

TELESCOPES: MAKE YOUR OWN REFRACTOR

There are many different types of telescopes but the two most basic and common types are reflector and refractor telescopes. Reflectors use mirrors, whereas refractors use lenses to gather light and magnify objects. Follow this guide to make your own refractor.

SAFETY

Children will need adult supervision. Never look at the Sun directly as this may damage your eyes permanently.

WHAT YOU NEED

- Two cardboard tubes (or two A4 pieces of black card)
- Piece of corrugated cardboard
- Sticky tape
- Scissors
- Pair of compasses or pencil and ruler
- Two glass or plastic lenses of different sizes (such as two magnifying glasses), both must be smaller in diameter than the cardboard tubes
- Glue

WHAT TO DO

- 1** Take one of your cardboard tubes, or make a tube by rolling up a piece of black card and fixing it with sticky tape along its edge. It should have a diameter of approx. 4.5cm and length of at least 20cm. This is the outer tube of your telescope.
- 2** Take the second cardboard tube, or make one as explained above. This is the inner tube of your telescope. Its diameter needs to be just slightly smaller, so it fits tightly into the outer tube but can slide back and forth. If you are using identical kitchen roll tubes or similar, you can make a cut along the length of the tube, slide it inside the outer tube to get an idea of the right size. Once you've measured it, you can put sticky tape along the cut edge.
- 3** Take the bigger lens and try to fit it into one end of the outer telescope tube. You might want to glue it into place. If it is too small, copy the next step for both lenses.
- 4** Take your compass or pencil and ruler and draw a circle on the corrugated cardboard matching the diameter of the inner telescope tube.

- 5** Take your smaller lens and trace it in the centre of the circle on the corrugated cardboard.
- 6** Carefully cut out the circles, leaving you with a ring shape.
- 7** Slide the small lens in the centre of the ring. It needs to fit tightly. You might want to use glue to secure it.
- 8** Now slide the whole ring inside one end of the inner telescope tube.
- 9** Slide the inner tube into the outer telescope tube. Look through the smaller lens, find an object to observe and adjust the focus by sliding the inner tube back and forth. What can you spot?



FIG: 1 FIG: 2 FIG: 3 FIG: 4 FIG: 6 FIG: 8 FIG: 9

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TRY THIS!

Don't forget to decorate your telescope, observing the night sky will be more fun with a funky telescope.

DID YOU KNOW?

Refractors are amongst the earliest types of optical telescopes. Because of their original design by Galileo Galilei over 400 years ago, they are still known as Galilean telescopes today.