9 Why distant things look dim and small

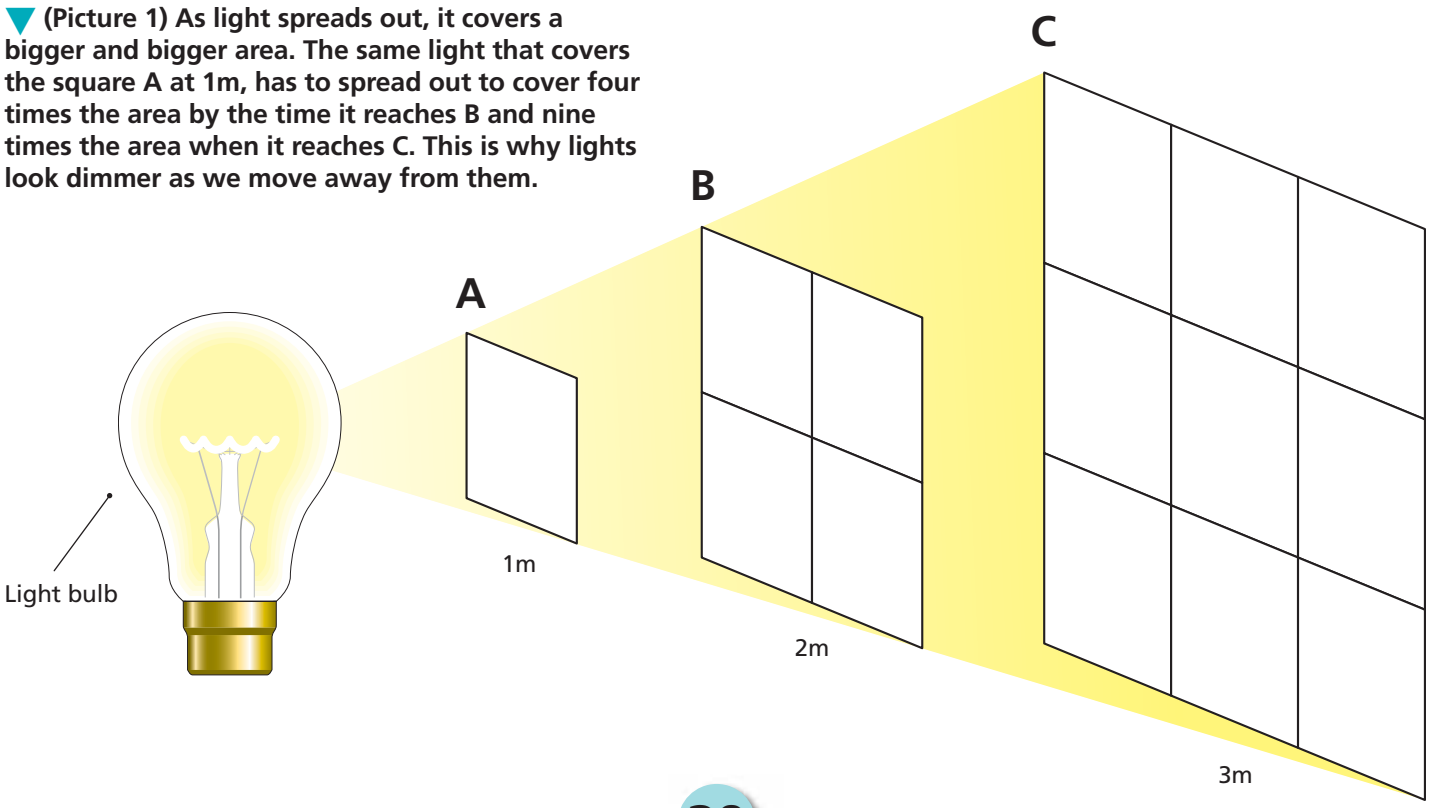
Light spreads out from an object. The further from the object you are, the less of the light you receive and the dimmer it seems.

The Sun looks very bright – in fact it is so bright that we cannot safely look at it directly. But if we were to visit Mercury, the planet nearest the Sun, or Pluto, the planet furthest from the Sun, would the Sun look the same? To find out, we can use a bulb as a model Sun.

When light spreads out

A light bulb, like the Sun, is a source of light (Picture 1). The bulb gives out a certain amount of light, which spreads out in all directions. If we are close to the bulb, for example a metre away, a large proportion of the light enters our eyes (this is shown by the shape at **A** in Picture 1). But as we move further away, a smaller and smaller proportion of the light reaches us. The rest goes to light the room. When we are twice as far from the bulb, we only receive a quarter as much light, so the lamp appears a quarter as bright (**B**). When we are 3 metres away from the bulb, only a ninth as much light enters our eyes as when we were 1 metre away (**C**).

▼ (Picture 1) As light spreads out, it covers a bigger and bigger area. The same light that covers the square A at 1m, has to spread out to cover four times the area by the time it reaches B and nine times the area when it reaches C. This is why lights look dimmer as we move away from them.



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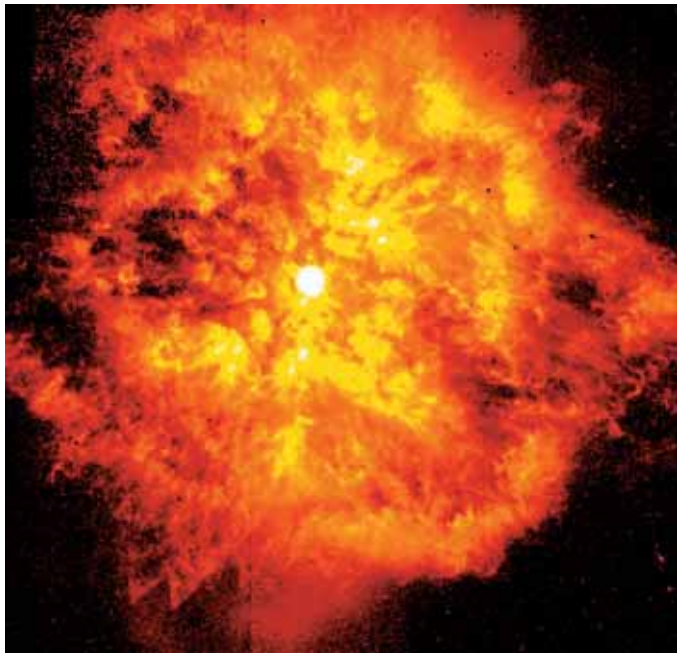
▼ **(Picture 2) If we were to visit the planet Mercury, which is two-thirds closer to the Sun than the Earth is, the Sun would appear as a huge, bright disc. Pluto is forty times farther away from the Sun than the Earth is and so from Pluto the Sun would appear hardly brighter than any other star.**

The same thing is true of the stars in the night sky. Many stars are thousands of times bigger and brighter than our Sun, but because they are far away, we receive such a tiny part of their light that they appear small and dim. The picture below shows an exploding star billions of LIGHT YEARS away. It was taken by the Hubble Space telescope.



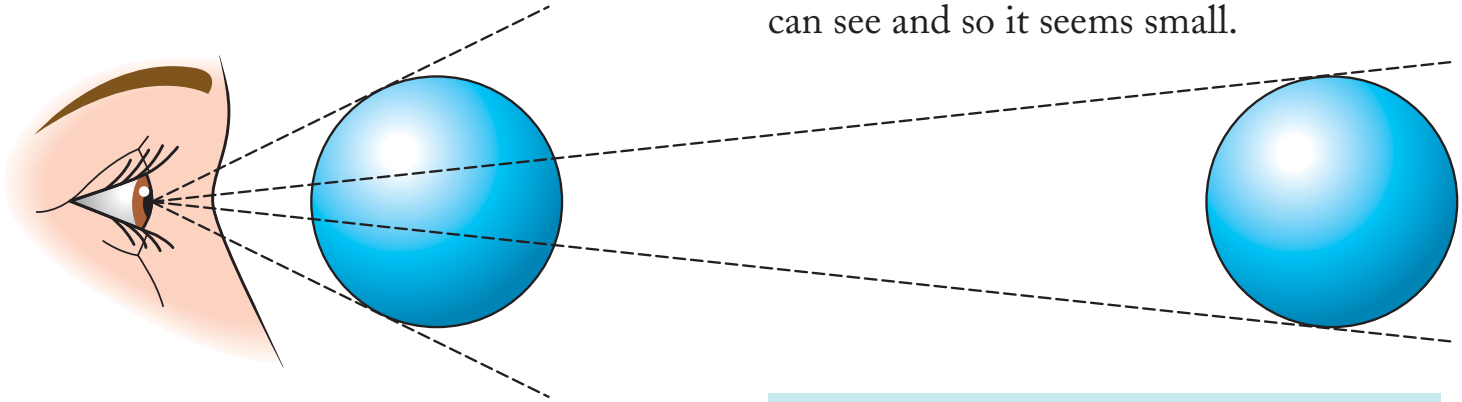
As you can see, the brightness of light appears to fall very sharply indeed the further we move away from it. The light, of course, stays the same brightness. It is just that less of it reaches our eyes (Picture 2).

Why distant things look small

Hold a marble close to your eye (Picture 3). It will look quite large. Now hold it at arm's length and it will look much smaller.

The marble is the same size; it just appears to have changed size.

How big something appears depends on how much of our view it uses up. It is the same reasoning that explains why distant things look dim. When something is close, it fills up much of the area our eyes can see and so it appears large and in a lot of detail. When something is further away, it takes up only a small amount of the area that we can see and so it seems small.



▲ **(Picture 3) As objects get further away, they appear smaller because they take up less of our field of view.**

Summary

- **Bright objects appear dim when they are far off because only a tiny part of their light reaches our eyes.**
- **Objects appear small when they take up only a small part of our view.**