book. It is a method using coordinates, a celestial equivalent of terrestrial longitude and latitude, except that in astronomy these coordinates are known as **right ascension** and **declination**. For such measurements of position, it is convenient to think of the stars as being fixed to the inside of a sphere with the Earth in the centre, even though we know otherwise. Figure 1·3 illustrates the system. The **celestial equator** is a projection on this sphere of the terrestrial equator. North and south of the terrestrial equator we have latitude, north and south of the celestial equator we have declination. East and west along the terrestrial equator longitude is measured; eastwards along the celestial equator we measure right ascension. Terrestrial longitudes begin on the Greenwich meridian, but on the celestial sphere the starting point is different: it depends not only on the celestial equator but also on another circle, the **ecliptic**.

The ecliptic is the Sun's apparent path in the sky. In the northern-hemisphere summer the Sun is north of the celestial equator, and in the southern-hemisphere summer it is south of the celestial equator. The points where the Sun and the ecliptic cross the celestial equator are the times of **equinox**, those two days in the year when day and night are equal. Right ascension is measured eastwards from the Spring or **vernal equinox**, when the Sun moves north of the celestial equator. It is measured, as previously noted, along the celestial equator. Measurements along the ecliptic are measurements of **celestial longitude**, and north and south of it, **celestial latitude**. Halley and the Greeks used those coordinates, but now right ascension and declination are found to be more convenient.

The ecliptic, however, is used for defining the Sun's path and enters into calculations of **eclipses**, those times when the Sun and Moon are aligned in the sky. There are two kinds of eclipse: those of the Moon and those of the Sun. Figure 1·4 shows how the Sun, Earth and Moon are aligned for a lunar eclipse, when the Moon passes either fully or partially into the shadow cast by the Earth. Since the Moon orbits the Earth once a month, one might expect a lunar eclipse every month, but this does not occur because the Moon's orbit is tilted with respect to the ecliptic. A solar eclipse (Fig. 1·5) takes place when the Earth comes into the Moon's shadow, which happens when Sun, Moon and Earth are in alignment. Eclipses of the Sun can be of two kinds – **annular** and **total**. If the Moon, in its elliptical orbit round the Earth, is at greater than average distance, its main shadow – the **umbra** – will not quite reach the Earth. Then the observer on Earth will not see the whole of the Sun's disc eclipsed, but only the central area of it: a ring or annular section of the Sun is still visible. At a total eclipse, when the umbra covers an area of the Earth, observers within that area will see the Sun's disc completely obscured; those outside the area but in the secondary shadow (the **penumbra**) will see the partially eclipsed Sun, where the disc appears with only a section blotted out.

At a total solar eclipse the Sun's light is reduced nearly 800 times compared with that of full Moon, bright stars are visible, birds go to roost, animals prepare for rest, the air temperature begins to drop, and surroundings take on an eerie cardboard look. The Sun's tenuous atmosphere, the **corona**, appears as a pearly coloured light, and bright pink flame-like

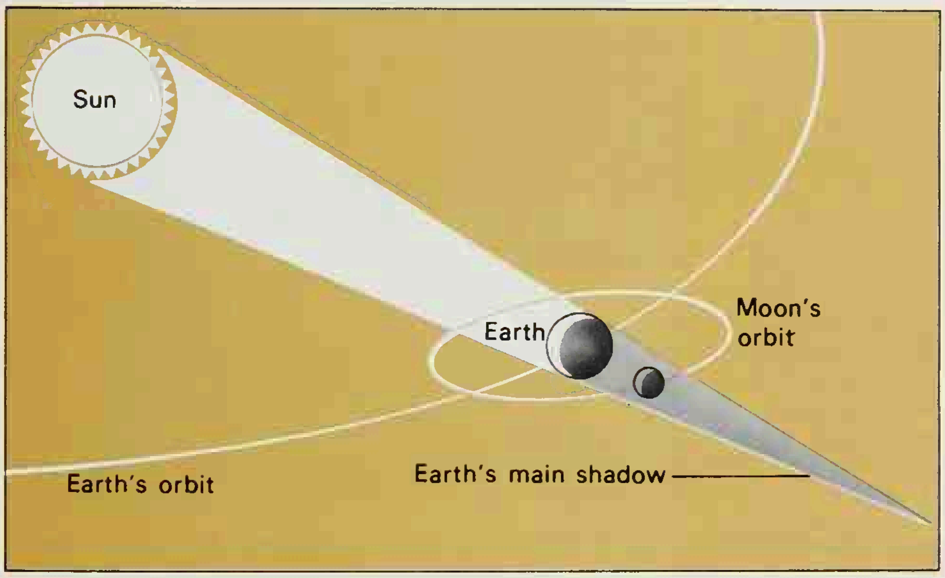

Fig. 1·4, above: *A diagram of an eclipse of the Moon, which happens when the Moon passes into the Earth's shadow.*

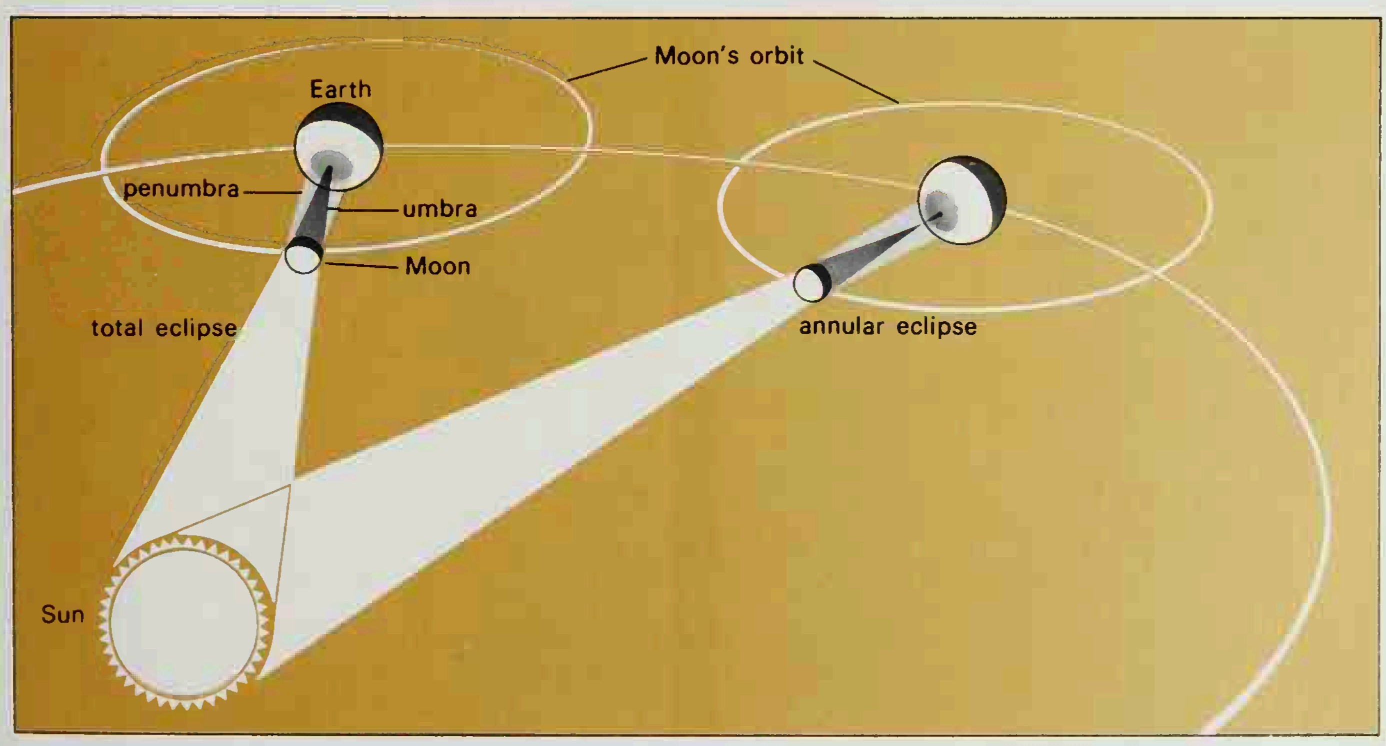

Fig. 1·5
A total eclipse of the Sun (left) and an annular eclipse (right) when a small ring of the Sun's disc is still seen when the Moon blots out the central portion.