Physics 201 - Lecture 1

1. Physics → Ancient Greek "nature"

(i) fields, trees, plants, sky, clouds, ... → entire universe. WHAT/HOW/WHEN

(ii) the underlying structure / meaning of something. "human nature"

"The nature of nature"

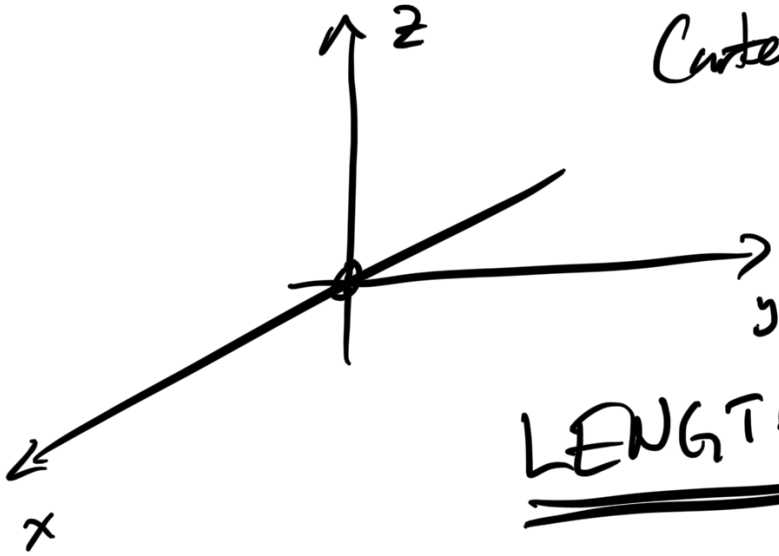
Mathematical Description.

(2) Mathematics

- math is language of physics.

Let's create a universe ⇦ !!!!

Step 1: Create a space for it.



Cartesian Coordinate System.

LENGTH → meter (m)

Step 2: Put stuff in.

MASS → (kg)

Step 3: Let it evolve.

TIME → (s)

Step 4: Let it heat up.

TEMPERATURE → (K)

For Physics 201: That's it !!

Every other Physical Quantity can be expressed in terms of these 4 basic quantities.

SI units (m, kg, s, K) ↩

Force, Energy, velocity, acceleration, density....

$$\vec{F} = m\vec{a}$$

$$(kg)(m/s^2)$$

$[F] \leftarrow kg \cdot m/s^2 \rightarrow 1 \text{ Newton}$

$1\ N$

Density $\equiv \frac{\text{mass}}{\text{volume}}$ $\left(\frac{kg}{m^3}\right)$

$$\rho_{H_2O} = 10^6\ kg/m^3$$

$$\rho_{Hg} = 13 \times 10^6\ kg/m^3$$

How do we do Science?

Step 1: Ask a question ??

Step 2: Collect Data → experimat.

① ~~test tubes~~, lab coats, bad hair.

② ~~No idea what will happen !!~~

Step 3: Process data
graph data
analyze data
...

PHYS 201

Given.

Step 4: Develop a model mathematic

that can be used to predict

future experiments.

$$F = ma \qquad E = mc^2$$

$$\Delta x = v_i t + \frac{1}{2} a t^2$$

⋮

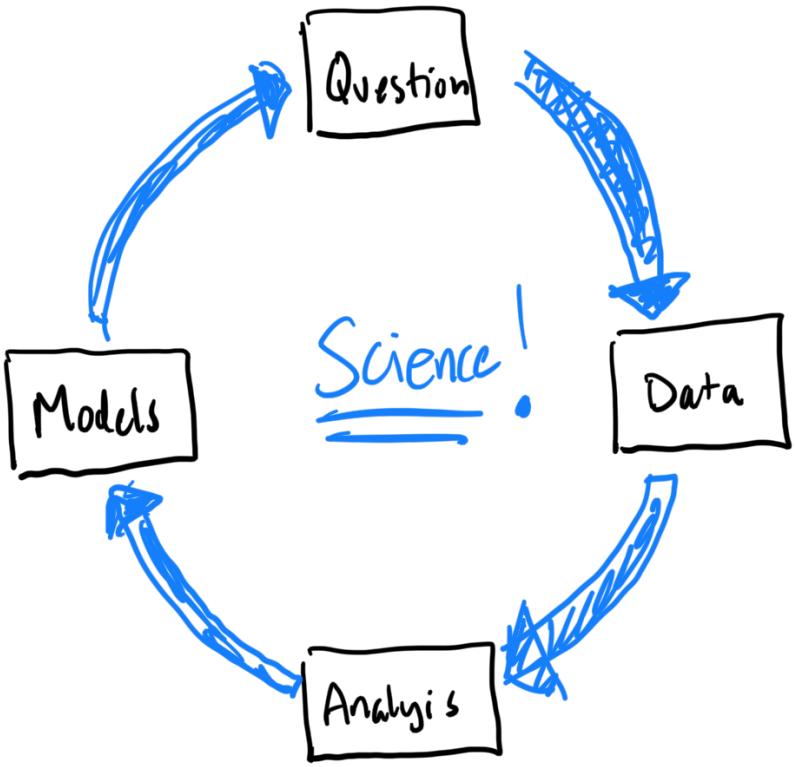
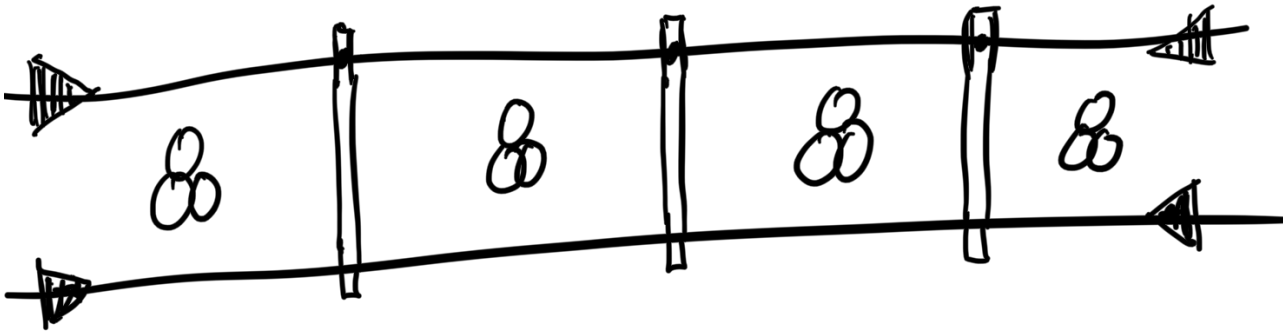
Theories	Laws
→ basic underlying concepts.	→ purely mathematical
→ microscopic	→ based on experiments.
↓	$F = ma$
math	↑ ↑ ↑ (Newton's 2nd Law)
	measured measured measured.

Theorems

Evolution

Theory of

General Rel.



Science is a methodology for updating our beliefs!