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Higgs Boson

http://www.gridpp.ac.uk/cubes/3.jpg

Higgs Boson: the 'God Particle'

By recreating the hot conditions fractions of a second after the Big Bang, scientists hope to see new physics, discover the "God particle", uncover new dimensions and even generate mini-black holes.

The Higgs boson explains why all other particles have mass and is fundamental to a complete understanding of matter.

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The Standard Model

The Higgs is nicknamed the God particle because of its importance to the Standard Model, the theory devised to explain how sub-atomic particles interact with each other.

The 16 particles that make up this model (12 matter particles and 4 force carrier particles) would have no mass if considered alone.

So another particle - the Higgs boson - is postulated to exist to account for this omission.

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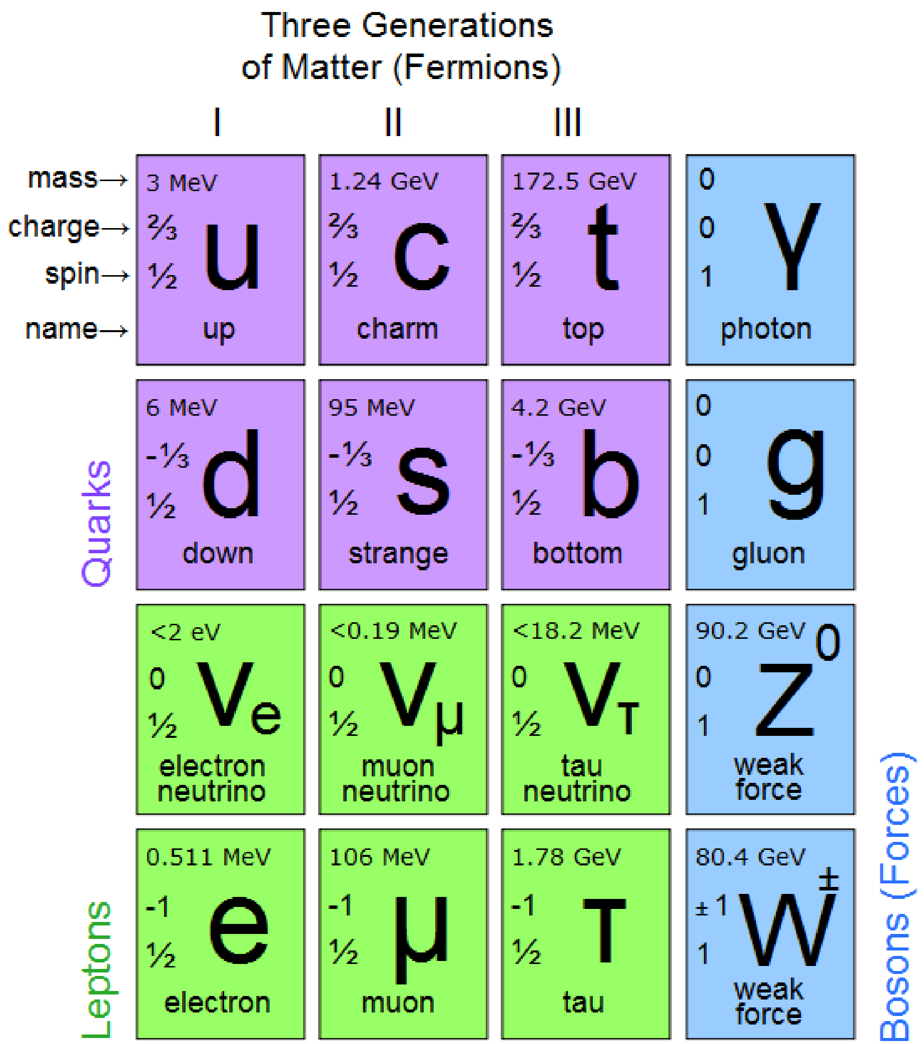

http://www.astroengine.com/wp-content/uploads/2008/08/standardmodel.png

What is the Higgs boson?

In quantum physics, there are basically six types of quarks, six types of leptons (all 12 are collectively known as “fermions”) and four bosons.

Quarks are the building blocks of all hadrons in the Universe (they are contained inside common hadrons like protons and neutrons)

The “glue” that holds hadrons together (thus bonding quarks together) is governed by the “strong force,” a powerful force which acts over very small distances (nucleon-scales).

The strong force is delivered by one of the four bosons called the “gluon”

When two quarks combine to form a hadron, the resulting particle is called a “meson”; when three combine, the resulting particle is called a “baryon.”

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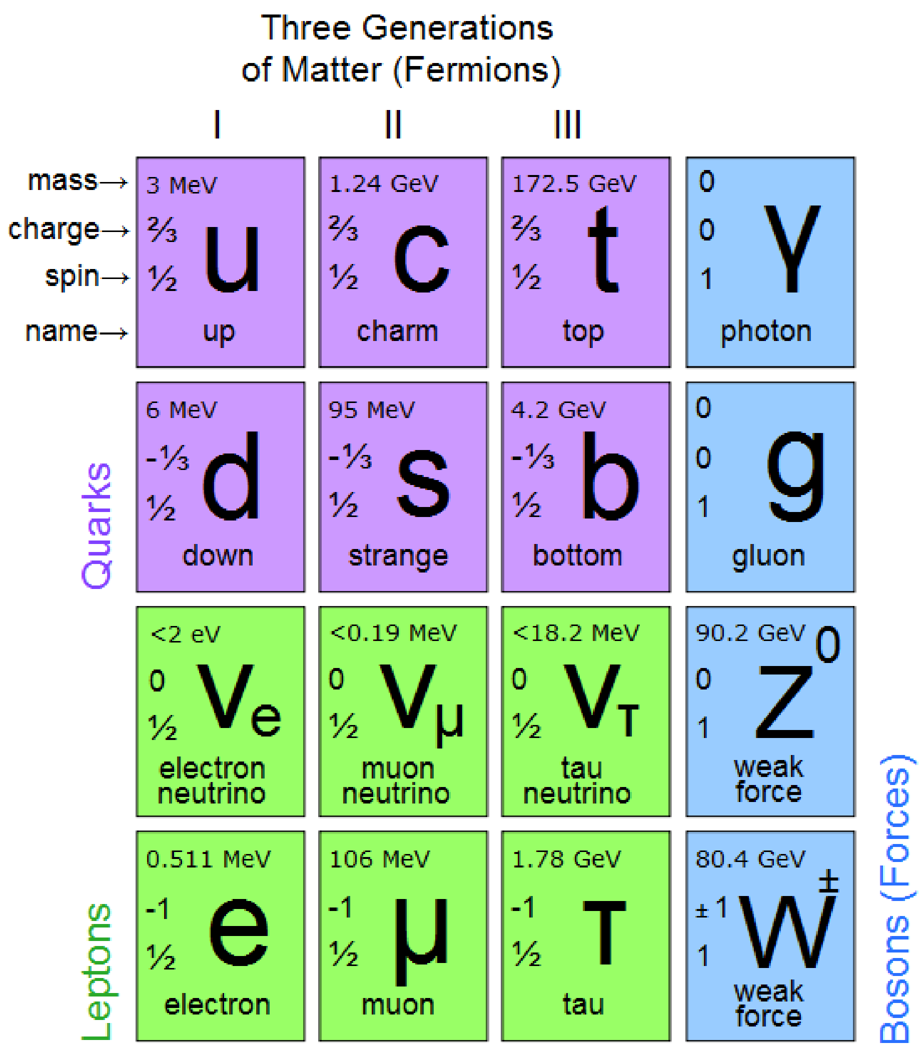

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What is the Higgs boson?

The Higgs Field

We need to find a way of describing how these Standard Model particles have (and indeed, have no) mass.

As a particle travels through the Higgs field (which can be thought of as a 3D lattice filling the Universe, from the vacuum of space to the centre of stars), it causes a distortion in the field.

As it moves, the particle will cause the Higgs field to cluster around the particle. The more clustering there is, the more mass the particle will accumulate.