GranPa & Zoe

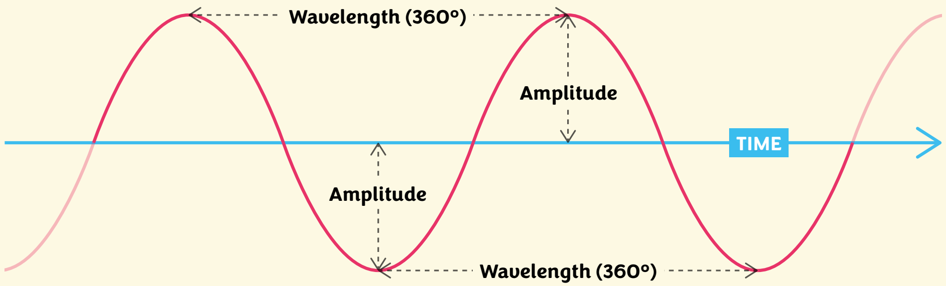
Mission: Light

Research Log

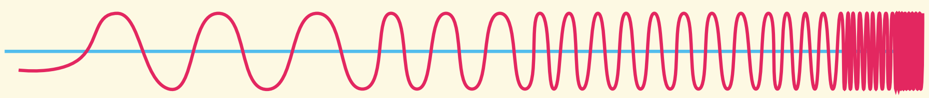
Put your knowledge of light into practice

Wavelengths

The sun, electrical apparatus, and mobile phones all give off two closely connected fields: an electric field and a magnetic field, which vibrate together.
This creates electromagnetic waves.



All these waves are defined by their length. That's why we talk about wavelength. It is calculated in metres (in nanometres or in millimetres, depending on the wave). What we are calculating is in fact the length between two consecutive crests.



At a certain length, between 400 and 700 nanometres, the waves can be detected by the human eye: that is light!

The human eye cannot detect waves above and beyond those frequencies, but that does not mean that they do not exist. This is the case for radio waves, which are longer, and used by Wi-fi networks, terrestrial television and satellites, and for X-rays, which are shorter, and are used for radiographs of the human body.

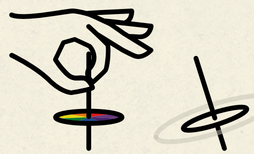
Experiment 1

The Newton Disc

YOU WILL NEED:
A PAIR OF SCISSORS,
TOOTHPICKS

1. Cut out one or several coloured disc shapes

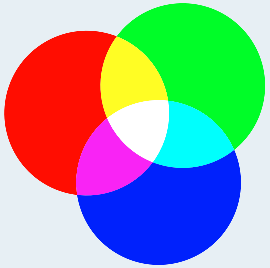
2. Use a toothpick to make it spin like a top

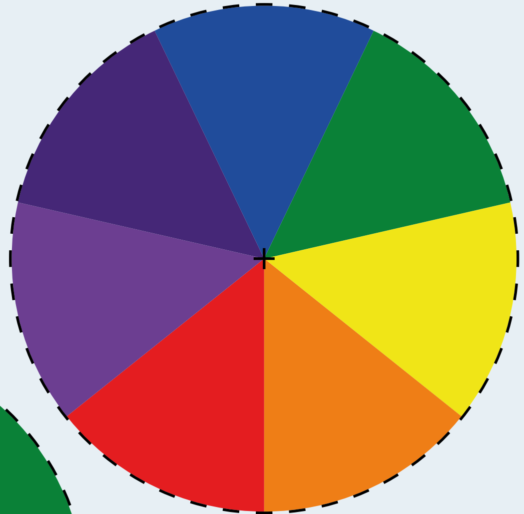


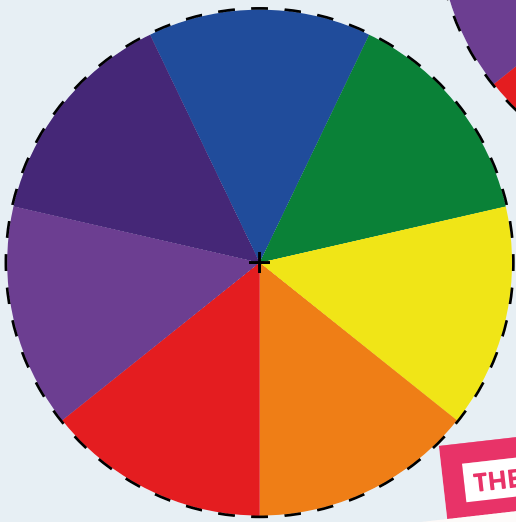
As it spins, it turns white!
(well, a little grey)

Explanation

As the disc spins faster, your eyes can't follow each colour and they mix them up, which makes... white: because white is the sum of all these colours.







THERE IS NO SUCH COLOUR AS PINK?

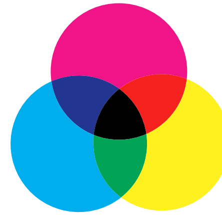
You may have heard that pink is not a colour, or that pink does not even exist. This is not totally correct.

In fact, pink is not part of white light. When you decompose light, you get violet on one side, and red on the other, but not pink. It is a colour which actually does not exist in the different shades of the light spectrum.

But that does not mean that pink does not exist elsewhere! Just try telling flowers (roses, for example) or flamingos that their colour does not exist... We can even create it. With paint, for example, when we mix red and white. And with light, we can mix red and blue, and our brain does the rest!

Experiment 2

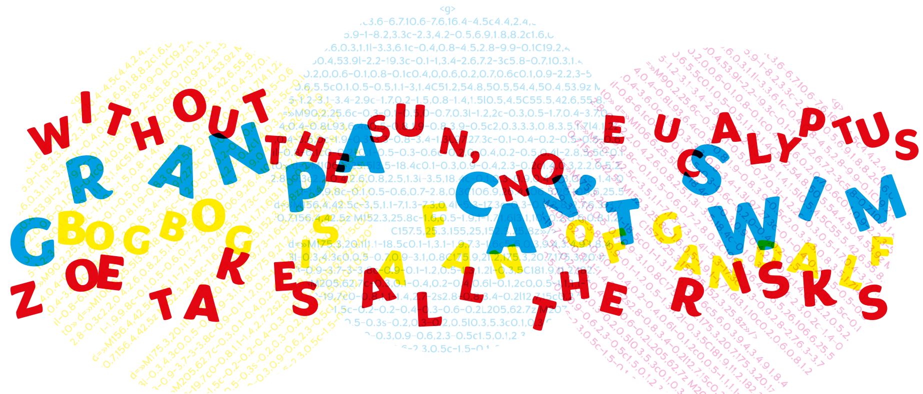
Crack the code



Filter light to change colours

There are codes hidden in these shapes. Of course, you should be able to see what they are by squinting and concentrating. But you can also place a coloured filter in front of your eyes.

To do that, use a book cover, or else tracing paper that you have coloured with felt pens. You will see the colours change. Some of them will get darker and you will be able to read the code!



Explanation

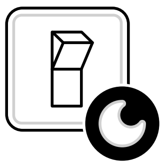
The filter lets the same colour get through and blocks the others. Then you can see all the different shades of the colour which is the same as the filter, or else... black.

Experiment 3

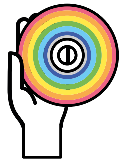
Make a rainbow

Break light down to see its colours

You will need:
1 CD (preferably CD-R), 1 TORCH



1. Switch the light off and make sure you are in the dark



2. Put the CD flat on the table and shine the torch on it, placing the torch about 10 cm above the centre

3. Look at the CD from above, almost vertically, and observe the rings of rainbow colours

Explanation

White light is made up of several colours, and by making it bounce off the CD, you are breaking it down. Indeed, on the surface of the CD there are tiny engravings which code the information (music, film...) and whose size is about the same as the wavelength of the light. That makes the CD act like a diffraction network.

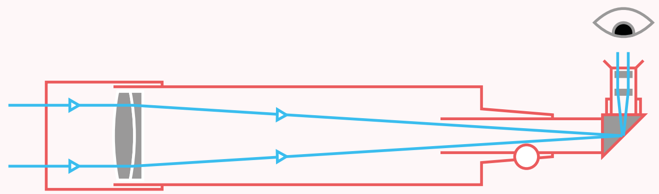
What sort of telescope?

Some astronomers observe the sky with a refractor telescope; others use even reflector telescopes. Refractor telescopes are great for observing planets in our solar system, while with reflector telescopes we can see even farther: other galaxies, for example.

What's the difference?

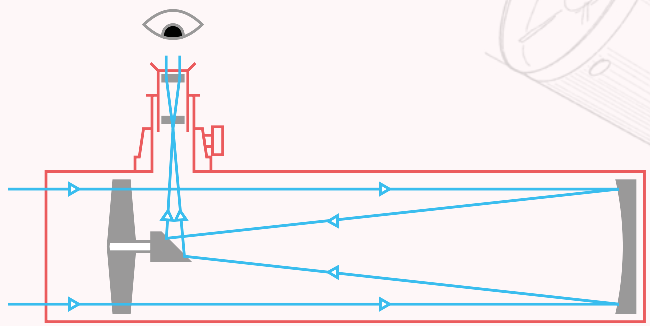
Well, it is the way telescopes react with light. They enlarge the surface which captures the light to concentrate it just on one point: the focal point. But to do this, they use different methods.

Refractor telescope

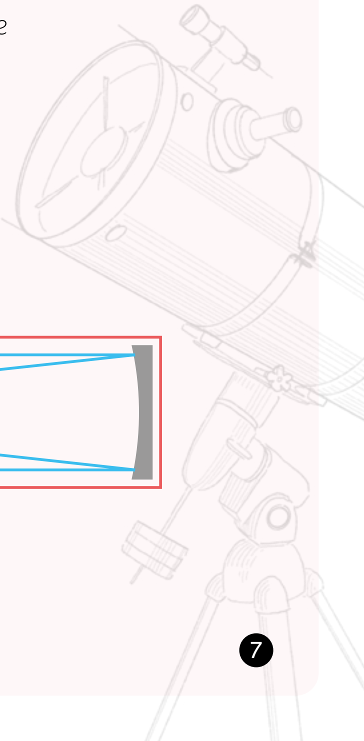


In a refractor telescope, light crosses two lenses to create a magnifying glass effect.

Reflector telescope



For the reflector telescope light bounces off a concave (primary) mirror, and converges into one point.



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