

Topic:	Year group	Term
Light	6	Spring

### Background knowledge

The children first study light in year 3 and this unit builds on the work covered then. It is therefore important that the shadow investigations build on the work covered in year 3 and does not repeat it. The light maze as described in *A creative approach to science* by Nicky Waller (p 113) will be useful in developing how light travels in straight lines. There is also an example for modelling how we can see things on p114.

Light appears to travel in straight lines, and we see objects when light from them goes into our eyes. The light might come directly from light sources, but for other objects some light must be reflected from the object into our eyes for the object to be seen.

Objects that block the light (are not fully transparent) will cause shadows. Because light travels in straight lines the shape of the shadow will be the same as the outline shape of the object.

### Common misconceptions

- Children may think the processes of refraction and reflection are the same.
- Children may think that shadows are always the same size. The shape and size of the shadow formed depend on the size of the object blocking the light and the angle of the light source.
- Some children may think that light is emitted from our eyes. Explain that objects can be seen when the light from the object enters our eyes.
- Children may initially believe that we can only see objects that emit light, such as the Sun or a light bulb. Explain that not all objects emit light themselves. Instead, we can see objects that reflect light into our eyes.

### What should I already know?

I can describe dark is the absence of light.

I can explain that light is needed in order to see.

I can explain that light is reflected from a surface.

I can explain and demonstrate how a shadow is formed.

I can explore shadow size and explain how to change it.

I can explain the dangers of direct sunlight and bright lights and describe how to keep protected,

National Curriculum Objectives / Key Skills	The Journey
<ul style="list-style-type: none"><li>• Explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes.</li><li>• Use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye.</li><li>• Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.</li><li>• Recognise that light appears to travel in straight lines.</li></ul> <p><b><u>Working scientifically</u></b></p> <p>Use relevant scientific language and illustrations to discuss, communicate and justify their scientific ideas (non-statutory).</p> <p>Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs.</p> <p>Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate.</p>	<ol style="list-style-type: none"><li>1. How we see</li><li>2. Light and straight lines</li><li>3. Shadow formation</li><li>4. Plan - shadow experiment</li><li>5. Investigate - shadow experiment</li><li>6. Evaluate - shadow experiment</li><li>7. Refraction</li><li>8. Explore light</li></ol>

Identifying scientific evidence that has been used to support or refute ideas or arguments.

Talk about how scientific ideas have changed over time (non-statutory).

### Scientific enquiry



### Outcomes

**Working towards:** I can describe that light travels in straight lines and relate this to how we can see. I know the shape of the shadow is the same as the object that casts it. I can plan a test to investigate how the size of shadows changes with support, taking simple measurements and describing the relationship between the size of shadow and the distance from the light source. I can make a periscope and describe how it works. I can relate this to other optical instruments. I can state some facts about the work of Sir Isaac Newton.

**Expected:** I know that light travels in straight lines and use this to explain how we can see. I know the shape of the shadow is the same as the object that casts it. I can plan a test to investigate how the size of shadows changes, taking accurate measurements and explaining the causal relationship between the size of shadow and the distance from the light source. I can make a periscope and explain how it works. I can relate this to other optical instruments explaining how they work. I know about the work of Sir Isaac Newton.

**Exceeding:** I know that light travels in straight lines and use this to model and explain how we can see. I know the shape of the shadow is the same as the object that casts it explaining why. I can confidently plan a test to investigate how the size of shadows changes, taking precise measurements and explaining the causal relationship between the size of shadow and the distance from the light source. I can make a periscope and explain confidently how it works. I can relate this to other optical instruments explaining how they work clearly. I know about the work of Sir Isaac Newton explaining what I found out in my investigations.

## Key Vocabulary

Light source - object that produces light

Iris - the coloured part of the eye that controls the size of the pupil

Retina - the layer at the back of the eye that is sensitive to light

Lens - the part of the eye that focuses light onto the retina

Pupil - the black part of the eye that lets light into the eye

Reflection - when light bounces off an object

Ray diagram - a diagram that shows how light travels

Angle - where two lines meet at a point

Periscope - an instrument that uses mirrors to make objects visible around barriers

Shadow - a dark area caused by an object blocking a source of light

Opaque - an object or material that does not allow any light to pass through it

Translucent - an object or material that allows some light to pass through it

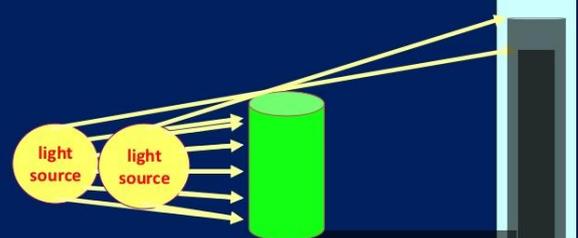
Solar eclipse - when the Moon blocks sunlight from reaching Earth and casts a shadow

Refraction - the changing of direction of light when it passes from one medium to another

Medium - any substance which can allow sound or light to pass through it

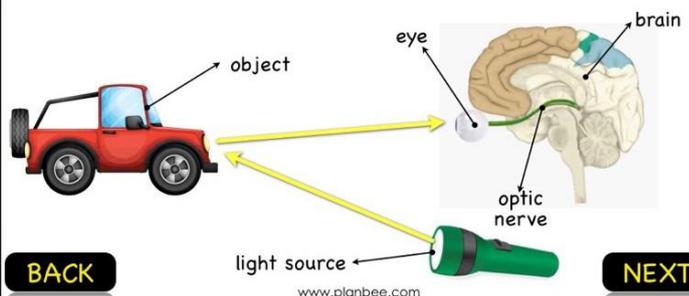
## Timeline / Diagrams

### How does light form shadows?



- ⚙ Light rays travel in straight lines, radiating out from the light source.
- ⚙ If rays are blocked by an opaque object a shadow forms where the light cannot reach.
- ⚙ If the light source is moved closer to the object, more light is blocked and a larger shadow is formed.

We can see objects because light is **reflected** off their surfaces. The light travels in a straight line from the light source and bounces off the object to our eyes. Our eyes then send a message to our brains through the optic nerve to tell us what we have seen.



Lens - a piece of glass or other transparent material which refract light using curved surfaces  
Rainbow - an arc of colours in the sky, caused when light from the Sun passes through raindrops  
Prism - a triangle-shaped block of glass or transparent plastic  
Coloured filter - a plastic or glass sheet that can filter some of the colours out of white light  
Spectrum of light - the range of different colours seen when white light is passed through a prism

#### Key people / places

Famous scientist - Sir Isaac Newton (colour only)  
STEM scientist- optical engineer

#### Assessment questions / outcomes

Describe how light travels.  
With a partner, model how you can see objects.  
Describe how your periscope works.  
Sort the materials into opaque, transparent and translucent.  
How are shadows made?  
Explain how this optical instrument works.  
How is a rainbow formed?