

Special Relativity

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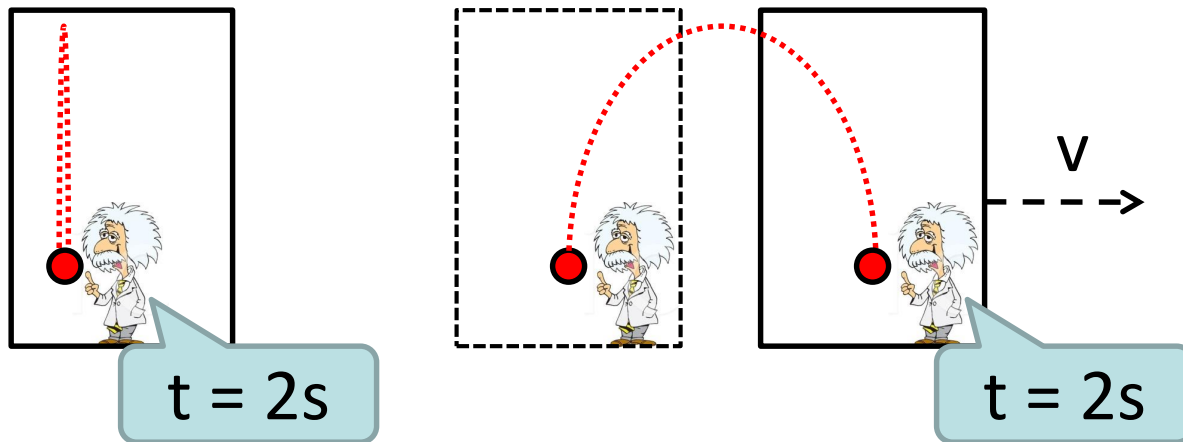


Galilean Relativity

*“Laws of mechanics are the same in all **inertial** reference frames.”*

What does this mean?

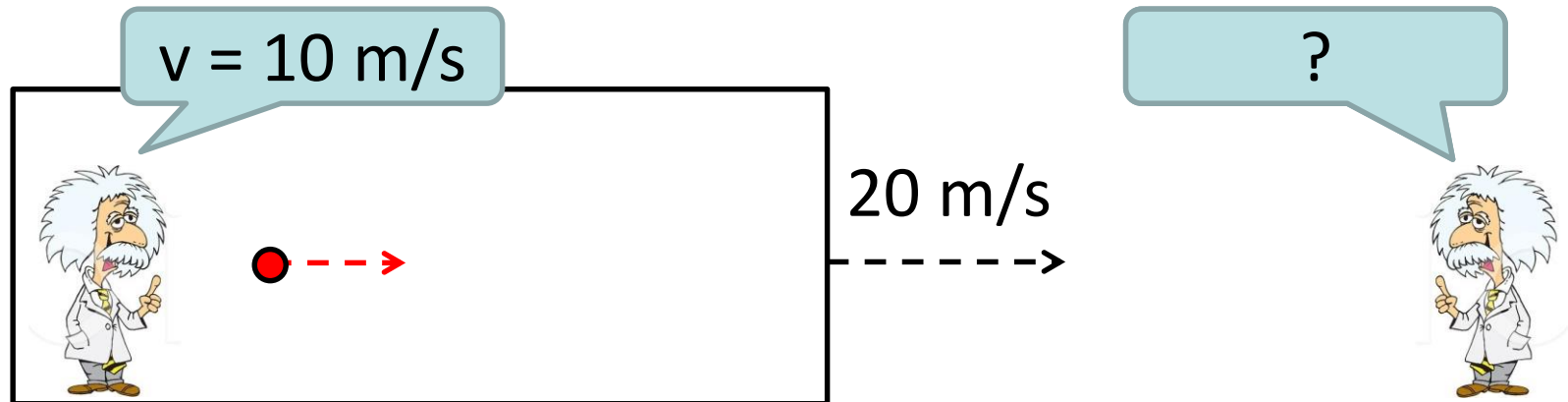
Inertial \rightarrow No acceleration
(constant velocity)



Relative Velocity

Question:

A ball is thrown at 10 m/s to the right on a train moving at 20 m/s to the right. For an observer on the ground, how fast is the ball moving?

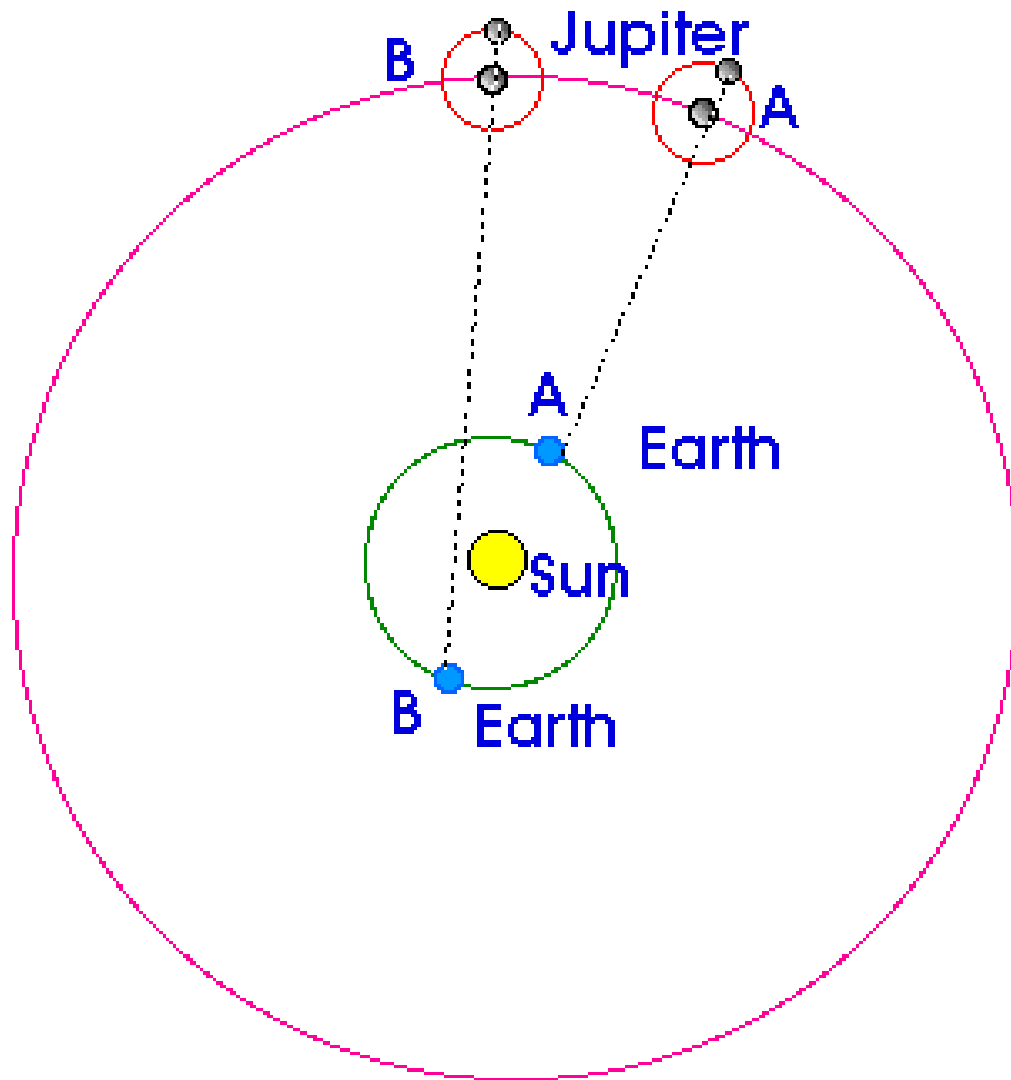


$$V_{CA} = V_{CB} + V_{BA}$$

Velocity addition
formula (Galilean)



How fast is light?



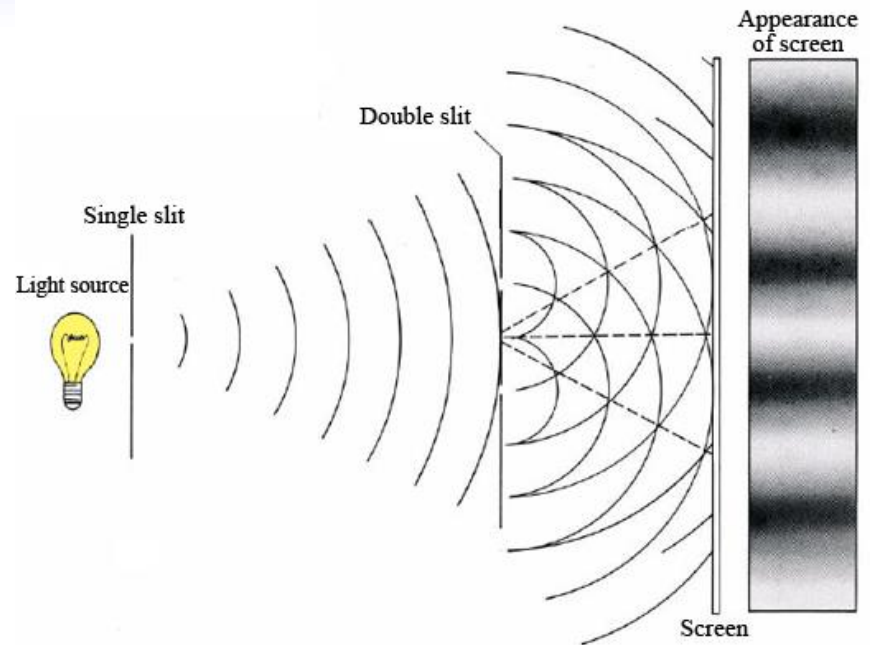
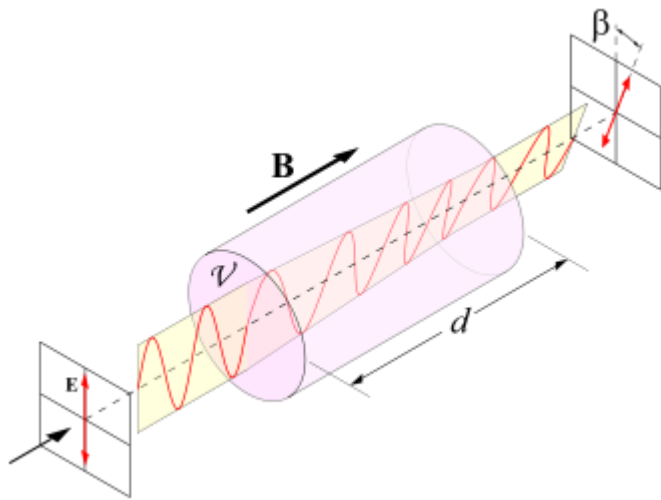
Very fast but not infinitely fast!

$$c = 300,000 \text{ km/s}$$



What is light?

Light has wavelike properties.

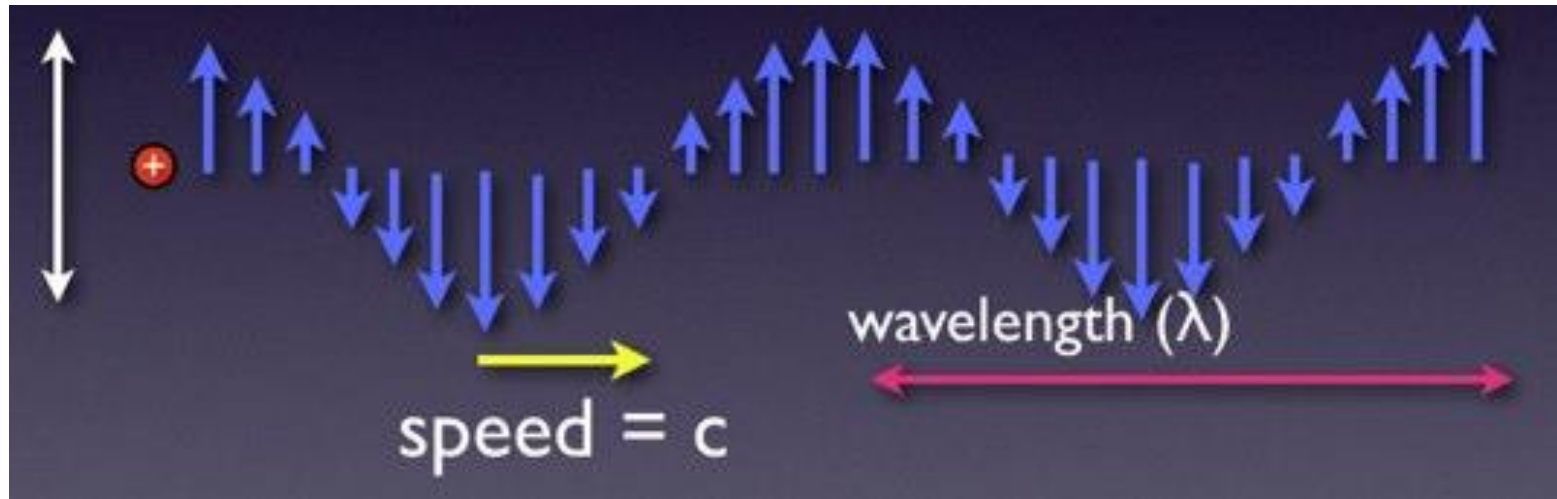


Scientists observed light was related to electricity and magnetism.

Maxwell united electricity and magnetism in 1873 and we began to understand the true nature of light.

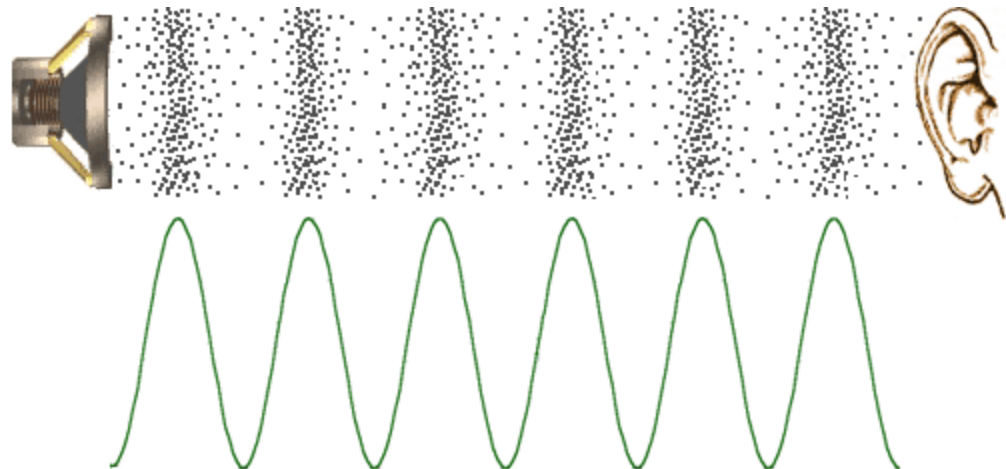


Electromagnetic Fields

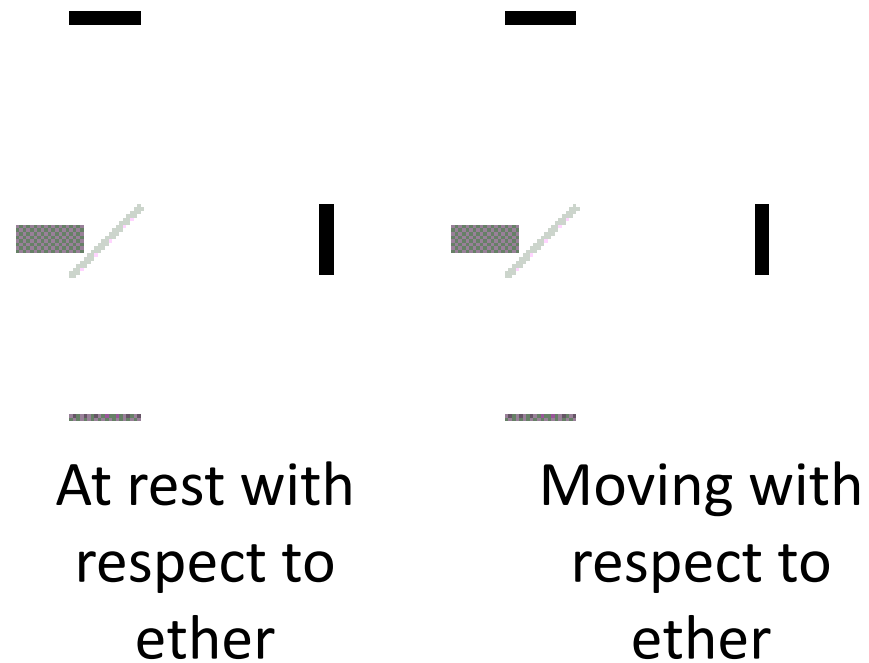
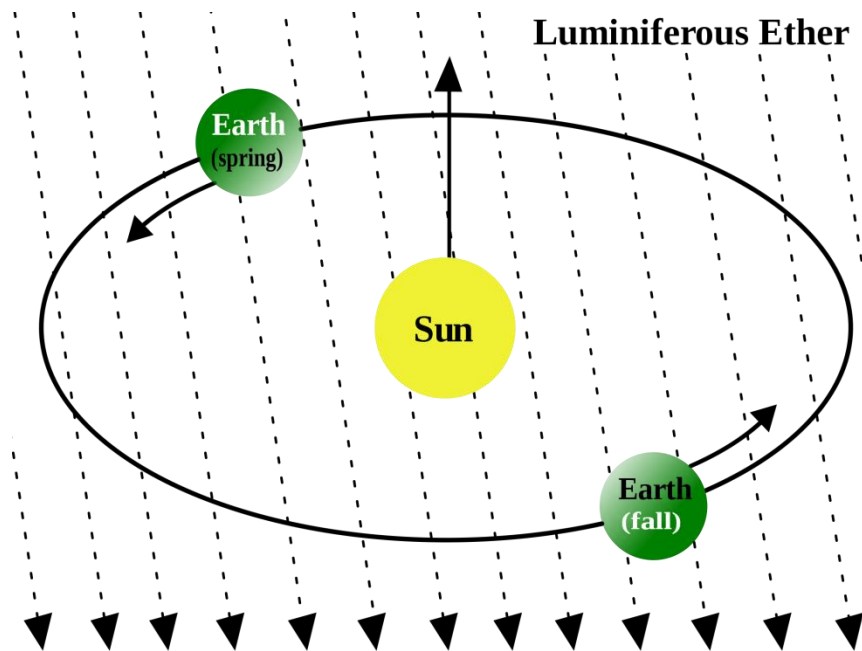


Light is an electromagnetic *wave*!

But what medium is it “waving” in?



Electromagnetic Fields

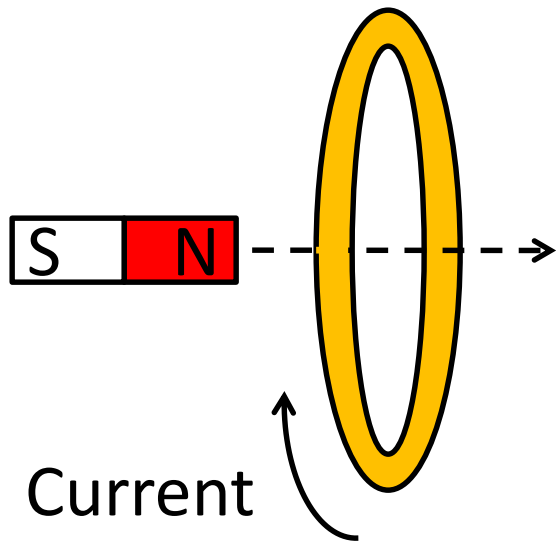
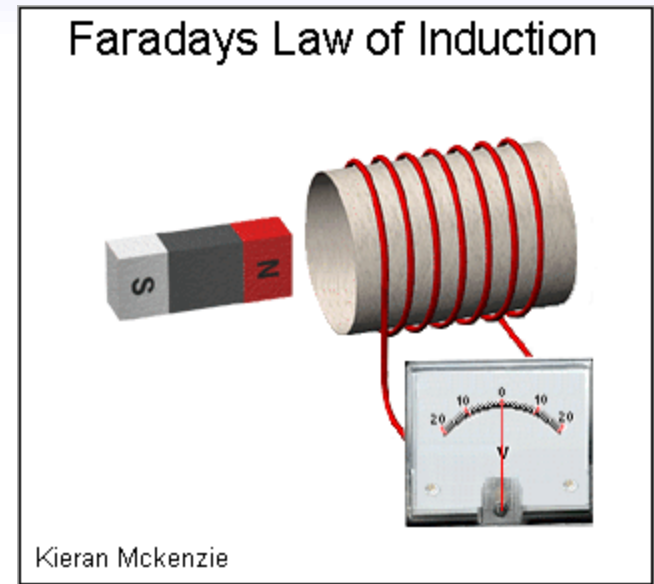


No ether was (of ever has been) detected!

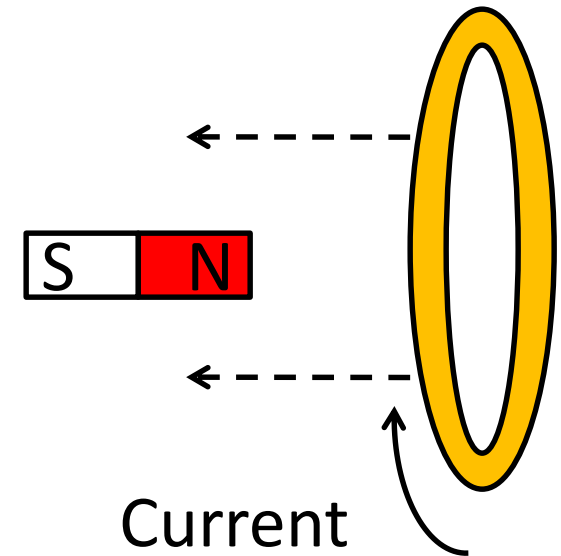


Electromagnetic Fields

Einstein noticed a curious feature of Maxwell's equations.

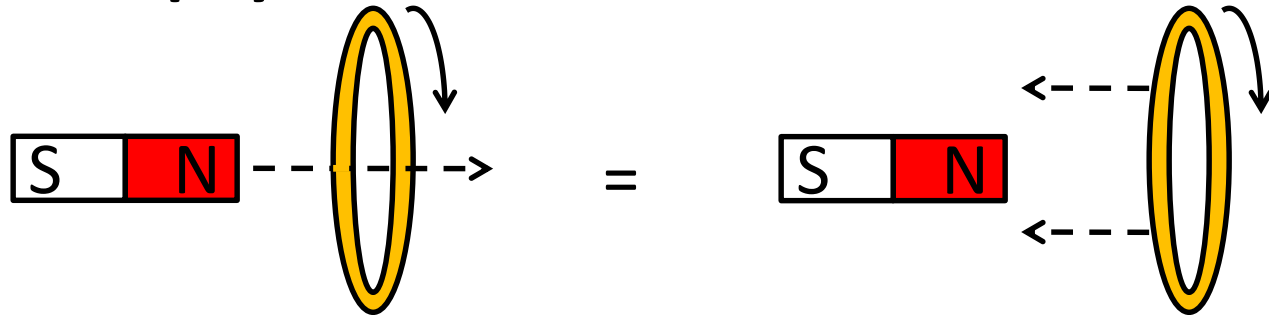


Same effect...
but different
equations!



Postulates of Special Relativity

1) The laws of **physics** are identical in all inertial frames.



2) Speed of light is independent of motion of the source.

