Specular vs. Diffuse Reflection

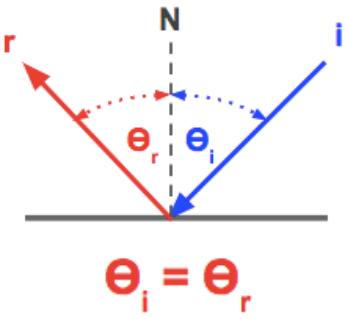
Lesson Notes

Learning Outcomes

- What is specular reflection?
- What is diffuse reflection?
- How are they similar? And how are they different?

The Law of Reflection ... Revisited

When light reflects off a mirror, the angle between the incoming ray (incident ray) and the normal line is equal to the angle between the outgoing ray (reflected ray) and the normal line.



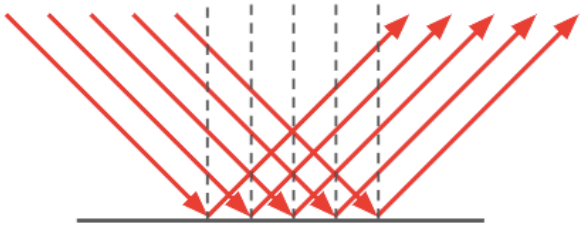
What is Specular Reflection?

Specular reflection is the phenomenon in which a beam of light (a bundle of parallel light rays) reflects off a surface and remains as a beam of light. This is observed when light beams reflect from microscopically **smooth surfaces**. The normal lines for adjacent light rays in the beam are parallel to each other.

What is Diffuse Reflection?

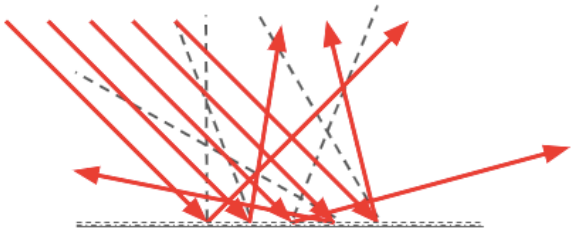
Diffuse reflection is the phenomenon in which a beam of light (a bundle of parallel light rays) reflects off a surface and becomes scattered in a variety of directions. Observed when light beams reflect from microscopically **rough surfaces**. The normal lines for adjacent light rays in the beam are **NOT** parallel to each other.

Specular Reflection



(Light remains concentrated in a beam)

Diffuse Reflection



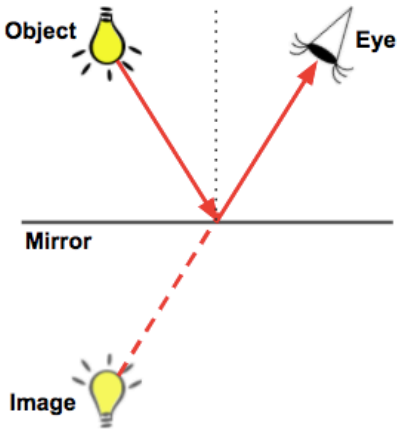
(Light is diffused or spread about in a variety of directions)

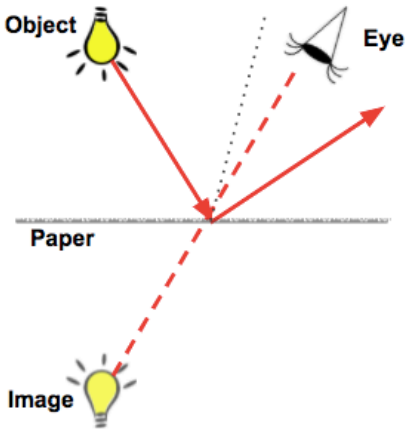
Reflection Off Paper Surfaces

Paper consists of numerous interwoven fibers that make the surface of paper microscopically rough. Light that strikes the surface is diffused about the surface, illuminating the entire surface. Paper surfaces are easy to read off of because the surface is uniformly illuminated and absent of a glare.

Specular and Diffuse Reflection AND the Viewing of Images

When sighting along a line of sight at the image location for a mirror, a ray of light comes to the eye. For a rough surface, there is no such ray of light.





What About the Law of Reflection

In both specular reflection and diffuse reflection, light follows the law of reflection. That's **NOT** the difference between the two types of reflection. The difference between the two types of reflection has to do with the fact that the normal line for each ray of light within the beam is not parallel to each other. Because of surface irregularities, not every ray encounters the same surface orientation.