

Chapter 13-1

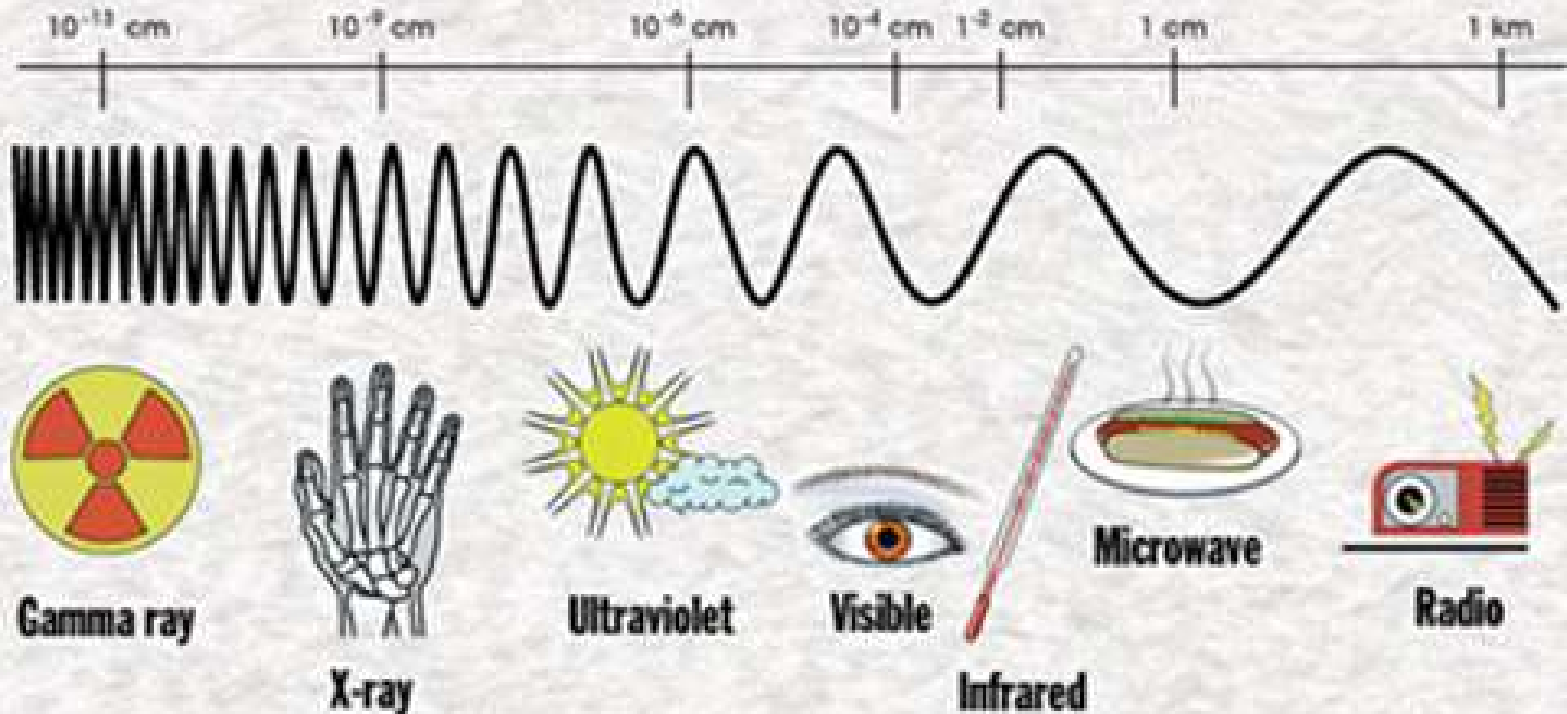


Electromagnetic Waves

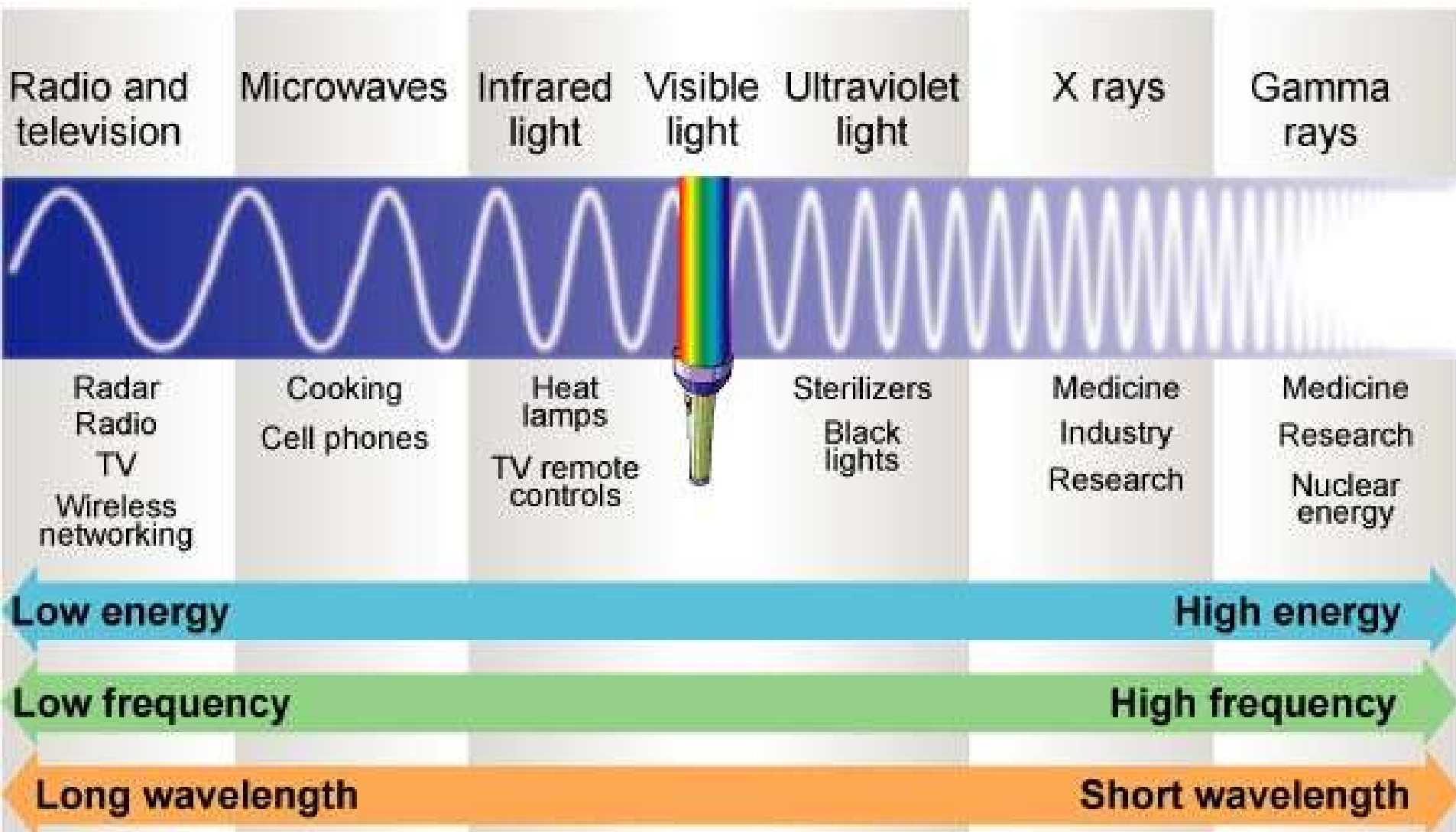
- Electromagnetic Wave – A transverse wave consisting of oscillating electric and magnetic fields at right angles to each other.
- The spectrum includes more than visible light – not all light is visible to the human eye.
- Light is a wave and also a particle.

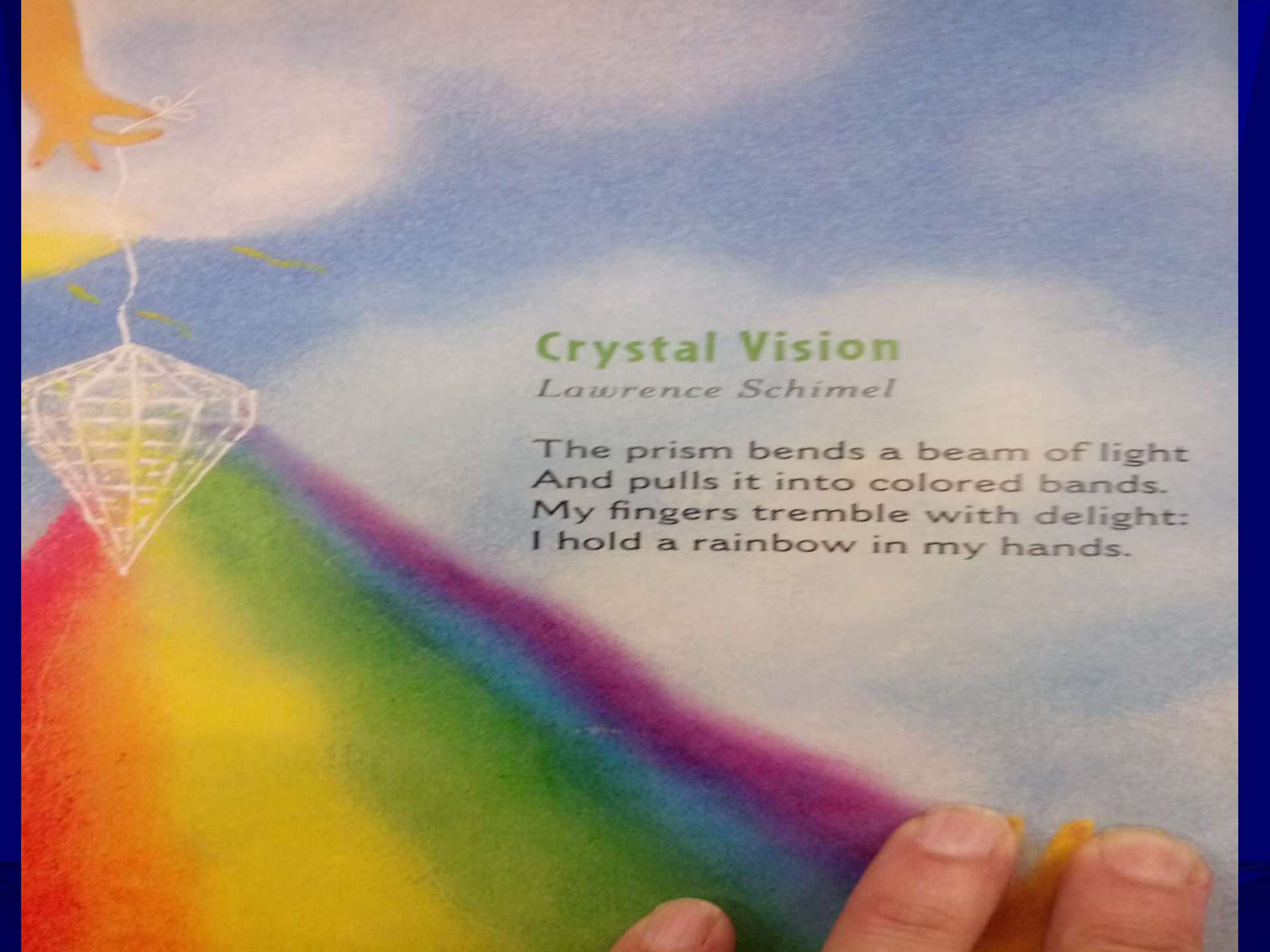
Electromagnetic waves vary depending on frequency and wavelength.

The Electromagnetic Spectrum



Electromagnetic Spectrum





Crystal Vision

Lawrence Schimel

The prism bends a beam of light
And pulls it into colored bands.
My fingers tremble with delight:
I hold a rainbow in my hands.

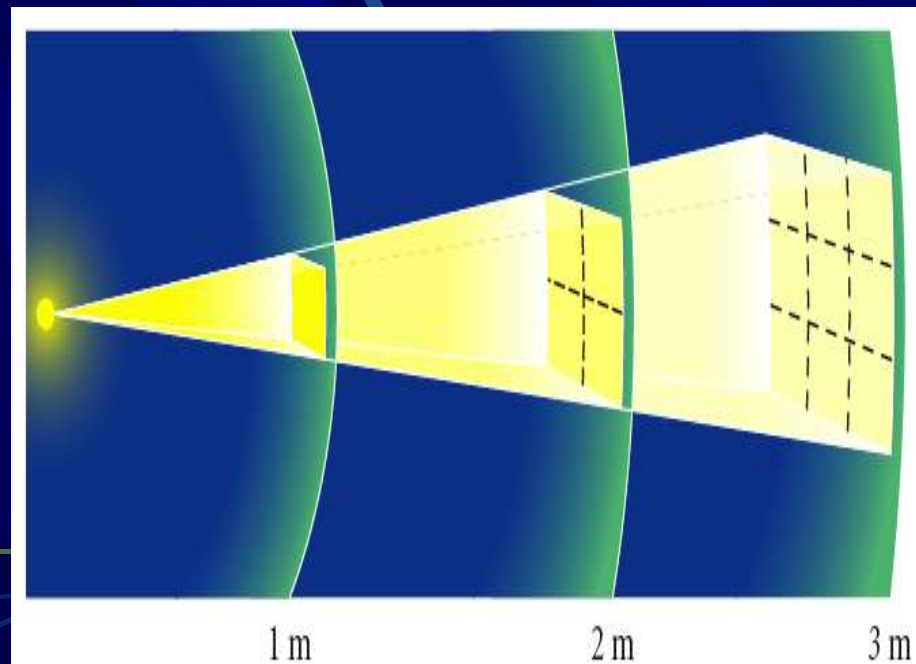
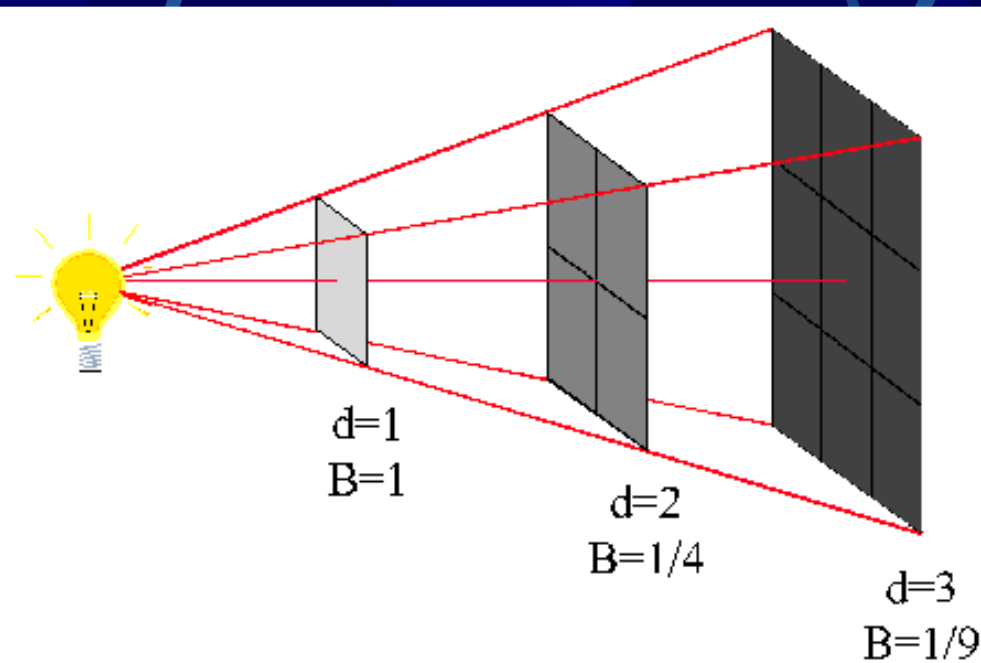
- In visible light, the differences in frequency and wavelength account for different colors.
- The differences in wavelength and frequency also distinguishes visible light from invisible electromagnetic radiation, such as X Rays.

- Radio Waves – Longest wave – AM FM, TV, radar gun (baseball)
- Microwaves – 2nd longest – radar communication, microwaves
- Infrared waves – 3rd – infrared photography, night vision
- Visible Light – 4th – microscope, astronomy
- Ultraviolet Light – 5th – sterilization, forensics
- X rays – 6th – medical exam of teeth & bones, see structural damage, image of paintings
- Gamma Rays – Shortest Wave – Cancer treatment, food irradiation

- All electromagnetic waves move at the speed of light.
- $\text{Speed} = \text{wavelength} \times \text{frequency}$
- Only the wavelength and frequency change.
- This change decides which type of electromagnetic wave it is, radio, gamma, etc.

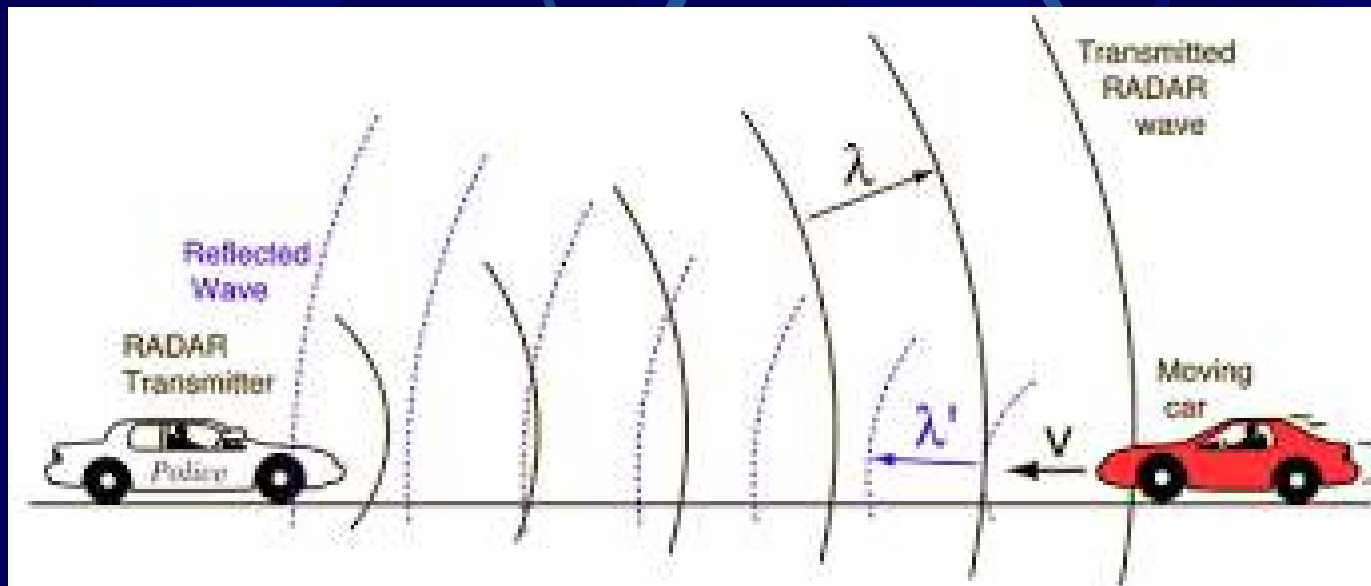
- The speed of light in a vacuum =
 2.99792458×10^8
- The speed of light in air =
 2.99709×10^8
- We use 3×10^8

- Waves can be approximated as rays.
- Next chapter we'll be drawing out light rays.
- Brightness of light decreases by the square of the distance from the source.



Electromagnetic Waves

- Radio Waves – Radio, older tv's, and baseball radar guns



Electromagnetic Demos, Labs and Videos

1. Radio – Radar Gun

Electromagnetic Demos

- 2. Microwave Demos





Electromagnetic Demos

3. Infrared - Night Vision Goggles and Thermal Camera, RC Cars



Electromagnetic Demos & Labs

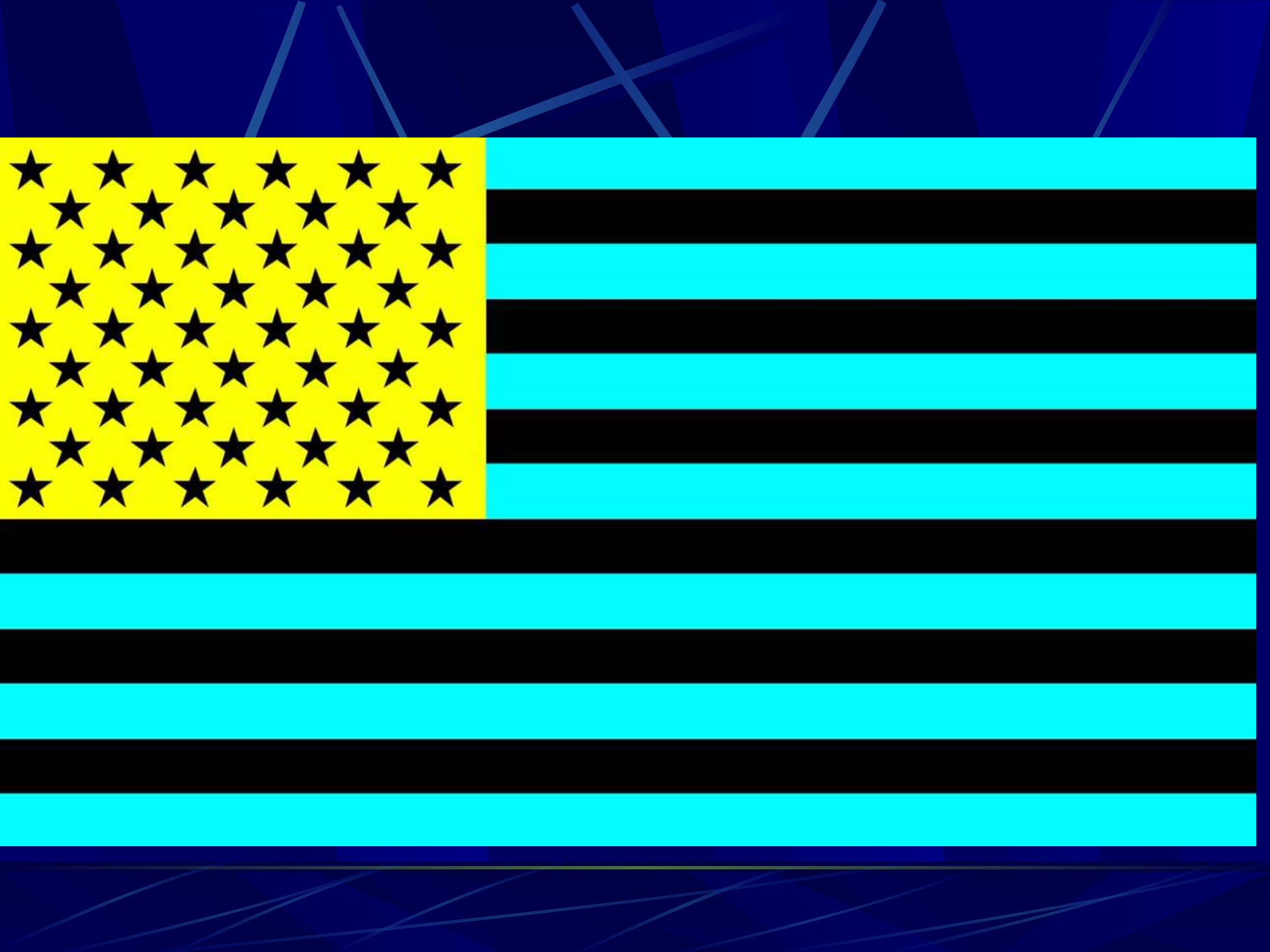
4. Visible - Color Spotlight, diffraction glasses, 3d, bubbles, virtual goggles, eye dissection, strobe light spinning and desktop strobe fountain













Electromagnetic Demos

5. UV demos and coloring



Electromagnetic Demos

6. X rays



Electromagnetic Demos

7. Gamma Waves - Geiger Counter

