

Whats after God Paricle !



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Chandan Kumar Duarah 24 July 2012 Updated 12 Feb 8993 views

As weeks passed, rumors began to brew. Scientists from the world's most expensive experiment called Large Hadrons Collider of CERN announced what they claim was the discovery of a "missing" particle that adds mass to matter (the Higgs boson, or so-called God particle). But people don't want to know the detail of the Higgs. Not yet. They want to know why it is important and how this changes human history.

Not only me, the first week of the month of July must have been a bit of a roller coaster ride for science community. Now most of people aware that on July 4th scientists of CMS and ATLAS detectors of Large Hadron Collider (LHC) at CERN, Geneva announced the discovery of a new particle. I visited the largest and most expensive laboratory and had a training as a science journalist when the LHC begun its operation of proton collision in 2010. I have been in close touch with CERN and a constant follower of its activities and progress it since this visit. Anyway, Higgs has opened up the door to a conversation between scientists and the public.

First and foremost discovery of Higgs carries the scientific importance of the discovery. It will recap the importance of this manifestation of the Higgs field. The Higgs field provides the many of them acquire a non-zero mass, and the mass is crucially important to us because it allows the formation of atoms, which in turn beget molecules, which in turn beget us! Now we have found the particle, which is a component or medium of the dark matter in our universe, which look dark to our eyes. And it is expected that we might be provided with clues that reveal the trail to unraveling the ultimate holy grail of fundamental particle physics - a quantum theory of gravity. It is theorized that with a quantum theory of gravity we may be able to trace the Big Bang expansion back to its very beginning, and understand precisely how our universe arose, presumably from nothing. It is important for Standard Model of particle physics. It is one of the most successful theories to explain how elementary particles interact with the fundamental forces. It is one key to the eternal quest to understand where the universe comes from.

The particle found by two teams of ATLAS and CMS detectors looking for the Higgs particle were 99.999% sure, a 5 sigma result, the “gold standard” for such work that they what they were seeing wasn’t a fluke. Scientists were sure that CERN would not get to 5 sigma by the time June last Melbourne conference on high energy physics. So it happened in the very last week. It was obviously an emotional moment when the announcement was made at the seminar on July 4. It was 48 years ago that that came up with a mechanism to account for the existence of mass, predicting the Higgs boson in the process.

Physicists were hoping that the LHC would throw up particles that would validate super symmetry, but it hasn't happened so far. Now scientists who are associated with research of super symmetry theory are very happy with the discovery of Higgs boson. Because some parts of super symmetry (SUSY) theory – called minimal models – would not hold if the particle was heavier than 135 GeV. If the Higgs boson had turned out to be more massive than 135 giga electron volts (GeV) some of researcher's work on super symmetry would have had to be abandoned. Fortunately, the Higgs Boson particle seems to have a mass of 125 GeV. SUSY is now a critical part of theoretical physics. It resolves many inconsistencies in theories and holds them together in a neat and beautiful mathematical framework. Already the simplest versions of the supersymmetry have been ruled out and the Higgs boson at 125 GeV could require even more changes, making many physicists nervous. At the moment, they are scientists calling it a "particle consistent with the Higgs". The next step is to find out for sure that is what it is. In one sense it is the end of the road, in that it's last piece of the standard model to be discovered. But in another, it's the beginning of where machines like the LHC go next. The next stage of exploration will include measuring all the properties they haven't seen. Hopefully this will provide clues for things like super symmetry, which could be a comprehensive way to go beyond the Standard Model because it provides a framework for things like dark matter.

The Higgs-heretics points out the holes in the data so far collected allow other interpretations to also “fit”. One of the main points to their disbelief is that while the new particle has so far behaved like the long-sought Higgs Boson, it was also much lighter than expected. This opens up possibility of a pantheon of Higgs Boson-like particles. This reason would help explain other mysteries, such as the elusive “dark matter” which is thought to make up more than a quarter of the universe. The reasons physicists have been questing for the Higgs Boson for so long is it may be what gives atoms their mass. Without mass, nothing can bind together to form stars, planets and living things.

The Standard Model still has holes in it something needs to account for the dark matter and energy in the universe. Alternative theories to super symmetry exist. Some require additional forces in nature, new interactions among particles, or for the Higgs boson itself to be composed of simplest pieces. However those models have their own problems to be a consistent model of nature. As yet super symmetry is still the front-runner for theories beyond the Standard Model and most physicists remain optimistic for its prospects. Some scientists are hopeful that besides the discovery of the Higgs, they will also see something else. Already the simplest version of the super symmetry has been ruled out and the Higgs boson at 125 GeV could require even more changes, making many physicists nervous.

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The string theory of physics is also an important theory, which is impossible to test so far. It could gain in credence if evidence for super symmetry crops up at the LHC. The Higgs like particle takes us a step closer to solving the mystery of the universe, which is inextricably connected to the mystery of our own origin. Likewise, other new physics is now more likely to be uncovered at CERN's LHC, which will add to our knowledge base. The new particle, which has a mass about 130 times greater than the proton mass, would appear to be the long sought after Higgs Boson. The actual confirmation that it is Higgs will still need to be the long sought after Higgs Boson. The actual confirmation that it is a Higgs will still need to await some final experimental checks, but it certainly has all the characteristics of a Higgs particle so far. The new particle, which has a mass about 130 times greater than the proton mass, would appear to be the long sought after Higgs boson. The actual confirmation that it is Higgs will still need to be the long sought after Higgs boson. The actual confirmation that it is a Higgs will still need to await some final experimental checks, but it certainly has all the characteristics of a Higgs particle so far.

The LHC is going to shut down by the end of the year for two years, during which time engineers would rewire the machines to double its power. It has now been given a three-month extension before shut down to probe the newly discovered particles aggressively. By the end of the year, LHC would have generated three times more data than it has now. That would be helpful to validate some theories, including the Higgs boson, but not necessarily conclusive for anything.

One of the founders of the Higgs theory, Gerald Garalnik, was quoted in the New York Times saying he was glad to be at a physics meeting “where there is a applause, like a football game”. But there may not be always applause. Scientists at Cornell University have cast doubt on what it was the CERN’s Large Hadron Collider actually saw raising questions about whether enough data has been collected to make an accurate call. There is a difference between finding a particle and saying that it is the Standard Model Higgs. If we find something that looks like a duck and walks like a duck, we can’t say that it is a duck, Vivek Sharma, professor of physics at the University of California in San Diego said. Anyway the purported discovery of the Higgs Boson is only the beginning of this spectacle. Future discoveries would discover particles that are present everywhere but nowhere to be seen, or new dimensions of space that would help develop exotic new physics. It is presumed that the next several years, the LHC would rigorously test several theories of physics, providing many anxious moments to thousands of theoretical physicists around the world.

Chandan Kumar Duarah

The writer is a former Robert Bosch Fellow, an environmentalist and Guwahati based journalist.

BY CHANDAN KUMAR DUARAH

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