

Higgs field

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What Exactly is the Higgs Mechanism

- Physicists at the time were trying to understand why some particles had more mass than others (to sum the problem another way: We don't understand why certain particles have mass; it's believed that all force carrying particles should NOT have mass. To the contrary, we've learned that particles that carry weak force do have mass). We needed to know what the driving force was behind this mechanism.
- This is where the physicist: Peter Higgs stepped in.
- He was able to come up with a theory which suggested that there was an energy field that all particles in the Universe interacted with. The more massive the particle, the more it interacted with this field. Conversely, the less massive particles interacted with this field less.

What is the Higgs Boson

- The Higgs boson is the carrier of the Higgs Field, just as the photon is responsible for Electromagnetic Field, the W and Z bosons are responsible for the Weak Nuclear Force, and the Gluon is responsible for the Strong Nuclear Force. Using the same analogy as above the Higgs Boson can be represented as the water molecules that make up the ocean.
- Since the Higgs boson quickly decays into other more stable particles, it's far more difficult to observe than other subatomic particles created in particle accelerator collisions. In these particle accelerators, scientists attempt to mimic the conditions similar to that of the big bang (when this Higgs boson is created). It's believe to exist only for a septillionth of a second, making the work of sorting through the data collected from trillions of collisions in order to find the Higgs a tedious process.
- However, in the middle of 2013, CERN announced that the boson discovered through particle collisions at the Large Hadron collider in Geneva is the long sought after Higgs Boson particle.
- Why should you care about any of this? Because the Higgs boson particle is part of the reason why you exist. In fact, the Higgs boson is basically responsible for all of our physical reality. If particles didn't have mass, they would zip around the universe at speeds similar to the speed of light, which wouldn't allow the particles to coalesce into atoms, which in turn, form matter.

An elusive particle

- A problem for many years has been that no experiment has observed the Higgs boson to confirm the theory.
- On the 4th of July 2012, the ATLAS and CMS experiments at CERN's Large Hadron Collider announced they had each observed a new particle in the mass region around 125 GeV.
- GeV is an electronvolt which is a unit of energy.
- This particle is consistent with the Higgs boson, but it will take further work to determine whether or not it is the Higgs boson predicted by the Standard Model.