Alvin Virgil Tollestrup

Alvin Virgil Tollestrup, a key figure in the development of Fermilab, notably the creation of the Tevatron, succumbed to cancer on 9 February 2020 in Warrenville, Illinois.

Born on 22 March 1924 in Los Angeles, Alvin moved with his family when he was six to Logan, Utah, where his grandfather's position as a psychology professor helped them weather the Depression. There young Alvin had a basement laboratory with a chemistry set and electronic components.

Later the family moved to Salt Lake City. In his senior year of high school, while preparing a term paper for an inspiring chemistry teacher, Alvin devoured Robert Millikan's 1935 book on cosmic rays, wrote about the latitude effect, and began to dream of Caltech and a career in research.

Alvin graduated in 1944 from the University of Utah with a degree in general engineering; he had enrolled in physics courses rather than less interesting ones that a specific engineering degree would require. He qualified for the US Navy's radar school, where he could learn about microwave and pulse techniques. He was assigned to install and test equipment and, eventually, to teach radar technology.

Supported by the GI Bill, Alvin went to graduate school at Caltech in 1946 and worked with William Fowler and Charles Lauritsen in the Kellogg Radiation Laboratory. Their group developed a new method to determine masses and mass defects of nuclides by precisely measuring the energy released in nuclear reactions. Its application to the light elements became the subject of Alvin's 1950 dissertation.

Continuing on at Caltech as a research fellow, Alvin began a move toward high-energy physics with a series of pion photoproduction measurements. He used Caltech's 500 MeV electron synchrotron to map out the 3–3 resonance—now known as $\Delta(1238)$.

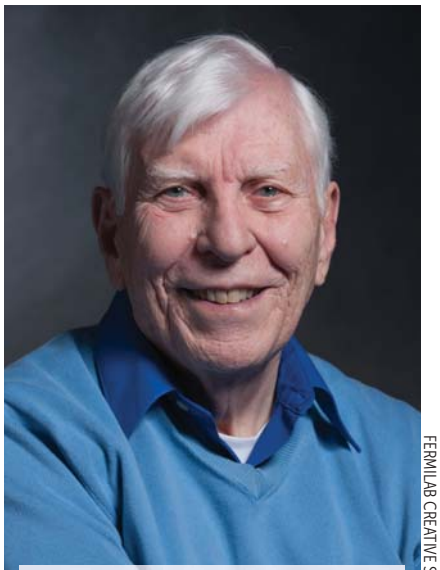
Alvin spent 1957–58 at CERN, the fledgling European laboratory, on an NSF fellowship. He worked with Giuseppe Fidecaro and others on the 600 MeV synchrocyclotron and reported the first detection of the rare decay of a charged pion into an electron and a neutrino. The first experiment at CERN's first accelerator, it supported the nascent V – A description of weak interactions. On his return to Caltech, Alvin was promoted to associate professor, and he became a full professor in 1962.

Alvin went to Fermilab on sabbatical in April 1975, when a magnet-development program had been launched to realize Robert Wilson's vision of a superconducting synchrotron. The early model magnets were primitive, but Alvin brought a focus on underlying physical principles and a faith that judicious application of freshman physics could master any challenge. He regarded failures as discoveries to be made. His approach is exemplified in his 1979 report *The Amateur Magnet Builder's Handbook*. One of his indispensable innovations was to secure the superconducting magnet coils with interlocking stainless steel collars. For his contributions to the Tevatron, which was for two decades the world's highest-energy accelerator, Alvin received the National Medal of Technology in 1989.

It would be several years before the Tevatron—as a proton accelerator and proton–antiproton collider—became an official project, but Alvin was already looking forward to the research it would enable. In December 1976 Fermilab created a colliding-beams department. Alvin was appointed to a five-person steering group that guided the exploration of both detector and accelerator issues, including the production and cooling of antiprotons. In less than a year, Alvin became department head.

By the spring of 1979, the first design report was produced for a detector and superconducting solenoid magnet that would become the Collider Detector at Fermilab (CDF). Alvin was central to expanding the collaboration into an international team that included institutions in Japan and Italy. The CDF group submitted the formal design report to the Department of Energy in the summer of 1981, and first collisions were seen in the detector four years later. During the exciting period of the top-quark discovery in 1994 and 1995, Alvin held regular sessions with young CDF physicists, especially the postdocs in the Fermilab group.

Alvin was always on the lookout for unique and promising physics opportunities. For more than two decades, he worked with an international group of accelerator and detector physicists to address the challenges of designing a high-energy collider that would use short-lived muons rather than stable electrons or protons. He dove into the technologies required for high-field accelerator magnets and the operation of RF cavities in high magnetic fields.



Alvin Virgil Tollestrup

FERMILAB CREATIVE SERVICES

As a nonagenarian, Alvin attached himself to a group of young physicists exploring novel methods for detecting the hypothetical axion. He drew on his accumulated radar wisdom and what he liked to call "those damn Smythe problems" from William Smythe's classic *Static and Dynamic Electricity*. In a series of beautiful technical notes, Alvin produced a complete simulation of how nonlinear dielectric crystals interact with microwave cavity modes.

Alvin delighted in identifying promising early-career researchers. He helped them to create detailed research plans and continually challenged them to develop a deep and thorough understanding of their observations. Many young researchers savored the chance to experience firsthand his incisive approach to problem solving. The Tollestrup Award for Postdoctoral Research, presented annually by the Universities Research Association, celebrates Alvin as talent scout and mentor. We cherish the memory of his achievements and his example.

Chris Quigg
Fermi National Accelerator Laboratory
Batavia, Illinois
Mel Shochet
University of Chicago
Chicago, Illinois PT