

The Higgs particle

What is the Higgs particle?

It is the heaviest of the elementary particles which include electrons and quarks (quarks make up protons and neutrons). The Higgs particle is more accurately called the Higgs Boson. Bosons are the particles that underlie all forces, eg electromagnetism.

Why is it so important?

One of the fundamental questions in physics is how things get their mass. The Higgs particle is thought to be the particle responsible for the mechanism behind this. It could complete the picture of something called the Standard Model - the theory of elementary particles and how they interact. When (or if!) the Higgs particle is found though, other new particles may turn up too or the Higgs particle could turn out to be made of smaller pieces. The hunt would then be on to find the smaller pieces and it wouldn't be the end at all!

Have we found it yet?

No-one has found conclusive evidence of the Higgs particle. However, there have been some glimpses that it may be just over the horizon.

How are we trying to find it?

Particle physicists explore particles such as the Higgs particle by other colliding particles, such as electrons, travelling at almost the speed of light. One of the places where this will happen is the Large Hadron Collider. When it is finished in 2007, it will be the world's largest particle accelerator – a massive 27 km long circular particle racetrack. It lies near Geneva in Switzerland but also crosses into France! When the particles collide a huge amount of energy is generated and from this new particles are produced.

What does all this have to do with Einstein?

Particle accelerators give particles energy to make them go faster. However, even though the energy speeds up the particles, each extra bit of energy speeds the particle up less. It looks like energy is going missing. The 'missing' energy is actually turned into mass and makes the particle heavier. This effect was predicted by Einstein in his famous equation $E=mc^2$. This equation relates energy and mass. Finding the Higgs particle would be the last piece of the puzzle and explain what mass is.

Where can I get more information?

<http://www.phy.uct.ac.za/courses/phy400w/particle/higgs.htm>

<http://www.exploratorium.edu/origins/cern/ideas/higgs.html>