leading a group of engineers analysing pressure-wave propagation from mine explosions and exploring the effects of these waves on various hull geometries. Immediately after Pearl Harbor, he and a colleague tried to enlist in the army, but were told that what they were doing would be a greater contribution to the war effort than fighting in foxholes.

Word of Starr's technical and leadership skills spread throughout the then small community of American physicists, and in 1942 he was invited to join the staff of E. O. Lawrence at the University of California Radiation Laboratory at Berkeley. Lawrence's intention (largely unknown to Starr at the time) was to train him in the principles of cyclotron resonance for eventual reassignment to the 'calutron' or 'racetrack' uranium-235 separation project at Oak Ridge, Tennessee, which at the time was not reaching its production goals.

Lawrence asked Starr to form and lead a team of several hundred engineers, to troubleshoot the early-production calutrons through experiments performed on a small-scale model he was to construct. The ensuing improvements were incorporated into new production machines, and by the spring of 1945 sufficient ^{235}U had been separated to provide the critical mass for a weapon.

Many years later, Starr and Floyd Culler, wartime chief of chemical physics at Oak Ridge, were in my office reminiscing about the days when they watched their technicians use tweezers to pick apart flakes of ^{235}U, embedded in halide impurities, for shipment to Los Alamos and assembly into the Little Boy bomb. The hair on the back of my neck quite literally stood up. On the morning of 6 August 1945, when the uranium atoms in those flakes split in the sky over Hiroshima, my father was stationed with the US Navy in Manila Bay in the Philippines. Starr was convinced that the decision by President Truman to use atomic weapons against Japan was correct, making invasion unnecessary and thus saving the lives of countless Japanese and Allied servicemen that would otherwise have been sacrificed. Maybe my Dad would have been among them.

After the war, Starr transferred to the Clinton Lab at Oak Ridge to participate in the design work on reactors for nuclear power led by Eugene Wigner and Alvin Weinberg. In 1946, he was hired by North American Aviation to initiate their nuclear programme, later forming and becoming president of a new division of the company, Atomics International. There, in collaboration with Wally Zinn at Argonne National Lab in Illinois, he pioneered the application of atomic energy to the generation of electricity. It was this that he considered his most important contribution to the world.

In 1966, he left the power-reactor industry to become dean of engineering at the University of California, Los Angeles, before moving on, six years later, to found EPRI under contract from the US electric utility industry. In the first of these jobs, he made pioneering contributions to the academic discipline of risk analysis. In the second, among other achievements, he stood firm to establish an environmental division at EPRI despite the vigorous opposition of a number of utility executives, who simply wanted to ignore issues such as the acid rain caused by emissions from power plants using fossil fuels.

For his accomplishments, Chauncey Starr received numerous awards — including honorary degrees, membership of national and international academies, and medals from heads of state. But I know that the recognition he found most personally satisfying came near the end of his life: he was able to witness the rebirth of interest in nuclear power in the United States, the fruit of his younger days, which had lain dormant for so many years.

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