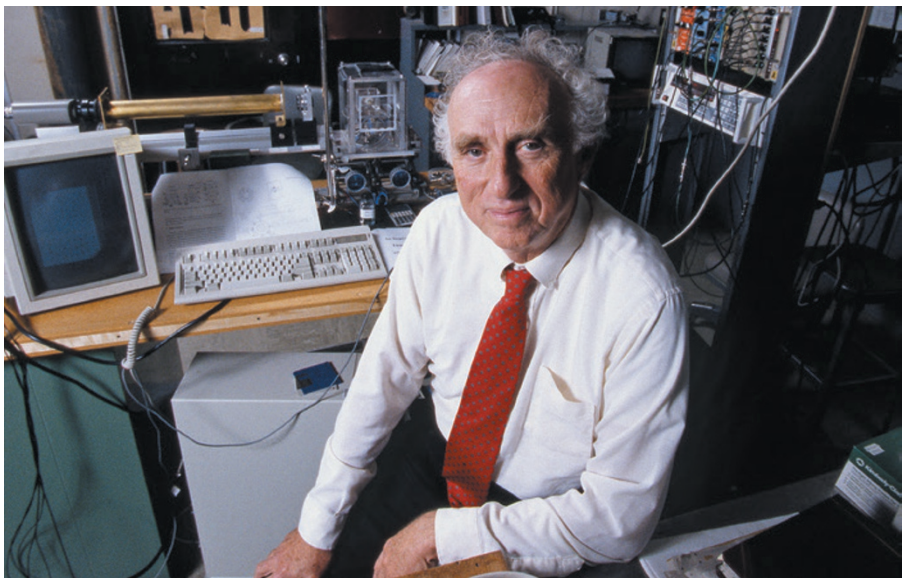
# Martin L. Perl

## *(1927–2014)*

Discoverer of the tau lepton subatomic particle.



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The tau lepton, a subatomic particle uncovered by Martin Lewis Perl, was one of the biggest surprises in elementary particle physics in recent decades. Perl discovered this third type of lepton (the other two types are the lighter electrons and muons) at a time when there was no experimental evidence for its existence or any theoretical indication that a third 'family' of particles should exist.

Perl, who died on 30 September at the age of 87, was born in 1927 in Brooklyn, New York, to Jewish immigrants from Poland. Through determination and hard work, his father had established a printing and advertising company that sustained the family throughout the depression of the 1930s. Perl once reflected that his parents' high expectations — they demanded that he achieve A grades in every course — "was good training for research, because large parts of experimental work are sometimes boring or involve the use of skills in which one is not particularly gifted".

Even though he graduated from high school at just age 16 and received a medal for his achievements in physics, Perl never thought of becoming a scientist. Neither he nor his family thought it was possible to make a living as a physicist. Perl decided instead to become a chemical engineer. His studies at the Polytechnic Institute of Brooklyn were interrupted by military service during the Second World War, but he completed his bachelor's degree in 1948.

After graduating, Perl joined General Electric, where he worked in the electron-tube division. To develop and improve the company's production process for vacuum tubes, at the time used in appliances such as televisions and radios, Perl needed to understand how the electron vacuum tube worked. He started taking physics courses at the Union College in Schenectady, New York, and it was here that he realized where his real interest lay.

In 1950, Perl left industry to start a PhD at Columbia University in New York, under the supervision of physicist Nobel laureate Isidor Isaac Rabi. The lessons that Perl took from Rabi — the importance of working on fundamental problems, choosing your own research problems, getting the right answers and checking them thoroughly before publishing — guided him throughout the rest of his career.

After a research and teaching job at the University of Michigan in Ann Arbor, Perl got his first opportunity to think seriously about high-energy experiments on charged leptons when he was offered a position at the yet-to-be-built Stanford Linear Accelerator Center (SLAC) in Menlo Park, California. He moved to SLAC in 1963, and in December 1975, he and his colleagues published a paper entitled 'Evidence for Anomalous Lepton Production in $e^+$–$e^-$ Annihilation' (M. L. Perl *et al. Phys. Rev. Lett.* **35,** 1489; 1975). It was not until the end of 1979, however, that the discovery of the tau lepton was finally verified.

Until this point, the prevailing view among physicists had been that only two types of lepton existed: electrons and muons. The tau lepton is more than 3,000 times heavier than an electron and is highly unstable. Its discovery transformed the expectations of fundamental particle physics and paved the way for the discoveries of other elementary particles, including the tau neutrino and the bottom and top quarks. In 1995, Perl shared the Nobel Prize in Physics with Frederick Reines, who received his share for his part in the detection of the neutrino, another component of matter.

Martin's enthusiasm for fundamental physics was contagious. Once, while working as a PhD student in his laboratory, I found an anomaly in our data that suggested the existence of a new fractionally charged particle. Martin, who treated any research he was involved in very seriously, immediately cancelled his trip to a scheduled conference and stayed with our group for a few days. We pored over the data until we worked out — with some disappointment — that the anomaly was most likely an artefact of our experimental set-up.

As well as fundamental physics, Martin loved building mechanical devices and electrical instruments. When I and some other students were constructing an apparatus for an experiment, he was so curious and enthusiastic that he would frequently stop by to watch and learn about our progress. Martin always rewarded independent thinking. But while he helped his students to follow their own ideas, he also taught them to be realistic about what was possible — and to move on from a problem if they failed to make progress. His teachings served us both in the lab and later in life.

Martin had exceptionally high standards. He was a creative researcher who never chased honours, titles or respect, although respect always chased him. Everyone who knew him was impressed by his simplicity and honesty, summed up in the words he wrote at the end of his Nobel biography: "It was good fortune …" ■

**Valerie Halyo** *is a visiting scholar in experimental high-energy physics at Princeton University, New Jersey, USA. She earned her PhD under the supervision of Martin L. Perl at Stanford University in California from 1997 to 2001.*
*e-mail: valerieh@princeton.edu*