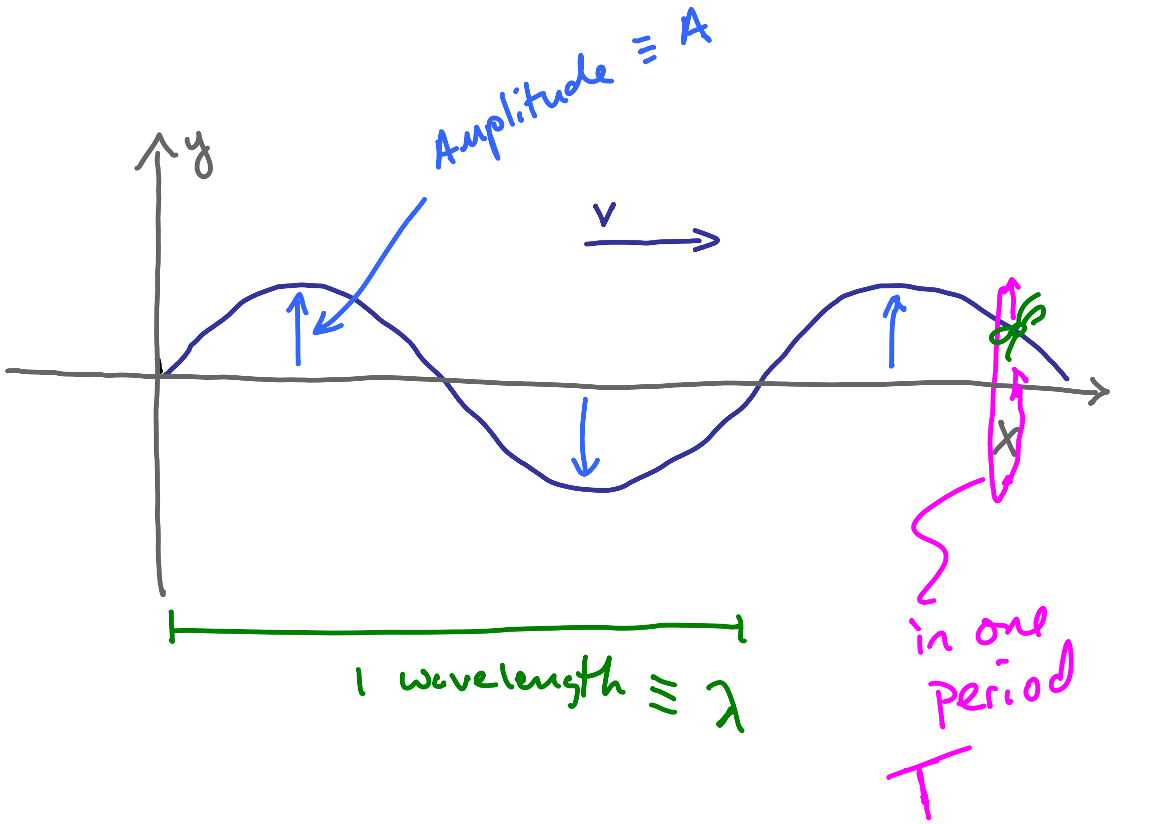
Physics 102 - February 12, 2014

Last Time

Waves



Transverse wave

String
water

harmonic motion is <u>along</u> direction of wave propagation

→ longitudinal wave (sound)

wave shape moves 1 λ in 1 T

$$v = \frac{\lambda}{T} \quad m/s$$

velocity of wave → $v = \lambda \nu$ ← frequency

wavelength

$$\frac{1}{T} = \text{frequency} = f \text{ (sound)} = \nu \text{ (light)}$$

$$\frac{1}{\text{seconds}} = 1 \text{ Hertz} = 1 \text{ Hz}$$

1 crest of wave per second pass a given pT 1 Hz

1000 crests " " 1000 Hz 1 kHz

1 kilo Hz

1 million " " " 1000000 Hz

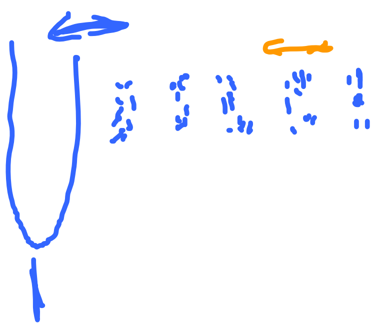
1 MHz

1 mega Hertz

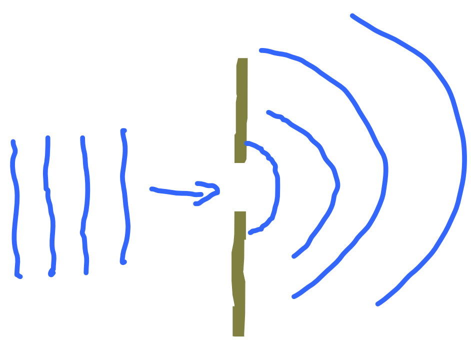
If a wave → exhibits

Interference → Wave Amplitudes add Together

⇒ Superposition

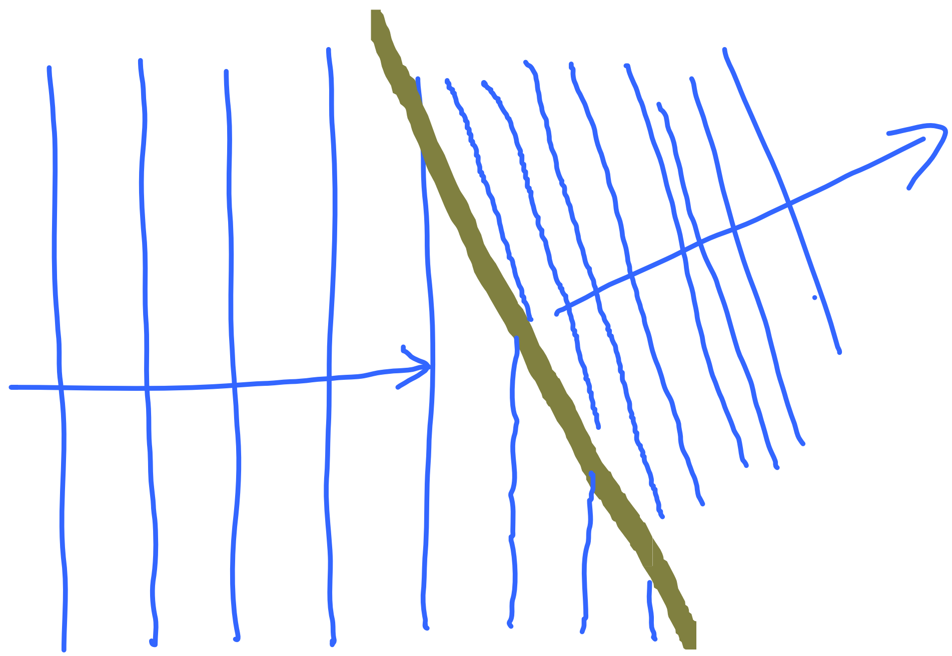


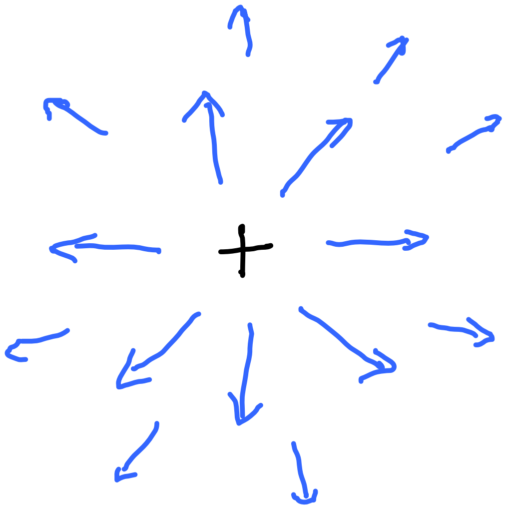
Diffraction → Waves spread out as they go through a small opening



Refraction

→ Bend at the interface between media

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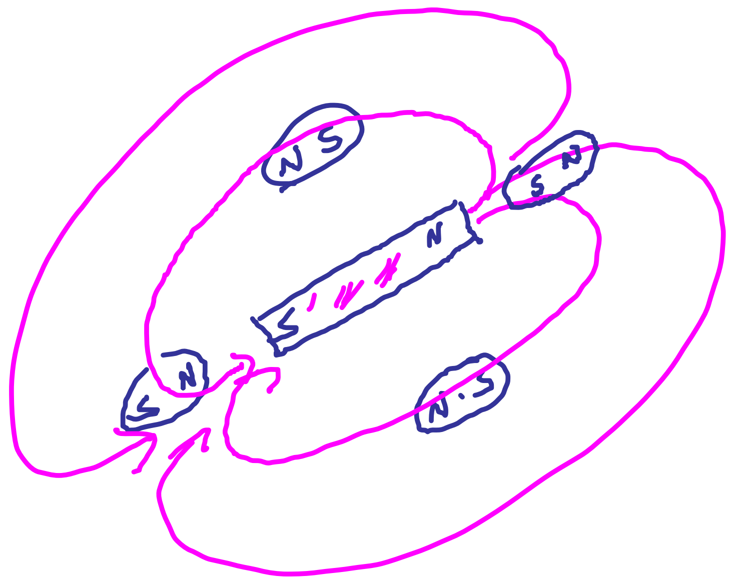
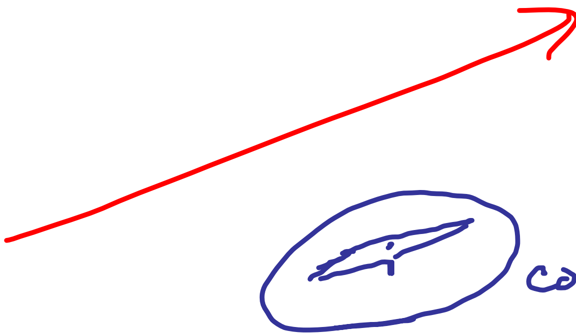
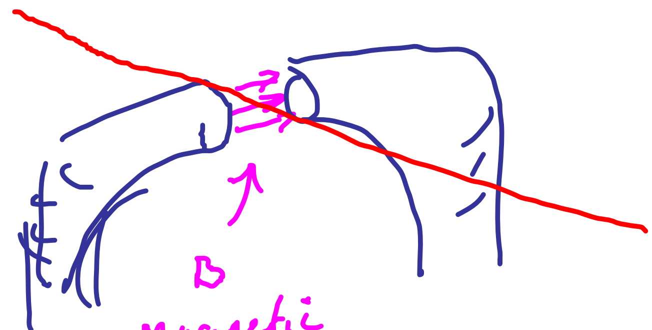

N S
S N
S N
N S
N S

electric charges moving



compass

compass moves!



B magnetic field

Maxwell's Equations

1873

James Clerk Maxwell

1831-1879 (Edinburgh)

$$\oint_s \vec{E} \bullet d\vec{a} = \frac{Q_{encl}}{\varepsilon_o}$$

$$\int_s \vec{B} \bullet d\vec{a} = 0$$

$$\int_c \vec{E} \bullet d\vec{l} = -\frac{d\int_s B \bullet d\vec{a}}{dt}$$

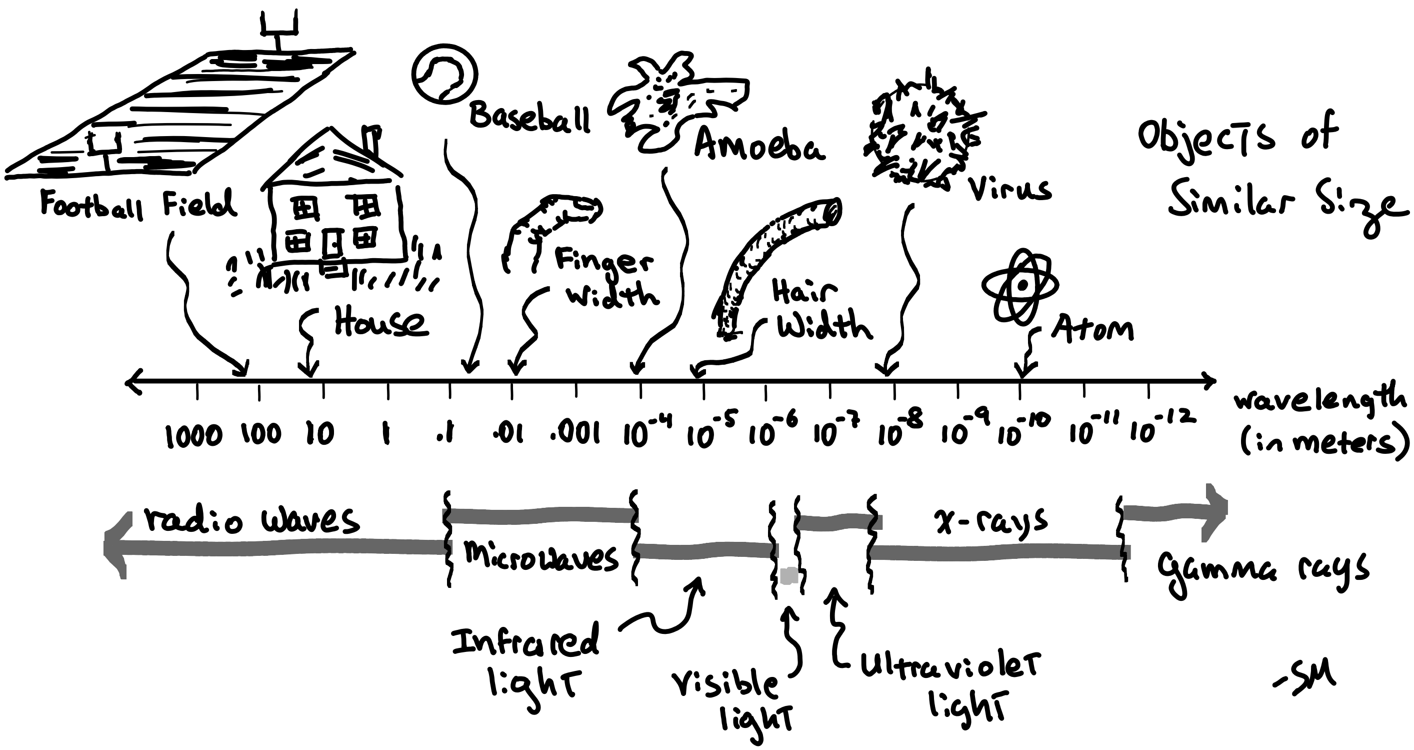
$$\int_c \vec{B} \bullet d\vec{l} = \mu_o I_{encl} + \mu_o \varepsilon_o \frac{d\int_s \vec{E} \bullet d\vec{a}}{dt}$$

So-called Integral form of Maxwell's Equations

"E" is symbol for electric field

"B" is symbol for magnetic field

The variety of electromagnetic waves



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