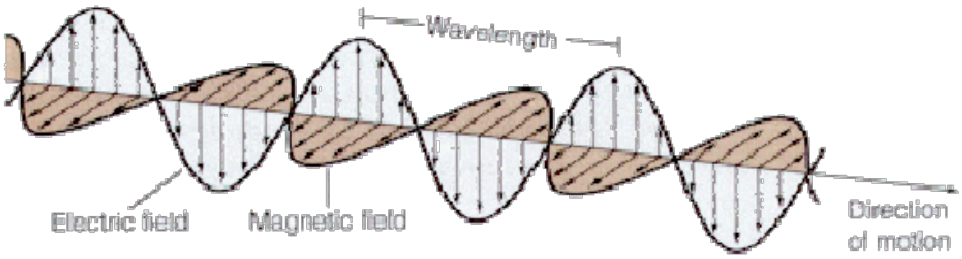
Light

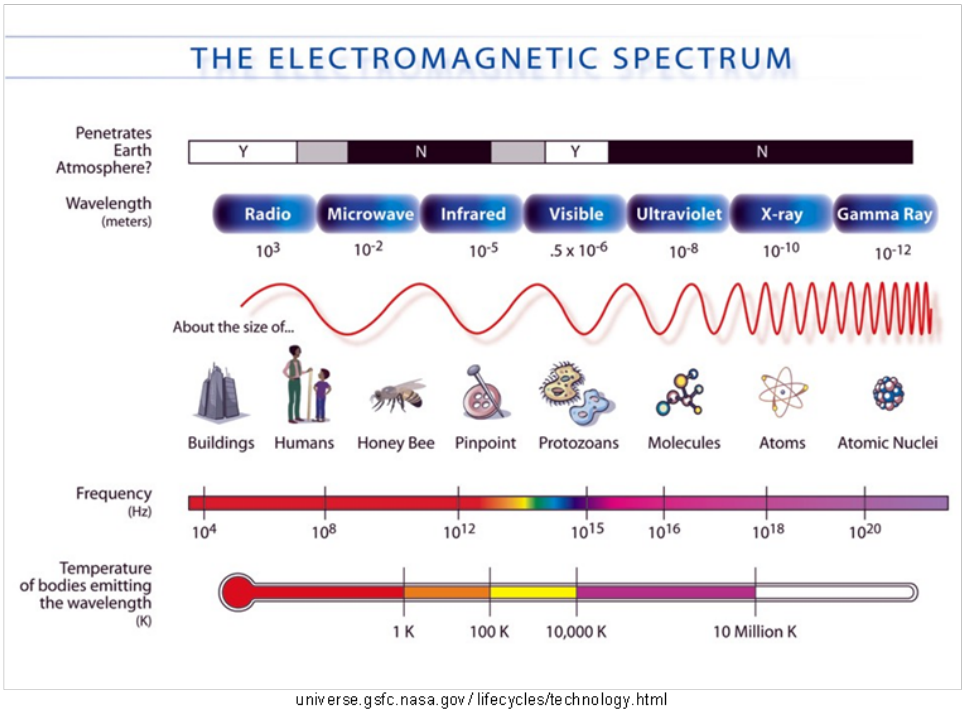
- Light is the range of frequencies (wavelengths) that can be seen with the human eye. Light travels as an electromagnetic wave and can be thought of as a packet of energy.
  - For our purposes, we will use the properties of transverse waves to describe light.
  - The main difference is that energy light carries depends on it wavelength (or frequency), not its amplitude.
  - The science of astronomy/astrophysics is all based on observing the EM spectrum that reaches the Earth.

- We see only a small part of the electromagnetic spectrum. The EM spectrum consists of radio, micro, infrared, visible (colour), ultraviolet, X, and gamma rays.

- Visual Spectrum (approximate)
  - Red: 600 – 700 nm
  - Yellow: 575 – 600 nm
  - Green: 500 – 575 nm
  - Blue: 425 – 500 nm
  - Violet: 375 – 425 nm



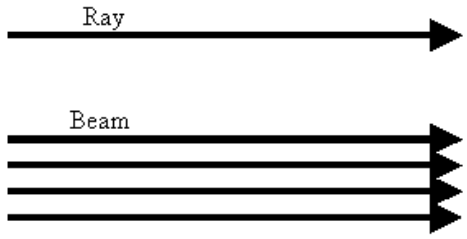
Matt Oltersdorf et al.: www.twcac.org/ Tutorials/notes(3).htm



universe.gsfc.nasa.gov/lifecycles/technology.html

- We see objects because they reflect light (non-luminous bodies) or they emit light (luminous bodies)
  - We see the visual spectrum of light. Certain colours appear because an object absorbs all light except that colour.
  - Black objects absorb all light and reflect none.
  - White objects reflect all light and absorb none.
- Light travels in a straight-line path (except in extreme gravitational fields); this is called rectilinear propagation.

- We use the ray model. We use rays to represent the path followed by light. A collection of rays is called a beam of light.



⇨ The speed of light, c, is 299,792,458 m/s in a perfect vacuum → This is the fastest anything can travel according to Einstein's Theory of Relativity. We round to $c = 3.00 \times 10^8$ m/s.

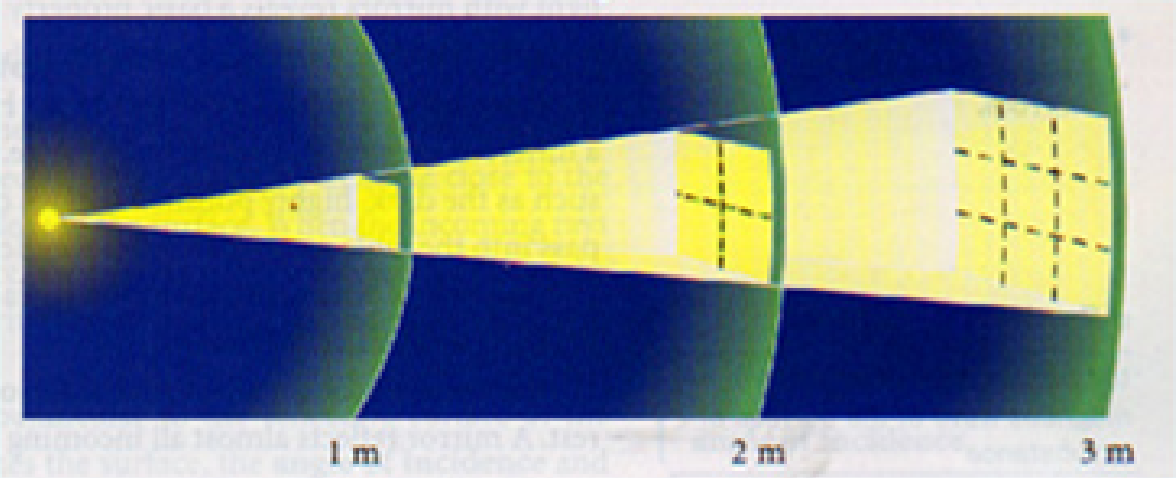
- The speed of light changes as it enters different media

- $c = f\lambda$, like we studied for waves.

- Since c is constant, if the frequency increases, wavelength decreases and vise – versa. f and λ are inversely proportional.

⇨ To describe the properties of the EM spectrum we use the unit of nanometers, nm (1 nm = 10^{-9} m)

Inverse Square Law



The inverse square law applies to rays emitted from a point source. The same amount of light is spread out over a larger area and is therefore diluted.