Steven Weinberg

Steven Weinberg, a visionary and audacious light who forever changed our understanding of the universe, died on 23 July 2021 in Austin, Texas. He was born in New York City on 3 May 1933 and received his BA from Cornell University in 1954. At Princeton University, under Sam Treiman, he earned his PhD in nuclear physics in 1957.

Steve's remarkable 1967 paper "A model of leptons" unified electromagnetism and the weak nuclear interaction into one framework, his electroweak theory. In three pages, he used gauge theory to predict W and Z bosons as mediators of the weak interaction, their masses, the existence of neutral currents, and a "Higgs" boson—all subsequently confirmed by experiment. For that work, Steve was awarded the 1979 Nobel Prize in Physics, shared with Abdus Salam and Sheldon Glashow. Electroweak theory is the cornerstone of today's standard model, which unifies all the forces of nature save gravity. It is the work of many minds and Steve's consistent leadership.

His many other seminal contributions include, most notably, effective field theory, a calculable low-energy approximation of the underlying fundamental theory. In a 2009 review article, Steve argued that the standard model is the leading term in an effective field theory, an assertion still not proven by experiment.

The need for verification in experiment was central to Steve's thinking. He came to believe that further progress in particle physics required a national commitment. In 1987 and 1993, Steve testified before Congress, stressing the need for the proposed Superconducting Super Collider, but Congress opted to fund the International Space Station.

His interest in cosmology led Steve to write his popular 1977 book *The First Three Minutes: A Modern View of the Origin of the Universe*. He inspired physicists and astronomers to work together to explain why the universe is the way it is. The state of the field is well described in his *Cosmology* (2008). His biggest contribution to cosmology was proposing solutions to the dark-matter problem that are well motivated from particle theory. He proposed axions as dark-matter candidates, and his work on weakly interacting particles set the stage for weakly interacting dark-matter candidates, still not confirmed experimentally.

LOUISE WEINBERG

Steven Weinberg

For his monumental contributions to physics, Steve received many awards and honors, including the National Medal of Science in 1991. In presenting the Benjamin Franklin Medal to him in 2004, the American Philosophical Society said that Steve was "considered by many to be the preeminent theoretical physicist alive" at the time.

Steve's academic career took him from Columbia University to the University of California, Berkeley. When Louise, his wife, was admitted to Harvard Law School in 1966, Steve received temporary appointments at MIT and Harvard, where in 1973 he became the Higgins Professor of Physics. The family moved to Palo Alto for a year in 1976 after Louise accepted a visiting offer from Stanford Law School, and Steve became a visiting professor in the university's physics department. In 1980 Louise accepted a professorship at the University of Texas at Austin School of Law. Two years later Steve sought an appointment at Texas, where he founded the UT Theory Group and held the Josey Regental Chair in Science.

One thing that always impressed me about Steve was how hard he worked. It is well worth one's effort to work through some of his complex calculations. Steve's practice was to write a book based on his notes for each of his classes. The results included his definitive three-volume set, *The Quantum Theory of Fields* (1995–2000), and his most recent book, *Foundations of Modern Physics* (2021).

Steve's other popular books include *Dreams of a Final Theory* (1992) and *To Explain the World: The Discovery of Modern Science* (2015). A frequent contributor to the *New York Review of Books*, he never shied away from expressing his views on religion and society. Steve was also an engaging speaker, referring interestingly to history and literature, and he had a sense of humor that captivated audiences.

Steve was an extremely kind and generous person, as illustrated in the following story conveyed to me by my former student David Medellin: "When I came to Austin, I wrote to Steven Weinberg asking if I could speak with him about research opportunities. He replied saying that he was not going to his office regularly, but that he would . . . meet with me if I let him know beforehand. I was amazed. I couldn't believe *THE* Steven Weinberg would come *just* to meet me at his office." That was not an isolated event; Steve truly cared about students, as I witnessed on many occasions, and as several wrote in online tributes to him (see "Steven Weinberg [1933–2021]," PHYSICS TODAY online, 3 August 2021).

The last time I talked with Steve was this past April. We discussed the history of quantum entanglement and the possibility of resuming our lunch meetings after the pandemic. Steve liked to go to a particular restaurant near campus and would usually order the blue-plate special with meatloaf. He often insisted on treating me, but when we split the bill, he made sure we left the same tip! I was looking forward to telling Steve about my group's recent work on quantum-limited acoustic detection, testing the limits of Albert Einstein's 1907 prediction on Brownian motion, and its relevance to the search for dark-matter events in bubble chambers. Steve would have liked it, a combination of two of his passions: cosmology and history of science. Alas, Steve is gone, a reality that is hard to accept. He will be remembered as one of the greatest physicists of all time.

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