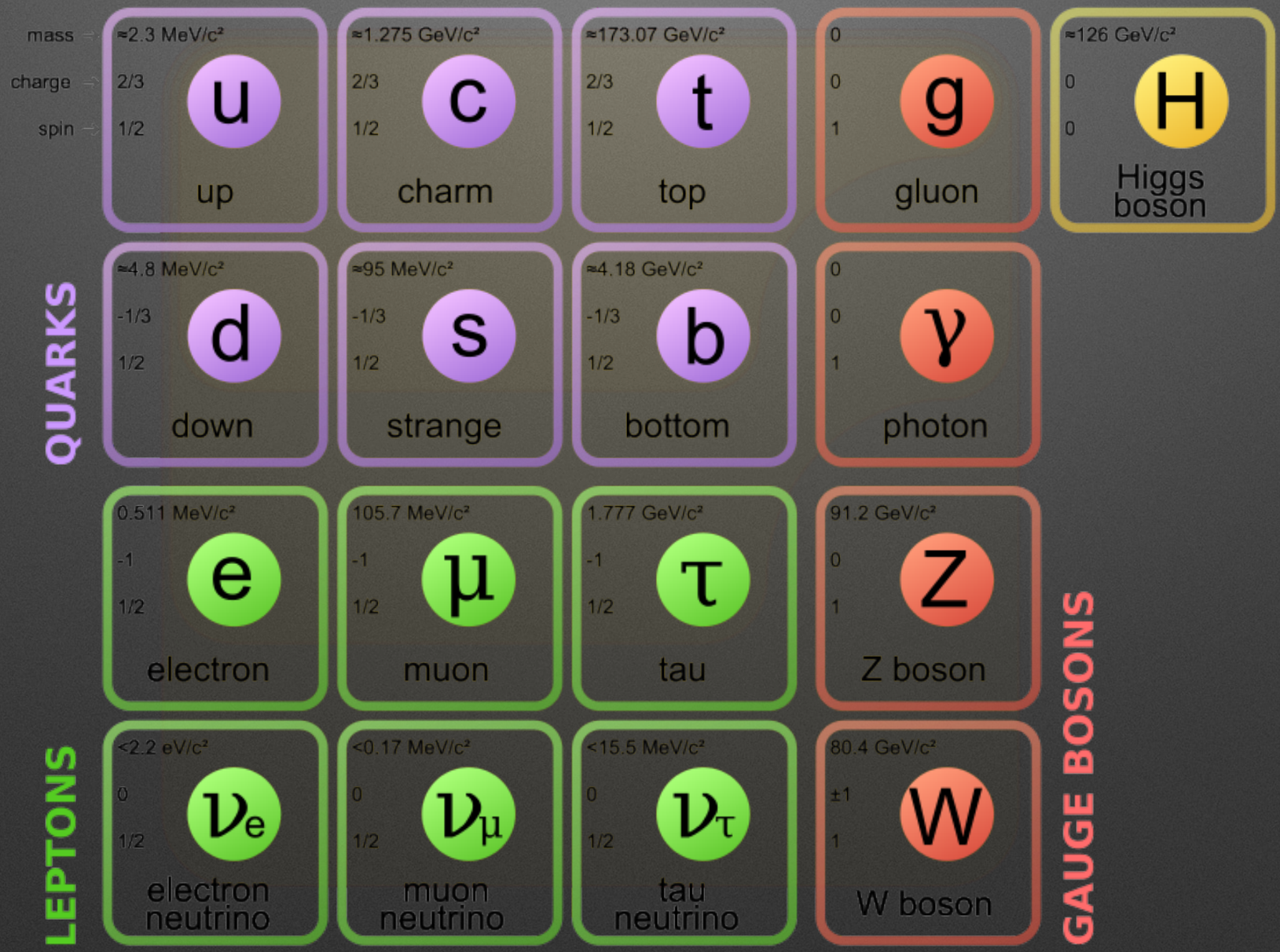
An Overview of the Standard Model



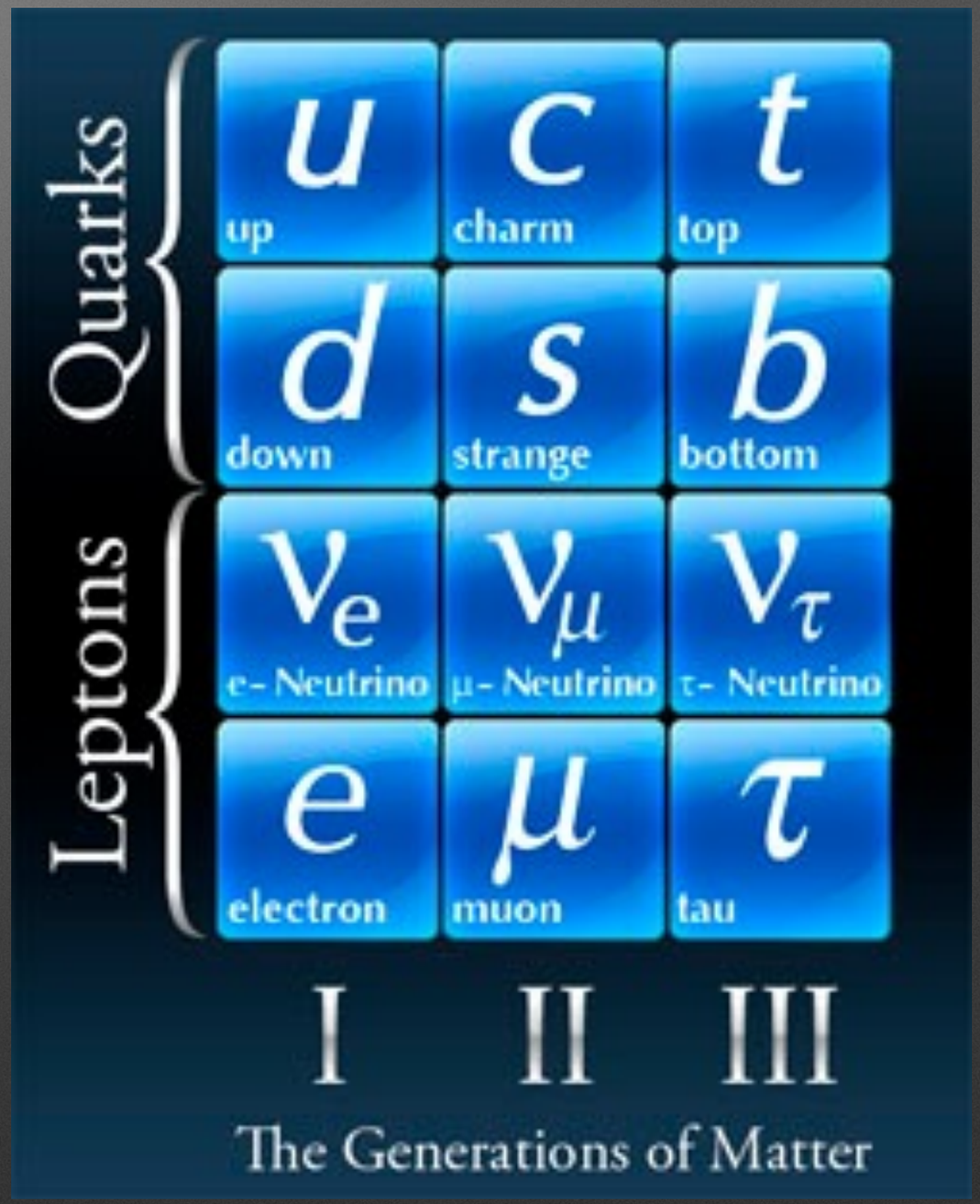
By Omar Amer

What is the Standard Model?

- Describes interactions of sub-atomic particles
- Mass, Charge, Spin
- As fundamental as is known
- Quarks, Leptons, Gauge Bosons
- Three Generations

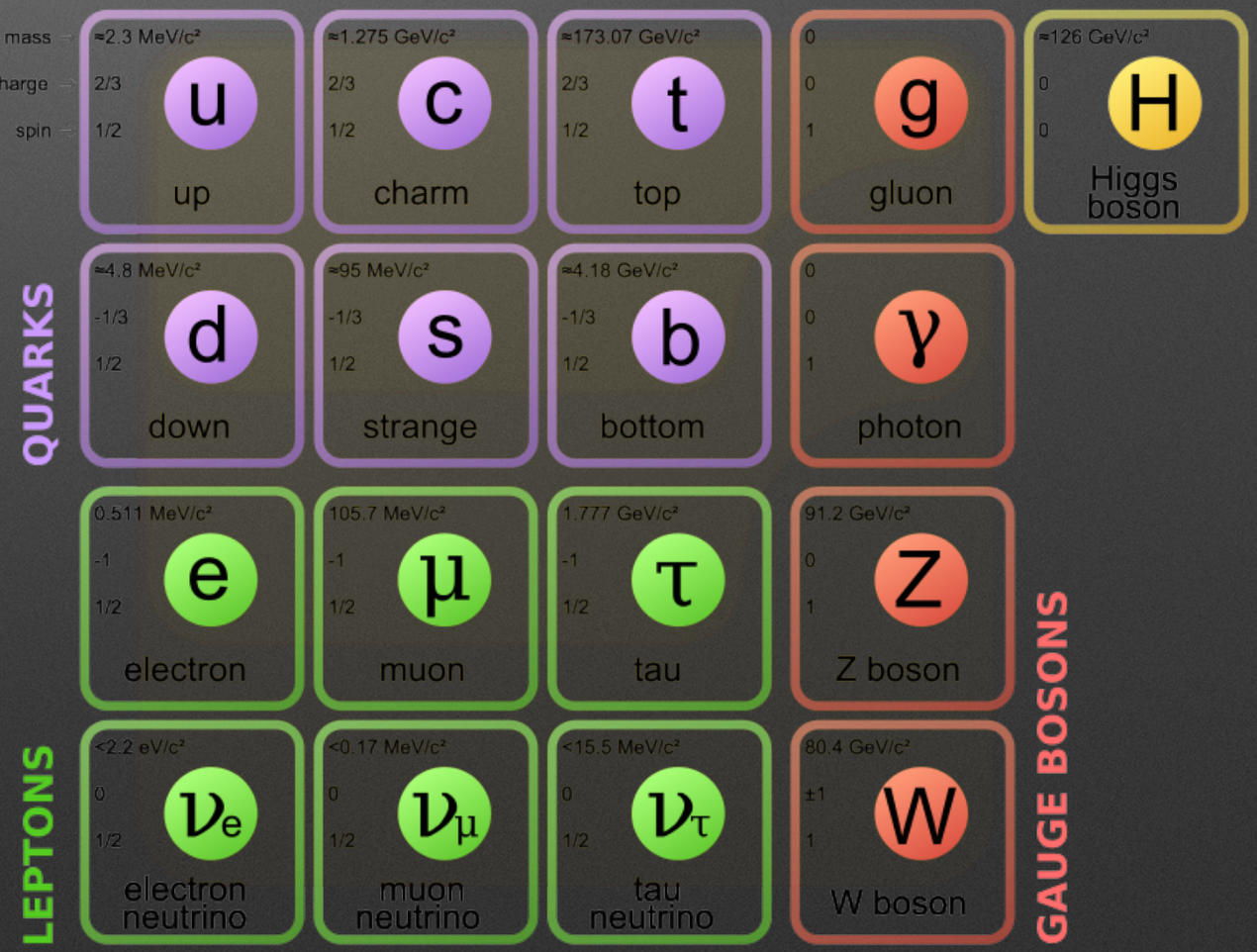
Generations of Matter

- Matter comes in 3 sets of 2
- Each set more massive
- Less massive is more stable
- Decay to smaller particles



Forces and Force Carriers

- Three (Four) Forces- 5 (known) Force Carriers
  - Electroweak-Photon, W± and Z bosons
  - Strong-Gluons
  - Gravity- Graviton



Electroweak Force

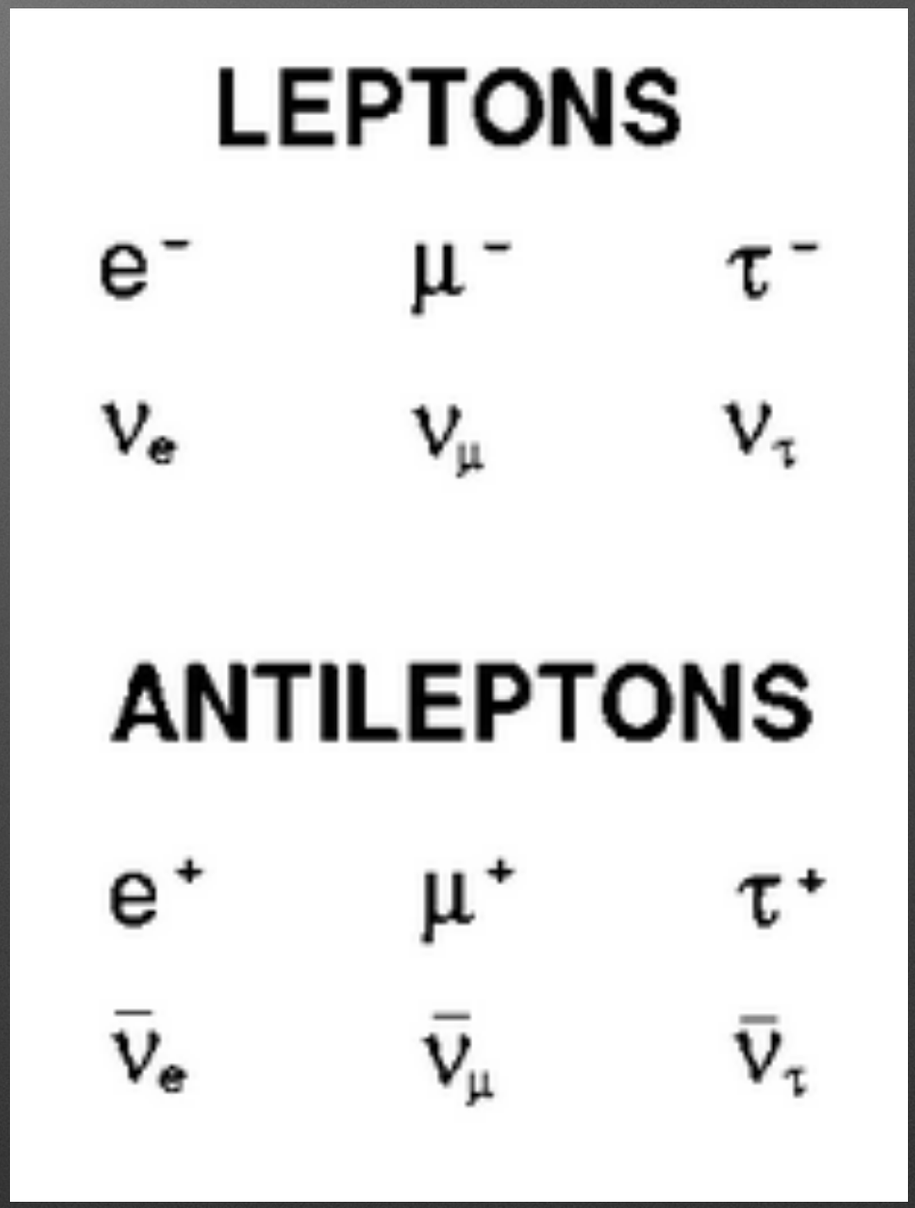
- Combination of electromagnetic and weak forces
  - Apparent at high energies
- Weak
  - Acts through release and absorption of W± and Z bosons
  - Only path for quarks to change "flavor"
  - Interacts with all half integer spin particles (Fermions)

Electroweak Part II

- Electromagnetic Force
  - Interacts through release and absorption of photons
- Charged particles interact

Leptons

- Come in two classes
  - Charged
  - Neutral (Neutrinos)
- Half Integer Spin
- Mass
- Lepton Number



Strong Force

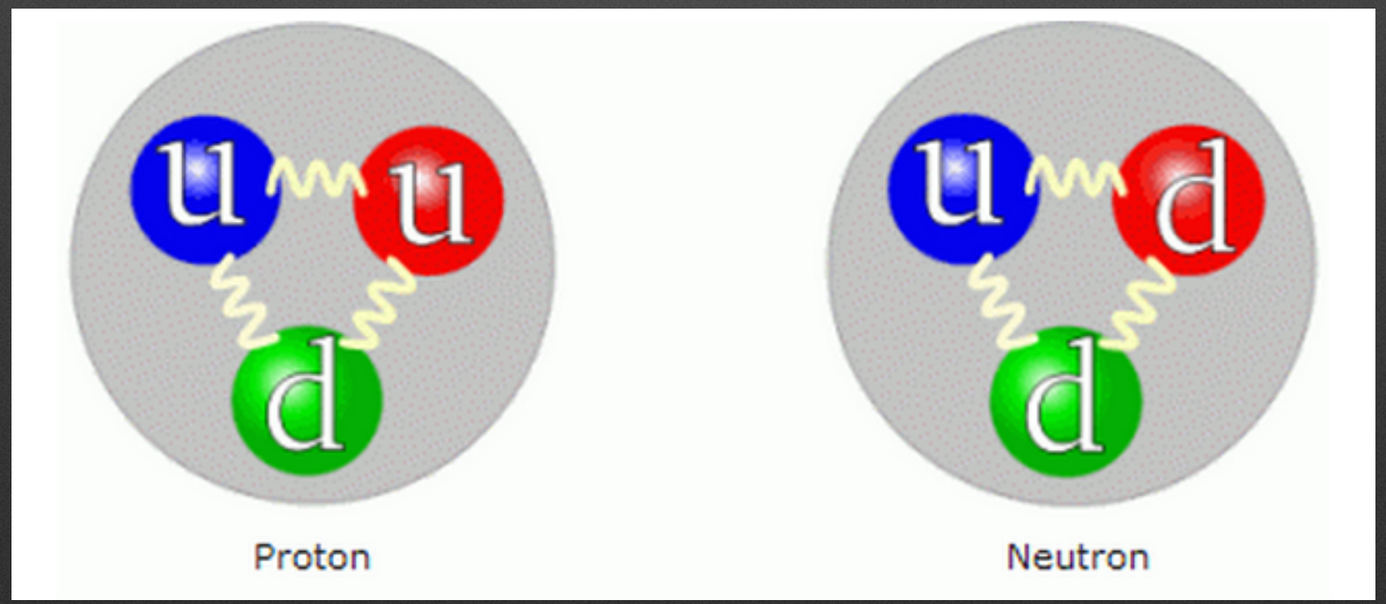
- Interacts through exchange of gluons
  - Gluons have both a color and an anticolor
- Interacts with colored particles only
- Binds quarks together
- Strongest force
  - Screened at distances

Quarks

- Make up hadronic matter
- Interact with the strong force through gluons
- "Flavors"
- Have color charge
- Electric charge in thirds
- Color confined

Color

- Quarks come in 6 different "colors"
  - Red Blue Green and Anti - Red, Blue and Green
- Multiquark states must neutralize color
- i.e Red + Blue + Green or Red + Anti-Red etc.



Questions?