

- Like all waves, EM radiation has a frequency and wavelength that are related.

$$v = c = f\lambda$$

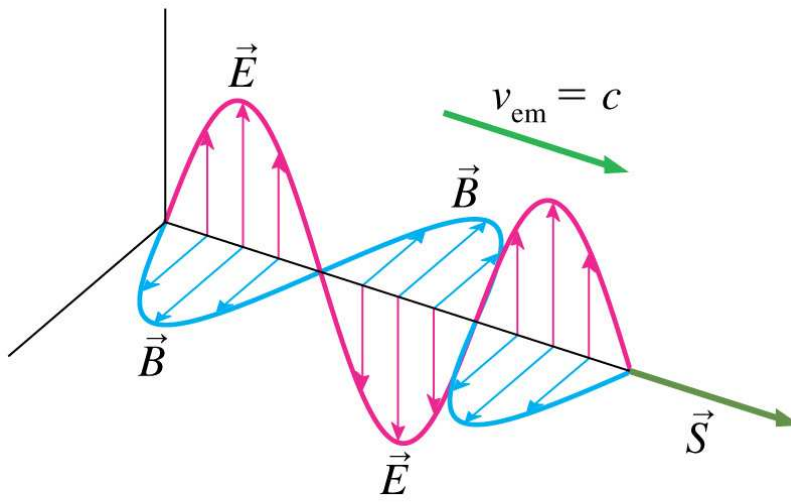
- The speed of light is  $c = 3.00 \times 10^8$  m/s
- Example: What is the highest frequency of visible light?

$$f = \frac{v}{\lambda} = \frac{3 \times 10^8 \text{ m/s}}{400 \times 10^{-9} \text{ m}} = 7.5 \times 10^{14} \text{ Hz}$$

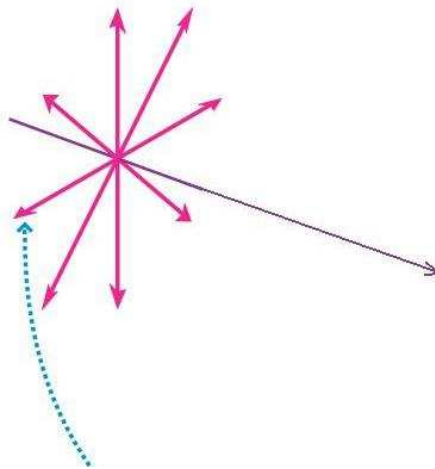
- Like sound waves, light waves have an intensity which measures the amount of power that hits a surface.

Definition :  $I = \frac{P}{A}$       Often :  $I = \frac{P}{4\pi R^2}$

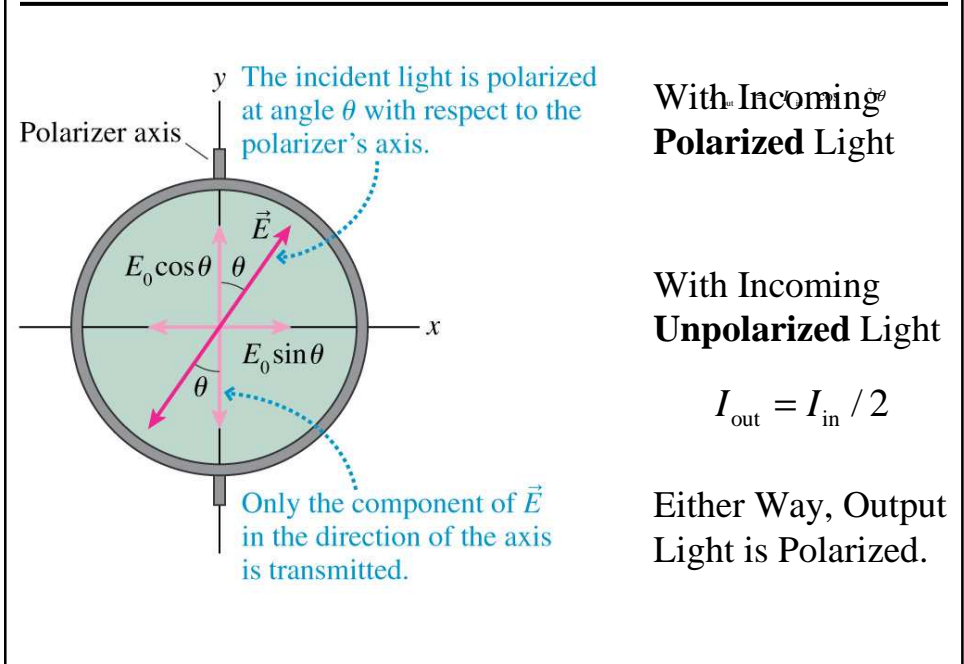
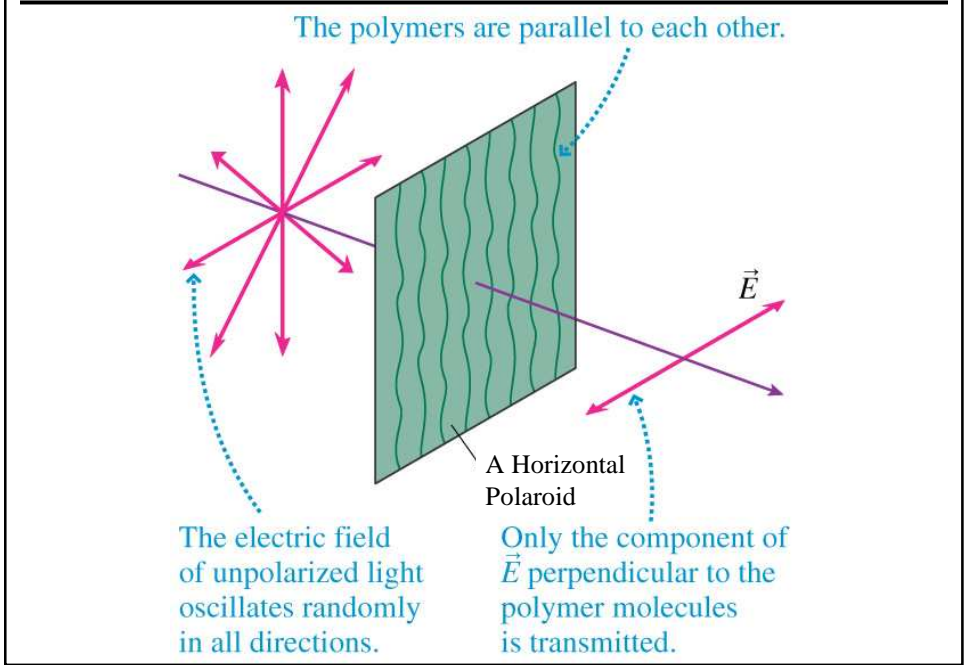
- If light spreads out as it leaves a source, the intensity obeys  $1/R^2$  relationship with distance.
- Intensity is also the Brightness of the light.



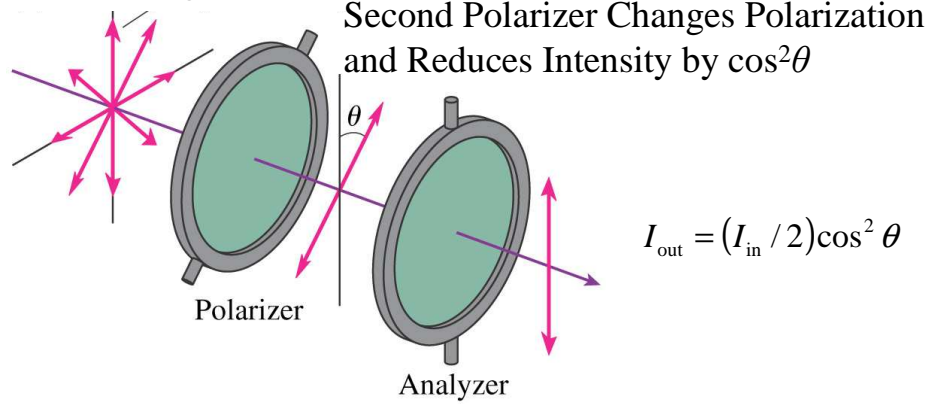
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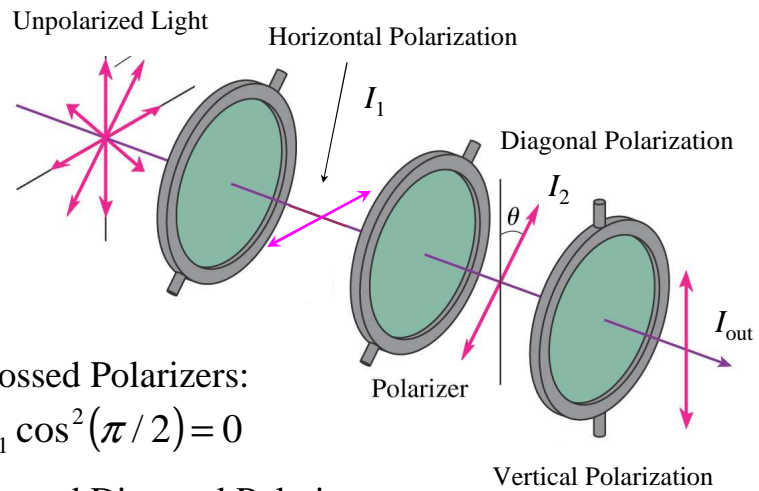
The electric field of unpolarized light points randomly in all directions.



First Polarizer Polarizes  
and Cuts Light in Half



Only the **difference** in angles matters.  
If Polarizers are “crossed”, no light gets through.



With Crossed Polarizers:

$$I_{out} = I_1 \cos^2(\pi/2) = 0$$

With Inserted Diagonal Polarizer:

$$I_{out} = I_2 \cos^2(\pi/4) = I_1 \cos^4(\pi/4)$$