



Taming Light Rays

Experiment Guide

8 - 12

Optics

Duration: 10 minutes

How do you draw a sun? A round, yellow spot with rays? But did you know that you can't actually see light rays? We only see light when it enters our eyes. When light travels in space as a ray, we typically can't see the ray itself. Except when we use a trick!

How does it work?

Light rays traveling through empty space are invisible to us. When light hits something that reflects it back, we can see it because part of the light enters our eyes. This is called scattering. You might have seen this when dust is in the air and you can see sunbeams coming through a window. This also works in liquids. When you add milk to water, countless tiny fat droplets spread throughout the water. They scatter light in all directions, including into our eyes – that's how we see the beam.

Crazy Light

Light rays aren't just invisible; you could even say they don't truly exist. Physics has found that light spreads everywhere as a wave. In our experiment, however, we tame the light – we use a laser that combines the waves so they appear as a beam. We shine it into water with a little milk to make the laser beam visible!

Lights on!

You need:

- A very dark room
- Laser pointer (e.g., cat toy – WARNING: NEVER look directly into the laser light!)
- A rectangular transparent container with clear walls, such as a storage container or aquarium
- Water
- Milk
- To explore further: Mirror



Step 1

Darken the room – the darker, the better!



Step 2

Convince yourself: Light rays are invisible. Shine the laser pointer at a wall. You see the dot on the wall, but not the beam.



Step 3

Fill the container with water (5-10 cm high).



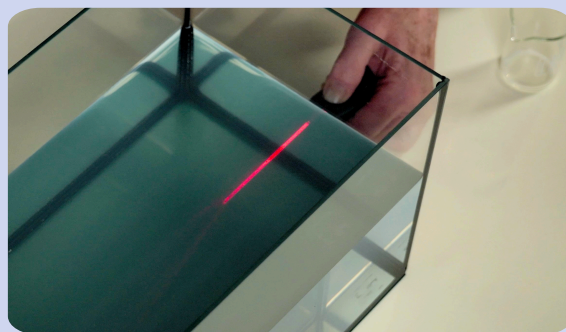
Step 4

Shine the laser pointer into the water from the side – can you see a beam in the water?



Step 5

Now for the special ingredient: Add a few drops of milk (just a little!) to the water and stir.



Step 6

Shine the laser pointer into the container again – the laser beam becomes visible!

Want to research more?

- Hold a mirror outside where your beam exits the container. Can you steer the light beam through the water with it?
- Try shining the laser from different angles through the water and onto the mirror. What do you observe?

Background Knowledge

Laser beams are an important tool in research. At ISTA, Johannes Fink's research group uses laser light to transmit information between components of quantum computers. Lasers must always be very precisely aligned. Just like in our experiment, mirrors are used for this, but also lenses or cables through which the laser light is directed.



You can also find the entire experiment on YouTube!