

The occultation of the fixed stars by the nucleus of a comet, or by its innermost vaporous envelopes, might throw some light on the physical character of these wonderful bodies; but we are unfortunately deficient in observations by which we may be assured\* that the occultation was perfectly central; for, as it has already been observed, the parts of the envelope contiguous to the nucleus are alternately composed of layers of dense or very attenuated vapor. On the other hand, the carefully conducted measurements of Bessel prove, beyond all doubt, that on the 29th of September, 1835, the light of a star of the tenth magnitude, which was then at a distance of  $7''\cdot78$  from the central point of the head of Halley's comet, passed through very dense nebulous matter, without experiencing any deflection during its passage.† If such an absence of refracting power must be ascribed to the nucleus of a comet, we can scarcely regard the matter composing comets as a gaseous fluid. The question here arises whether this absence of refracting power may not be owing to the extreme tenuity of the fluid; or does the comet consist of separated particles, constituting a cosmical stratum of clouds, which, like the clouds of our atmosphere, that exercise no influence on the

(*sidera*), *etiamsi faciem illis non habent similem.*" Pliny (ii., 25) also refers to Apollonius Myndius, when he says, "*Sunt qui et hæc sidera perpetua esse credant suoque ambitu ire, sed non nisi relictæ a sole cerni.*"

\* Olbers, in *Astr. Nachr.*, 1828, s. 157, 184. Arago, *De la Constitution physique des Comètes; Annuaire de 1832*, p. 203, 208. The ancients were struck by the phenomenon that it was possible to see through comets as through a flame. The earliest evidence to be met with of stars having been seen through comets is that of Democritus (Aristot., *Meteor.*, i., 6, 11), and the statement leads Aristotle to make the not unimportant remark, that he himself had observed the occultation of one of the stars of Gemini by Jupiter. Seneca only speaks decidedly of the transparence of the tail of comets. "We may see," says he, "stars through a comet as through a cloud (*Nat. Quæst.*, vii., 18); but we can only see through the rays of the tail, and not through the body of the comet itself: *non in ea parte qua sidus ipsum est spissi et solidi ignis, sed qua rarus splendor occurrit et in crines dispergitur. Per intervalla ignium, non per ipsos, vides*" (vii., 26). The last remark is unnecessary, since, as Galileo observed in the *Saggiatore* (*Lettera a Monsignor Cesarini*, 1619), we can certainly see through a flame when it is not of too great a thickness.

† Bessel, in the *Astron. Nachr.*, 1836, No. 301, s. 204, 206. Struve, in *Recueil des Mém. de l'Acad. de St. Petersb.*, 1836, p. 140, 143, and *Astr. Nachr.*, 1836, No. 303, s. 238, writes as follows: "At Dorpat the star was in conjunction only  $2''\cdot2$  from the brightest point of the comet. The star remained continually visible, and its light was not perceptibly diminished, while the nucleus of the comet seemed to be almost extinguished before the radiance of the small star of the ninth or tenth magnitude."