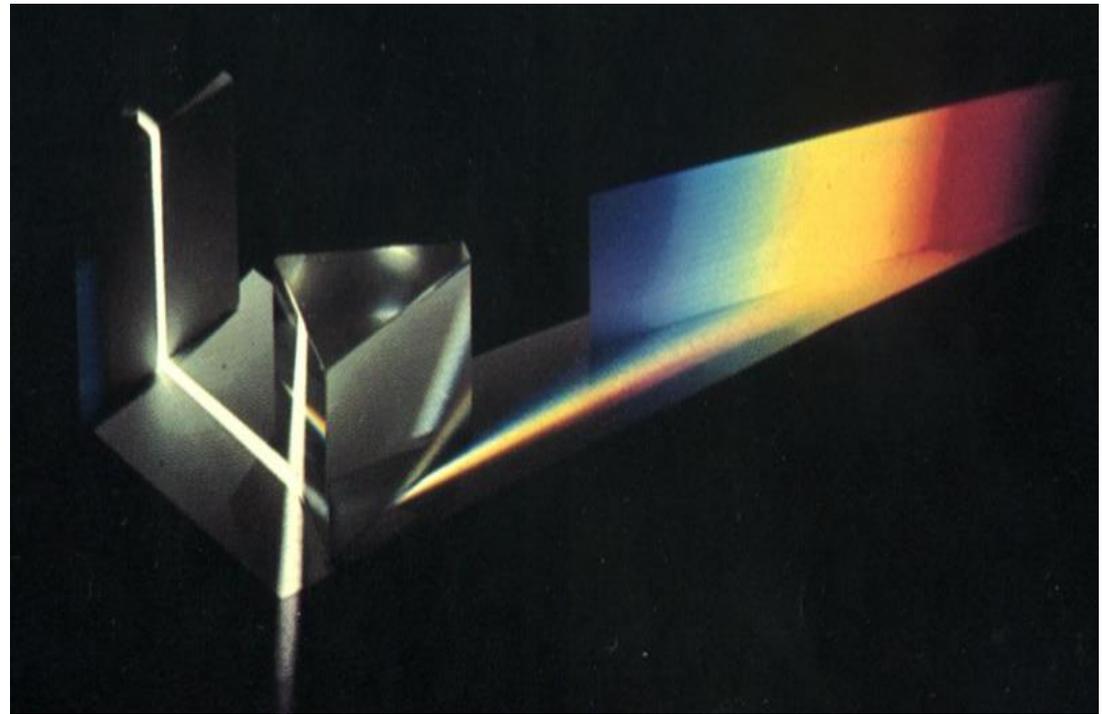


Light meets Matter

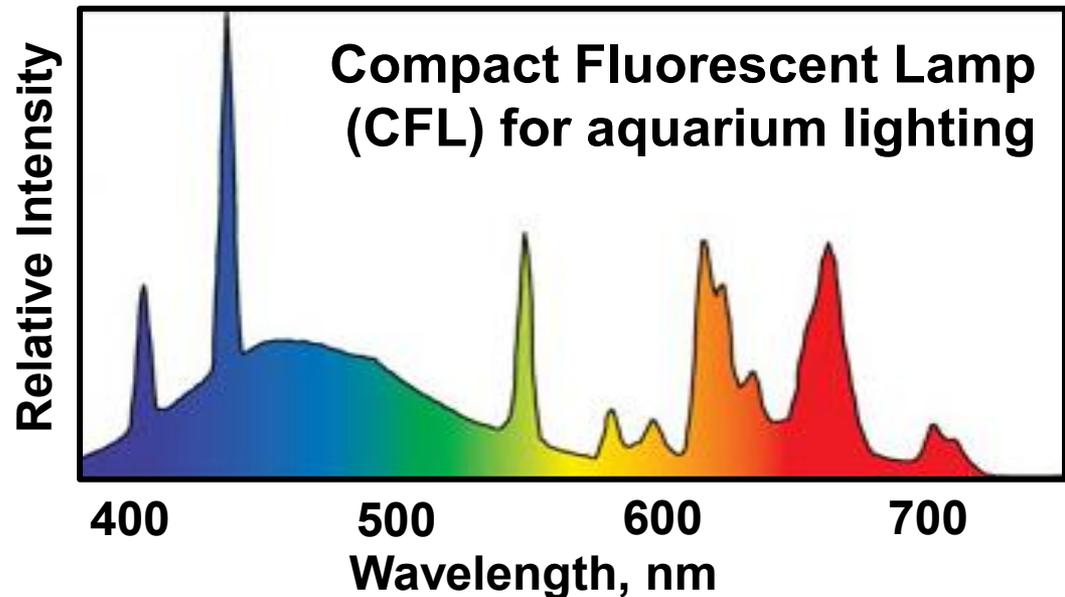


Describing Light

1. Wavelength:
type of photon

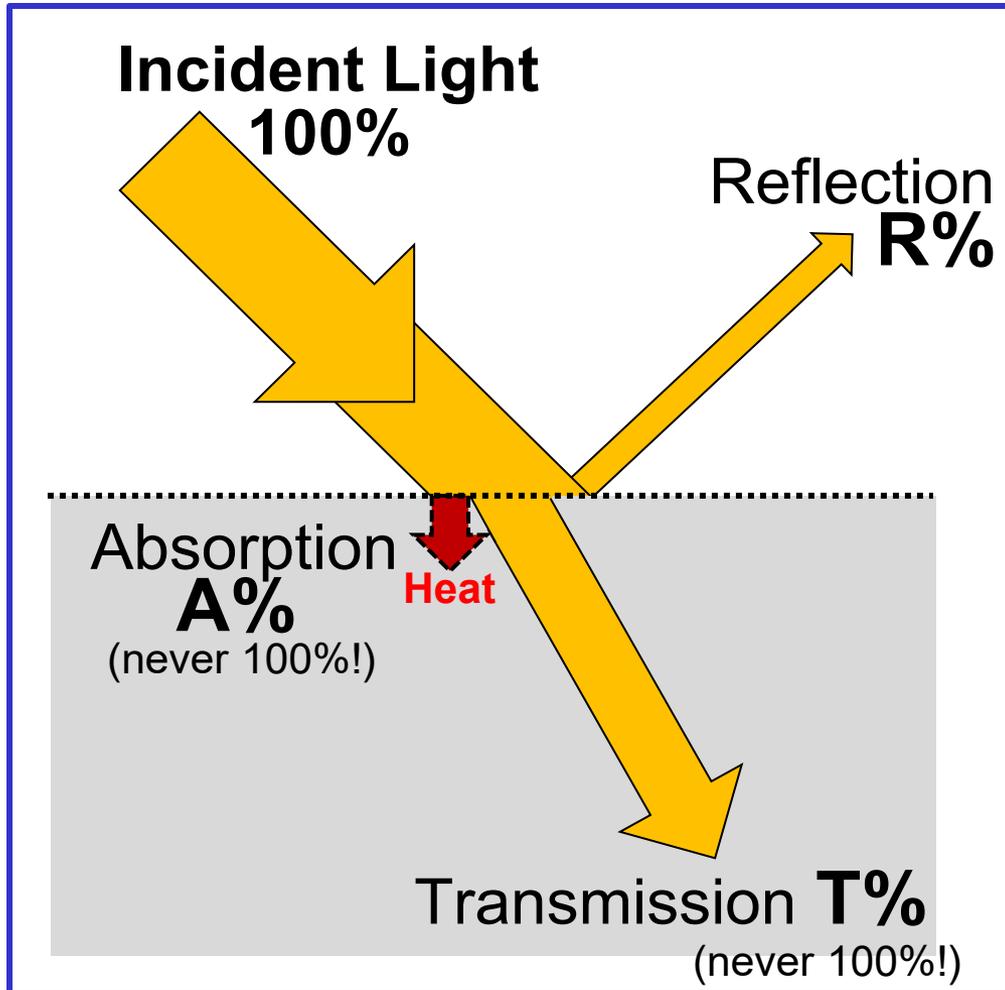
2. Intensity:
amount of
photons

3. Spectrum:
composition
of light;
types of
photons and
their relative
abundance



What (always) happens to light?

The material world around us can be viewed as **objects** (substances, materials) and **boundaries** (surfaces, interfaces).



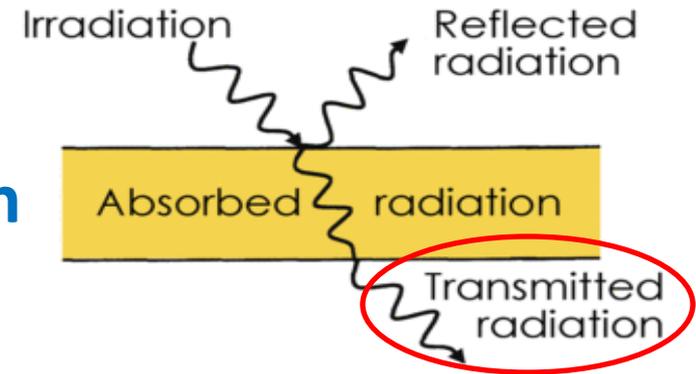
Light (energy!) can be **reflected**, **transmitted** or **absorbed** by matter.

$$T\% + R\% + A\% = 100\%$$

What *exactly* happens to light waves depends on the nature of the material, the smoothness of the surface, the angle of incidence, and the light wavelength.

Transmission

passage of light in forward direction



All objects around us can be classified as:

Transparent



(Large T%)



Translucent

partial or selective transmission

Opaque

(most materials)
do not allow transmission of light,
form shadows



(T%=0)

Shadows

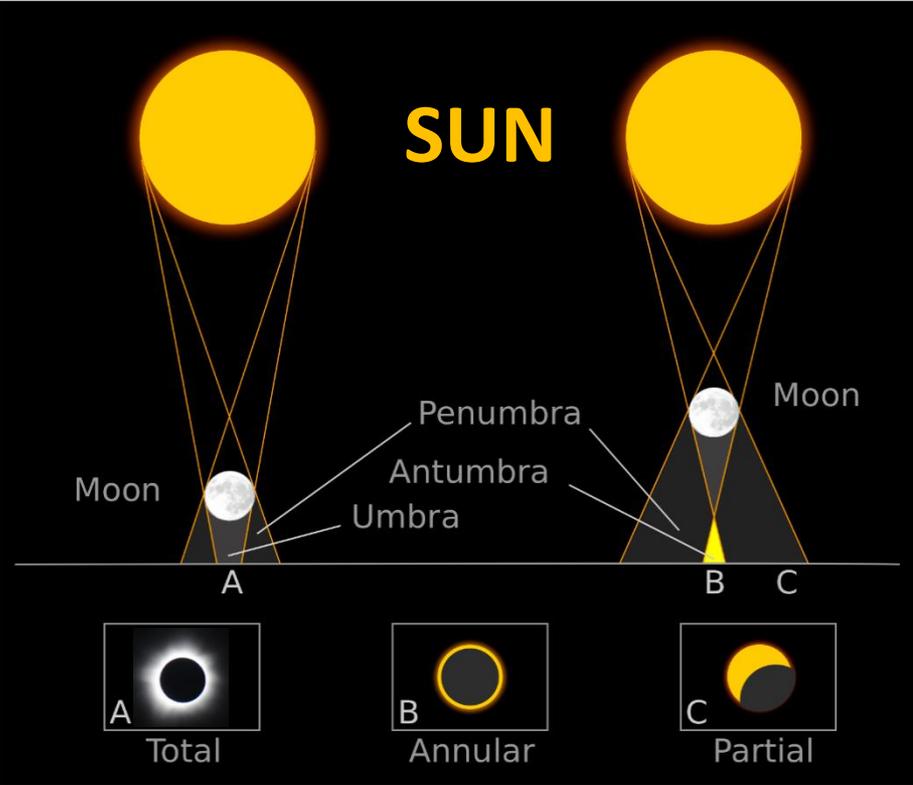


- Light rays travel in straight lines, radiating out from the light source.
- If rays are blocked by an opaque object, a **shadow** forms where the light cannot reach.
- If the light source is moved relative to the object, different amount of light is blocked, and a different shadow is formed.



Egyptian obelisk at St. Peter's Square, Vatican City

Solar Eclipse



Translucent Creatures

(partial transmission)



Mantis shrimp larva



**How do you
hide in the
ocean?**

**You become
see-through!**

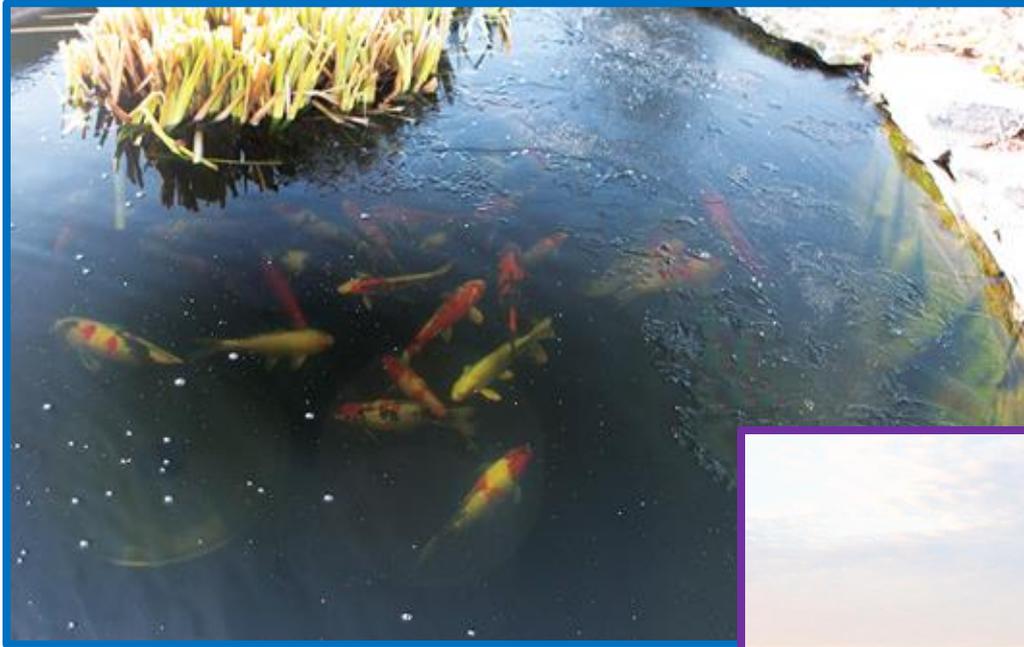
Light Filters *(selective transmission)*



**Rose Window
St. Patrick's Cathedral, New York**



Water: a transparent...mirror?



- Vertical rays of light are mostly transmitted through a transparent material (with *just a little reflection and absorption*).

- If light rays strike the surface at some angle, more of the light is reflected (*larger angle results in more reflection*).

