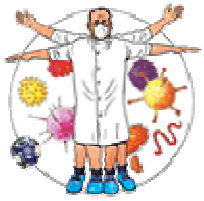
MAKE YOUR OWN FIBRE OPTIC



You will need:

An empty 2-litre lemonade bottle
Torch
Drill
Access to a sink
A friend to help you

How to do the experiment:

1. Drill a hole into the bottom of the lemonade bottle. This should not be directly into the bottom but low down on one side (WARNING: This step MUST be performed by a competent adult).

2. Cover the hole with your finger and fill the bottle with water. Do not put the lid back on the bottle. Keep the bottle held over a sink.

3. Get a friend to shine a torch through the back of the bottle so it shines straight out through the drilled hole.

4. Take your finger away from the hole and watch where the light shines.

Why did this happen?

What you see is a spot of light at the bottom of the curved stream of water. But as we all know that light travels in straight lines - how did this happen?

If you sit under water in a swimming pool and look straight up, you can usually see a wavy image of the ceiling and other swimmers above the surface.

However, if you try looking at the surface from a shallow angle, you will notice that you can no longer see the ceiling but the surface behaving a bit like a mirror.

This phenomenon is called total internal reflection and occurs when the angle between the surface of the water and the direction of the travelling light is quite small.

It will only happen when light tries to leave a substance (such as water) in which it can't move very quickly. Total internal reflection can produce the most efficient mirrors known to man.

So how does total internal reflection relate to this experiment?

When the water flows out of the bottle it forms a curved stream. As the light from the torch shines through the water, it eventually hits the edge of this stream at a shallow angle.

At this point total internal reflection occurs, the inside surface of the water stream behaves as a mirror, and the light bounces back towards the other side of the stream.

This sequence of light hitting the surface and being reflected again at a shallow angle continues all the way to the end of the stream, even if the water is going round a corner.

The light will stay in the stream indefinitely and will illuminate anything that gets in the way, such as your hand or the bottom of the sink.

This is exactly the same process as that seen in a fibre optic Christmas tree.

The light in the bottom is channelled along the plastic rods by total internal reflection and produces pretty colours at the ends (the end of the stream).

This process is also used in communications: flashing lights a bit like Morse code are sent down immensely long glass fibre optic cables to transmit information to its destination.

Read more about the BA Festival Of Science 2006 on the BBC Where I Live website for Norfolk at **bbc.co.uk/norfolk**. Here you will find more Kitchen Sink Science from the Naked Scientists to try at home.

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