is white after refraction, when the emergent rays are parallel to the incident, and in no other case. If this were so, the production of colorless images by refracting media would be impossible; and such, in deference to Newton's great authority, was for some time the general persuasion. Euler[2] observed, that a combination of lenses which does not color the image must be possible, since we have an example of such a combination in the human eye; and he investigated mathematically the conditions requisite for such a result. Klingenstierna,[3] a Swedish mathematician, also showed that Newton's rule could not be universally true. Finally, John Dollond,[4] in 1757, repeated Newton's experiment, and obtained an opposite result. He found that when an object was seen through two prisms, one of glass and one of water, of such angles that it did not appear displaced by refraction, it was colored. Hence it followed that, without being colored, the rays might be made to undergo refraction; and that thus, substituting lenses for prisms, a combination might be formed, which should produce an image without coloring it, and make the construction of an *achromatic* telescope possible.

Euler at first hesitated to confide in Dollond's experiments; but he was assured of their correctness by Clairaut, who had throughout paid great attention to the subject; and those two great mathematicians, as well as D'Alembert, proceeded to investigate mathematical formulæ which might be useful in the application of the discovery. The remainder of the deductions, which were founded upon the laws of dispersion of various refractive substances, belongs rather to the history of art than of science. Dollond used at first, for his achromatic object-glass, a lens of crown-glass, and one of flint-glass. He afterwards employed two lenses of the former substance, including between them one of the latter, adjusting the curvatures of his lenses in such a way as to correct the imperfections arising from the spherical form of the glasses, as well as the fault of color. Afterwards, Blair used fluid media along with glass lenses, in order to produce improved object-glasses. This has more recently been done in another form by Mr. Barlow. The inductive laws of refraction being established, their results have been deduced by various mathematicians, as Sir J. Herschel and Professor Airy among ourselves, who have simplified and extended the investigation of the formulæ which determine the best combination of lenses in the object-glasses and eye-glasses of tele-

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[2] *Ac. Berlin.* 1747. [3] *Swedish Trans.* 1754. [4] *Phil. Trans.* 1758