

gathering light from far away, the two ways of doing it, and why the best telescopes leave the ground

What a telescope is actually for *

- a telescope's first job is to **gather light**, not to magnify. A distant object is faint long before it is small
- the **aperture**, the diameter of the main lens or mirror, decides how much light is collected
- **light gathered goes as the square of the aperture**, so doubling the diameter collects four times as much
- **resolving power** is the ability to show two close objects as separate, and it too improves with aperture
- **magnification is the least important of the three**, since magnifying a faint blurred image only gives a larger faint blurred image
- so a bigger telescope is better mainly because it is **bigger**, not because it magnifies more



light arriving from a distant object and being brought to a single point: the wider the opening that collects it, the more light reaches that point, which is what makes a faint object visible at all

The two kinds of telescope

Refracting

- uses a **lens** to gather and bend the light
- light passes **through** the glass
- suffers **chromatic aberration**, coloured fringes, since colours bend differently
- a large lens **sags under its own weight**, being supported only at the edge
- so refractors are limited to modest sizes

Reflecting

- uses a **curved mirror** to gather and focus the light
- light **bounces off** the surface
- **no chromatic aberration**, since reflection treats all colours alike
- a mirror can be **supported from behind** across its whole area
- so every large modern telescope is a reflector

the deciding argument is mechanical rather than optical: a lens can only be held at its rim while a mirror can be propped up from behind, and that is why the largest instruments in the world are all mirrors