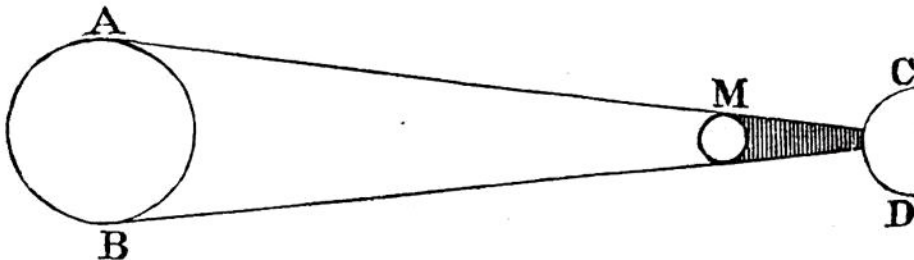


though surrounded by a haze, until, having passed the limits of the penumbra, she regains her accustomed brightness. The cone of the earth's umbra extends beyond the orbit of the moon, so that, if she be in her node at the time when she comes into conjunction with the earth and the sun, she must pass through the umbra of the earth, and a total eclipse will be observed; but the eclipse may also be total if she be only a short distance from her node, or, to express the fact more definitely, if the moon's latitude be equal to the apparent semi-diameter of the earth's shadow, minus the semi-diameter of the moon's disk. All lunar eclipses are universal, that is to say, they are visible at all those parts of the earth where the moon is above the horizon, and present the same appearance as to magnitude and duration. It may also be observed that the eastern side of the moon first immerses into, and emerges from, the shadow, for the motion of the moon being swifter than that of the earth's shadow, she approaches it, and, having passed through, leaves the shadow to the westward.

An eclipse of the sun is occasioned by the interposition of the body of the moon between the earth and the sun, and consequently can only occur at the time of the new moon.

Let A B represent the sun, M the moon, and C D the earth. Now if the shadow or umbra of the moon extend so



far as to cover a portion of the earth's surface, an individual situated thereon would observe a solar eclipse. An eclipse of the sun differs in many particulars from an eclipse of the moon; it does not present the same appearance on all parts of the earth where it is seen, for in one it may be total, in another partial, and in a third annular; nor can an eclipse of the sun happen at all the places where the sun is visible, as the penumbra cannot, under any circumstances, cover a hemisphere; it is not seen in all places at the same time, and it always commences on the western side.

The object of this sketch prevents us from entering into