Grade 8 - Light and Optics

Topic 2: Reflections

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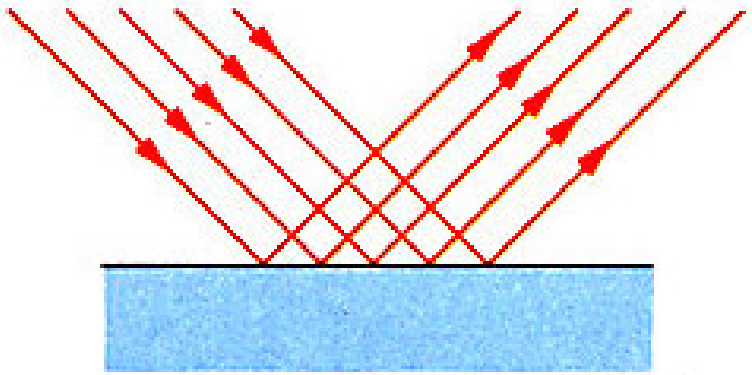
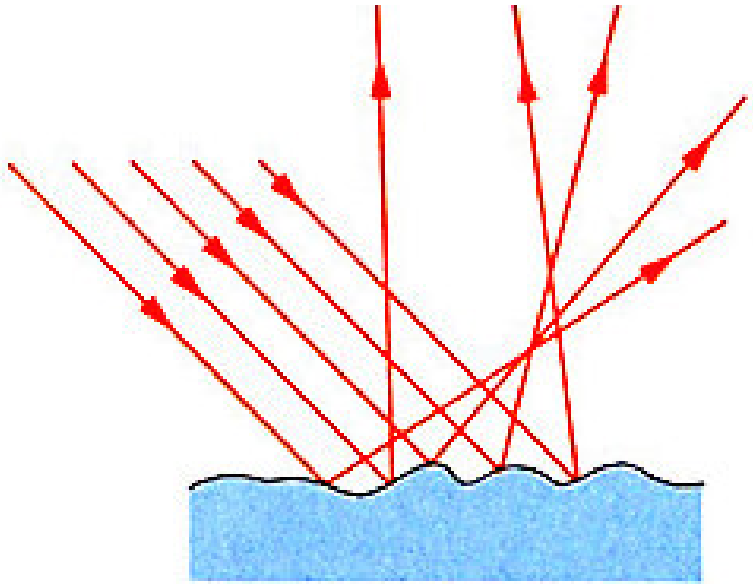
Reflection

Process in which light strikes a surface and bounces back off that surface.



Specular reflection



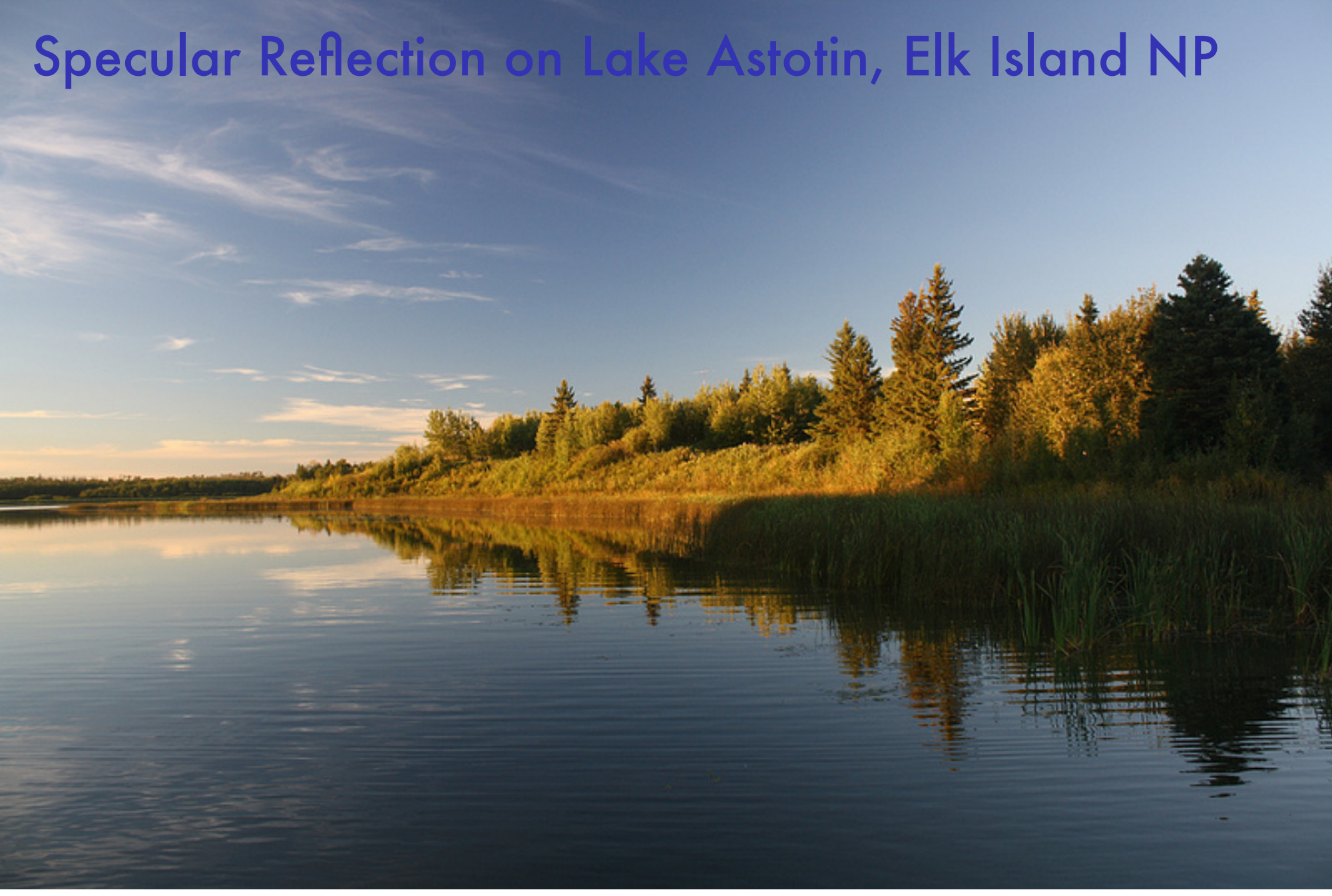
Diffuse reflection

Specular vs. Diffuse Reflection

Specular reflection: Mirror-like reflection of light from a surface, in which light from a single incoming direction (a ray) is reflected into a single outgoing direction. A smooth surface will have all light reflect together and form a clear image

Diffuse reflection: Reflection of light from a surface such that an incident ray is reflected at many angles rather than at just one angle as in the case of specular reflection. A rough surface will scatter light and will not form a clear image

Specular Reflection on Lake Astotin, Elk Island NP

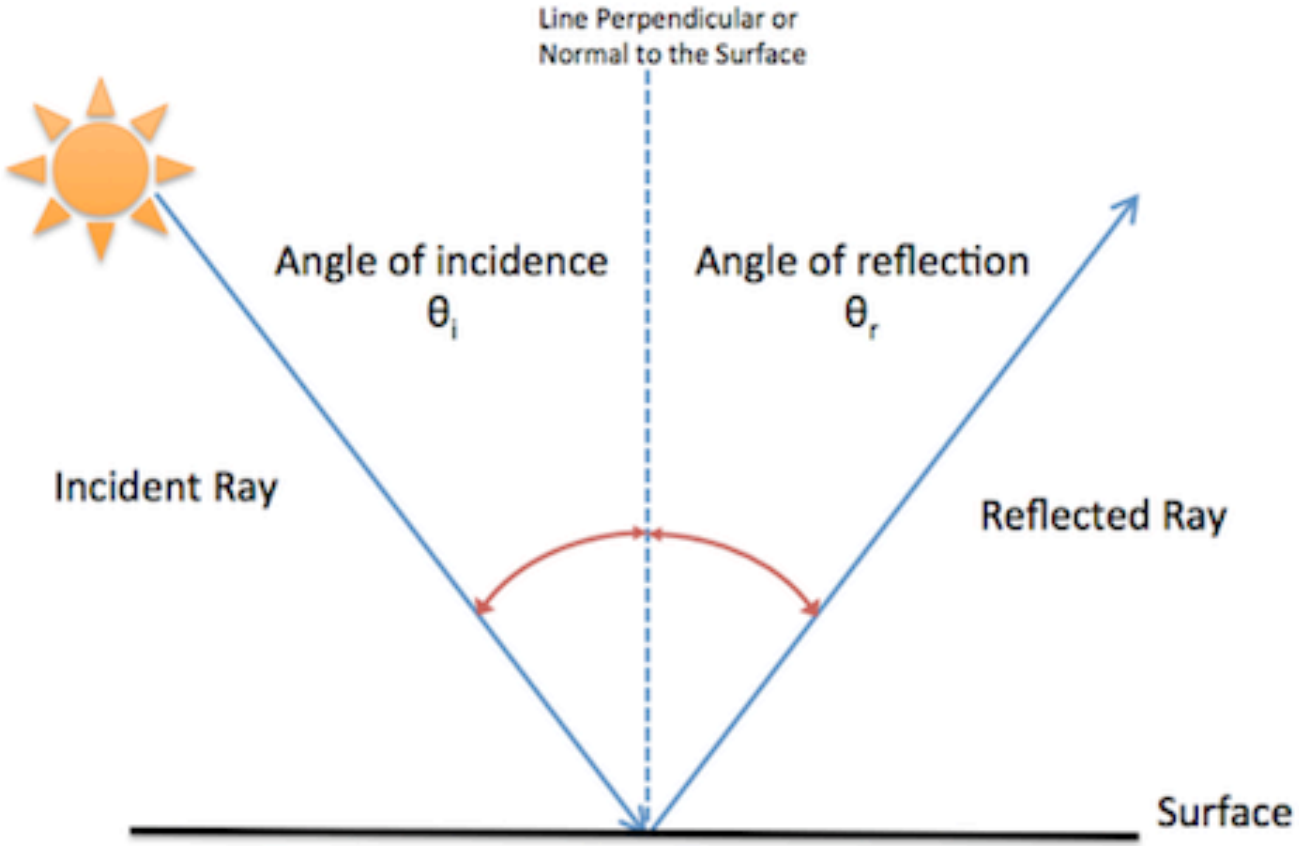


Scientific Law

- A scientific law is a statement of a pattern that has been observed and tested again and again with the same results each time.
- Scientific laws do not explain why we see a pattern.

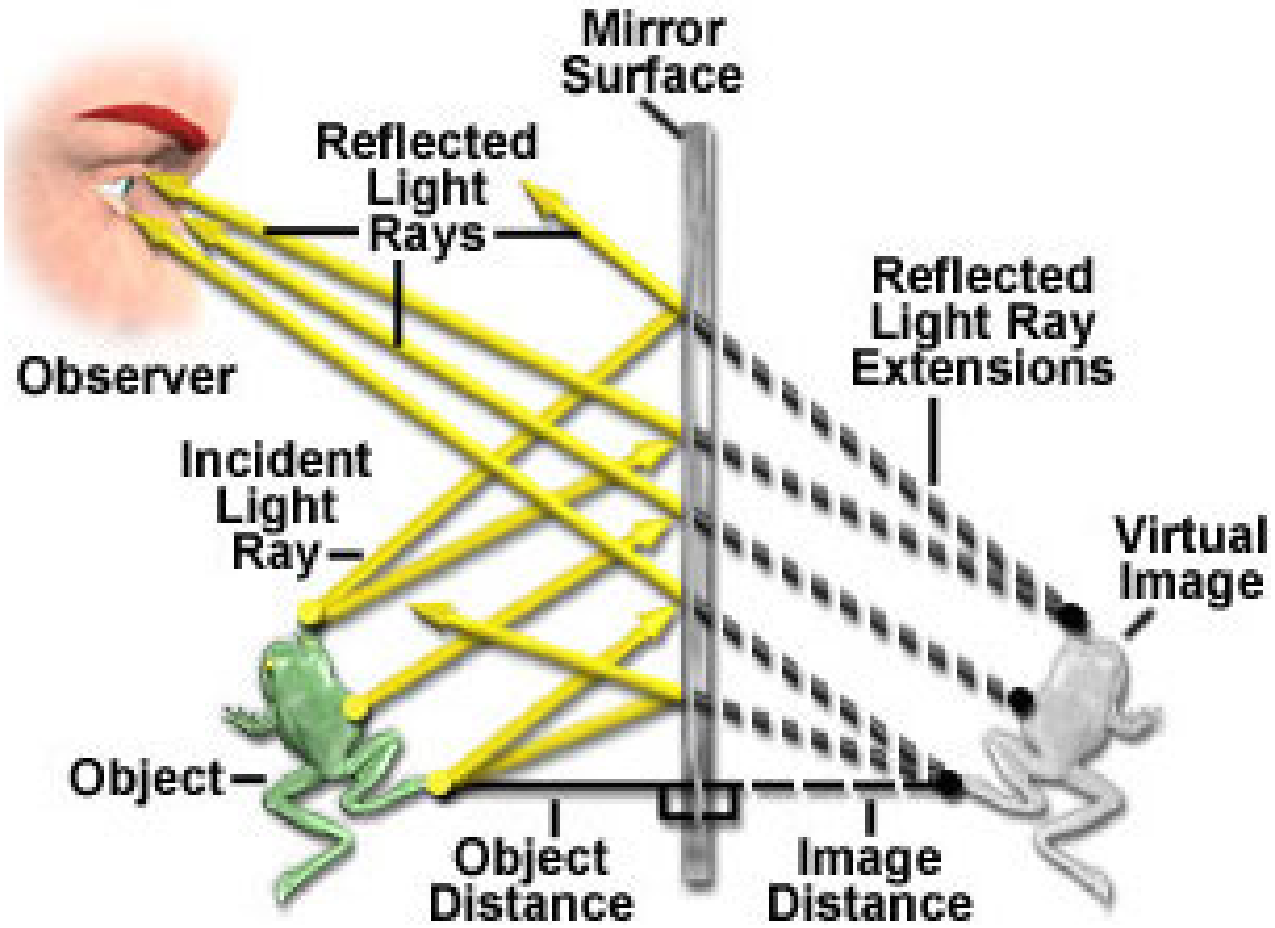
Law of Reflection

- Angle of incidence equals the angle of reflection
- The incident and reflected rays and the normal are all on the same plane



Law of reflection - the angle of incidence, θ_i is equal to the angle of reflection, θ_r.

How do we see reflections?



How do we see reflections?

How do we see reflections?

The distance between object and plane (mirror surface) is same as distance between plane and virtual image.

Concave vs. Convex Surfaces

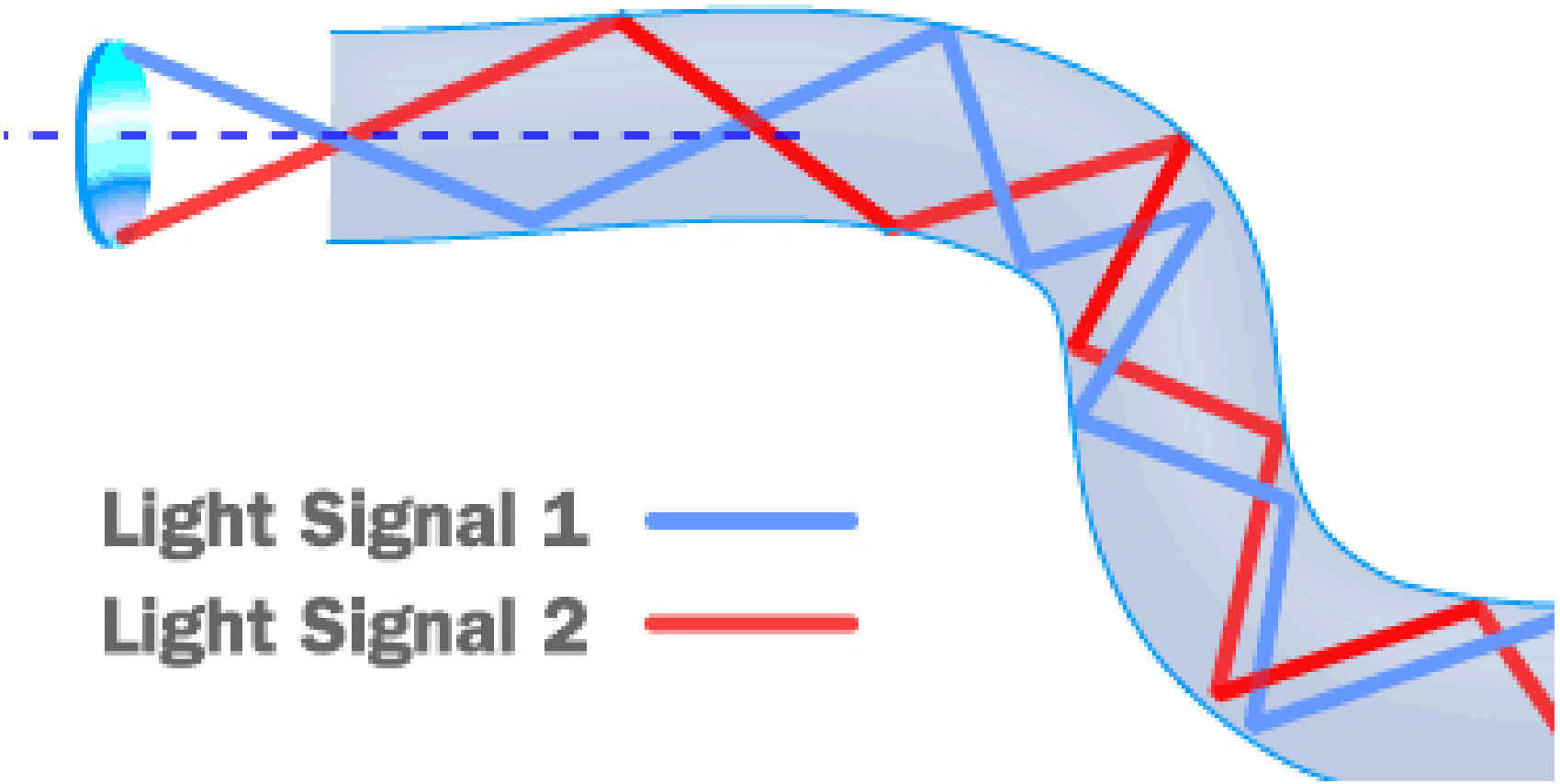
Concave: The surface "caves" inwards

Convex: The surface pushes or bulges outwards

The Many Uses of Reflections

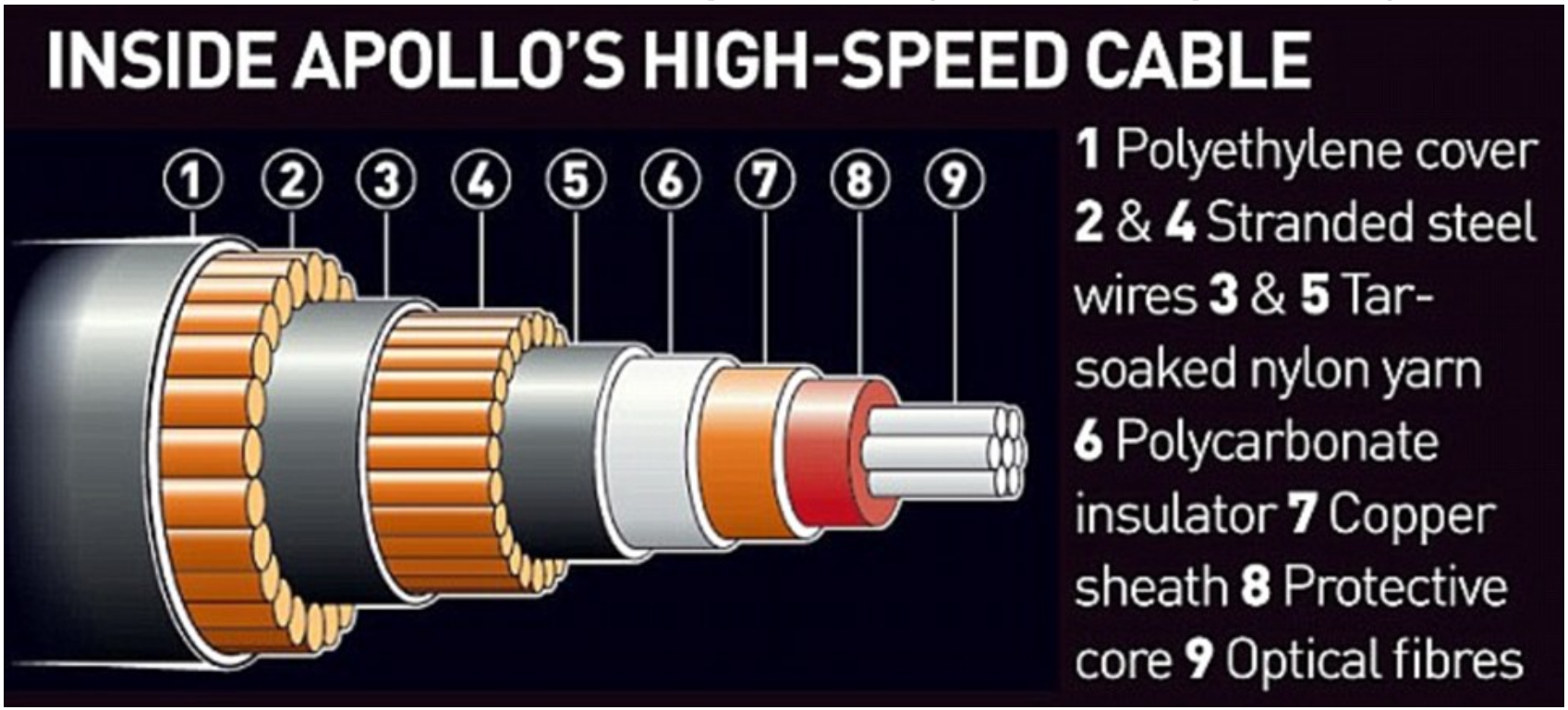
- Reflectors on cars and bikes, safety clothes
- Sideview mirrors on cars are convex
- Security mirrors in stores are convex
- Regular mirrors
- Funhouses to make weird body images
- To see around corners
- Fiber Optics

The Many Uses of Reflections: Fiber Optics



The Many Uses of Reflections: Fiber Optics

Fiber optics work on the principle of total internal reflection. Light energy carrying a signal does not escape. It just keeps on being reflected continuously until the end. And since light travels at 300 000 km/s, it reaches its destination almost instantaneously here on Earth. That's why they are used for fast telecommunication (telephone signals, computer signals)



Sharks like fiber optic cables too (video)

Sharks and other fish are attracted to the cables, possibly due to the electromagnetic signals emitted by the cables. Although the cables already have protective materials designed to shelter them from the various dangers of the environment, they are easily damaged. After an underwater camera in 2010 recorded a shark taking bite out of a fiber optic trans-Pacific cable belonging to Google, the company is now reinforcing its underwater fibre-optic cables with an extra layer of protective material in order to protect its 100,000 miles of cables from sharks.

The Many Uses of Reflections: Archimedes' Burning Mirrors (Video)

Draw a labelled sketch and write an explanation explaining how Archimedes' Burning Mirrors was supposed to work.

The Many Uses of Reflections: Solar Thermal Power (Video)

Make a labelled sketch and write an explanation explaining how a solar thermal power plant works.