

The accurate convergence of all the rays of light, which enter through the pupil, to their respective foci on the retina, is necessary for the perfection of the images there formed; but, for the complete attainment of this end, various nice adjustments are still requisite.

In the first place, the *Aberration of Sphericity*,* which is a consequence of the geometrical law of refraction, introduces a degree of confusion in the image; which is scarcely perceptible, indeed, on a small scale, but which become sensible in instruments of much power; being one of the greatest difficulties which the optician has to overcome in the construction of the telescope and the microscope. Nature, in framing the human eye, has solved this difficulty by the simplest, yet most effectual means, and in a manner quite inimitable by human art. She has, in the first place, given to the surfaces of the crystalline lens, instead of the spherical form, curvatures more or less hyperbolic or elliptical; and has, in the next place, constructed the lens of an infinite number of concentric layers, which increase in their density, as they succeed one another from the surface to the centre. The refracting power, being proportional to the density, is thus greatest at the centre, and diminishes as we recede from that centre. This admirable adjustment exactly corrects the deficiency of refraction, which always takes place in the central portions of a lens composed of a material of uniform density, as compared with the refraction of the parts more remote from the centre.†

The second adjustment for perfect vision has reference to the variations in the distance of the focus which take place according as the rays arrive at the eye from objects at different distances, and which may be called the *Aberrations of*

* See Fig. 411, and the note referring to it, p. 324.

† Sir David Brewster has ascertained that the variations of density producing the doubly refracting structure, in the crystalline lens of fishes, are related, not to the centre of the lens, but to the diameter which forms the axis of vision: an arrangement peculiarly adapted for correcting the spherical aberrations. *Philos. Trans.* for 1816, p. 317.