Measuring Light

Speed of Light

- Albert A. Michelson (1852 -1931)
  - Measured the time it took light to travel through a 35 km evacuated pipe
  - Measured the speed of light at $2.997996 \pm .00004 \times 10^8$
  - 1st American to receive the Nobel Prize

Official Numbers

- Speed of light (c)
  - 299792458 m/s
  - 3.00×10^8 m/s

First Source of Light

- Candela(cd)
  - SI unit of luminous intensity (I)
  - 1 candela = luminous intensity of one candle

Important Terms for Light

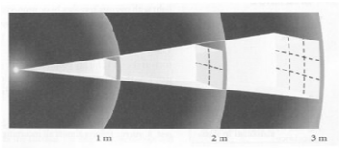
- Luminous - emits light
- Illuminated - reflects light
- Luminous Flux (F) - rate at which light is emitted
- Lumen (lm) - unit of measure for luminous flux
- Luminous Intensity (I)- the (F) that falls on a 1 m^2 surface 1m away
  $I = F/4\pi$ (measured in candelas)
- Illuminance - illumination of a surface measured in lm/m^2 or lux (E)

I can see you!

- Transparent
  - Light passes through readily.
- Translucent
  - Light passes through but is diffused such that objects cannot be identified.
- Opaque
  - Light does not pass through.

How Bright is that Light ?

- The farther we are from a light, the less bright it looks



Distance	1x	2x	3x
Brightness	Original	1/4 of original	1/9 of original

Inverse square relationship

How Bright is that Light ?

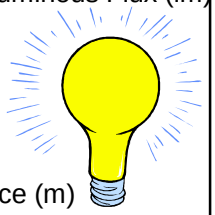
- The farther we are from a light, the less bright it looks
- To find the Illuminance

$$E = \frac{F}{4\pi d^2}$$

Luminous Flux (lm)

Illuminance (lux)

Distance from surface (m)



Illumination Sample Problem

- A 500 lm light source is projected on a wall 0.5 meters away. What is the illumination on the wall?

Answer: 159 lm/m^2 or lux

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