Light travels in straight lines through air. But what happens when it travels from one material into another? You likely have noticed that a spoon or stir stick, when placed in a glass of water, looks somewhat disconnected at the surface of the water. The spoon is not really disconnected. It is made of a solid material. So what is happening?

What is Refraction?

When light crosses a boundary, for example, from water to air, the light is

refracted. **Refraction** is the bending of light at the boundary of two transparent

substances. The transparent substances are sometimes called media. While

refraction causes some very interesting visual effects, it is more than just an optical curiosity. Refraction is used in designing and building camera lenses, eyeglasses, and telescopes.

When a light ray moves from one medium into another, its speed changes. For

example, the speed of a light ray in water is less than the speed of a light ray in air (see chart). It is the change in the speed of light that causes the refraction of light.

**NOTE!** Since light travels faster in air than it doesin water the air is the “fast” medium whilethe water is the “slow” medium.

|  |  |
| --- | --- |
| Medium | Speed (km/s) |
| Air | 300,000 |
| Ice | 229,000 |
| Liquid water | 226,000 |
| Vegetable oil | 204,000 |
| Glass | 197,000 |
| Ruby | 170,000 |
| Diamond | 124,000 |

**REFRACTION**

\_ bending of light as it moves from one medium into another

\_ caused by a change in the speed of light

\_ the more the light slows down the more it bends (refracts) toward the

Normal

Rules of Refraction

1. When travelling from a “fast” medium into a “slow” medium (i.e. such as air

to glass) the light slows down and bends toward the normal. In this case, the angle of incidence (i) is larger than the angle of refraction (R).

2. When travelling from a “slow” medium into a “fast” medium (i.e. such as glass to air) the light speeds up and bends away from the normal. In this case,

the angle of incidence (i) is smaller than the angle of refraction (R).