The Standard Model

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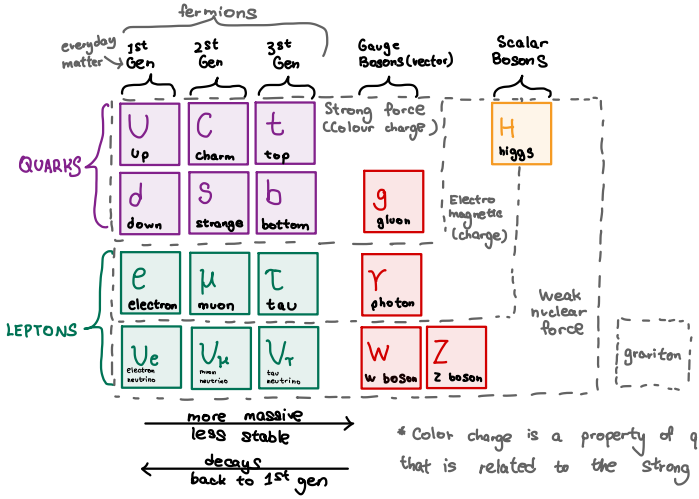
· Wiki: The Standard Model of particle physics is the theory describing 3 of the 4 known fundamental forces (gravity is not understood yet) in the universe, as well as classifying all known elementary/fundamental particles.

· To put it simply, the Standard Model shows the smallest "stuff" in the Universe.



* Color charge is a property of quarks and gluons that is related to the strong interaction.

Muons (200× mass of e)

· Muons can be created when cosmic rays strike gas atoms in Earth's atmosphere or in particle accelerators.

Taus (3500× mass of e)

· Tau-particles have a rest mass about 3500 times of an electron.

· They are only observed in particle accelerators.

· The existence of 3 generations are NOT KNOWN as of 2020.

· 2nd and 3rd generation particles are only produced in brief moments and are not seen in everyday life as they decay via the weak force (bosons: W^+, W^-, Z)

· ALL particles above have an antimatter version.

Gluons VS Pions for strong interaction

· The boson (exchange particle) for the strong force is both the gluon and the pion.

· Pions mediate interactions between nucleons (attracts protons together).

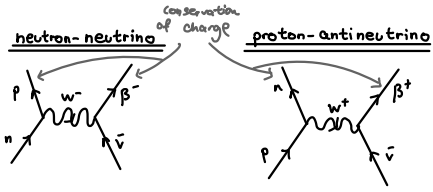
· On the other hand, gluons are responsible for holding quarks together to form hadrons.

· Gluons are fundamental bosons whereas pions are a type of meson which contains a quark and an anti-quark.

Neutrinos' Weak Force Interactions

· Trillions of neutrinos (mostly generated by Sun) fly through us every second.

· Neutrinos barely interact, but if they do, interact with baryons and decay similar to beta decay.



What is the Higg's boson?

· The Higgs boson is the particle associated with the Higgs field, an energy field that gives particles mass. (It gives things mass!!) Ex. Gauge bosons do not interact with Higgs hence do not have mass.