❖ 2022F-PHYS_0175: Physics 2 (Electromagnetism)

Instructor : Jeungphill Hanne

<Education>

- **PhD, Physics**, University of California-Los Angeles, USA

→***Majoring in Experimental Biophysics*** *(Dr. Giovanni Zocchi)*

- **PhD Study, Physics**, University of Florida (UF), USA

→ Majoring in Theoretical Elementary Particle physics

- **MS, Physics**, University of California-Riverside, USA
- **BS, Physics**, Inha University, South Korea

<Professional Experiences>

- Jul. 2010~ Aug. 2019: **Postdoctoral Research Associate**,

The Ohio State University Wexner Medical Center, *(Adviser: Dr. Richard Fishel)*

→***Studying DNA Mismatch Repair by Experimental Biophysics***

- Sept. 2006~ Apr. 2010 : **Senior Research Scientist**, LG Display Co, Ltd., South Korea

→Optical Physics, Optical/Electrical Engineering

<Research Background & Direction>

- Biophysics, Biomedical Science, Bio/Biomedical Engineering, Optical/Electrical Engineering

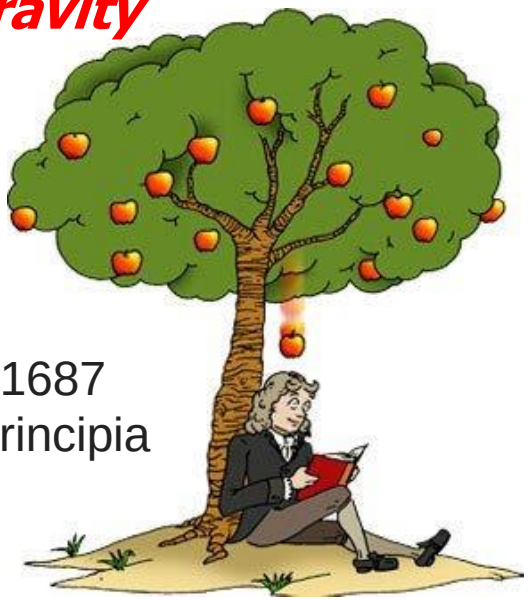
→ So, you can come to me anytime, and can ask any advice, or question for the future Career, and so on…., Very happy to share my experience, but the choice is yours !!

<Personal>

- Wife and a twins (Boy and Girl) ***(the 3rd grade in the middle school at the QSI international school of Chengdu)***

❖ "Physics Showtime" : ~1850? →~1995?, ~150 years

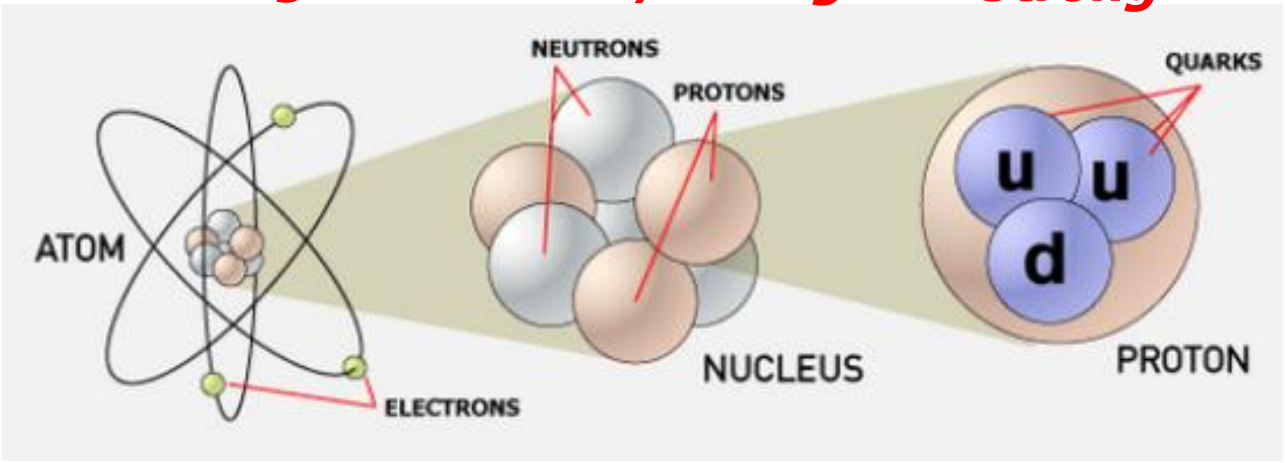
Gravity



1687
Principia

Isaac Newton

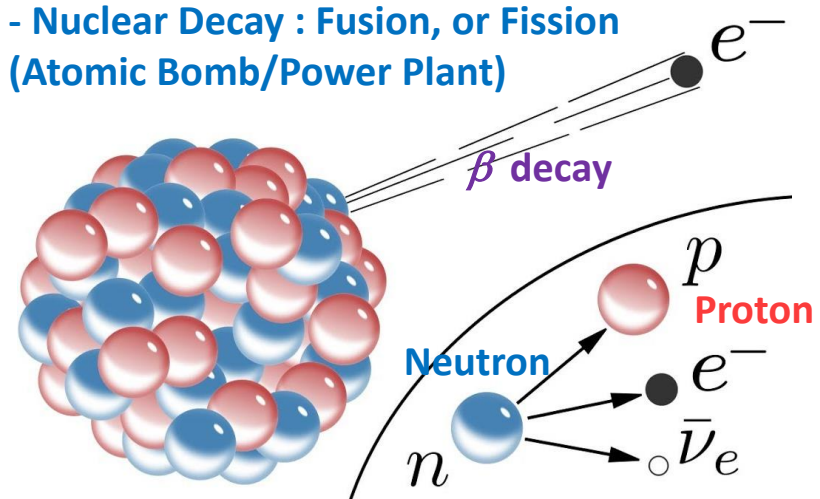
Electromagnetic ***Weak/Strong*** ***Strong***



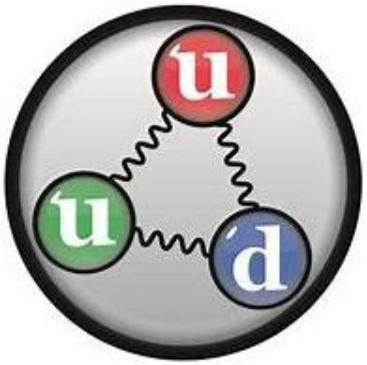
Strong (~Form the Nucleus glued between protons and neutrons)

Weak (Nuclear Decay process)

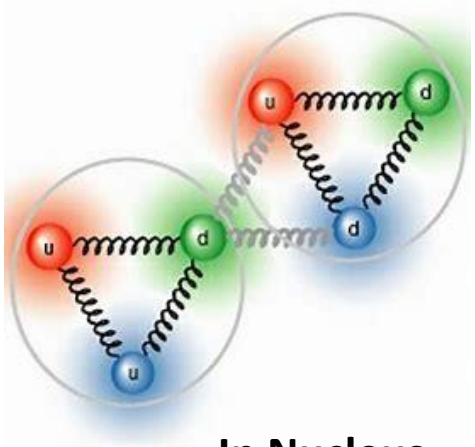
- Nuclear Decay : Fusion, or Fission (Atomic Bomb/Power Plant)



Quark-Quark interaction



In Proton, or Neutron



In Nucleus

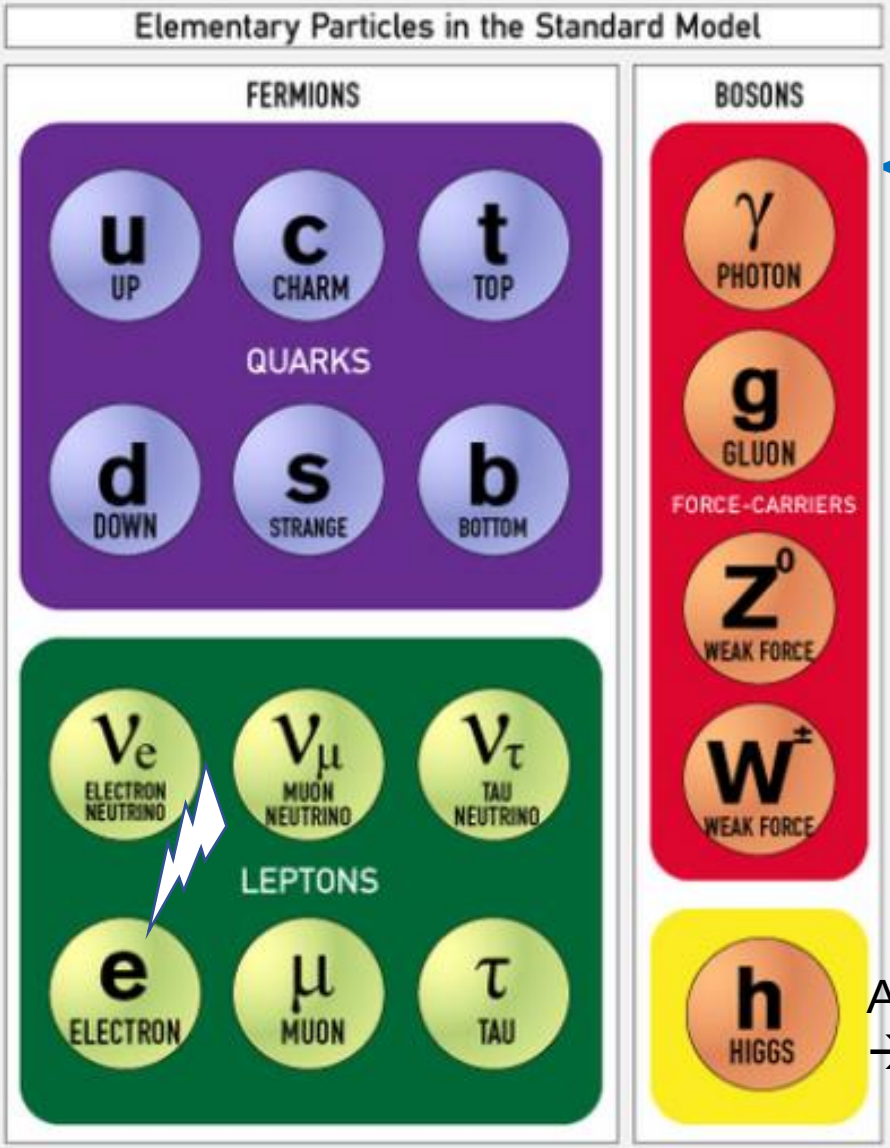
- "Elementary Particle in Nature" : no more break-down

Three categories of particles form the Standard Model. **Matter** is composed of quarks and leptons. The **fundamental bosons** provide three forces: electro-magnetism, the strong nuclear force and the weak nuclear force. **Gravity**, the fourth fundamental force, is not explained by the Standard Model.

The **Higgs boson**, discovered in 2012, provides an explanation for how the other particles get **mass**.

Currently, the Standard Model is incomplete and does not explain many important features of the known universe, such as:

- **gravity**
- **dark matter** (27 percent of the universe)
- **dark energy** (68 percent of the universe)



<Basic Properties>

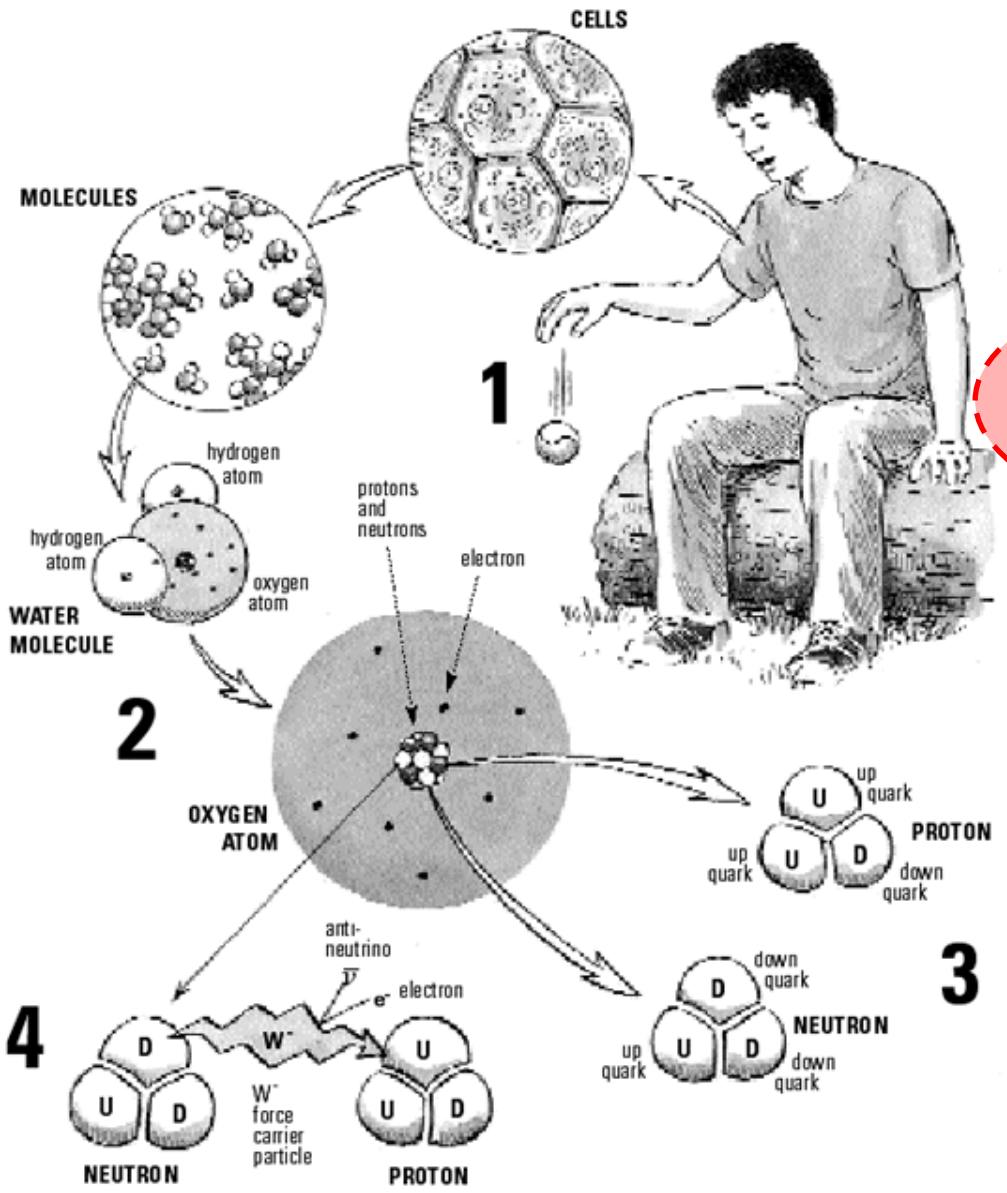
- ✓ **Mass**
- ✓ **Charge**
- ✓ **Spin** ~(Angular Momentum)
- ✓ **Parity**

All new elementary particles → Nobel Prize!!

HIGGS: 2015 Nobel Prize!!

"Standard Model"

- Four fundamental forces in Nature



1. Gravitational Force

Mass ←→ Mass

2. Electrical Force

Charge (+/-) ←→ Charge (+/-)

3. Weak Force

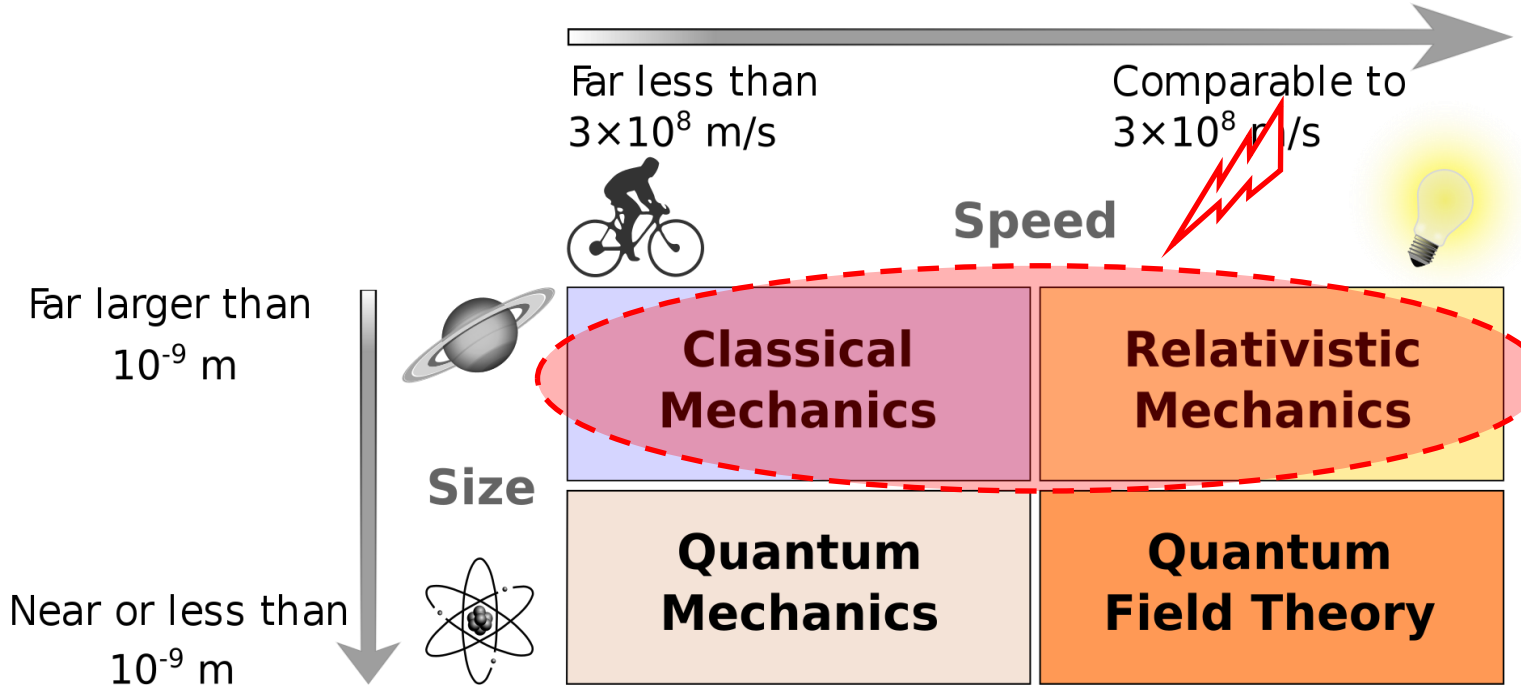
~ Nuclear decay

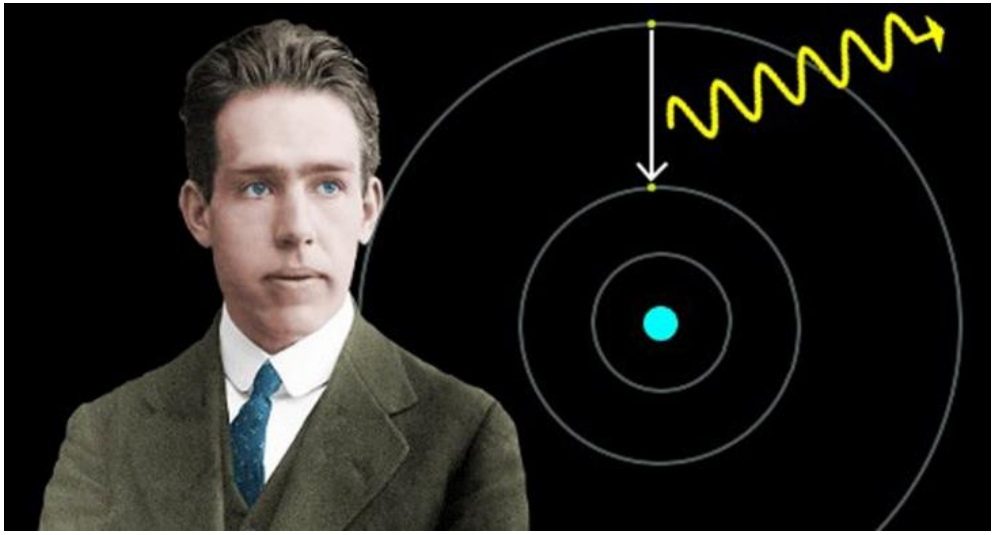
Nuclear → New Nucleus

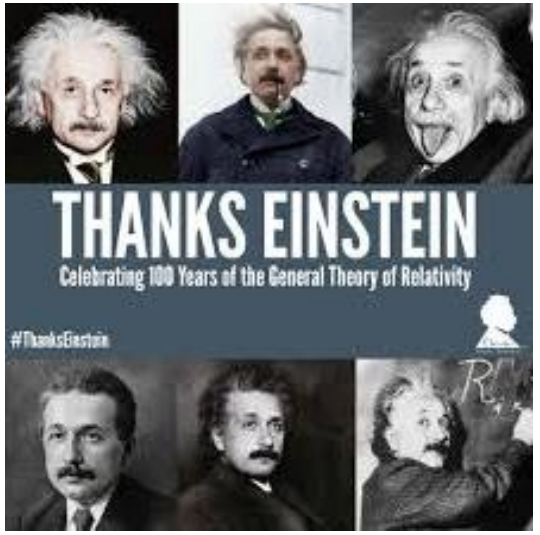
4. Strong Force

Quark ←→ Quark

- "Basic Physics Theory"







❖ So, What is Electromagnetism ?

→ “Physics” of the **Electric**ally **Charge**d particles/objects influenced by **Electric Forces**

- **Electric Charge** : one of the basic properties of the **elementary particle** in Nature
- **Electric Force** : one of the **Four Fundamental forces** in Nature
  → **Force between Charges**

For your reference,

❖ Basics of Physics so far,

- Four Fundamental forces in Nature
- Elementary Particles in Nature containing basic properties (i.e. mass, charge, spin, and parity)
- Self-complete, but Not a unified theory(?)