Let S S represent the surface of the earth, and *a b c* successive layers of the atmosphere, the lowest being the most dense, and let R E be the direction in which a ray of light from a star would pass to the earth, if there were no atmosphere; but in consequence of its having to move through the air, it is bent out of its course in a curvilinear path, and, instead of reaching the eye of an observer situated at E, it strikes upon the point O. But an observer situated at O would not see the star in its real position; for it is a law in optics, that an object is seen in the direction of the ray at the moment it enters the eye, and therefore the object will appear to be situated at a greater height than it really is, as at *r*, and this is the constant effect of atmospheric refraction. The same cause will also explain the statement frequently made, that a celestial body may be seen for some time after it has descended beneath the horizon; for the rays of light proceeding from it entering the atmosphere, are refracted, and meet the eye of the observer in such a direction as brings into sight bodies which are considerably below his horizon. The amount of refraction increases from the zenith to the horizon, being at the latter equal to about 33′, a quantity very appreciable.

The direct beneficial effect of this atmospheric refraction is to lengthen the duration of celestial light, by prolonging the activity of the sun and moon. But the deceptive positions it gives to celestial phenomena have a tendency to derange the calculations of astronomers. Tables have been formed by which the error may be in part corrected, but it may be doubted whether the tables are in all cases adequate for this purpose. It may appear a simple problem to determine the variable amount of refraction from the zenith to the horizon, but there are many difficulties connected with the investigation. The amount of refraction depends upon the density, and the density is variable; for, though it decreases with its height above the earth's surface, yet the amount of its decrease is not accurately known, being subject to those changes which are produced by a local or general alteration of temperature. But this is not the only cause which affects the amount of refraction, for the atmosphere is unequally loaded with vapour at different times, and the presence and quantity of the vapour sensibly affect the refracting power of the atmosphere.