Physics 100 – January 26, 2009

- Recitations – start this week
  - Calculator helpful
  - Copy of recitation problems
  - Spirit of recitation
- Probset 1
- Lecture notes

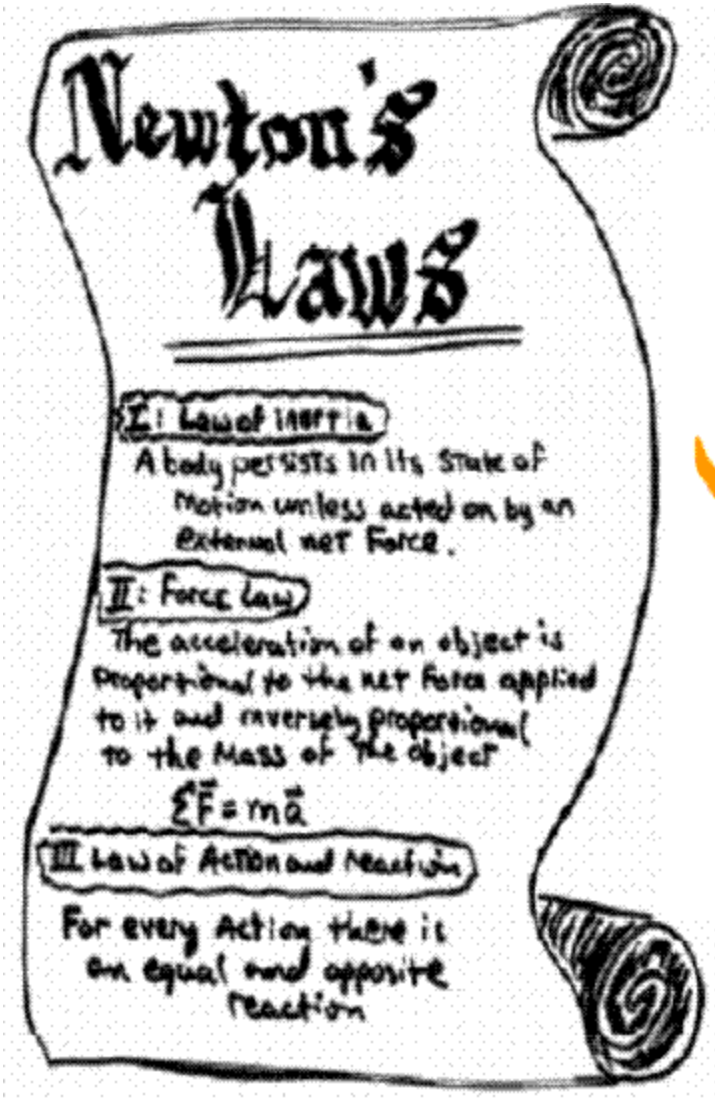
Ave Speed $\equiv \frac{\Delta x}{\Delta t}$ (no Direction)

Ave Velocity $\equiv \frac{\Delta x}{\Delta t}$ with direction information

Ave Acceleration $\equiv \frac{\Delta v}{\Delta t}$ (has a direction)

$x, v, a, t \rightsquigarrow$ Kinematic variables

Average vs. instantaneous



Newton's Laws + kinematical definitions

Inertia

$F = ma$

Action-reaction

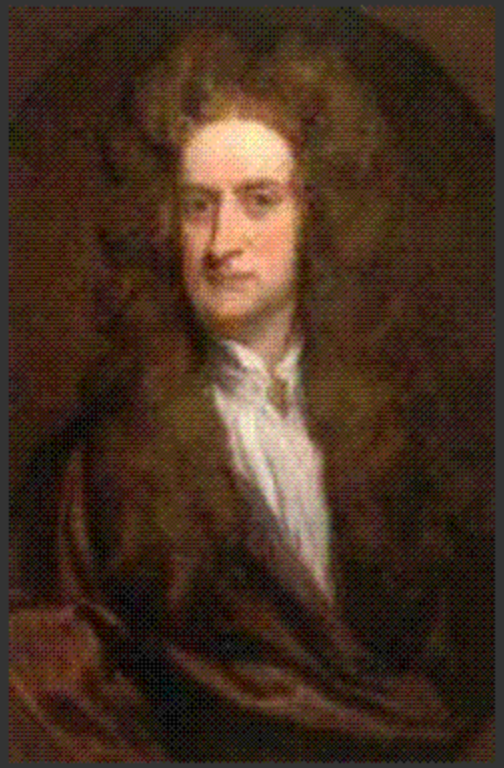
$V = \frac{\Delta x}{\Delta t}$

$a = \frac{\Delta V}{\Delta t}$

Allows us to make detailed calculations/predictions of how objects respond/move under the influence of forces

Deterministic universe

Sir Issac Newton

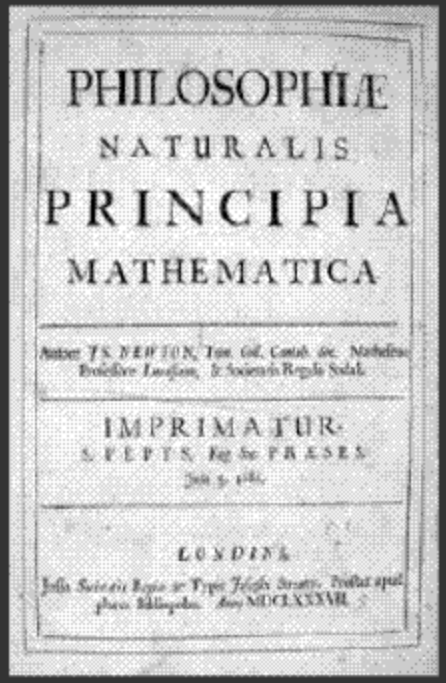


1643-1727

Born in Lincolnshire, England

Cambridge University

Philosophie Naturalis Principia Mathematica


PHILOSOPHIÆ
NATURALIS
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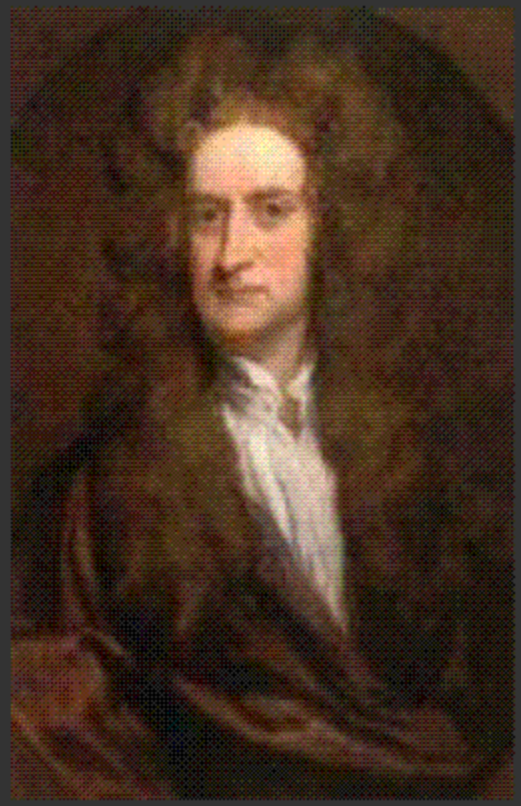
S. PEPYS, Reg. Soc. PRÆSES.

LONDINI

Optics, mechanics, gravitation, calculus

Sir Issac Newton



1643-1727

Newtonian physics

Newtonian universe

Includes everything but …

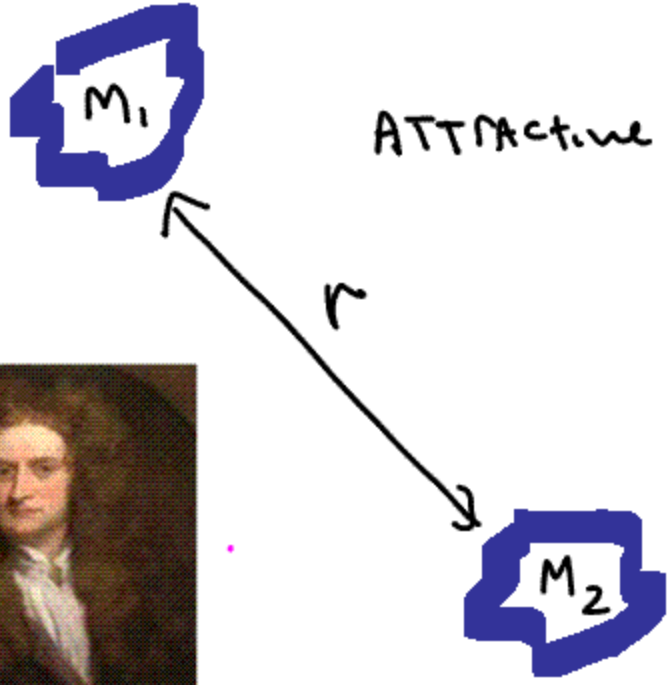
Electromagnetism

Quantum mechanics

Mechanics of extreme velocities or extreme density

Gravitation

$$F_{grav} = \frac{G m_1 m_2}{r^2}$$

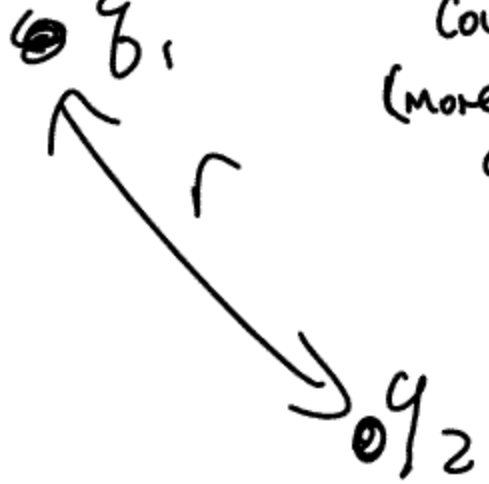


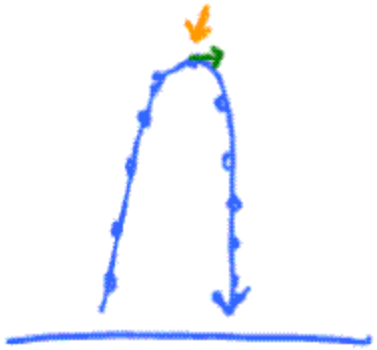
Isaac Newton

Electromagnetic Force

$$F = \frac{k q_1 q_2}{r^2}$$

From Coulomb (more later on that)





Battery tossed in air

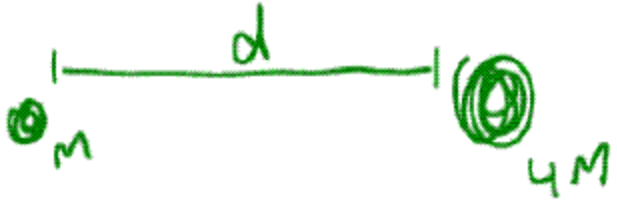
$F = ma$

Fsame, a same all pts

Newton's Laws of Motion can be subtle

Two stars a distance d apart
Star ① has mass m
Star ② has mass 4m

How does the gravitational attraction of Star ① for Star ② compare to the grav. attraction of Star ② for Star ①?



Action reaction forces the same

What is the "Essence" of the force ??
Who knows . . . Let's play Pretend

gravitational field

AT each point in space

gravitational Force
Mass

(Magnitude + direction)

that would be felt by
a little test mass at
that point

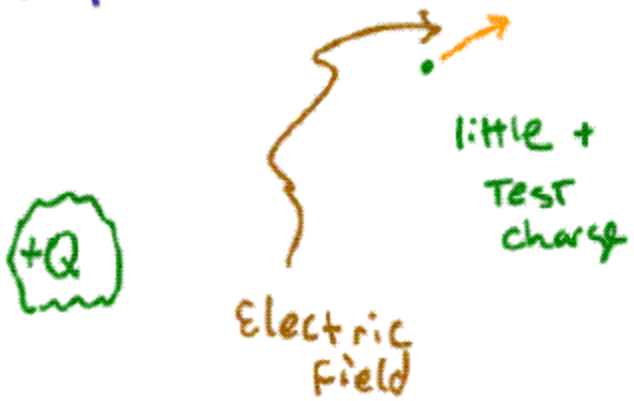
Electric field

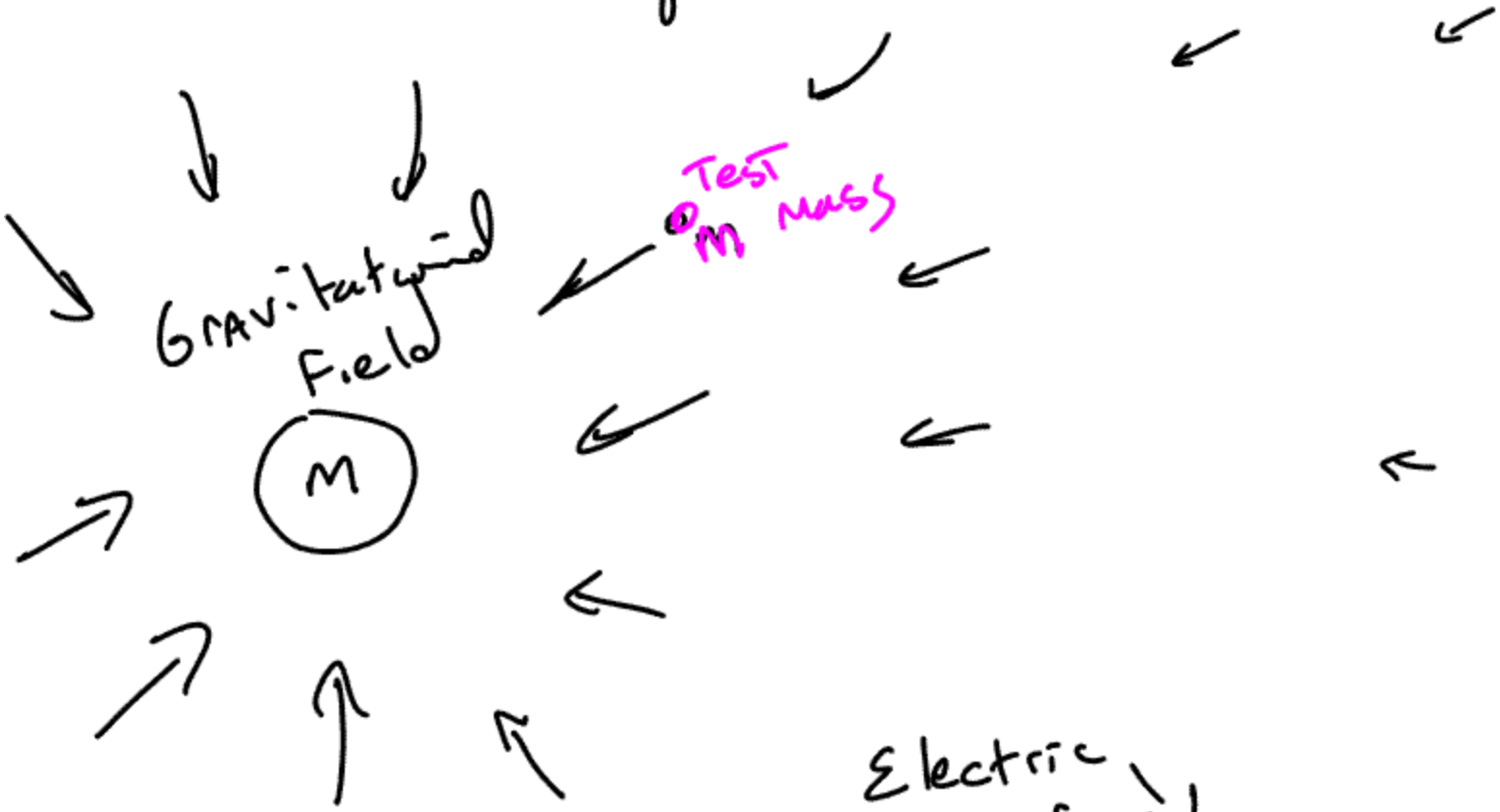
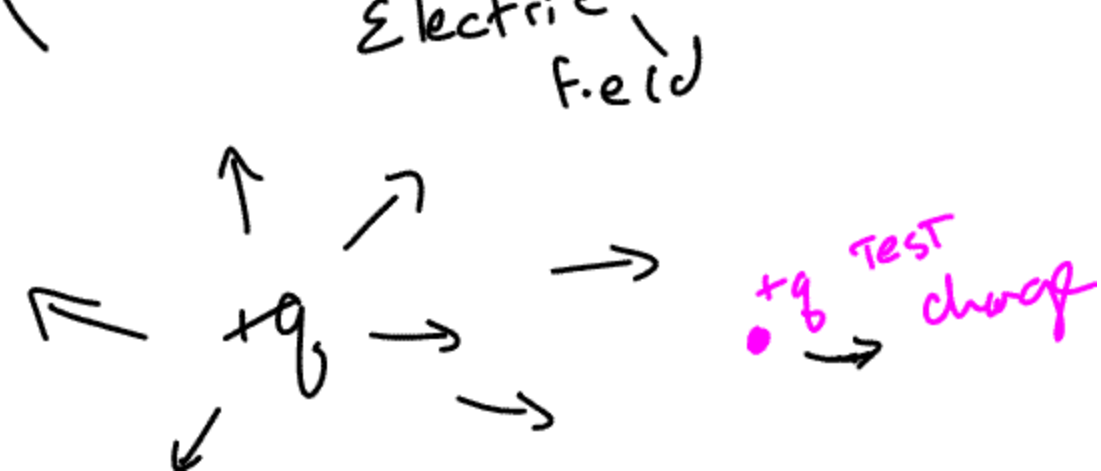
AT each point in space

Electric Force
charge

(Magnitude + direction)

that would be felt by
a little + test charge at
that point



Field concept

Field concept