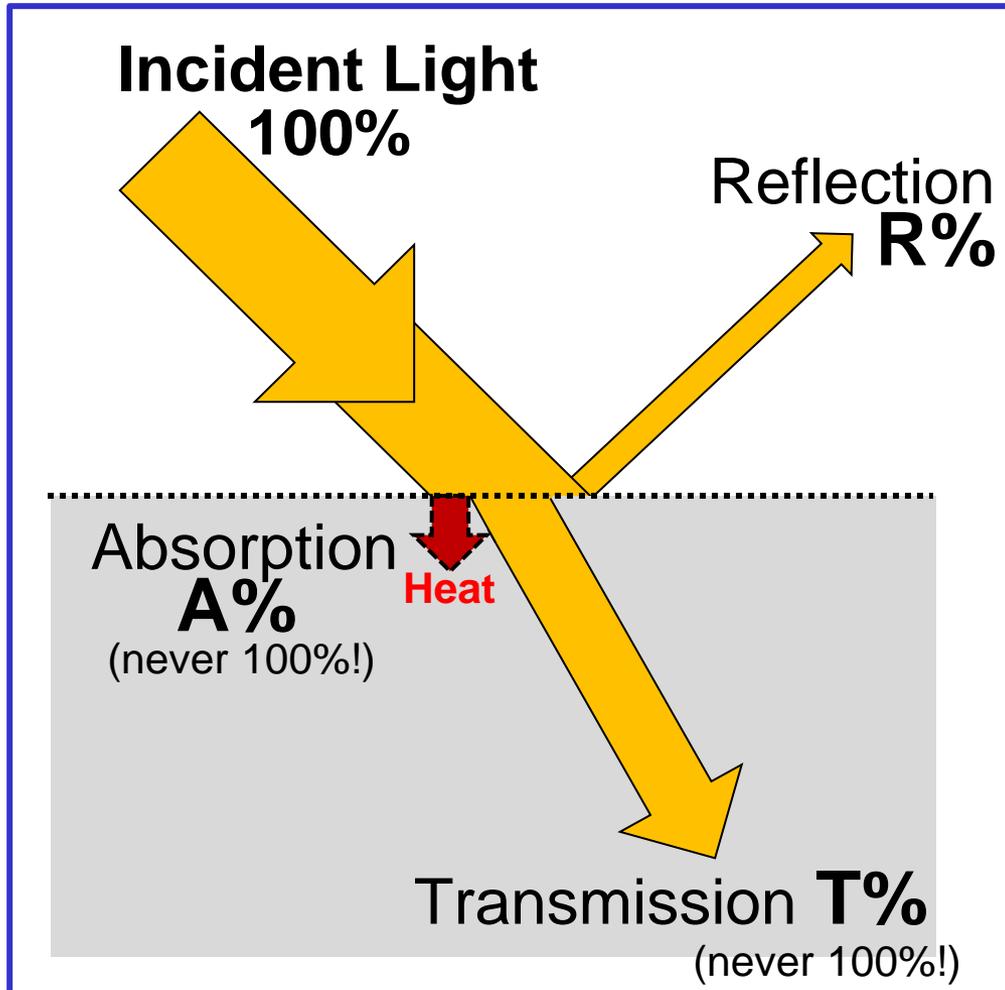


# What (always) happens to light?

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



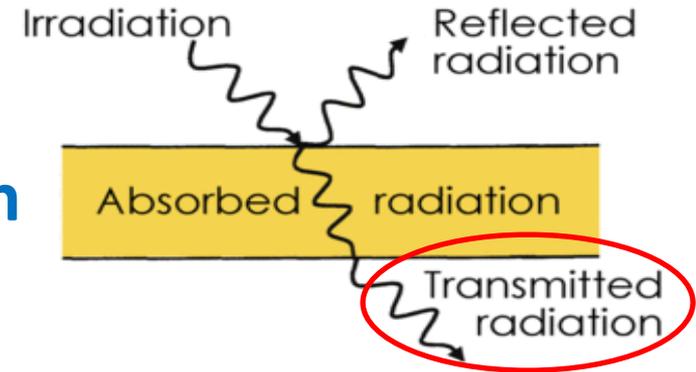
Light (energy!) can be **reflected**, **transmitted** or **absorbed** by matter.

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

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.

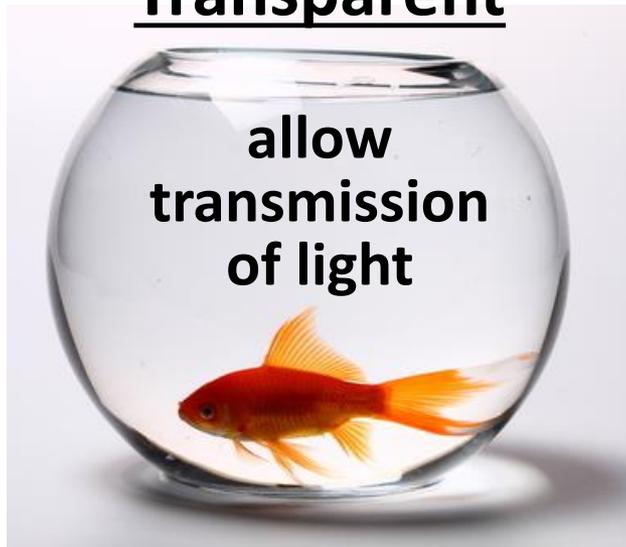
# Transmission

passage of light in forward direction



All objects around us can be classified as:

## Transparent



(Large T%)



partial or selective transmission

## Opaque

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



# Shadows

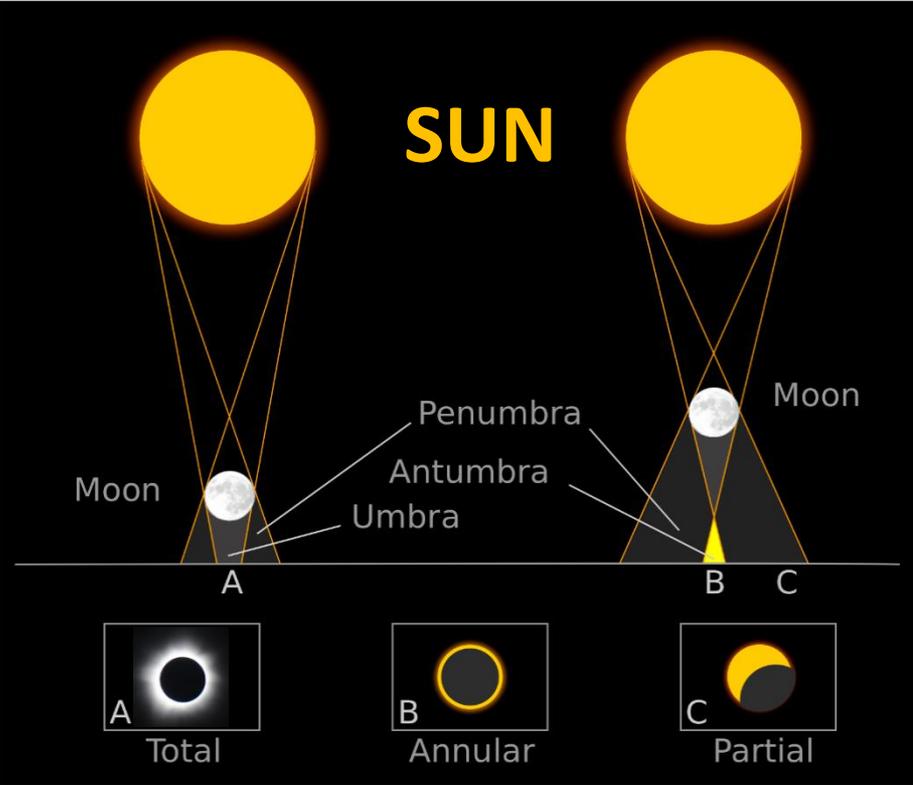


- Light rays travel in straight lines, radiating out from the light source.
- If rays are blocked by an opaque object, a **shadow** forms where the light cannot reach.
- If the light source is moved relative to the object, different amount of light is blocked, and a different shadow is formed.



**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)*



**Rashad Alakbarov, Azerbaijan**



**Tom Fruin, USA**

**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*).