Panel of Higgs Particle desk at ATLAS tent, CERN OPEN DAYS (2013.9.28-29)

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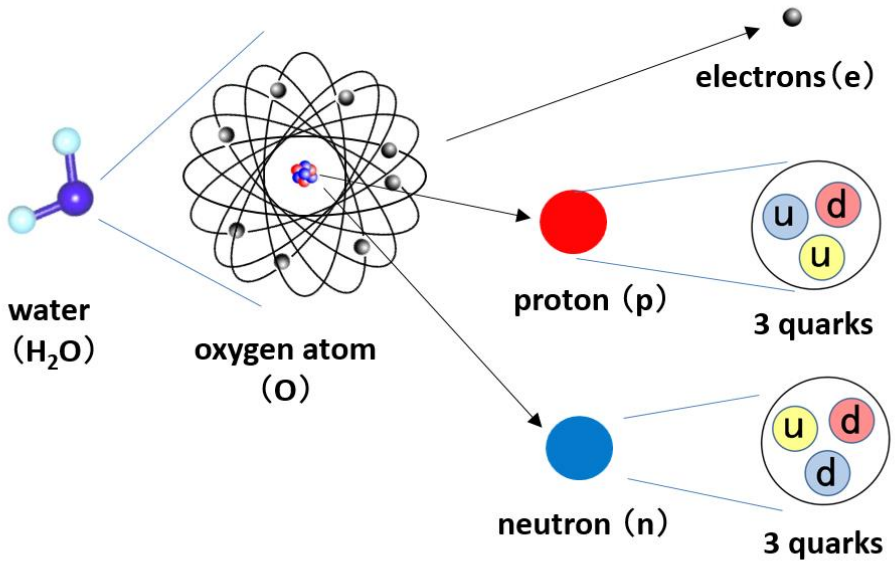
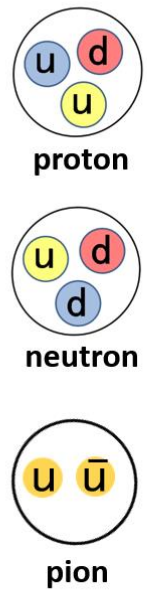
What the matters are made out of ?



Quarks are very strange !!

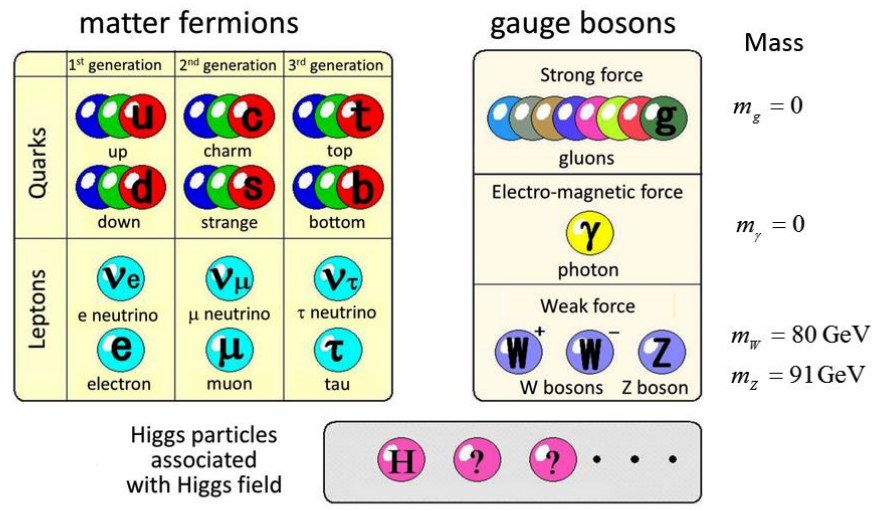


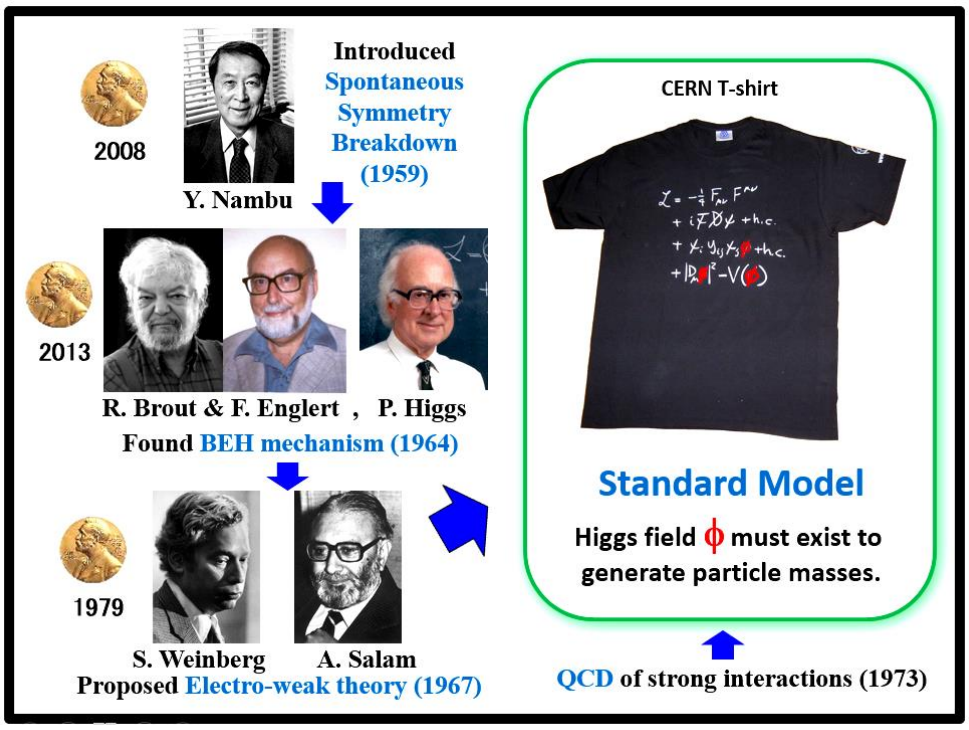
- Single quark never come out.
- They have fractional charges:
  - u up quarks $+\frac{2}{3}e$
  - d down quarks $-\frac{1}{3}e$
- Strong forces between quarks.

There are 4 forces in Nature

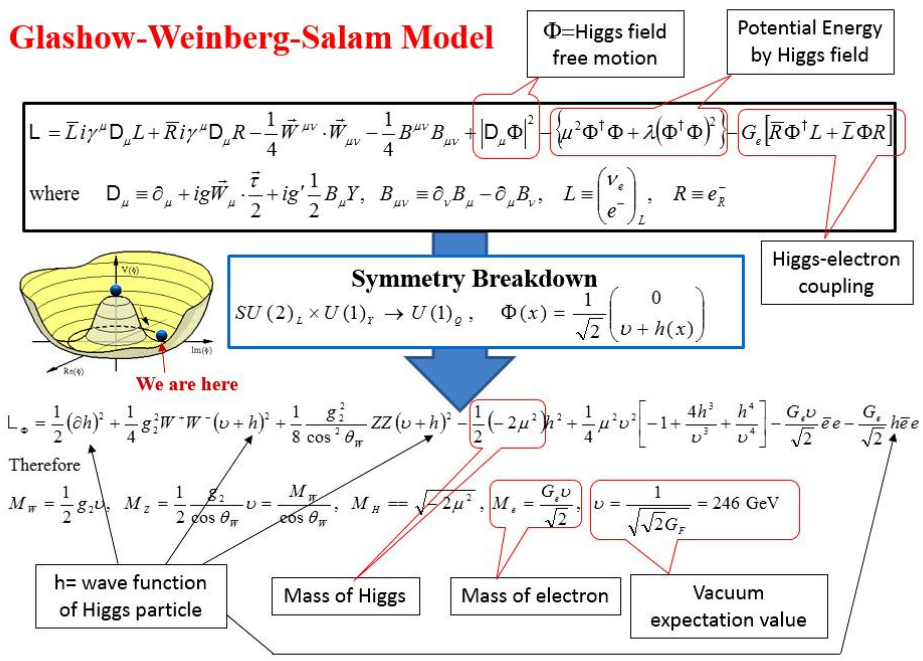
Strong	>	Electro-magnetic	>	Weak	>>>	Gravity
Bind quarks and making nucleus		Light, atom, crystal, radio, TV, phone, car, rain, thunder,.....		Sun/star energy, radio activities..		Falling apples, planet motions, satellite.....
These forces are carried by						
Gluons		Photons		W, Z bosons		Gravitons

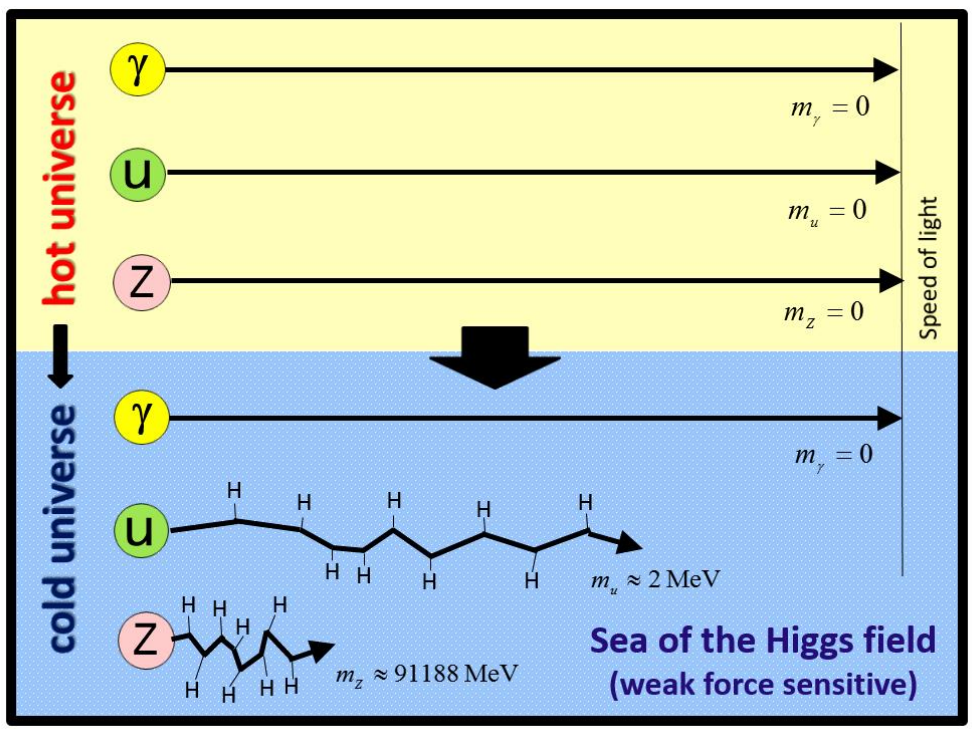
Elements of the Standard Model



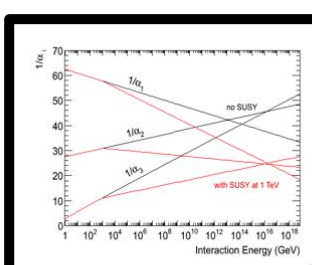


Glashow-Weinberg-Salam Model





SUSY particles may exist ?



SUSY = symmetry between Bosons and Fermions.
Spins of SUSY particles differ 1/2 from those of SM.

If SUSY particles exist at ~1 TeV, then

a. 3 forces can unify at high energy.

b. It avoids quantum divergence of Higgs particle mass.

c. Some SUSY particles can be dark matters.