conditions of successful physical speculation, which we have laid down.

It is proper to notice more distinctly the nature of the Geometrical Propositions contained in Euclid's work. The *Optica* contains Propositions concerning Vision and Shadows, derived from the principle that the rays of light are rectilinear : for instance, the Proposition that the shadow is greater than the object, if the illuminating body be less, and *vice versa*. The *Catoptrica* contains Propositions concerning the effects of Reflection, derived from the principle that the Angles of Incidence and Reflection are equal : as, that in a convex mirror the object appears convex, and smaller than the object. We see here an example of the promptitude of the Greeks in deduction. When they had once obtained a knowledge of a principle, they followed it to its mathematical consequences with great acuteness. The subject of concave mirrors is pursued further in Ptolemy's *Optics*.

The Greek writers also cultivated the subject of *Perspective* speculatively, in mathematical treatises, as well as practically, in pictures. The whole of this theory is a consequence of the principle that vision takes place in straight lines drawn from the object to the eye.

"The ancients were in some measure acquainted with the Refraction as well as the Reflection of Light," as I have shown in Book IX. Chap. 2 [2d Ed.] of the *Philosophy*. The current knowledge on this subject must have been very slight and confused ; for it does not appear to have enabled them to account for one of the simplest results of Refraction, the magnifying effect of convex transparent bodies. I have noticed in the passage just referred to, Seneca's crude notions on this subject; and in like manner Ptolemy in his *Optics* asserts that an object placed in water must always appear larger then when taken out. Aristotle uses the term ἀναχλάσις (*Meteorol.* iii. 2), but apparently in a very vague manner. It is not evident that he distinguished Refraction from Reflection. His Commentators however do distinguish these as διαχλάσις and ἀναχλάσις. See Olympiodorus in Schneider's *Eclogæ Physicæ*, vol. i. p. 397. And Refraction had been the subject of special attention among the Greek Mathematicians. Archimedes had noticed (as we learn from the same writer) that in certain cases, a ring which cannot be seen over the edge of the empty vessel in which it is placed, becomes visible when the vessel is filled with water. The same fact is stated in the *Optics* of Euclid. We do not find this fact explained in that work as we now have it ; but in Ptolemy's *Optics* the fact is explained by a flexure of the visual ray : it is