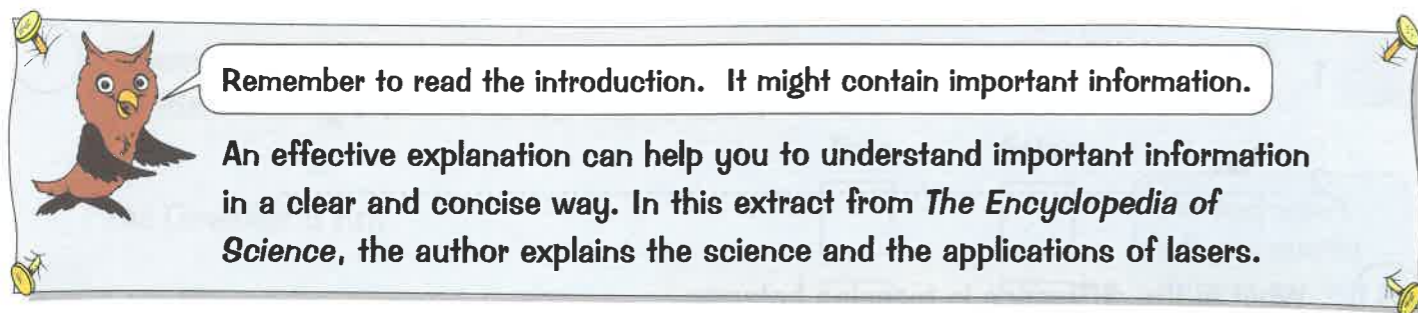


## Lasers

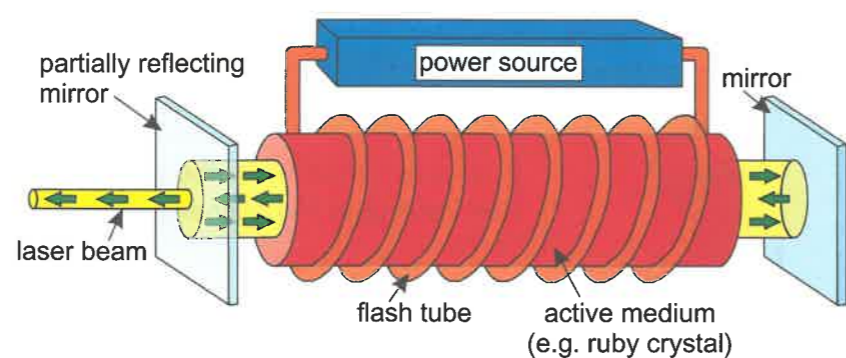


### What is a laser?

A laser is a machine which turns an ordinary beam of light into a straight, narrow beam of very bright light. Laser light does not spread out like ordinary light, so it is concentrated and very powerful. It can cut through steel and human tissue, and can be used to measure distances accurately, make holograms and compact discs, or guide missiles. Lasers usually produce light of a particular type, e.g. light of one colour only or invisible infra-red rays. All the waves are in step, and reinforce each other, which is why they are so powerful, and can travel long distances without fading.

Inside a laser is a tube filled with a gas, a solid or a liquid, called the active medium. This can be a man-made crystal, like ruby. Energy, such as light from a flash tube, is passed through the active medium, making it give off light. Some of this bounces to and fro between two mirrors, making the active medium give off even more light. This is called

lasing. The beam of concentrated light then escapes through the partially mirrored surface, emerging as a laser beam.



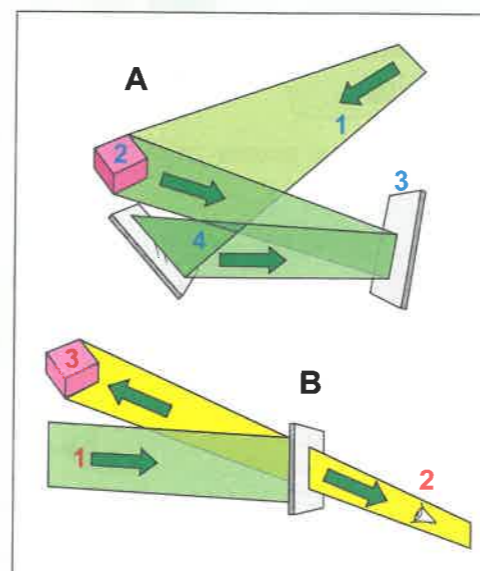
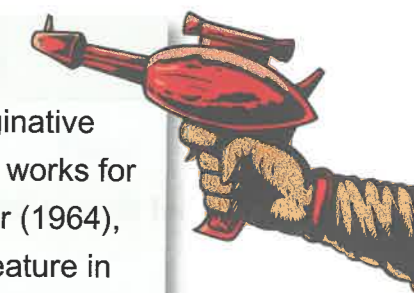
### Investigating the Earth

Lasers have been very useful in increasing knowledge about our planet. The distance from the Moon to the Earth was measured by bouncing a laser beam off a reflector on the Moon. Lasers reflected off satellites orbiting the Earth can also detect tiny land movements on our planet. Scientists can use this data to measure the movements of continents or to detect earthquakes and volcanic eruptions.



### Futuristic weapons

Although laser weapons are relatively new on the scene in real life, imaginative science fiction writers and filmmakers have incorporated lasers into their works for a long time. Laser weapons appear in the James Bond movie *Goldfinger* (1964), which was based on a book by Ian Fleming (1908–1964). Lasers also feature in the *Star Wars* films, where they are fired from guns and used as swords.



### Holograms

A laser beam can be used to record a ghost-like three-dimensional image called a hologram. The laser beam (1) is split into two parts. One part is aimed at the object (2), and the reflected light, called the object beam, illuminates the film (3). The other part, called the reference beam (4), is reflected by a mirror before illuminating the film. Where the two beams meet on the film, a hologram is formed. In figure B, a beam of light identical to the reference beam (1) is directed at the developed film. A viewer (2) sees the image (3) in three dimensions.

### History of the laser

- 1960 The first laser was developed by a scientist called T.H. Maiman.
- 1961 First commercially-built laser sold.
- 1961 First laser holograms developed.
- 1963 Lasers first used in surgery.
- 1976 Lasers used to measure Earth's movements.
- 1982 Compact discs launched.

- 1988 First transatlantic optical fibres send telephone messages.
- 1991 Laser-guided missiles used by USA in Gulf War.
- 1998 Experimental high-power microlasers are developed. They are so small that hundreds could fit on the head of a pin.
- 2003 NASA flies a plane powered by lasers.
- 2014 First cars available with laser headlights.
- 2019 Lasers used to amplify whispers. They could be used to send secret messages.

An adapted extract from *The Encyclopaedia of Science*.

### Consider

A **kenning** is a two-word phrase which describes an object (often using metaphors). For example, here are some kennings for 'winter': 'Snow faller', 'Face freezer', 'Christmas bringer'. Think of some two-word phrases you could use to describe a laser.

