

topological conservation laws entered the mainstream of quantum field theory.”

A few days before his death from idiopathic pulmonary fibrosis, Finkelstein had his laptop in his bed and was still working. He was a man who truly loved life.

Predrag Cvitanović

*Georgia Institute of Technology
Atlanta*

Leonard Susskind

*Stanford University
Stanford, California*

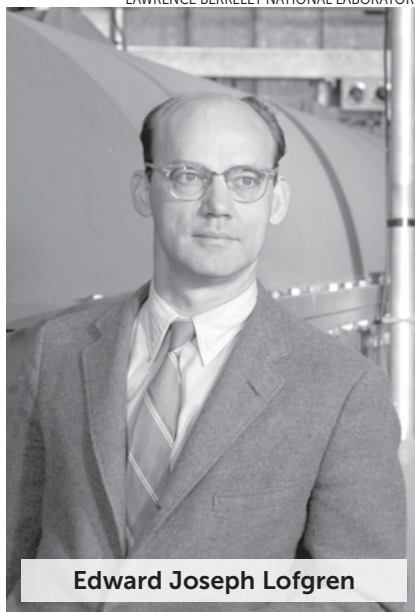


Edward Joseph Lofgren

Edward Joseph Lofgren, an innovative builder of particle accelerators, passed away in his residence at Piedmont Gardens in Oakland, California, on 6 September 2016 at age 102. He had outlived the entire first generation of scientists at Ernest Lawrence’s Radiation Laboratory (now Lawrence Berkeley National Laboratory). Lofgren will be remembered for his incredible skills in transforming ideas into practical hardware, his close association with Lawrence, and his uncanny intuition about the talents and potential of his Berkeley staff.

Lofgren was born in Chicago to Swedish immigrants on 18 January 1914. He moved with his family in 1927 to Los Angeles, where he grew up during the depths of the Depression. Although he had been admitted to Caltech, Lofgren didn’t have enough money to enroll there. By working on various bench jobs, he was able to complete two years at Los Angeles Junior College but still could not afford Caltech. Instead, to complete his education, he transferred in 1936 to the University of California (UC), Berkeley, where a scant five years earlier the first cyclotron had been operated at Lawrence’s Radiation Laboratory.

During 1938–40 Lofgren was a research assistant to Lawrence, who saw him as a talented physicist able to transform bold ideas into hardware. Lofgren’s first task was to improve uranium hexafluoride ion sources for the calutron, a mass spectrometer that Lawrence had transformed from the 37-inch cyclotron, to separate ^{235}U from ^{238}U . As a result of that work, Lofgren interrupted his graduate studies to contribute to the Manhattan Project efforts of the Berkeley team, first at Oak Ridge to help with the development of the calutron farms and then at Los Alamos to work on detonators in Luis



Edward Joseph Lofgren

Alvarez’s group. Lofgren’s research on ion sources, conducted under Lawrence’s supervision, became the basis of his thesis for his 1946 PhD from UC Berkeley.

With the initiation of the multi-GeV Bevatron project in 1949, Lawrence invited Lofgren to return to Berkeley Lab. Lofgren was able to demonstrate the phase-stability principle of Edwin McMillan and Vladimir Veksler by changing the RF frequency to match the cyclotron frequency of the particles as they accelerated to relativistic speeds in the 37-inch cyclotron; Lofgren thus made the machine the first synchrocyclotron. Soon after, Lawrence appointed Lofgren as the chief physicist on the project of building the synchrotron. His appointment marked the beginning of the “Berkeley approach” of managing accelerator projects as a partnership between a chief physicist and a chief engineer, who for the synchrotron was William Brobeck.

From 1950 through 1952, most of the laboratory’s efforts were diverted to building the ill-conceived Materials Testing Accelerator at the Livermore Laboratory. But with its impending termination, progress on the Bevatron quickly advanced. By the time the Bevatron began operation in early 1954, Lofgren was the leader of both a particle-physics research group, which competed with Owen Chamberlain and Emilio Segrè’s group to discover the antiproton, and the accelerator group that was charged with commissioning and operating the Bevatron. Although Lofgren’s group lost the antiproton race, it did discover the antineutron in 1956.

Lofgren kept the Bevatron competitive for particle-physics research by initiating a modernization campaign in 1960. It included adding an extraction system that brought the beam to a newly constructed experimental hall. However, by 1970 the machine was nearing the end of its utility for particle physics; the last such experiment ended in January 1971.

To renew the scientific viability of the Bevatron—rechristened the Bevalac—Lofgren and Hermann Gruner headed a project to bring heavy ions 45 meters downhill from the SuperHILAC linear accelerator to the synchrotron, where they would be injected. The new configuration enabled groundbreaking research in relativistic heavy-ion nuclear physics and extensive studies in radiation biology and ion-based cancer therapy for deep-seated tumors.

In 1973 Andrew Sessler appointed Lofgren to be associate director for accelerators at the Lawrence Berkeley Lab. He was responsible for the newly formed accelerator division, which operated the Bevalac and concentrated on high-energy and heavy-ion physics research and advanced accelerator R&D. Lofgren served in that role until his retirement in 1979. It was fitting that Lofgren’s final official act at the lab was ceremonially turning off the Bevatron for the last time in February 1993.

Lofgren’s many projects included the 200 BeV design study conducted at Berkeley Lab; the study’s report formed the basis for the cost estimate and site selection for a new proton synchrotron. To the disappointment of Lofgren and his Berkeley colleagues, their proposal to build the machine near Sacramento was declined in favor of a competing proposal to build the accelerator—with a rather different design—in Illinois at what is now Fermilab.

Understanding how the physical world works was at the core of Lofgren’s being. He never grew tired of hearing about new discoveries in physics or explaining physical phenomena, such as how the fog forms in San Francisco, to his neighbors at Piedmont Gardens.

William Barletta

*Fermi National Accelerator Laboratory
Batavia, Illinois
Massachusetts Institute of Technology
Cambridge*

Jose Alonso

*Lawrence Berkeley National Laboratory
Berkeley, California* **PI**