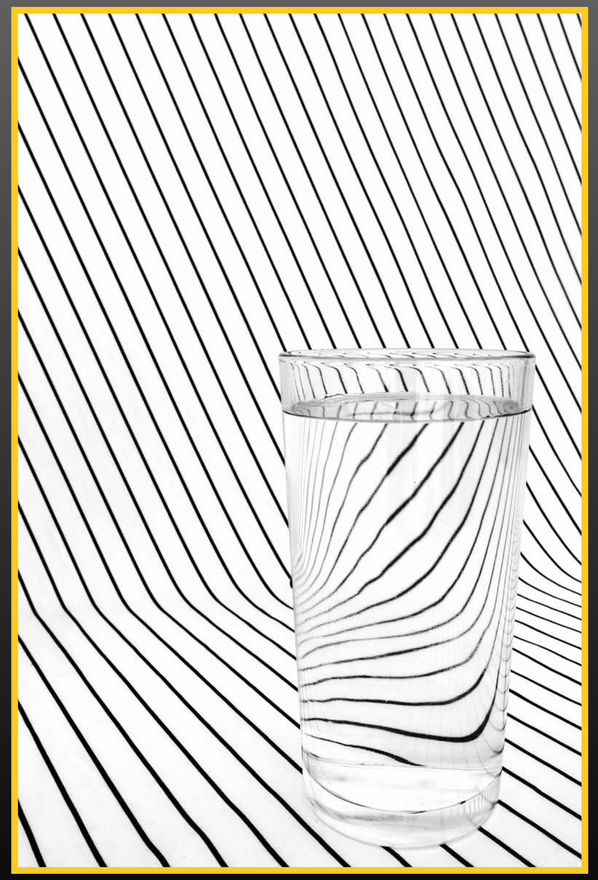
Seeing Light

Learning Objective:
To learn about refraction.

Next

What is happening in these photos?
What is similar and different about them?



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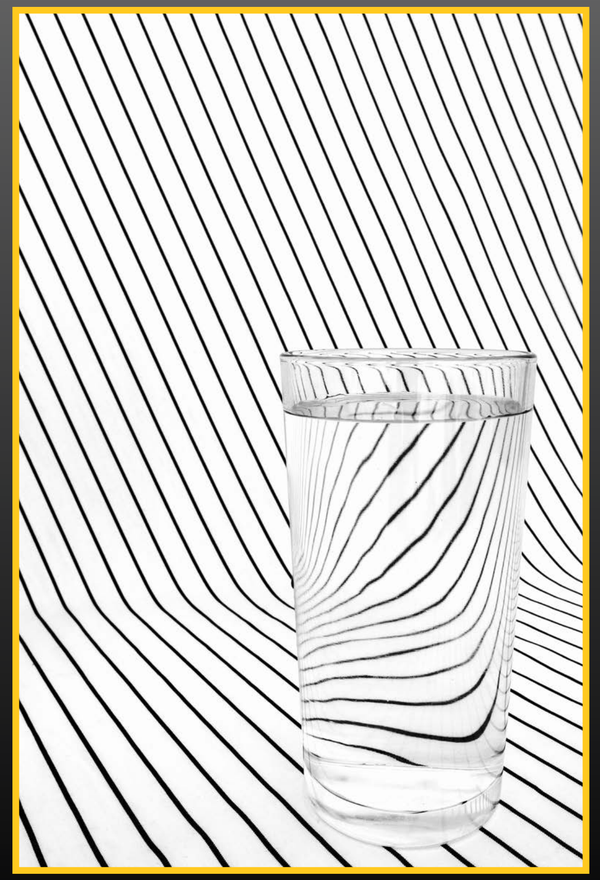
These two photos are examples of a common phenomenon called refraction.



I wonder if water is a common element of refraction?

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Refraction is when the light ray's direction is changed or bent. It happens when light travels between different mediums.

For example, when light travels between air and water, or air and plastic or glass.

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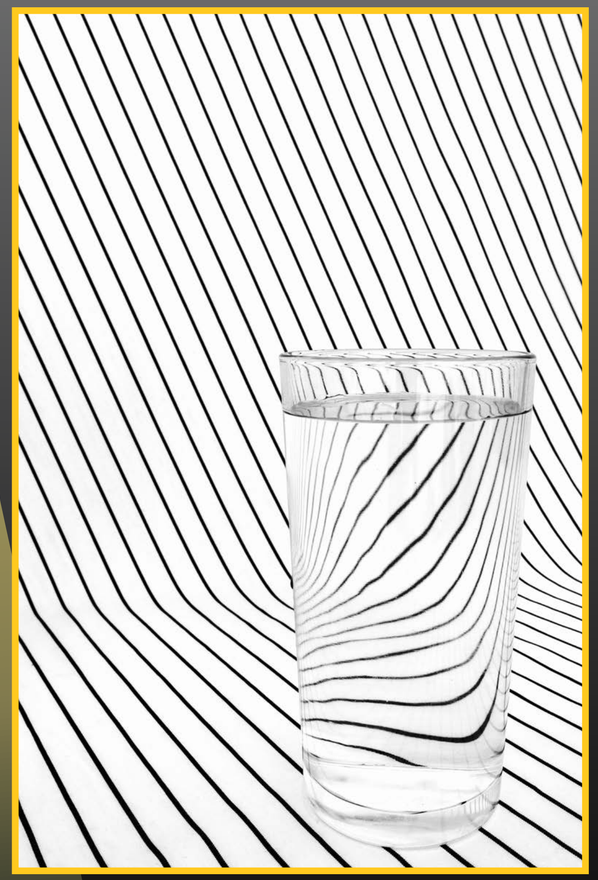
It can change the image that we see, as in these pictures.



How have these images changed?

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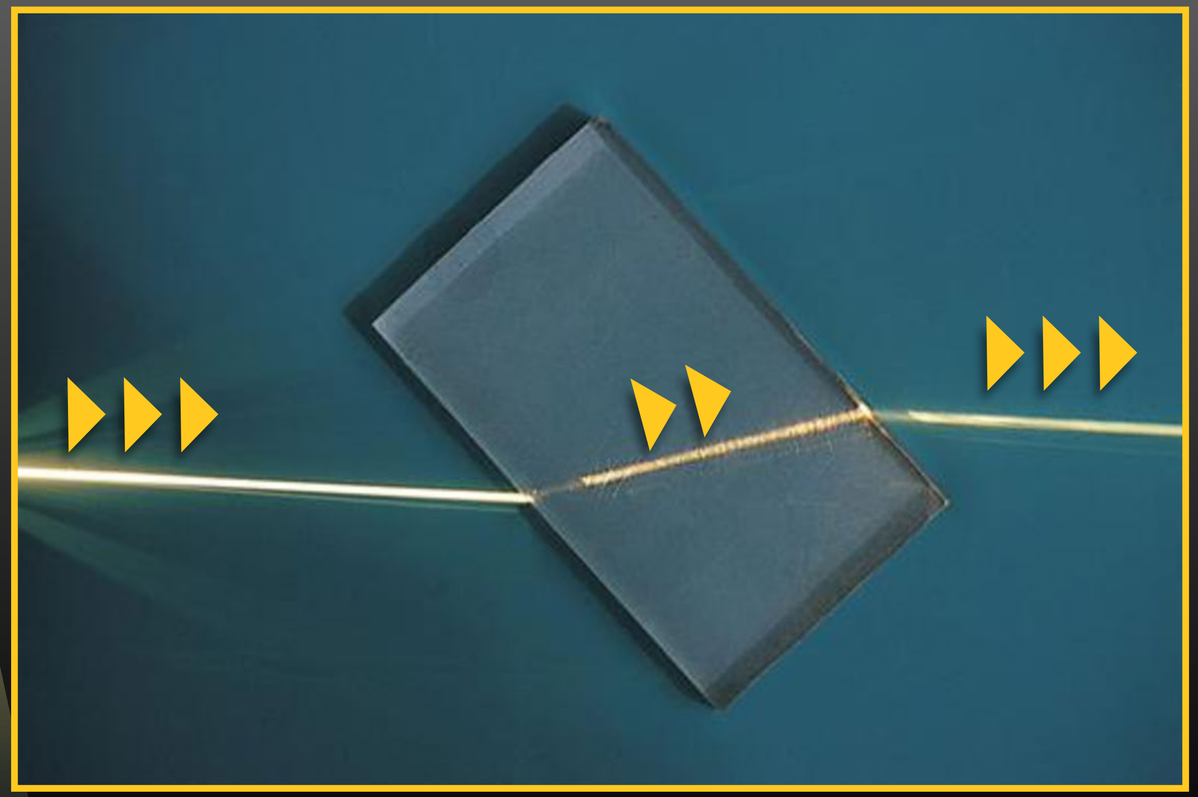
Light travels quickly through the air. When it reaches a transparent object (like the plastic in this photo), it will keep travelling through the object, but will be slowed down slightly.



When the light reaches the edge of the object and begins travelling through the air again, it can speed back up.

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When the light rays are distorted like this in water, it can change how things in the water look, and their position.

This fish is actually deeper than it appears to the man. This is because the light has been refracted on its way to his eye.

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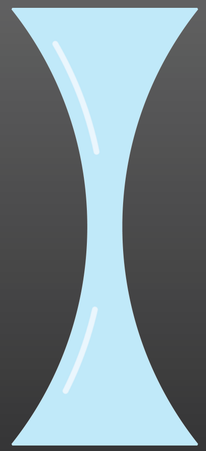
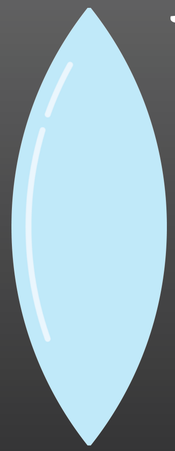
We use refraction to help us in many different ways using artificial lenses. These are usually convex (bulging out) or concave (caving in) in shape.



concave lens



convex lens

These special shapes can help bend the light in different ways.

Where else have we heard of a lens?

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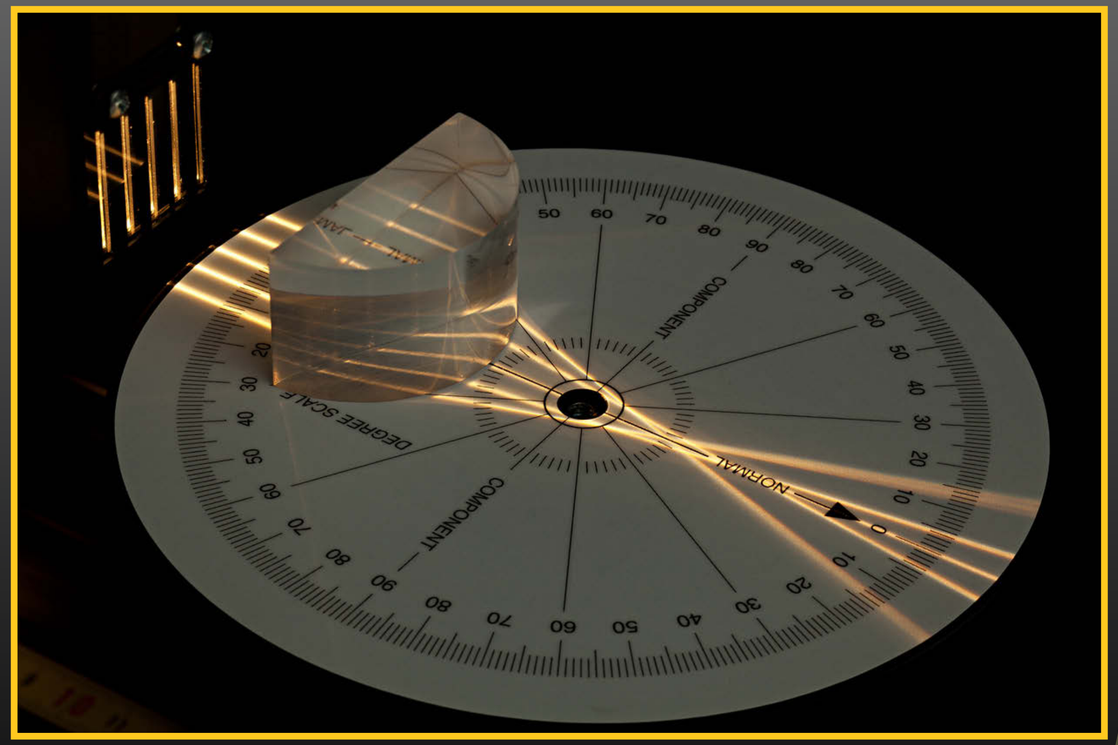
A convex lens will refract the light so that it comes to a focused point.

What might this kind of refraction be used for?



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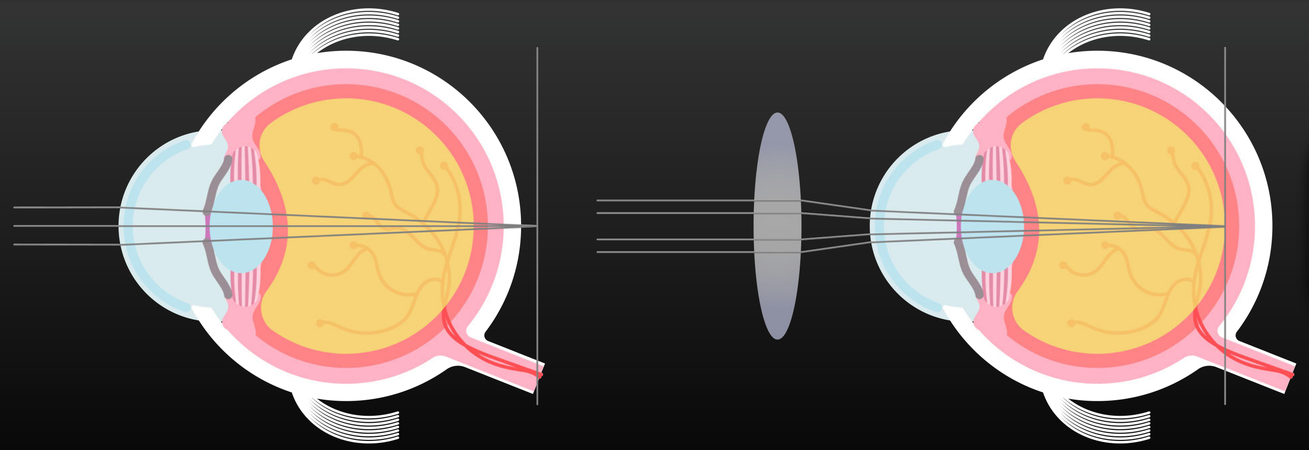
Convex lenses help correct the eyesight of people who are long-sighted. The lens in their eye doesn't focus the light directly onto the retina. A convex lens in their glasses helps focus the light in the right place.

This helps them see things which are close up, such as when they're reading.

Without glasses



With glasses

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Convex lenses are also used in magnifying glasses.
The glass is convex and changes the image so that it appears bigger.

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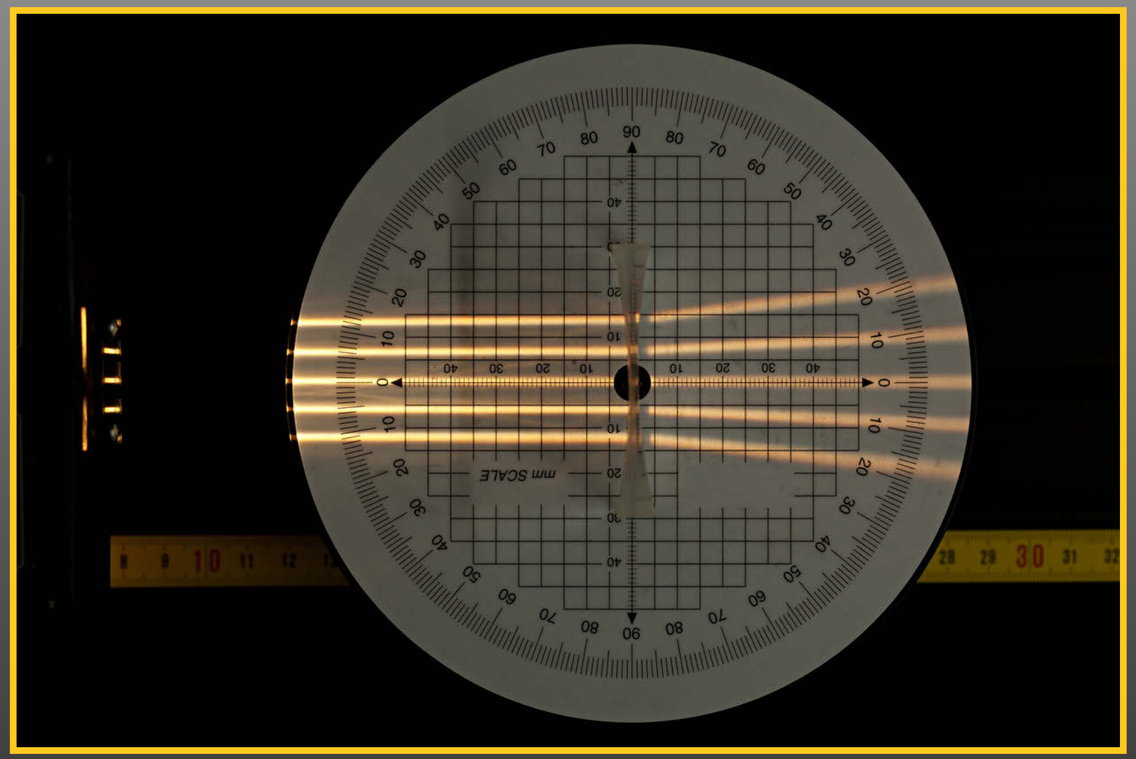

A concave lens refracts the light so that it spreads out.

What might this kind of refraction be used for?

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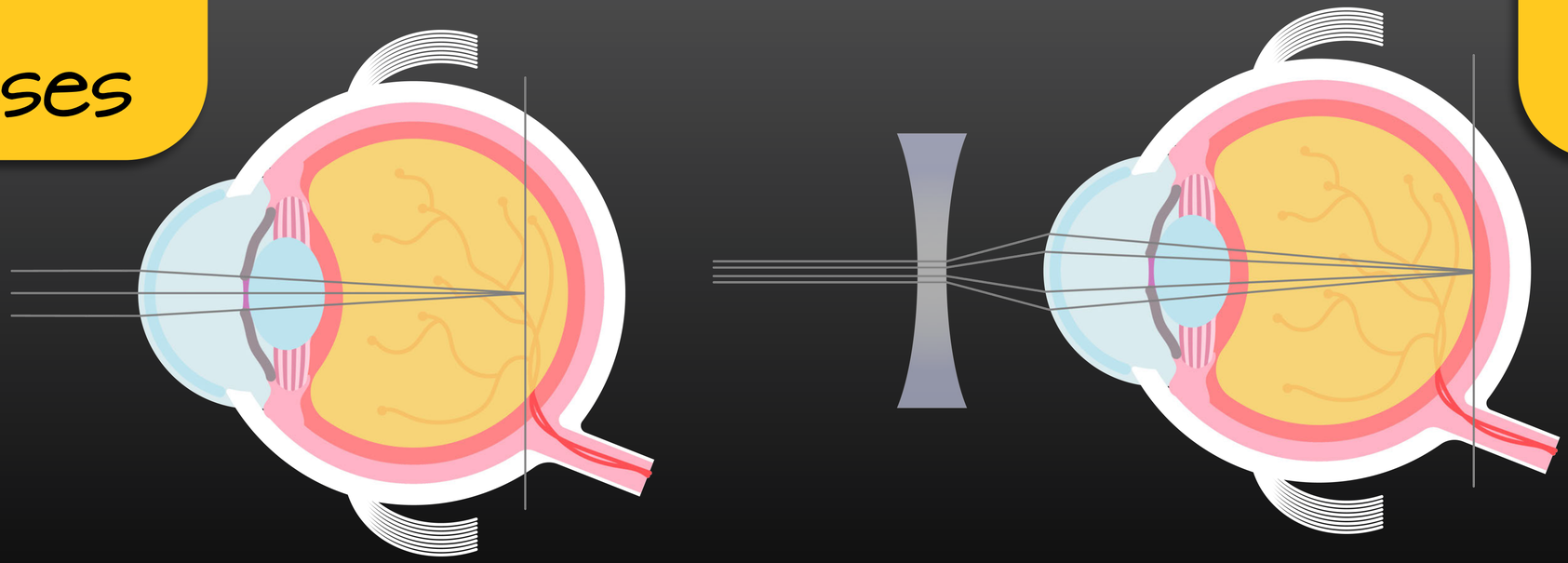
Concave lenses in glasses help short-sighted people by helping their eyes focus the light on their retina. Without glasses, their eyes focus the light in front of the retina, instead of on the retina.

Without glasses



With glasses

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Concave lenses may also be used in a torch to help spread the light out, so it can light up a larger area.

Projectors also use concave lenses to spread the image and make it bigger on a screen.

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Here is an object.
What will mainly happen when a light ray hits this object?

foil

reflect

refract

Back

Next

Foil is a reflective object. Its smooth, shiny surface reflects light easily.

foil

reflect

refract

Back

Next

Here is an object.
What will mainly happen when a light ray hits the end of this object?

A peephole

reflect

refract

Back

Next

A peephole in a door uses lenses to refract the light the user can see a wider area outside the door.

A peephole

reflect

refract

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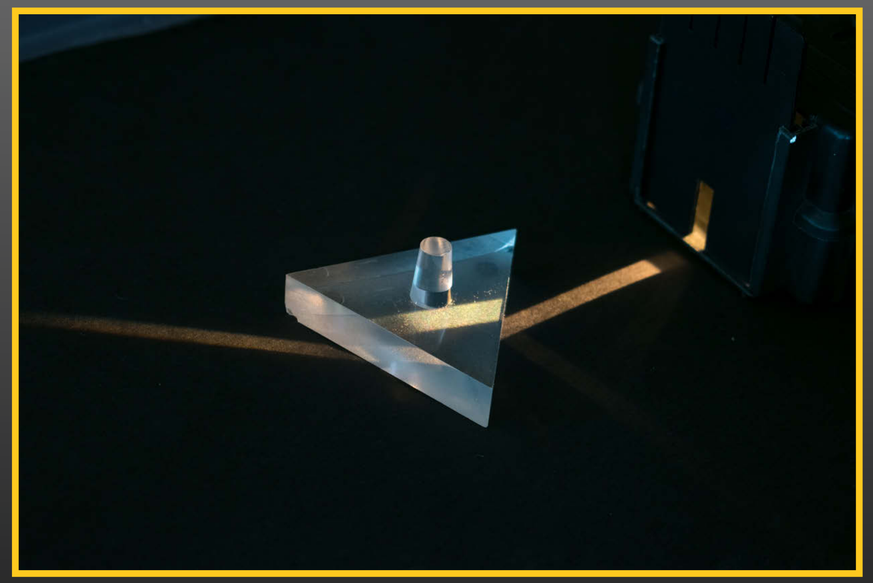
Here is an object.
What will mainly happen when a light ray hits this object?



A prism

reflect

refract

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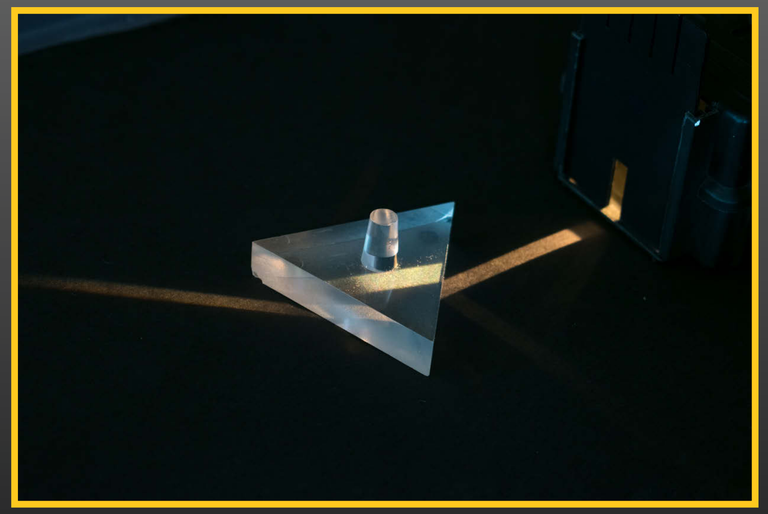
Transparent prisms are excellent at showing refraction. The light bends at the edges when the medium changes from air to glass.



A prism

reflect

refract

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Next

Here is an object.
What will mainly happen when a light ray hits this object?

A spoon

reflect

refract

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Next

A spoon reflects light. The shape of the spoon distorts the image, but it is still a reflection, not a refraction (the light doesn't travel through the spoon).

A spoon

reflect

refract

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Plenary

Which of these is the odd one out?

glasses

a mirror

water

Can you explain why?

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