

zenith distance of the stars, does not affect the ray of light passing through it? In the passage of a comet over a star, a more or less considerable diminution of light has often been observed; but this has been justly ascribed to the brightness of the ground from which the star seems to stand forth during the passage of the comet.

The most important and decisive observations that we possess on the nature and the light of comets are due to Arago's polarization experiments. His polariscope instructs us regarding the physical constitution of the Sun and comets, indicating whether a ray that reaches us from a distance of many millions of miles transmits light directly or by reflection; and if the former, whether the source of light is a solid, a liquid, or a gaseous body. His apparatus was used at the Paris Observatory in examining the light of Capella and that of the great comet of 1819. The latter showed polarized, and therefore reflected light, while the fixed star, as was to be expected, appeared to be a self-luminous sun.\* The existence of polarized cometary light announced itself not only by the inequality of the images, but was proved with greater certainty on the reappearance of Halley's comet, in the year 1835, by the more striking contrast of the complementary colors, deduced from the laws of chromatic polarization discovered by Arago in 1811. These beautiful experiments still leave it undecided whether, in addition to this reflected solar light, comets may not have light of their own. Even in the case of the planets, as, for instance, in Venus, an evolution of independent light seems very probable.

The variable intensity of light in comets can not always be

\* On the 3d of July, 1819, Arago made the first attempt to analyze the light of comets by polarization, on the evening of the sudden appearance of the great comet. I was present at the Paris Observatory, and was fully convinced, as were also Matthieu and the late Bouvard, of the dissimilarity in the intensity of the light seen in the polariscope, when the instrument received cometary light. When it received light from Capella, which was near the comet, and at an equal altitude, the images were of equal intensity. On the reappearance of Halley's comet in 1835, the instrument was altered so as to give, according to Arago's chromatic polarization, two images of complementary colors (green and red). (*Annales de Chimie*, t. xiii., p. 108; *Annuaire*, 1832, p. 216.) "We must conclude from these observations," says Arago, "that the cometary light was not entirely composed of rays having the properties of direct light, there being light which was reflected specularly or polarized, that is, coming from the sun. It can not be stated with absolute certainty that comets shine only with borrowed light, for bodies, in becoming self-luminous, do not, on that account, lose the power of reflecting foreign light."