

# Properties of light and interaction with materials

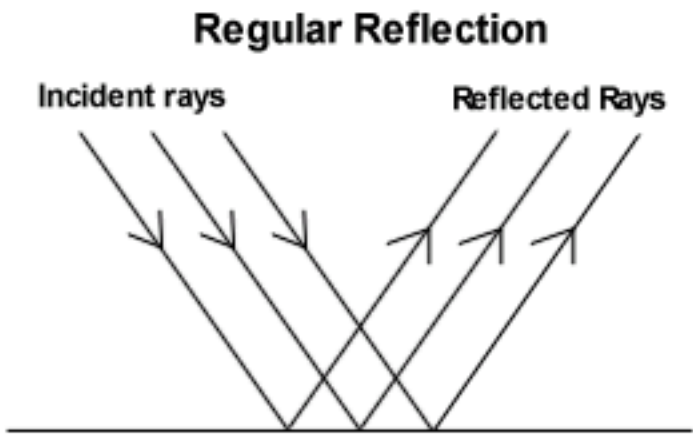
# Light behavior

When light hits an object it can:

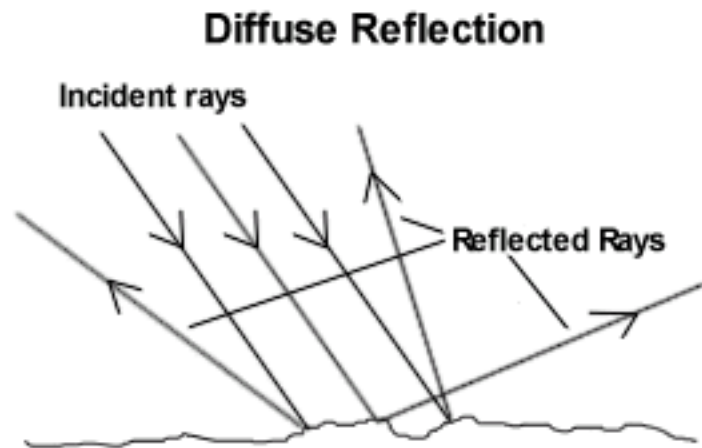
- Be reflected
- Be refracted
- Be absorbed
- Be transmitted
- OR a combination of these!

# Reflective surfaces

Surfaces can bounce light back – Reflection  
If the surface is not smooth it will result in diffuse reflection



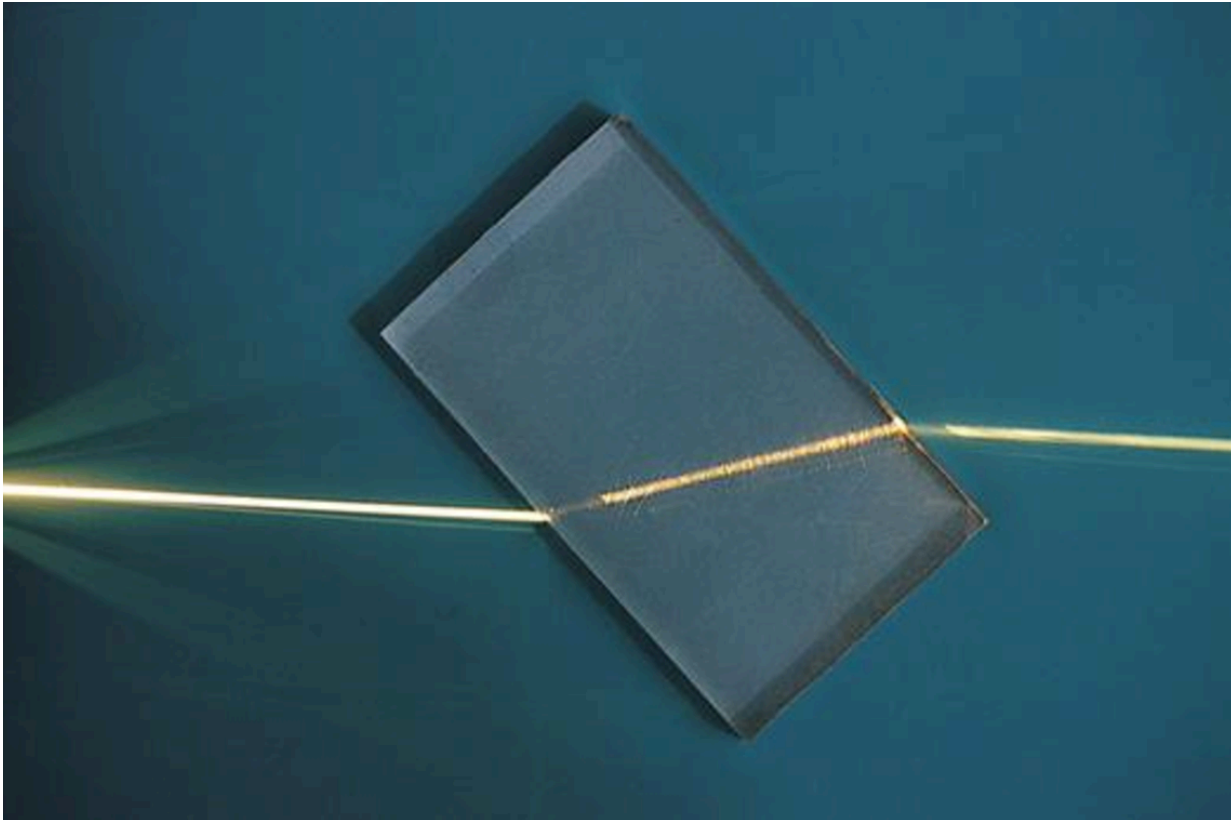
**Eg. plane mirror or any other surface that produces a reflected image.**



**This is like any surface that we can see but does not reflect an image**

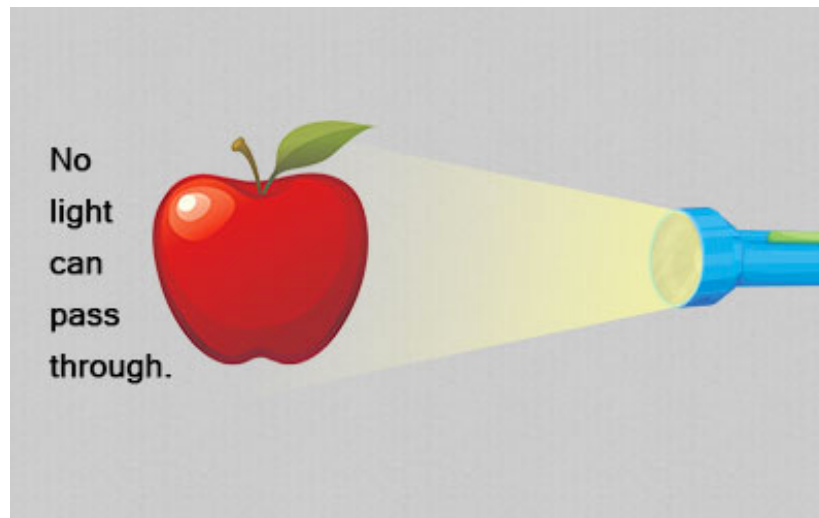
# Refractive surface

Passes through, but light is slowed and thus direction changes slightly



# Opaque surfaces

**Opaque** matter is matter that does not let any light pass through it. Matter may be opaque because it **absorbs** light, **reflects** light, or does some combination of both.



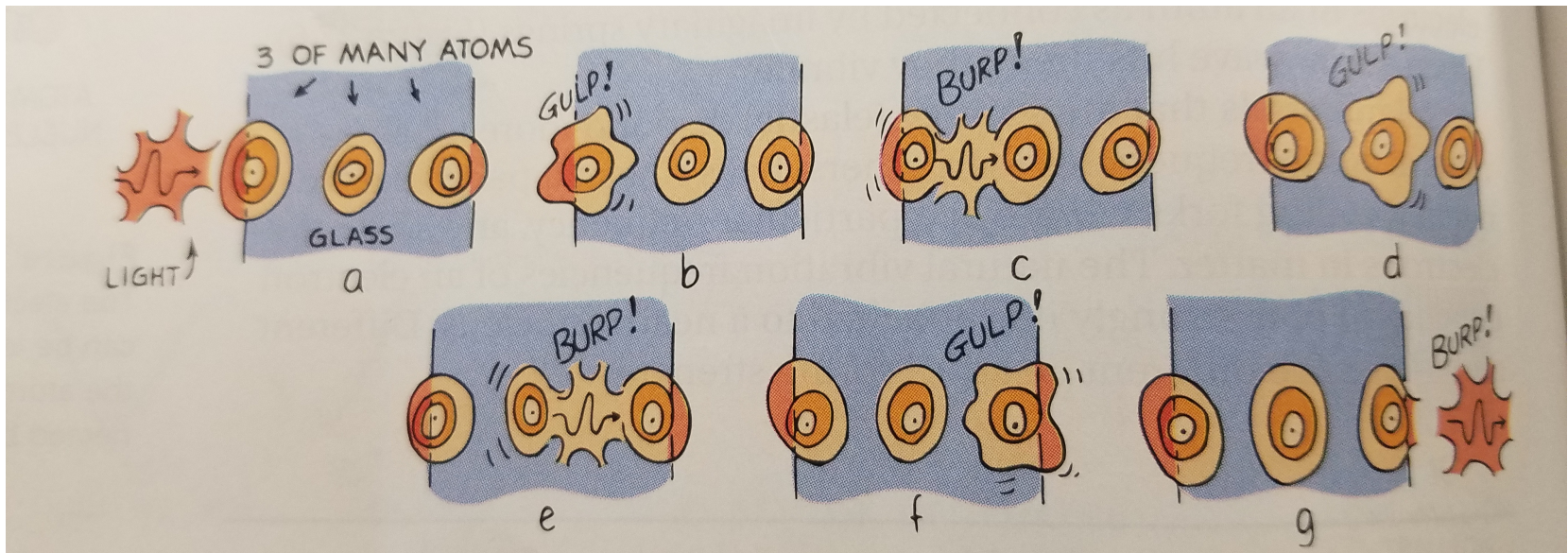
# Transparent

**Transparent** matter is matter that **transmits** light without scattering it. Examples of transparent matter include air, pure water, and clear glass. You can see clearly through transparent objects.



# Transmission of light

When light is **transmitted** through an object the light causes electrons of the atoms to begin vibrating. The vibrations of the electrons are passed on to neighboring atoms through the bulk of the material and reemitted on the opposite side of the object



# Translucent

**Translucent** matter is matter that **transmits** light but **scatters** the light as it passes through.

Light passes through translucent objects but you cannot see clearly through them because the light is scattered in all directions.





# Polarization

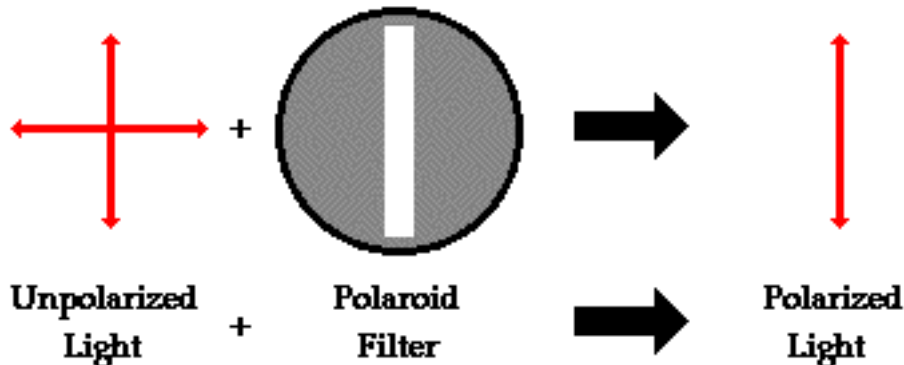
Remember EM waves are **TRANSVERSE** and Normal light vibrates in all directions

Polarization separates out the components of light that vibrate in different directions

A light wave is known to vibrate in a multitude of directions ...

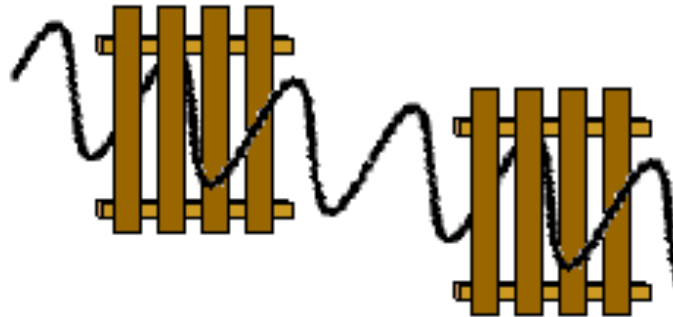


... In general, a light wave can be thought of as vibrating in a vertical and in a horizontal plane.

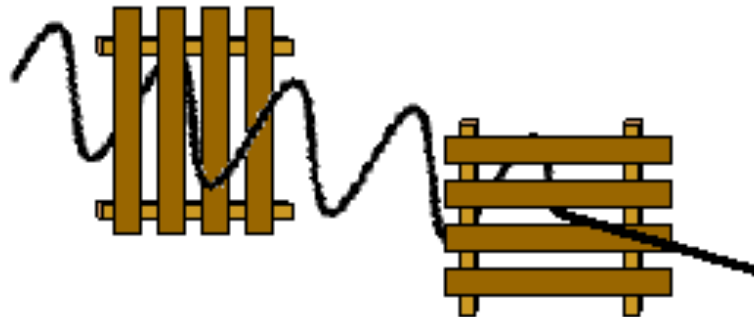


# Polarization

## The Picket Fence Analogy



**When the pickets of both fences are aligned in the vertical direction, a vertical vibration can make it through both fences.**



**When the pickets of the second fence are horizontal, vertical vibrations which make it through the first fence will be blocked.**