Beyond Standard Models
Higgsless Models

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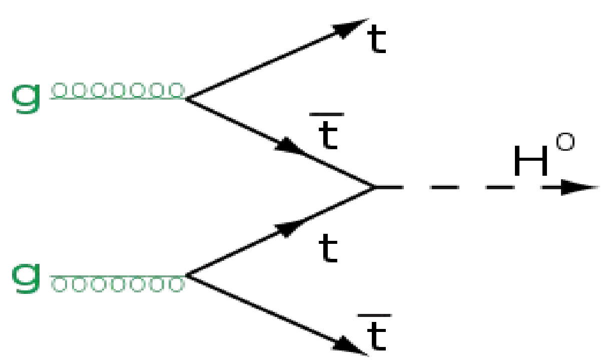
Standard Model

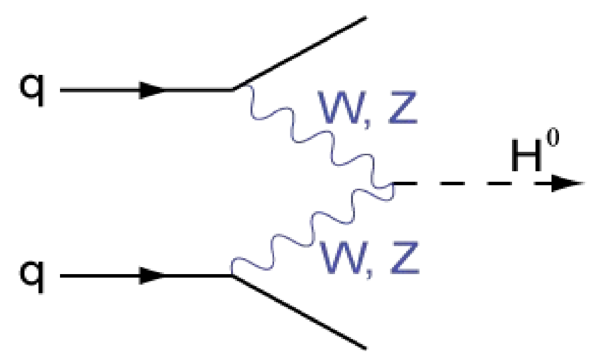
There are three basic forces in the Universe:

1. Electroweak force, including electromagnetic force,
2. Strong nuclear force,
3. Gravitational force.

The unification of these forces in the Standard Model requires that the force-carrying particles.

Physicists came up with a solution in 1963 that all particles had no mass just after the Big Bang. As the Universe cooled, an invisible force field called the "Higgs field" was formed together with the associated "Higgs boson". Any particles that interact with the Higgs field are given a mass via the Higgs boson. The more they interact with this medium, the larger their masses are, the more force is needed in order to accelerate them inside this medium and the particles that never interact are left with no mass at all.





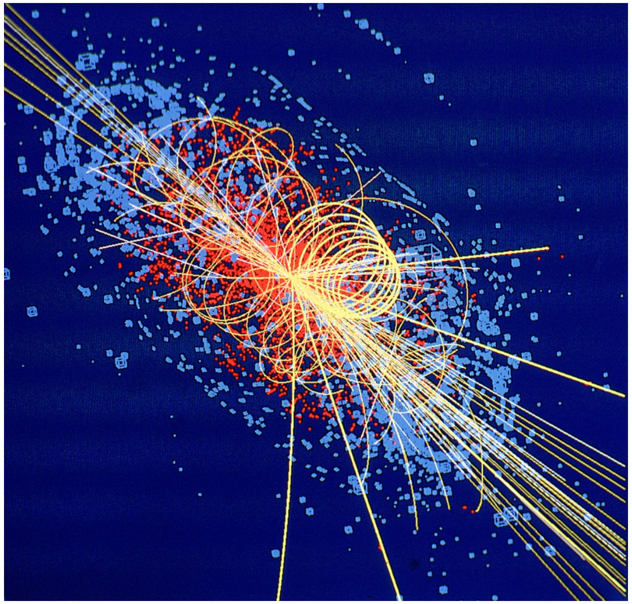
The Standard Model Problems

Mass remains a mystery in the Standard Model. It does not predict the value of the Higgs boson mass.

Although the mass of each successive particle follows certain patterns, predictions of the rest mass of most particles cannot be made precisely. The Higgs boson explains why particles show inertial mass (but does not explain rest mass) and the Higgs mechanism remains unproven.

The Model also has problems predicting the large scale structure of the universe. For instance, the Model generally predicts equal amounts of matter and antimatter in the universe, something that is observably not the case.

A simulation of a Higgs event -- these are the tracks that would be left in the detector by particles resulting from the decay of the Higgs particle.



The Standard Model Problems

The Standard Model can be valid at energy scales all the way up to the Planck scale (10^{16} TeV).

In theoretical physics, a ***hierarchy problem*** occurs when the fundamental parameters (couplings or masses) of some Lagrangian are vastly different (usually larger) than the parameters measured by experiment.

In particle physics the most important hierarchy problem is the question that ask the weak force is 10^{32} times stronger than gravity.

Many theorists expect new physics beyond the Standard Model to emerge at the TeV-scale, based on unsatisfactory properties of the Standard Model. The highest possible mass scale allowed for the Higgs boson (or some other electroweak symmetry breaking mechanism) is around one TeV; beyond this point, the Standard Model becomes inconsistent without such a mechanism because ***unitarity*** is violated in certain ***scattering processes***.

Standard Model Problem

Many models of ***Supersymmetry*** predict that the lightest Higgs boson (of several) will have a mass only slightly above the current experimental limits, at around 120 GeV or less.

Precision measurements of electroweak observables indicate that the Standard Model Higgs boson mass has an upper bound of ***144 GeV*** at the 95% confidence level as of March 2007.

Higgsless Models

- The Spacetime Model
- Technicolor Higgsless Models
- Extra-dimensional Higgsless Models
- Models of composite W and Z vector Bosons
- The top Quark condensate
- Unitary Weyl gauge
- Asymptotically safe weak interaction
- Regular Charge Monopole Theory
- Preon and models inspired by preons
- Symmetry breaking
- Theory of Superfluid vacuum masses

The Spacetime Model

In order to solve mass and gravitation enigma, it is necessary to redefine the concept of volume. As unexpected as it may sound, it is not the mass but a kind of volume called "closed volumes" in this document that makes the spacetime curvature. A volume introduced in this spacetime will naturally produce a convex curvature of it .

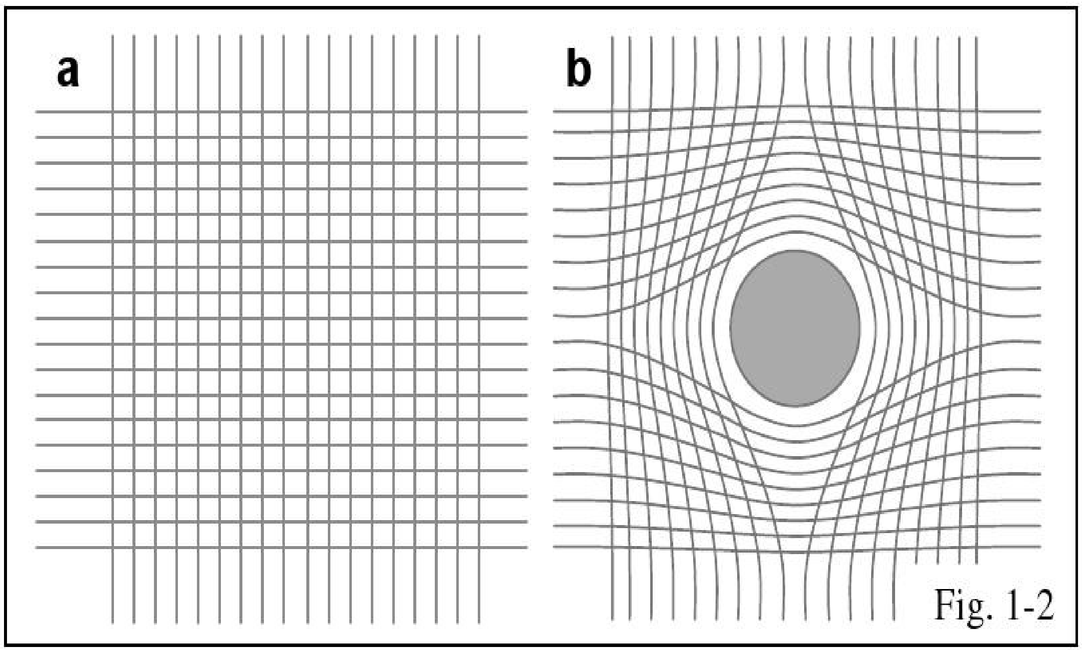


Fig. 1-2

The Spacetime Model

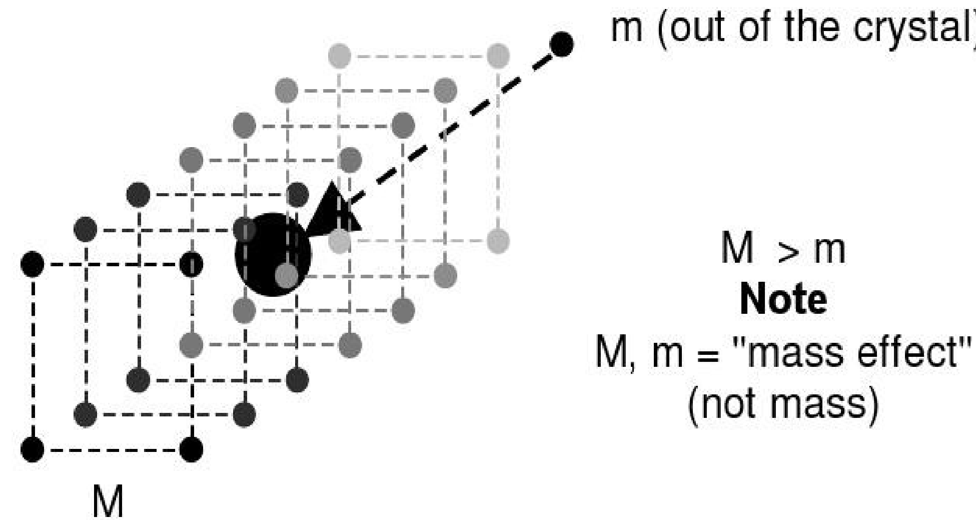
One of the Higgs Basis is: "Particles get mass when they move in the Higgs Field". Peter Higgs' idea is correct but, in reality, the Higgs Field is nothing but …spacetime. The following experimentation confirms this point of view:

Why does the mass of a particle moving inside a crystal increase ?

Closed volumes of each atom of the crystal (nucleons and electrons) curve the spacetime located inside the tunnel, on the path of the particle. Therefore, the density of spacetime will be higher inside the tunnel than outside the crystal.

The curvature of spacetime made by atoms is added to that made by the closed volume of the particle. Since "spacetime curvature ≡ mass effect", an increase of spacetime curvature will produce an increase of the mass effect.

The Higgs boson does not explain the increase of the relativistic particles but this theory does



Technicolor Model

Technicolor theories are models of physics beyond the standard model that address electroweak symmetry breaking, the mechanism through which elementary particles acquire masses. Early technicolor theories were modelled on quantum chromodynamics (QCD), the "color" theory of the strong nuclear force, which inspired their name.

Instead of introducing elementary Higgs bosons to explain observed phenomena, technicolor models hide electroweak symmetry and generate masses for the W and Z bosons through the dynamics of new gauge interactions. Although asymptotically free at very high energies, these interactions must become strong and confining (and hence unobservable) at lower energies that have been experimentally probed. This dynamical approach is natural and avoids the hierarchy problem of the Standard Model.

Preon Model

In particle physics, preons are postulated "point-like" particles, conceived to be subcomponents of quarks and leptons.

This model reduce the large number of particles, many that differ only in charge, to a smaller number of more fundamental particles.

It provide alternative explanations for the electro-weak symmetry breaking without invoking a Higgs field, which in turn possibly needs a supersymmetry to correct the theoretical problems involved with the Higgs field. Supersymmetry itself has theoretical problems.