Lecture Notes for PHYSICS 344 “Modern Physics”

Prof. Yong P. Chen (yongchen@purdue.edu)
Fall 2012, Purdue University

Lecture 2, M 8/21/2013

Summary of Lecture 2

- Brief History of Classical Physics
  - Before "classical physics", from Greek era
  - Development of Classical physics from 1600-1900

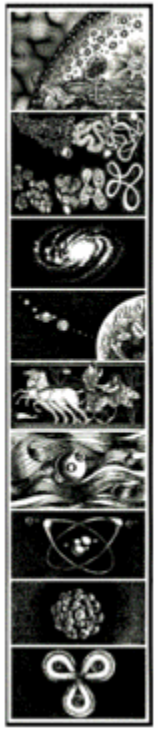
    [many pre-classical-physics notions overthrown by new Logic reasoning + *experiments*]
    - Mechanics (phys 172): Galeo, Newton, …
    - Electromagnetism (phys 272): Faraday, Hertz, Maxwell…
    - Thermodynamics/statistical mechanics
- Birth of "modern" physics after 1900s
- Examples of Contemporary physics
- Reading: Chapter 1 of Ken Krane (KK)
- Pls complete HW1 (survey)

Order of Magnitude Physics

The big picture: at the end of this course, you should be unafraid to estimate numbers you don't know, make approximations in equations, and figure out what physics is important in a given experiment or situation, and see whether an explanation or number is worth pursuing further. You will should also have understood a lot more physics.

http://www.its.caltech.edu/~oom/

http://stellar.mit.edu/S/course/8/sp12/8.226/



Every day, across forty-three orders of magnitude in distance scales, scientists are making discoveries that affect society.

To support sound public policy about the issues which arise from this research, it is essential for physicists to engage in the public debate.

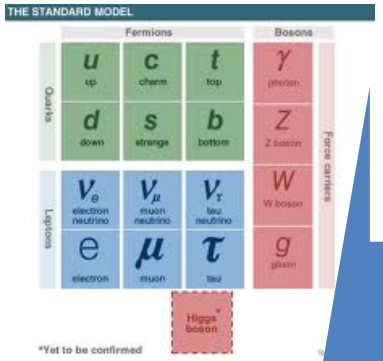
This class explores some of the questions that our present scientific achievements raise, both for our own community and for the public—at--large. By considering topics as diverse as the climate change and nuclear nonproliferation, this class makes the case that physics is a necessary part of the national discourse.

Lecture 2 joke "big picture": a priest, an astronomer and an engineer…

Frontiers in Contemporary Physics

What is the world made of?

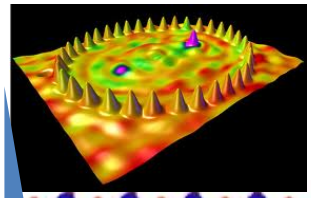
"elementary" particles & fields

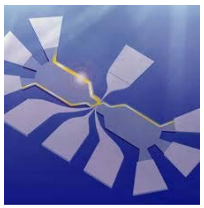


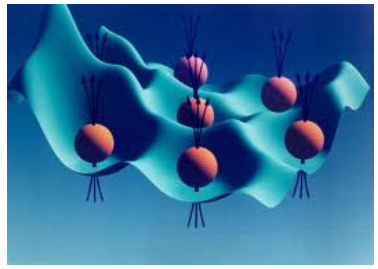
High energy & T, small scale, **ultra-relativistic**

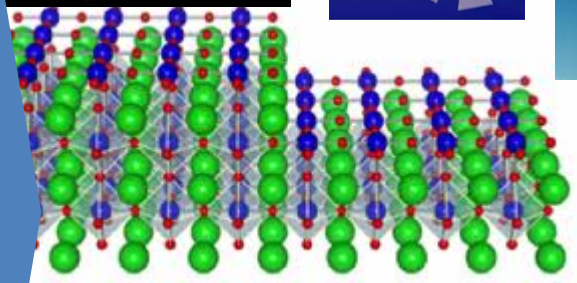
How is the world put together?

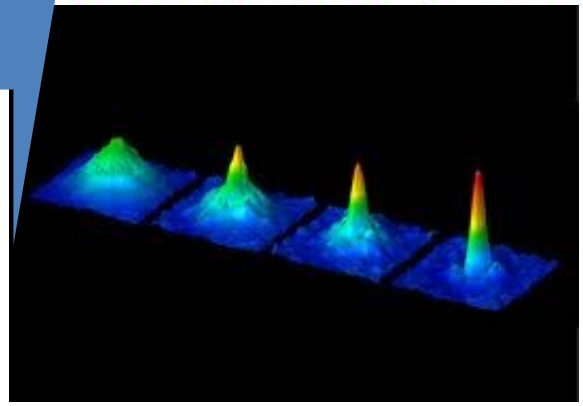
"effective" particles & fields











Low energy & temperature, large scale, "**non-relativistic**"

"Very small is connected with very large"

Next time (lecture 3)

- Crash overview of modern physics and main areas
- Exercise on scales and “order of magnitude”