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### Steven Weinberg

On May 3, 1933, Frederick and Eva Weinberg welcomed Steven Weinberg into the world in the city of New York. At an early age, he developed an inclination to science with the encouragement of his father and by the time he was 15 he was interested in theoretical physics. He would later go on to particle physics because he felt it to be an area where creative work could be done due to the principles not being well known. He wanted to go for the messes, where the action was. In 1945 he received his undergraduate degree from Cornell and went off to the Institute for Theoretical Physics in Copenhagen for a year of graduate study where he began his research in physics. After a year he returned and finished his graduate studies at Princeton. He received his Ph.D. in 1957, not knowing much about physics, knowing one extremely important thing; “That no one knows everything, and you don’t have to.”

He began his research/work at Columbia for two years and then Berkeley for an additional seven. During this time, he researched various topics in the attempt to teach himself different areas of physics. He gained an interest in astrophysics during this period and began to write a book which he completed in 1971 called *Gravitation and Cosmology*. After Berkeley, Weinberg went off to Harvard to be a Loeb lecturer and in 1969 he was accepted to be a Physics professor at M.I.T.

While working at M.I.T. his work on broken symmetries, current algebra, and renormalization theory turned to the unification of weak and electromagnetic interactions. In

1973, he became the Higgins Professor of Physics at Harvard and was appointed as Senior Scientist at the Smithsonian Astrophysical Observatory. During this point, his research was mostly about “the implications of the unified theory of weak and electromagnetic interactions, with the development of the related theory of strong interactions known as quantum chromodynamics, and with steps toward the unification of all interactions.” (Nobel Prize) In 1982, he moved to the University of Texas and became the Josey Regental Professor of science in the Physics and Astronomy Departments.

In 1979, Weinberg received the Nobel Prize for Physics along with Sheldon Lee Glashow and Abdus Salam for their work in formulating the electro weak theory, which helps explain the unity of electromagnetism with the weak nuclear force. Weinberg first proposed the electroweak theory in 1967. The theory states that electromagnetism and the weak force operated by the interchange of subatomic particles and that electromagnetism has the possibility to operate at possible infinite distances by the means of the photon, a massless particle. The weak force, on the other hand, operates only at subatomic distances by means of bosons, massive particles. Weinberg helped show that photons and bosons are actually part of the same family of particles, despite their apparent differences.

With his work as well as that of Glashow and Salam, the prediction of outcomes of new experiments in which elementary particles are made to impinge on one another became possible. They also helped predict, using the electroweak theory, the W and Z particles which were proved in a series of experiments in 1982-1983.

The idea of the electroweak theory occurred to him out of the blue on his way to work at M.I.T. The theory is a cornerstone of the Standard model of elementary particle physics. It

provides a thorough illustration of the basic units of matter and the way they act. It also fits almost exactly with the data collected by experimental physics.

Weinberg didn't stop at the electroweak theory, he also helped contribute additional research. This includes cosmology, gravity theory, Technicolor theory, symmetry breaking, high energy behavior of quantum field theory, super symmetry, infrared photons, quantum field theory, particle physics, and pion scattering.

Besides his research, Weinberg is and has been a pronounced public spokesperson for science, even going before congress on the platform of the Superconducting Super collider. He has also given multiple lectures on a wide range of topics including the larger meaning of science and has written articles for the New York Review of Books. Besides just writing articles, he has also written several books for the public domain which have been the top rated and most influential books in their subjects. His works include *Gravitation and Cosmology: Principles and Applications of the General Theory of Relativity*, *The First Three Minutes: A Modern View of the Origin of the Universe*, and *The Quantum Theory of Fields*. Through his books, Weinberg attempt to describe the universes existence and argues that the search for scientific truth can give meaning to life.

“The effort to understand the universe is one of the very few things that lifts human life a little above the level of farce, and gives it some of the grace of tragedy.”

Weinberg is also well known for his outspoken opinions on religion. He is an atheist who is known to dislike the use of religion and God to explain the creation of the world and every aspect of life. He prefers to believe that there is a logical, scientifically correct answer behind everything. In an interview, He compares religion to a dream/nightmare, and states that it has

brought more harm than good. “Certainly good causes have sometimes been mobilized under the banner of religion, but you find the opposite I think more often the case. It's more often been the motivation for us to kill each other - not only for people of one religion to kill those of another, but even within religions. After all, it was a Moslem who killed Sadat. It was a devout Jew who killed Rabin. It was a devout Hindu who killed Gandhi. And this has been going on for centuries and centuries. I think in many respects religion is a dream - a beautiful dream often. Often, a nightmare. But it's a dream from which I think it's about time we awoke. Just as a child learns about the tooth fairy and is incited by that to leave a tooth under the pillow - and you're glad that the child believes in the tooth fairy. But eventually you want the child to grow up. I think it's about time that the human species grew up in this respect. It seems to me that with or without religion good people will behave well and bad people will do evil things. But for good people to do evil things, that takes religion.”

Steven Weinberg proposed a unification theory that proved weak and electromagnetic interactions, which were believed to be two completely different forces, were, in fact, two characterizations of the same exact fundamental force. His electroweak theory has become the foundation of the standard model and his books have become the most influential and helpful in the study of particle physics.

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