

“The Atheist Scientist who discovered the God Particle”

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In the Particle zoo of elementary particles which make up our universe, there is only one particle named after a person. Peter Higgs, after whom the eponymous Higgs boson is named, passed away recently at age 94 in Edinburgh.

Almost exactly 60 years ago, Higgs proposed a mechanism which could give elementary particles like electrons and quarks a mass. This was essential since the underlying theory which explained the interaction of particles had no consistent mechanism to generate masses for particles. Independently several others including Brout, Englert and Kibble had also stumbled upon a similar mechanism. The idea, which had also been proposed earlier by Philip Anderson in the context of superconductivity, built upon the work of the Japanese Nobel laureate Y. Nambu and J. Goldstone.

The theory proposed by Higgs and others did not find favour with the particle physics community at first. However, by the early 1970s, it had been refined and became an essential part of the so-called Standard Model of Particle Physics which we believe explains the sub-microscopic reality.

Although theoretically the model was consistent and predictive, the missing link was still the Higgs particle. The mechanism which was thought to give masses to all massive particles also predicted the existence of this unusual particle which had not been detected. The clinching evidence for the validity of the theory could only come from the actual detection of this elusive particle. But this was difficult given the state of the accelerator technology in the 1970-80s.

The search for the Holy Grail of particle physics, as the Higgs search came to be known, took more than 3 decades, billions of dollars, a multinational collaboration with thousands of scientists and some very clever piece of technology. In 2008, the Large Hadron Collider (LHC) at CERN in Geneva, a project which was as ambitious as the Apollo program was finally commissioned. This most powerful particle accelerator in the world seemed to be our best shot at finding the Higgs. And it did not disappoint.

On July 4, 2012, a new particle which could be the Higgs boson was discovered at the LHC. It took another few months before it could be definitely said that this was indeed

the Higgs boson. The Nobel Committee obliged with surprising alacrity and Higgs and Englert were given the Nobel Prize in 2013 for their theoretical prediction of this particle (Brout had died in 2011 and Nobel Prizes are not given posthumously.)

Peter Higgs was born in 1929 and obtained his doctorate in molecular physics from King's College in London. Thereafter he worked at the Imperial College and University College, London before moving to Edinburgh in 1960. He spent the rest of his life at the University of Edinburgh where he was Emeritus professor at the time of his death.

Higgs was not just a brilliant researcher but also a great teacher who was known to have a flair for explaining very complex concepts in an extremely simple, yet profound way. Despite his fame and recognition, he was an exceptionally modest person. He was also notoriously shy of any publicity and, on the day the Nobel Prize was announced, went to a sea food bar to escape the media attention. He apparently did not possess a mobile phone or the internet.

Even though the name Higgs boson is widely accepted now, it did lead to some controversy in the particle physics community. This was simply because the idea not only had a longer history but also because several groups had independently proposed something similar. Some particle physicists thought that it was unfair to the others who had also contributed to the theory.

In 1993, another Nobel laureate Leon Lederman wrote a popular science book called "The God Particle: If the Universe is the answer, what is the question?" Incidentally, Lederman reportedly wanted the title to be "The Goddamn particle" but the publishers understandably rejected the idea! However, when the Higgs particle was discovered, the popular press dubbed it the "God Particle", a moniker which still raises hackles among the particle physicists. This is also ironical given that Peter Higgs was an atheist!

More than a decade after its discovery, there are still many unanswered questions about the properties of the Higgs boson and its interactions. There are plans to build an accelerator which is colloquially called the "Higgs factory" which will hopefully shed some light on the still mysterious particle which Peter Higgs in his characteristic modest fashion would refer to as "the boson that is named after me"!