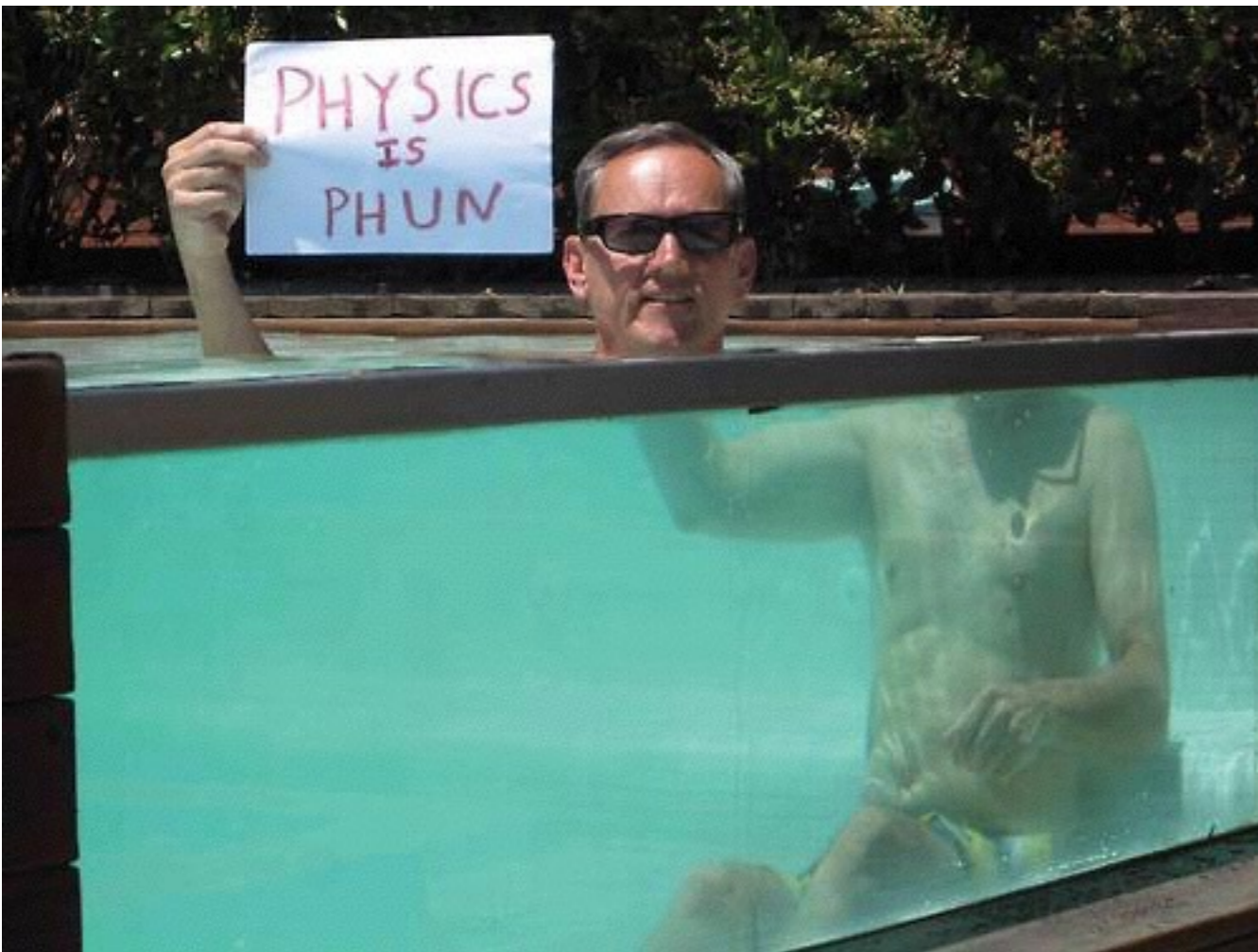


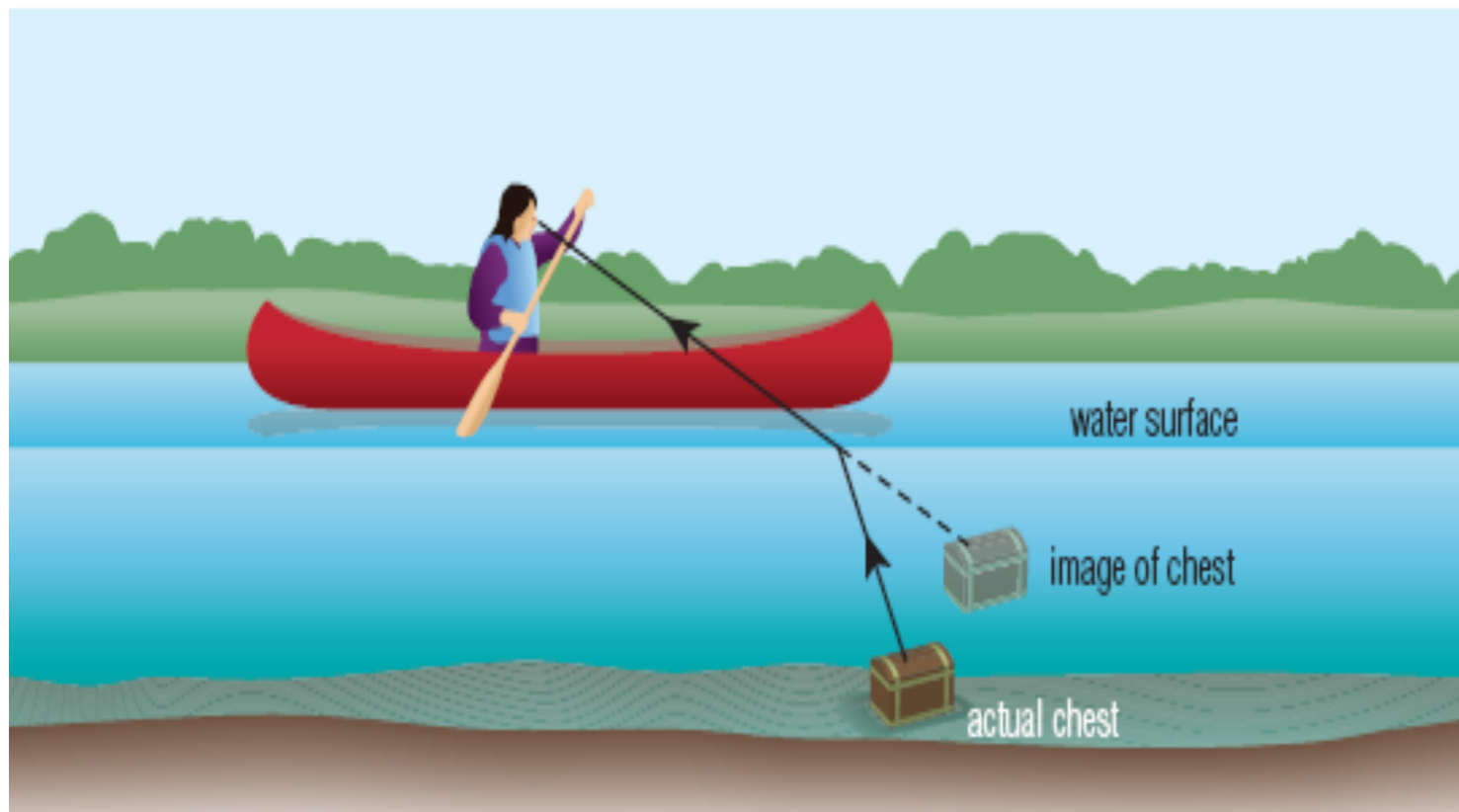
The Refraction of Light 1

Biology
is more
fun



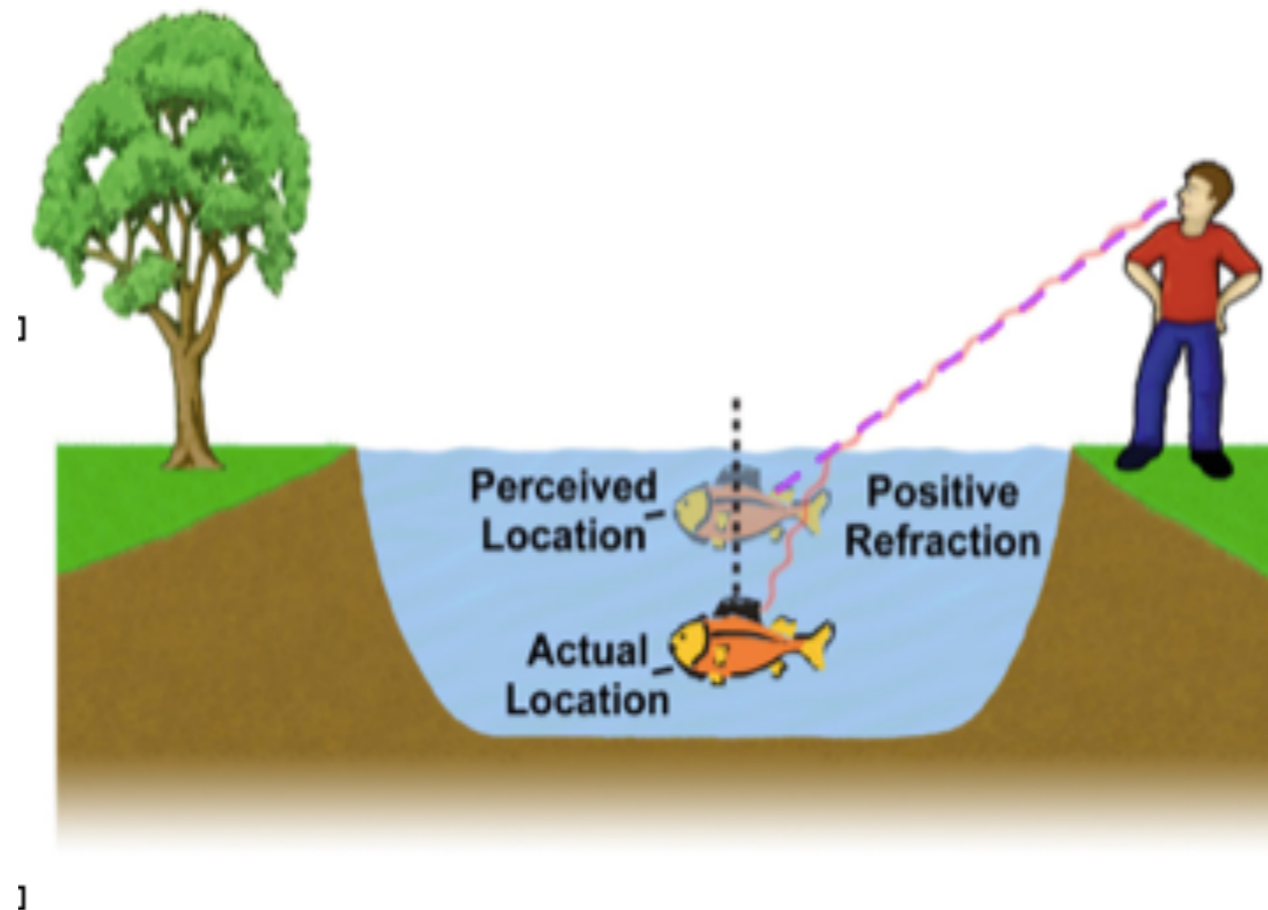
Refraction

- This effect is commonly seen when looking at something in the water.
- It appears like the light is coming straight to us when really it is bending



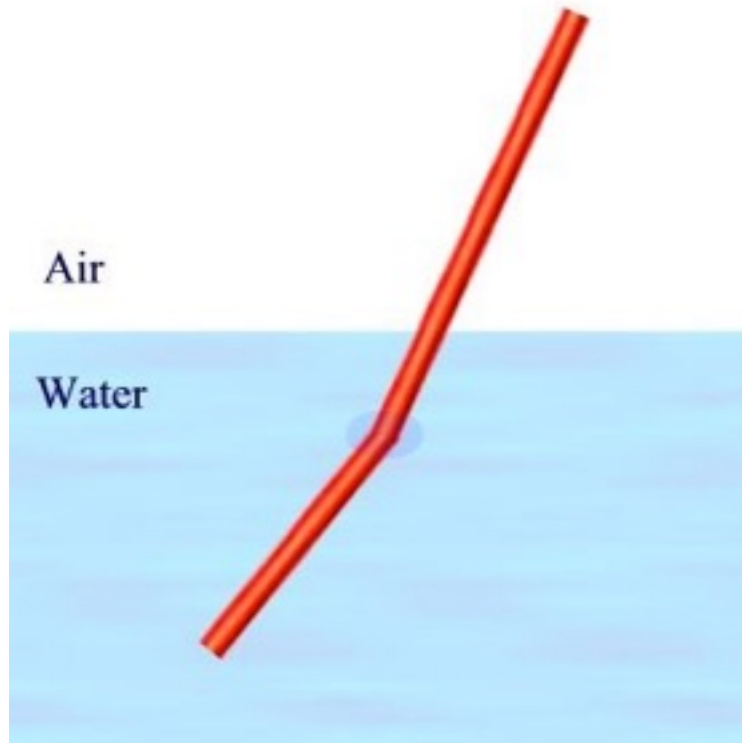
Refraction

- Light normally travels in a straight line
- when it passes from one medium to another, such as from air to water, light will change direction.
- **Medium** – (plural:media) **is a material that light travels through.**

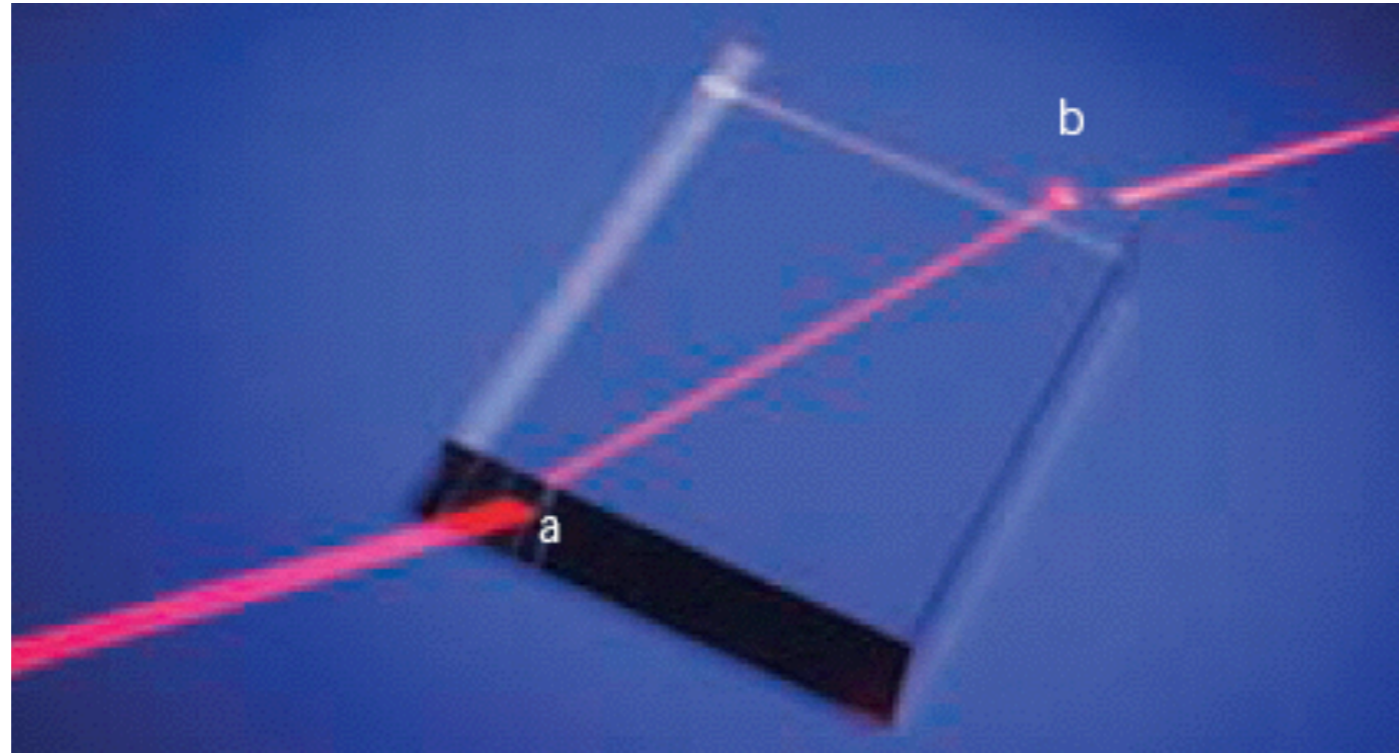


Refraction

- The bending of light rays as they pass between two different media is called **refraction**
- light bends due to changing the speed of light. The more light slow down, or speeds up, the more it is refracted.



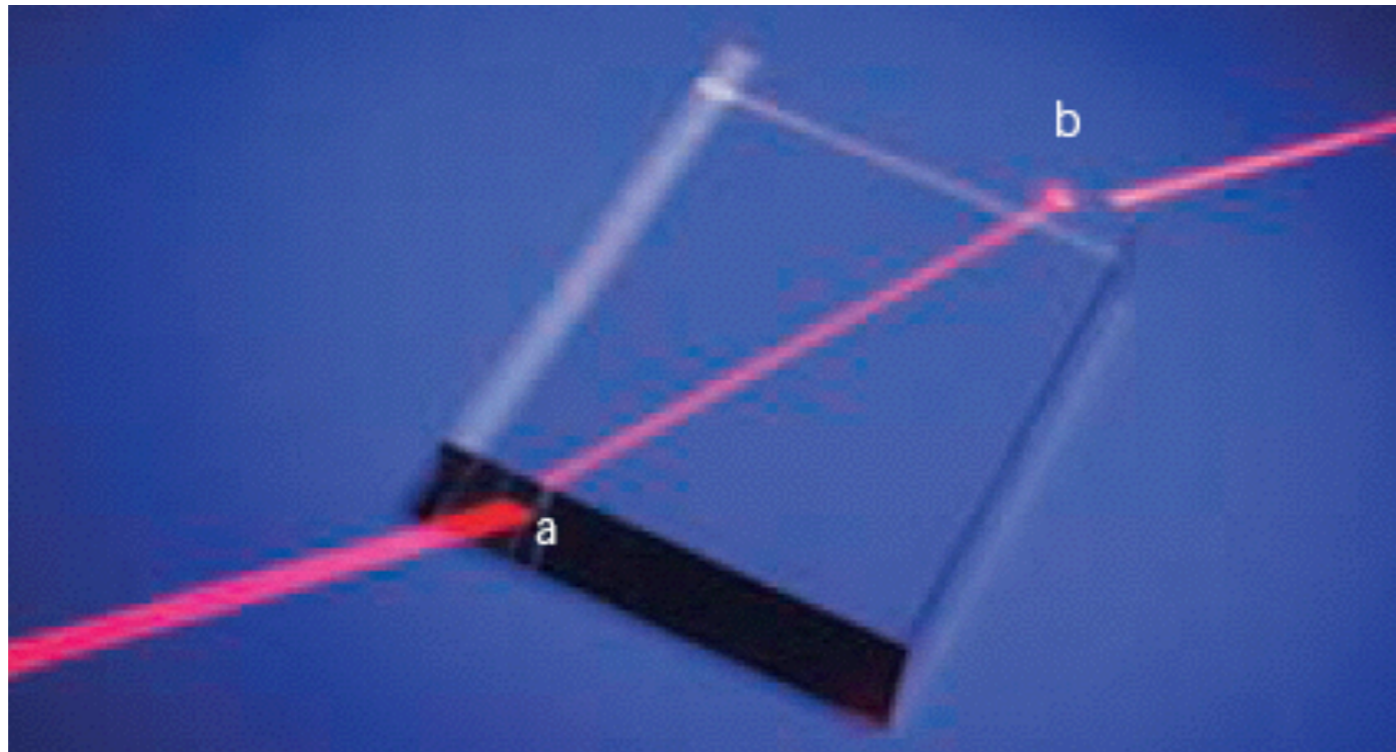
The Speed of Light



- Example: The light ray strikes the Plexiglas at an angle.
- (a). As the light enters the Plexiglas, it slows down and refracts
- (b). When the light leaves the Plexiglas and enters the air, it speeds up and refracts again

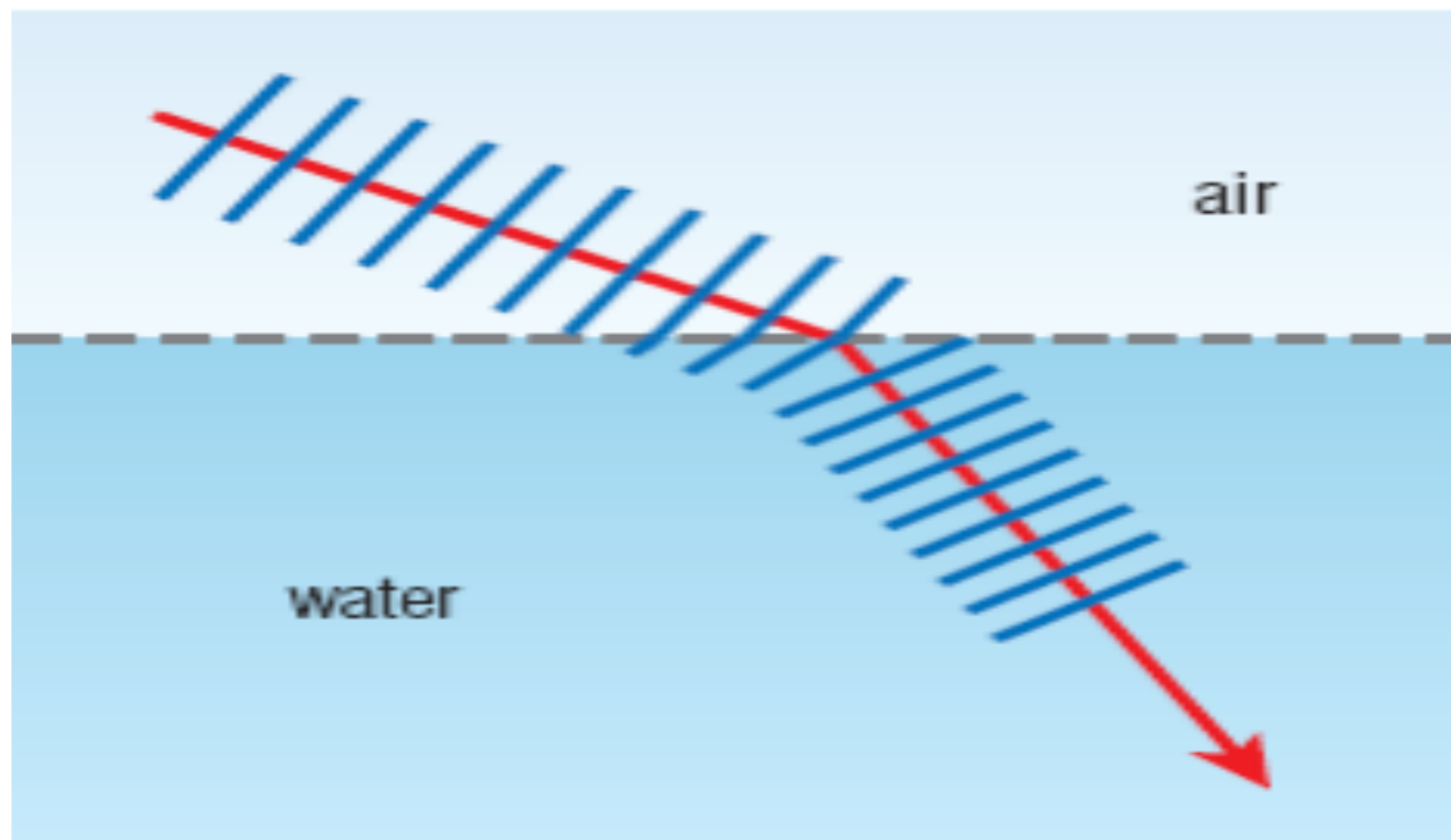
The Speed of Light

- Notice that light does not refract inside the block. Light refracts only at the boundary when it is entering or leaving a medium.
- **The angle of refraction entering the block is exactly reversed as the light leaves the block**

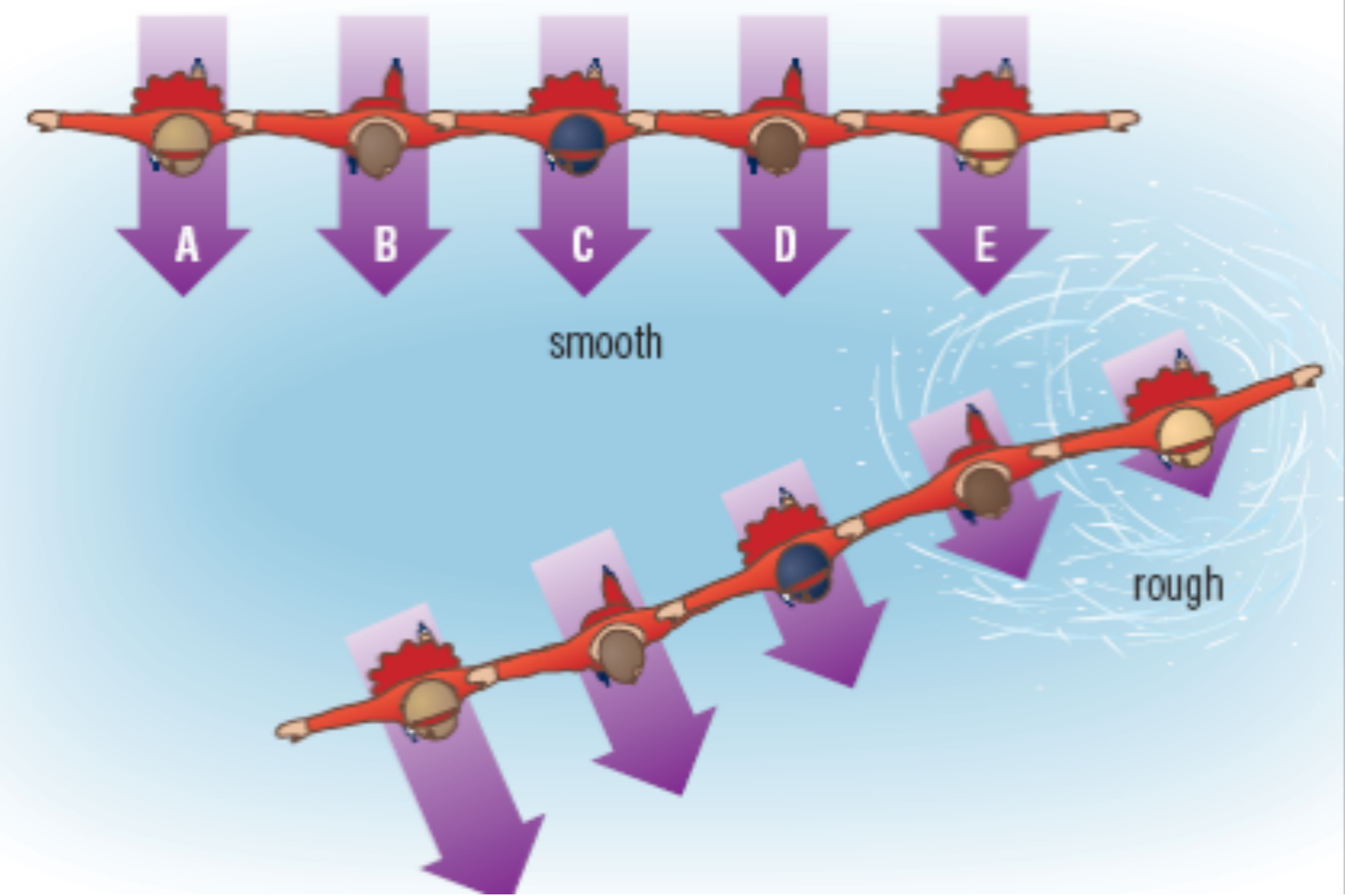


How Light Refracts

- As light enters a slower medium, the light waves are slow or be held up.
- If light strikes a medium at an angle, the part of the light wave that enters the medium first will slow down first.

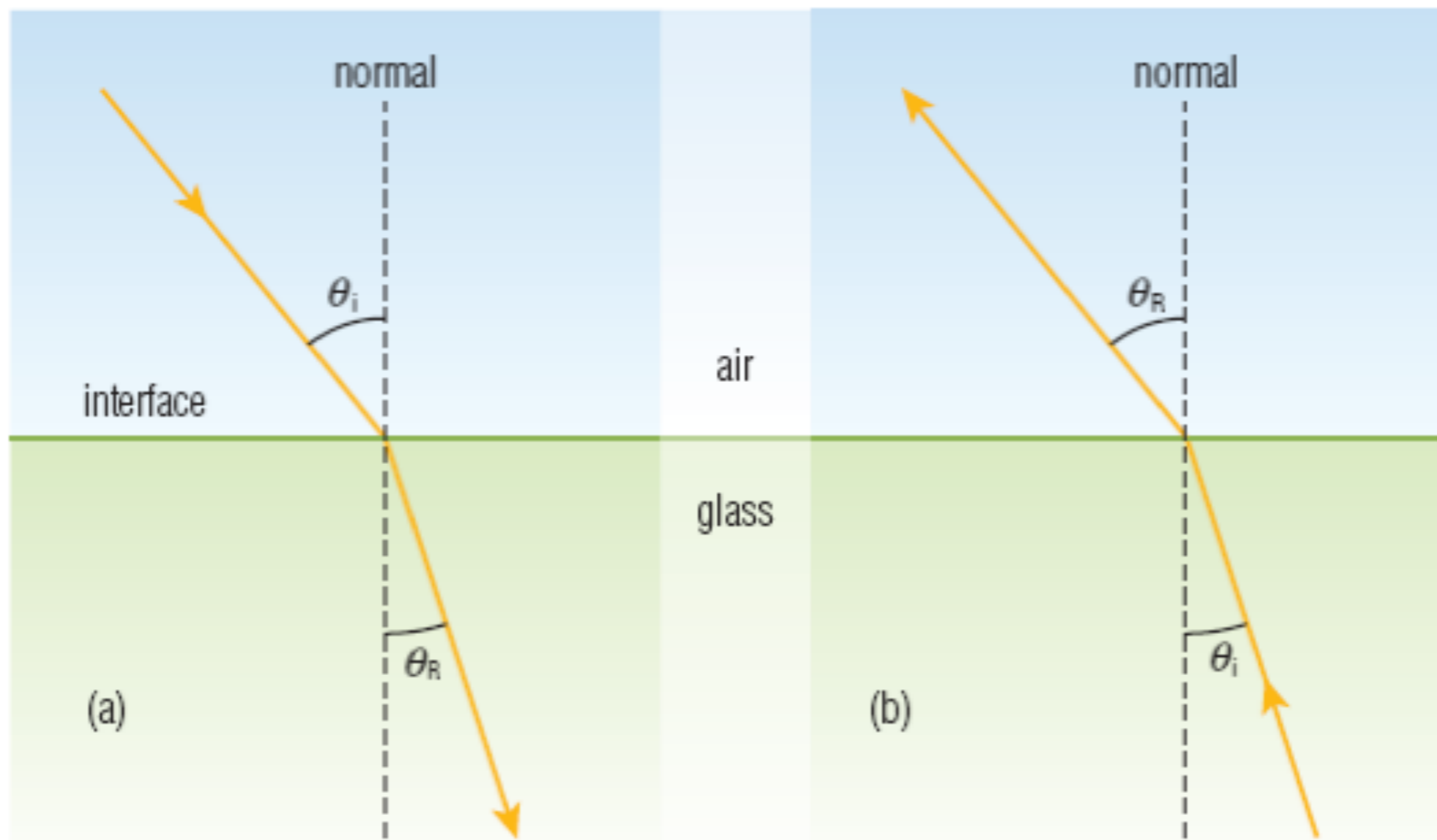


Example



How Light Refracts

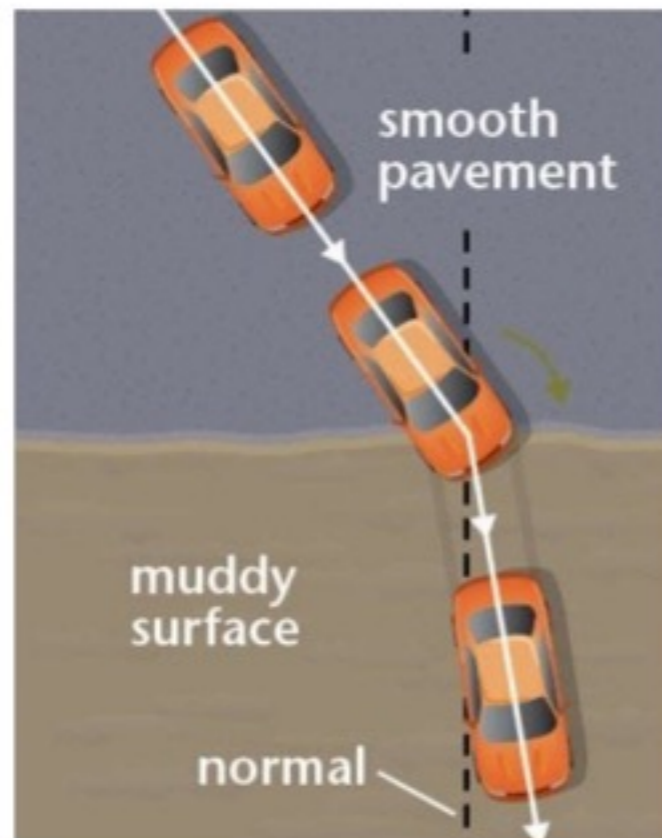
- The angles of the refracted light rays are usually measured from the normal, drawn at 90° to the surface where the light ray crosses between the two media



How Light Refracts

- When light travels from air, with a low refractive index, into water, with a higher refractive index, it bends **toward the normal**.
- When light travels from a denser (higher refractive index) medium into a less optically dense (lower refractive index) medium, it bends **away from the normal**.

Cause of Refraction

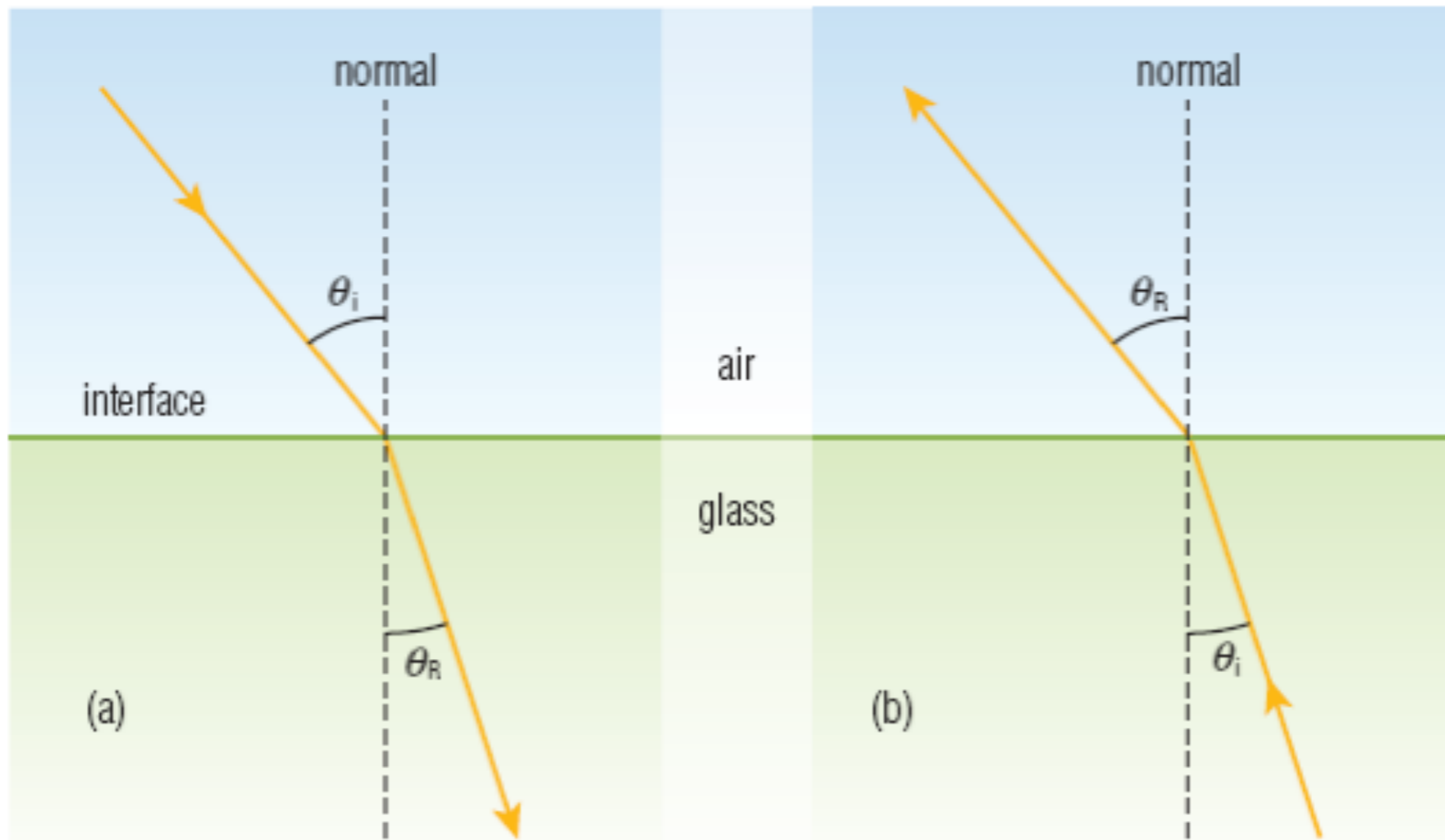


Car Analogy

- Car travelling at an angle towards a muddy surface
- One front wheel hits muddy surface and slows down
- Other wheels continue to move at a higher speed
- Causes the path to bend

How Light Refracts

- When light travels from air, with a low refractive index, into water, with a higher refractive index, it bends toward the normal.
-



The Index of Refraction

- The amount by which a transparent medium decreases the speed of light is indicated by a number called the **index of refraction**, also called the refractive index.
- **The larger the refractive index, the more the medium decreases the speed of light.**

Refractive Index Values for Selected Media

Material	Refractive Index
Air	1.0003
Water	1.333
Glycerin	1.473
Immersion Oil	1.515
Glass (Crown)	1.520
Glass (Flint)	1.656
Zircon	1.920
Diamond	2.417
Lead Sulfide	3.910