❖ 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 !!

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❖ Agenda for today

1. SCUPI 2021 Fall Academic Calendar

- Academic Calendar : Midterms & Final etc.
- My Schedule : Office hours etc.

2. Course Introduction

- Course information
  - Subject, Text book, Lecture Hour, Office hour, Course website, etc.
- Course Objective & Scope, Course Learning Key Points
- Course Grading & Tentative Course Schedule

3. Call class rolls

4. Brief Introduction of Physics 2

- What is physics and Why need Physics
- Scope of Physics & What is Electromagnetism

1. SCUPI 2022 Fall Academic Calendar

- **Academic Calendar : Midterms & Final etc.**

SCUPI Academic Calendar for 2022-2023 Fall

	Aug.	Sep.				Oct.				Nov.					Dec.				Jan.					Feb.		
Monday	29	5	12	19	26	3	10	17	24	31	7	14	21	28	5	12	19	26	2	9	16	23	30	6	13	20
Tuesday	30	6	13	20	27	4	11	18	25	1	8	15	22	29	6	13	20	27	3	10	17	24	31	7	11	18
Wednesday	31	7	14	21	28	5	12	19	26	2	9	16	23	30	7	14	21	28	4	11	18	25	1	8	12	19
Thursday	1	8	15	22	29	6	13	20	27	3	10	17	24	1	8	15	22	29	5	12	19	26	2	9	13	20
Friday	2	9	16	23	30	7	14	21	28	4	11	18	25	2	9	16	23	30	6	13	20	27	3	10	14	21
Saturday	3	10	17	24	1	8	15	22	29	5	12	19	26	3	10	17	24	31	7	14	21	28	4	11	15	22
Sunday	4	11	18	25	2	9	16	23	30	6	13	20	27	4	11	18	25	1	8	15	22	29	5	12	16	23
SCU Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
SCU Term	2022 Fall Teaching Weeks																		Final Weeks		Winter Recess					

1st Midterm

2nd Midterm

Final

This schedule is preliminary!!

1. SCUPI 2022 Fall Academic Calendar

- **My Schedule : Office hours etc.**

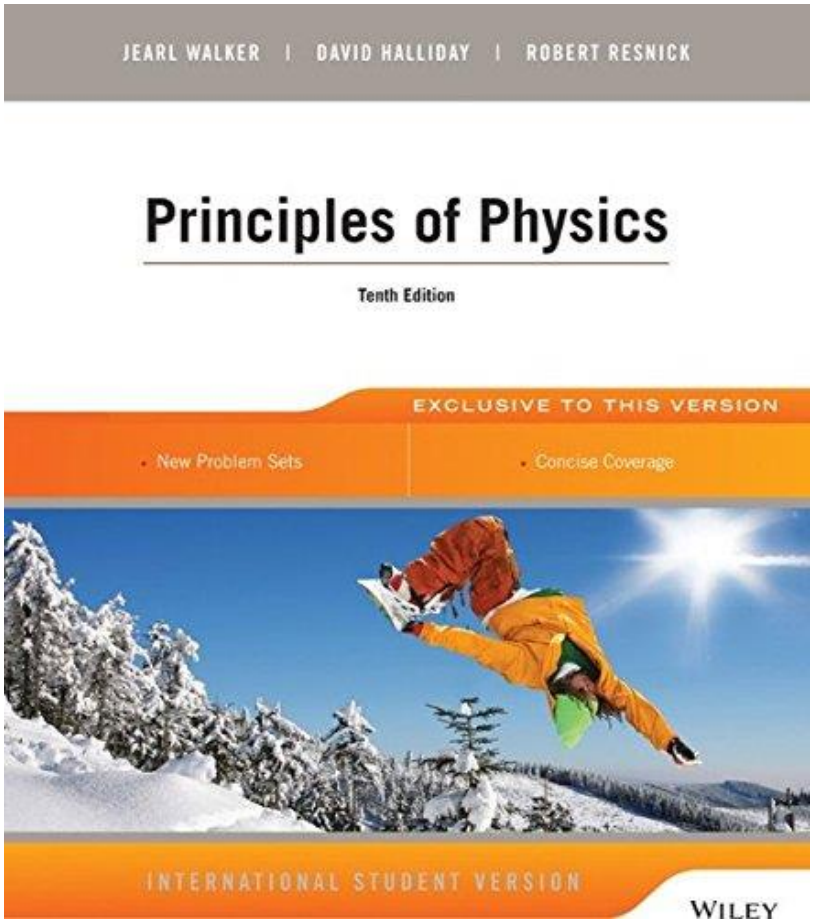
2022-2023 Fall Semester Course Schedule					
Class time	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
08:15-09:00					
09:10-09:55					
10:15-11:00				Physics 2 03 3-101	
11:10-11:55				Physics 2 03 3-101	
Lunch Break					
13:50-14:35	Electric Circuit 01 3-106	Electric Circuit 01 3-106	Office Hour Physics 2 02	Office Hour Physics 2 03	
14:45-15:30	Electric Circuit 01 3-106	Electric Circuit 01 3-106	Office Hour Electric Circuit 01		
15:40-16:25	Electric Circuit 01 3-106	Electric Circuit 01 3-106	Office Hour Electric Circuit 02		
16:45-17:30	Physics 2 02 3-101	Physics 2 03 3-101	Physics 2 02 3-101		
17:40-18:25	Physics 2 02 3-101	Physics 2 03 3-101	Physics 2 02 3-101		

*But, you can come to my office anytime when I am in my office ^^*

2. Course Introduction

• Course information

- **Physics for Science and Engineering 2**
  - Learn the basics of General Physics 2
    → **Electromagnetism**
    : Fundamental to Engineering Research
- **Text Book**
  - Principle of Physics by David Halliday , Robert Resnick & Jearl Walker, 10th edition.:ISBN-13: 978-1118230749s
- **Lecture**
  - Instructor : Jeungphill Hanne, PhD
    jeungphill.hanne@scupi.cn
  - Time : Refer to my Schedule
  - Office Hour:Wed.(13:50-14:35) /Thr.(13:50-14:35)
  - Office : 3-321A @ Zone 3
- **TA :** Hao, Allen, and Shawn
  - Office Hrs : To be announced.
- **Course Format**
  - Lecture, and Active Participation (i.e. Quiz* Group ***Presentation***, etc.)
- **Course Grading**
  - Two Midterms, Final, Homework, Quiz, and Attitude (ex. Attendance, Focus, Engagement, Punctuality for HW, etc.)



2. Course Introduction

• Course Scope & Objective

- Objective : Understanding the basics of “Electromagnetism”, Learning new Physical, or mathematical properties/theorem and eventually to be summarized to Maxwell’s eq.

- Scope : Electromagnetism(Electricity, Electrical Circuit, Magneticity, Induction, Electromagnetic Wave, Light, Geometrical/Wave Optics, etc.) →Connect to Maxwell’s equations

→ Required : **Some mathematical Background ! (Vector Calculus, 3D Integral, Diff. equ.)**

All concepts/Theories will be summarized to Maxwell’s Equation !

• Course Grading

- Grading Components : HW(15%), Quiz & Group presentation (5%), Midterm I (25%), Midterm II (25%), Final (24%) and Attitude(5% : Attendance, Focus, Engagement, Punctuality for HW, etc.)+maybe Plus alpha

→ < 60% attendance (might be failed for the course!)

Can be Flexible! *Tests are not accumulative!*

• Tentative Course Schedule

Week	ENGR_0031(Electric Circuits)	Topics	Assignment
Week 1 (8/29-9/4)	Break		
Week 2 (9/5-9/11)	Introduction & Chap 21	**Syllabus & Coulomb's Law**	HW1
Week 3 (9/12-9/18)	Chap22	**Electric Fields**	HW2
Week 4 (9/19-9/25)	Chap23	**Gauss' Law**	
Week 5 (9/26-10/02)	Chap 23 & Chap 24		HW3
Week 6 (10/03-10/09)	Chap 24 & Review	**Electric Potential**	HW4
Week 7 (10/10-10/16)	Chap 25 & **Mid Term 1**		
Week 8 (10/17-10/23)	Chap 25	**Capacitance**	HW5
Week 9 (10/24-10/30)	Chap 26	**Current & Resistance**	
Week 10 (10/31-11/06)	Chap 26 &Chap27		HW6
Week 11 (11/7-11/13)	Chap 27 & Chap 28	**Circuits**	HW7
Week 12 (11/14-11/20)	Chap 28	**Magnetic Fields**	
Week 13 (11/21-11/27)	Review, Chap 29 & **Mid Term 2**		
Week 14 (11/28-12/04)	Chap 29	**Magnetic Fields due to Currents**	HW8
Week 15 (12/05-12/11)	Chap 30	**Induction & Inductance**	HW9
Week 16 (12/12-12/18)	Chap 31	**Maxwell's Equation, Magnetism**	HW10
Week 17 (12/19-12/25)	Chap 32		HW10
Week 18 (12/26-1/1)	Chap33 & Review	**Electromagnetic Waves**	HW11
Week 19 (1/2-1/8)	**Final**		
Week 20 (1/9-1/15)	**Final**		

3. Brief Introduction of Physics2

- **Scope of Physics & What is Electromagnetism?**
  - Elementary Particle in Nature and its basic property
  - Four Fundamental forces in Nature
  - Physics Theory (Classical, Modern)

- What is Classical Mechanics for Gravity ?

→ "Physics" ('Motion') of the **Massive** particles/objects

→ Followed by **Newtonian Laws**

→ Influenced by **Gravitational Force**

What is "mass"(property), "Newtonian"(Law) and "Gravitational"(Force) ?

- What is Classical Mechanics for **Electromagnetism?**

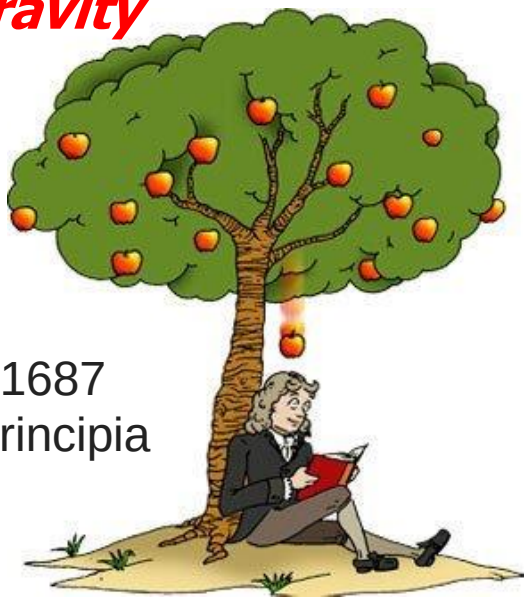
→ "Physics" ('Motion') of the **???** particles/objects

→ Followed by **???**

→ Influenced by **???**

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

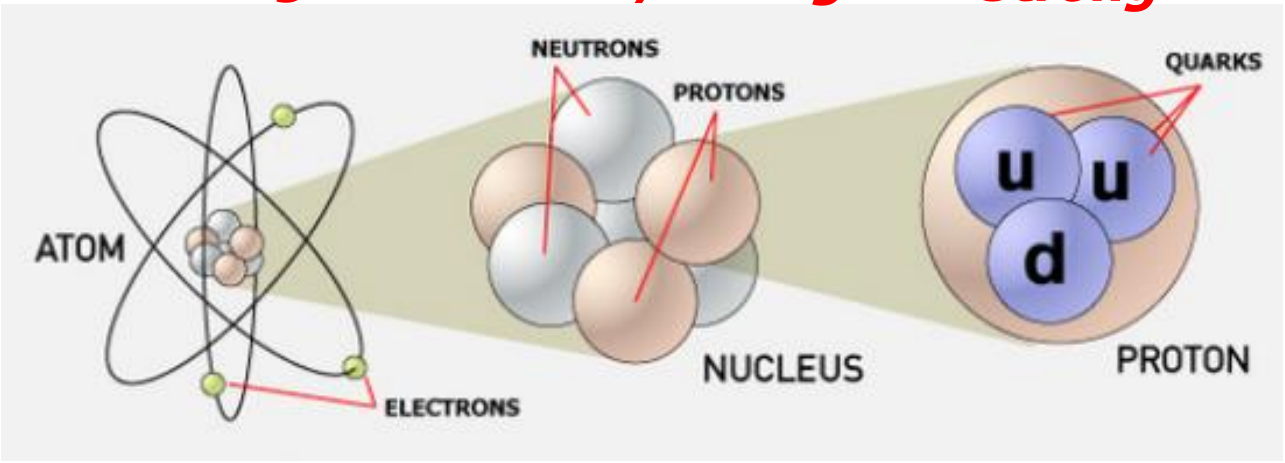
Gravity



1687
Principia

Isaac Newton

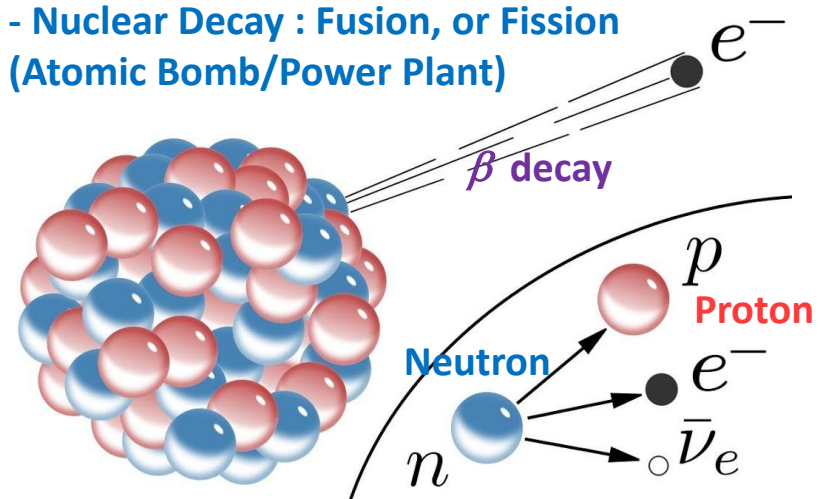
Electromagnetic ***Weak/Strong*** ***Strong***



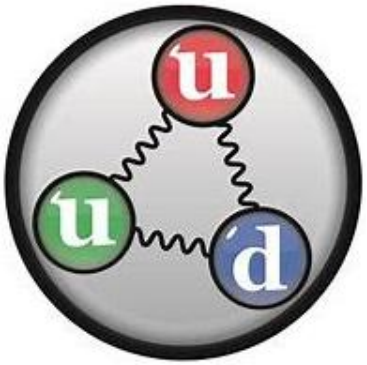
Strong (~Form the Nucleus glued between protons and neutrons)

Weak (Nuclear Decay process)

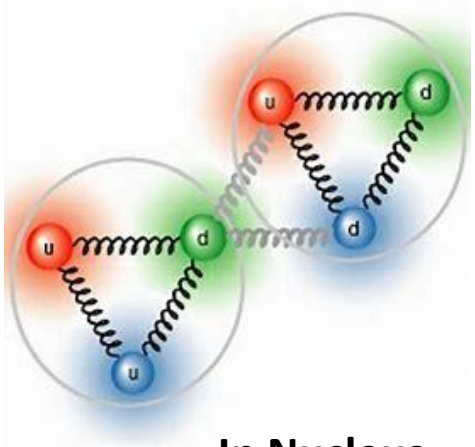
- Nuclear Decay : Fusion, or Fission (Atomic Bomb/Power Plant)



Quark-Quark interaction



In Proton, or Neutron



In Nucleus

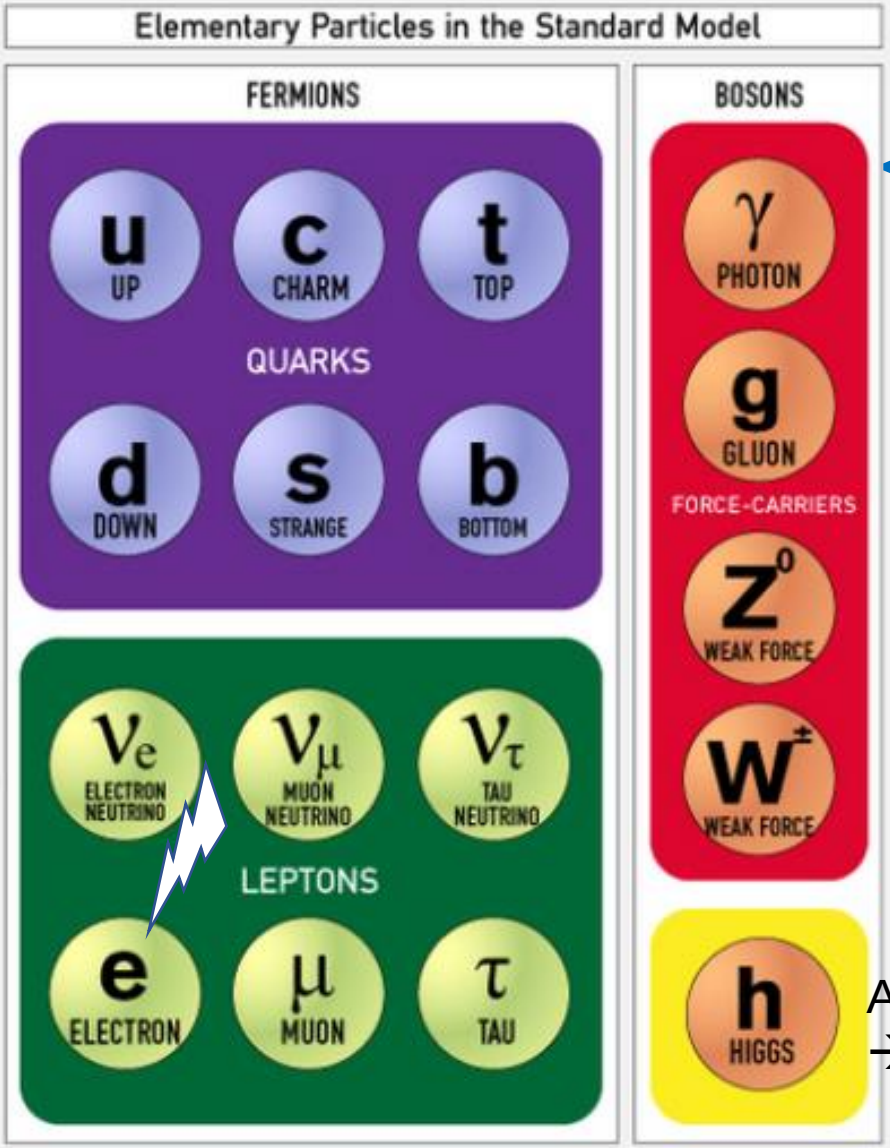
- "Elementary Particle in Nature" : no more break-down

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>

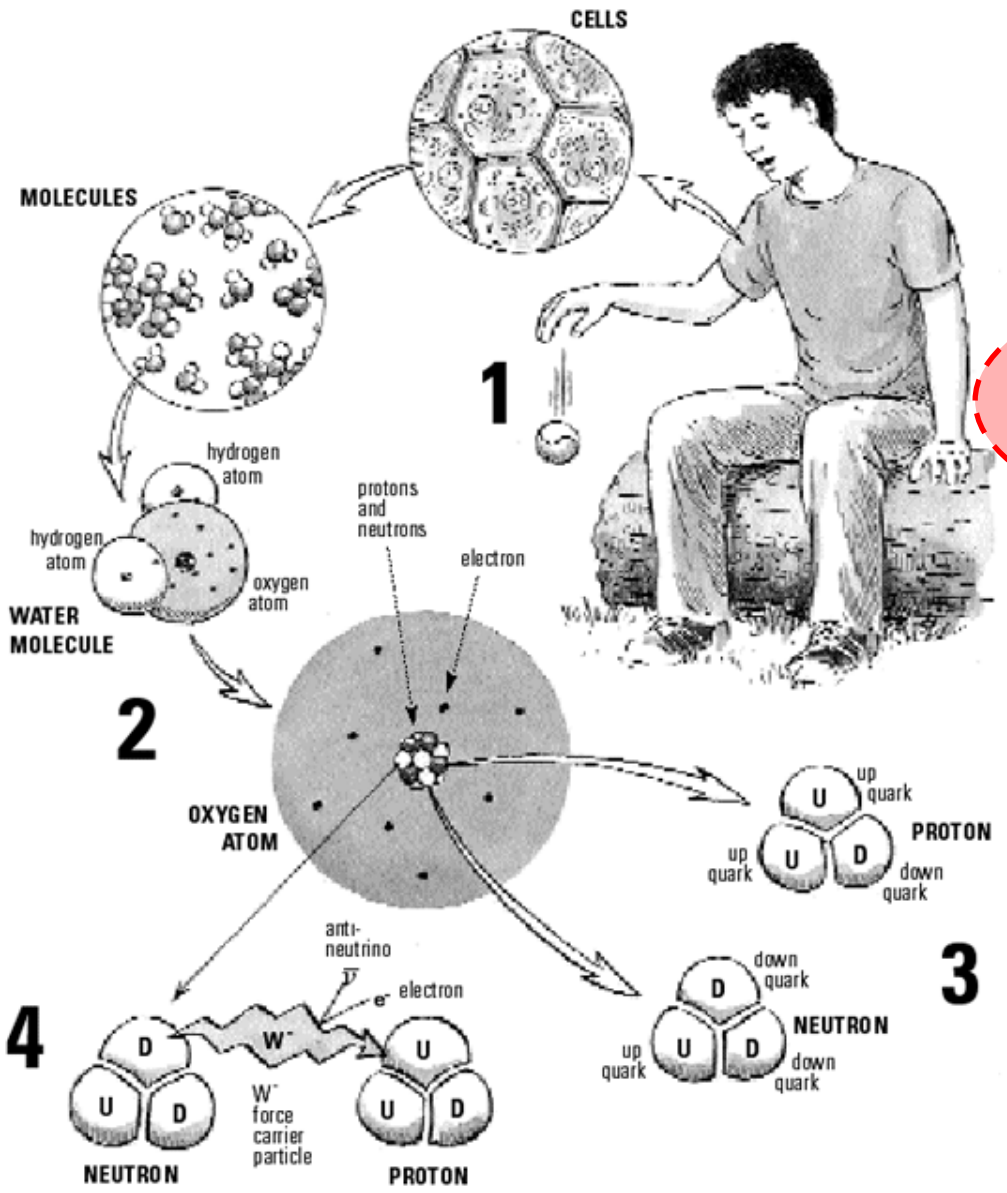
- ✓ **Mass**
- ✓ **Charge**
- ✓ **Spin** ~(Angular Momentum)
- ✓ **Parity**

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

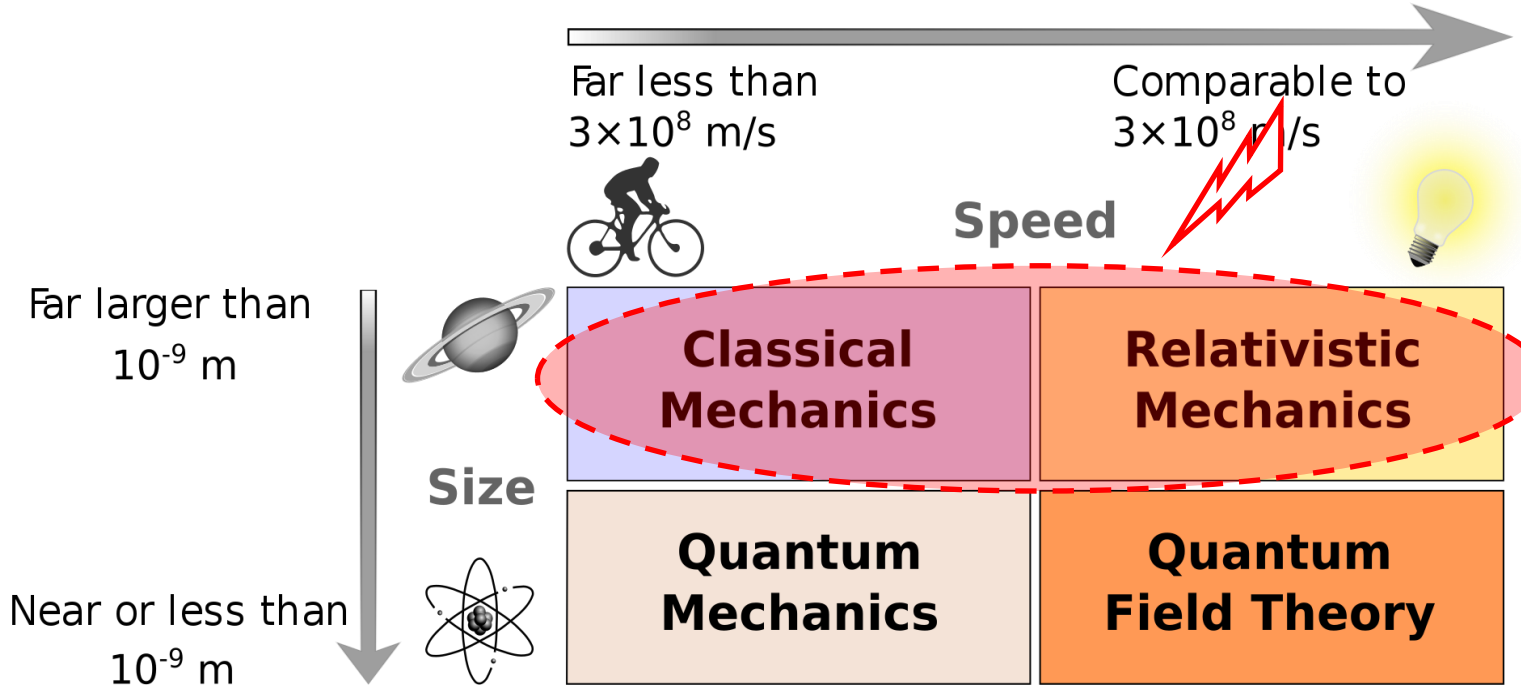
~ Nuclear decay

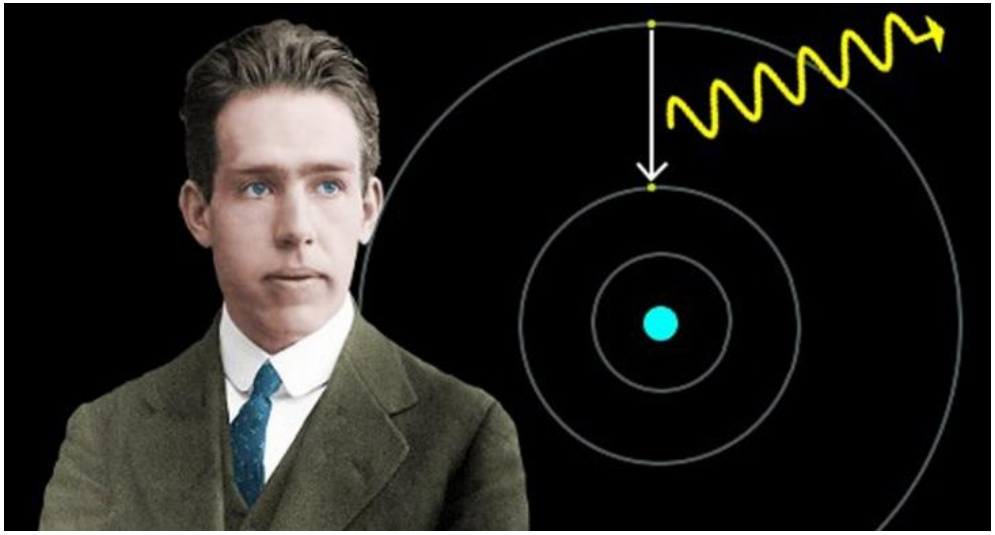
Nuclear → New Nucleus

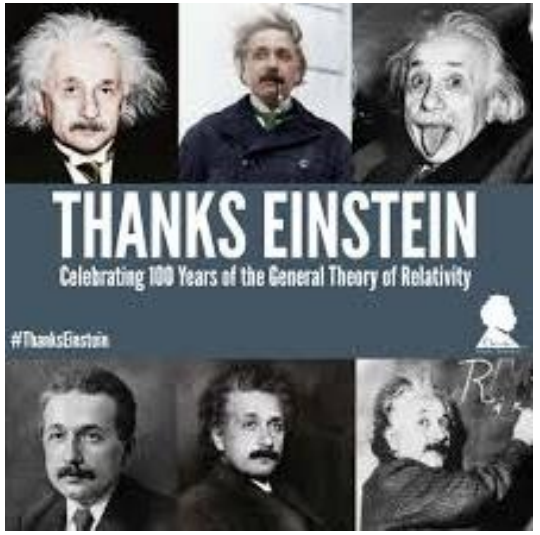
4. Strong Force

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(?)