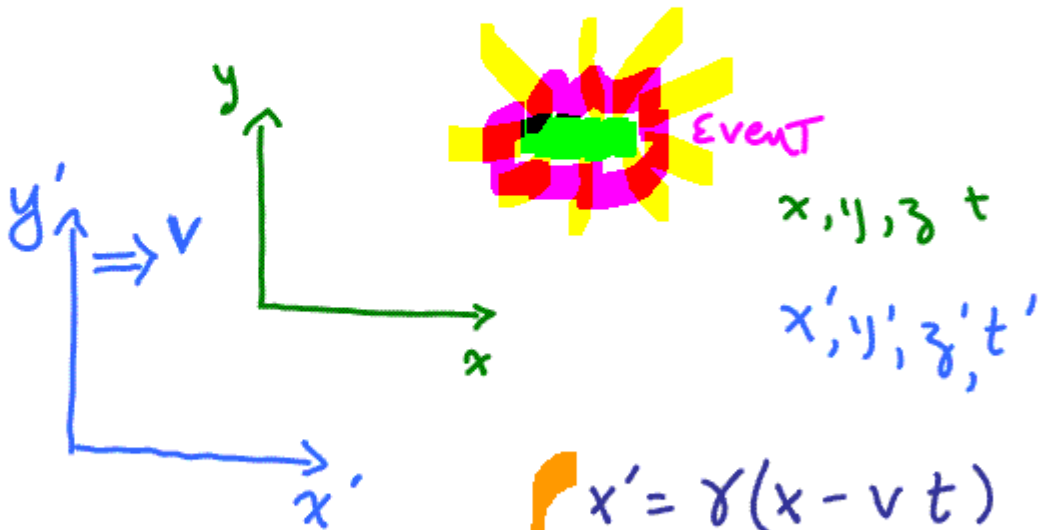
Physics 100 - January 31, 2007

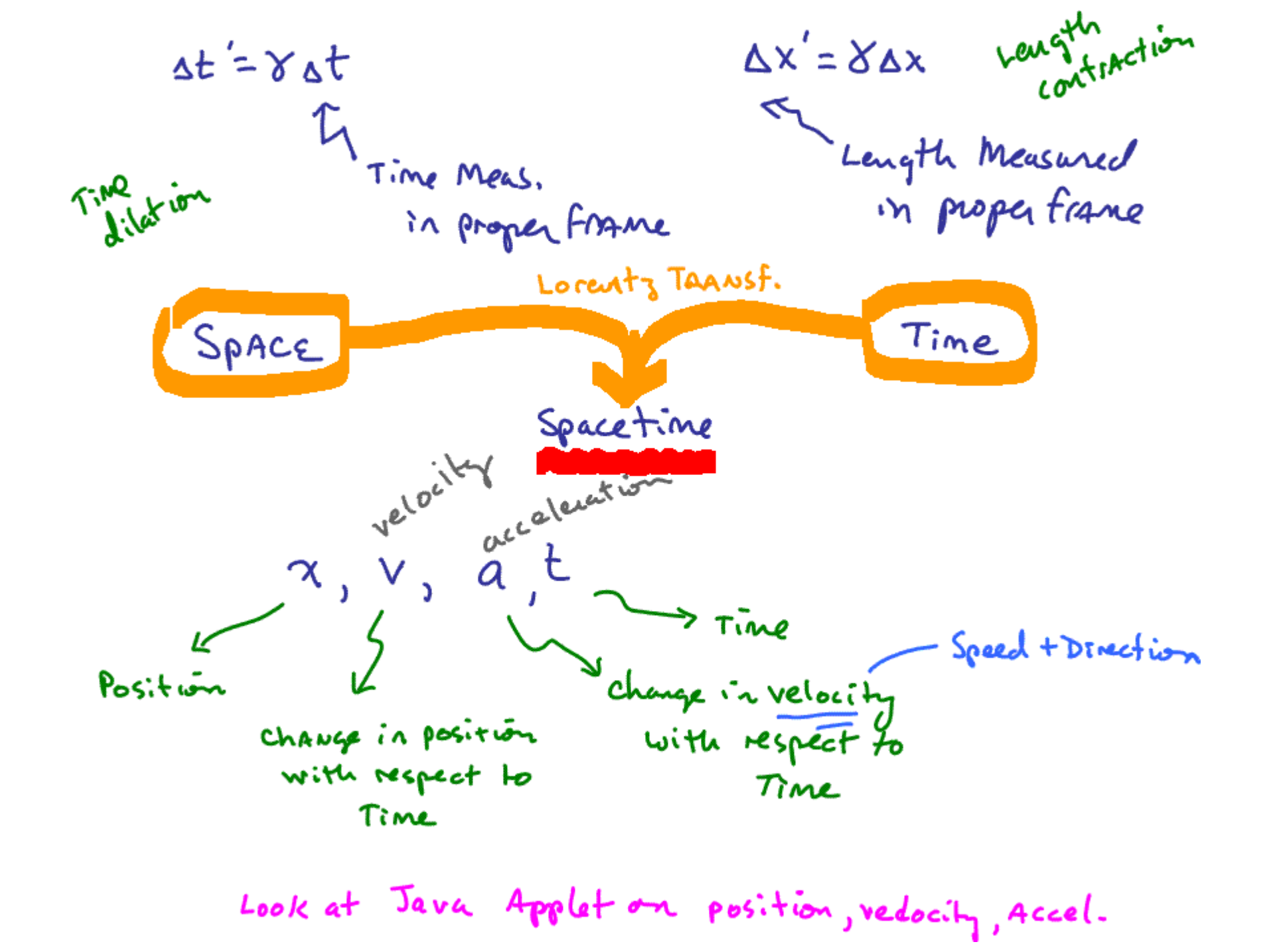
- Make up class
- Presentation project

Last Time



Observation of event in 2 reference frames related by Lorentz Transformations

$$x' = \gamma(x - vt)$$
$$y' = y$$
$$z' = z$$
$$t' = \gamma\left(t - \frac{vx}{c^2}\right)$$



Look at Java Applet on position, velocity, Accel.

What is Mass ?

Inertial Mass - larger mass → harder to accelerate

the same

Gravitational Mass

Gravitational Attraction

Work $\equiv W$ – (Force) (distance)

Force along distance moved

if force perpindicular to motion → NOT work

Force $\equiv F$ – that which causes acceleration

Momentum – $mv \equiv p$

Energy – ability to do work

- Kinetic energy
- Potential energy

} Many other forms of Energy ... as we will see

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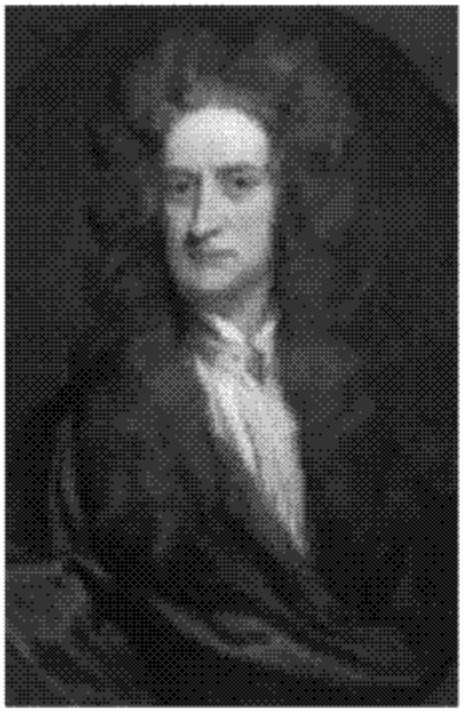
$E = mc^2$ Tells us that Mass is one form of Energy. In principle, energy can be converted to Mass and vice versa.

This is very profound and impt

Sir Issac Newton

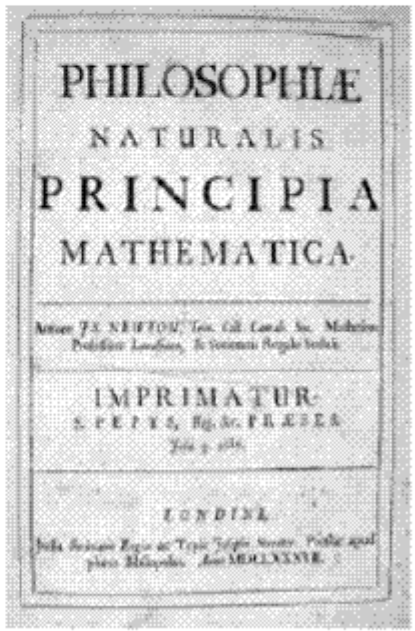


1643-1727

Born in Lincolnshire, England

Cambridge University

Philosophie Naturalis Principia Mathematica

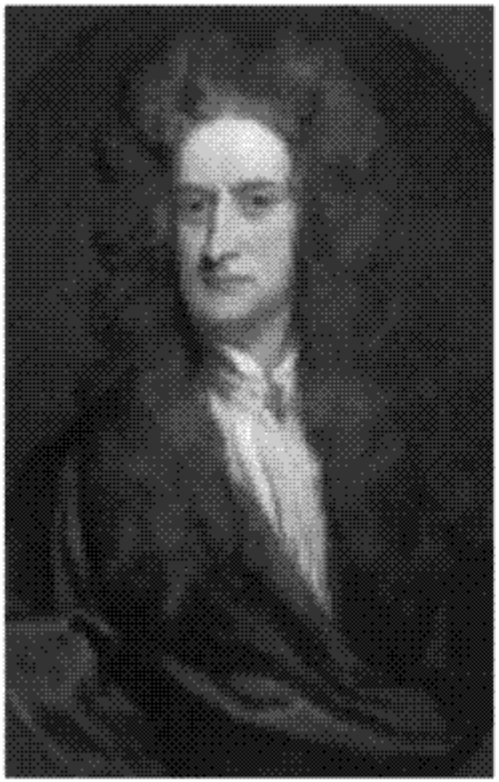

PHILOSOPHIÆ
NATURALIS
PRINCIPIA
MATHEMATICA

IMPRIMATUR

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

Newton's Laws

I: Law of Inertia

A body persists in its state of motion unless acted on by an external net force.

II: Force Law

The acceleration of an object is proportional to the net force applied to it and inversely proportional to the mass of the object

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

III Law of Action and Reaction

For every action there is an equal and opposite reaction

$$F = ma$$

$$v = \frac{\Delta x}{\Delta t} \qquad a = \frac{\Delta v}{\Delta t} \qquad F = m\frac{\Delta v}{\Delta t}$$

We now have all sorts of mathematical relations.

It's NOT so much a part of Physics 100 ... but

These relations can be used to solve for how an object will move under the influence of a force

CAN use this to predict where footballs and navel shells and rockets and planes, etc., will land

In Newton's universe ... if you input all the information about the particles in the universe (position, mass, velocity, forces present) into a supercomputer, you can calculate where all particles will be in the future, i.e.,

You can predict the future of the universe!

watch out Wall Street