

The Tale of Higgs Boson

Everything in our universe is made of two kinds of fundamental particles, much smaller than atoms. These are quarks and leptons, each of which has six types. The particles formed by their various combinations belong to the group of *fermions*. Common examples are electron, proton, and neutron. There is another group of fundamental particles called *bosons*, which act as force carriers. There are four fundamental forces in nature: gravitational force, electromagnetic force, weak force, and strong force, the last two being active in the subatomic world. Exchange of bosons is the cause of the forces, except for gravitation, which has no explanation as yet in the standard model of particle physics.

Till the other day another important issue had no explanation, except in theory, and that is about the *mass* of particles like electrons and protons. In 1964 Peter Higgs and other scientists developed a theory that suggested the possibility of a special type of boson, which explains mass. It came to be known as *Higgs Boson*. It has also been named *God particle* for its important role in understanding our universe. Many scientists rightly consider it a misnomer, as it has precious little to do with the idea of God. Actually the name was coined by the publisher of a 1993 book on Higgs Boson by physicist Leon Lederman, who originally proposed the name, *The Goddamn Particle*, for the book !!

Large Hadron Collider, the 27 km circular tunnel built by CERN, located 100 metre underground along the Franco-Swiss border, to experiment and study what happened during the Big Bang about 14 billion years ago, has generated much interest everywhere since last year. On July 4, 2012 its first important announcement came: through high energy collisions of photon beams moving nearly at the speed of light, an elementary particle has been discovered, which could be the Higgs Boson.

Stephen Hawking, the most famous living physicist, had a bet with another scientist of the University of Michigan that Higgs Boson would not be found. 'It seems I have just lost \$100,' said Hawking to BBC News on that day.

Indians have reasons to be proud. There are 100 Indian scientists at CERN among its 8000 strong team from 60 countries. The term, *boson*, is derived from the name of the great Indian scientist, Dr. Satyendra Nath Bose, who developed Bose-Einstein Statistics. His work laid the foundation for quantum statistics, Bose-Einstein Condensate, and the very concept of boson. Many scientists were awarded the Nobel Prize for doing further research on his line, though he himself got neither the award, nor international reputation commensurate with his achievements during his lifetime.