86. View of the ether as an "elastic solid."

The latest discussion of this form of the elastic-solid theory of light, which was gradually developed from independent beginnings in the three countries,[1] is to be

[1] In France and Germany, where even in the middle of the century the labours of English natural philosophers like Green, M'Cullagh, Stokes, were only very imperfectly known, the necessity was equally felt of studying the interaction of the ether and ponderable matter. In France the school of the eminent "elastician," Barré de St Venant, produced in M. Boussinesq the author of the earliest published attempt to solve the difficulties which the older methods of Cauchy had not overcome. In a lucid review of the state of physical optics, Saint Venant himself ('Ann. de chimie et de Physique," 4me série, vol. 25, 1872) hails with delight the researches of M. Boussinesq from 1865 onward, where the idea that the ether in the interstices of transparent bodies has different elastic constants is given up, and the participation of the ponderable matter in the vibrations is introduced in its place. "En effet," he says, "il est bien difficile de concevoir, d'une part, que l'éther puisse être agité au sein d'un corps dont la densité est probablement bien supérieure à la sienne, sans lui communiquer une fraction sensible de sa quantité de mouvement, et d'autre part, que les ondes ne soient pas bientôt éteintes par cette participation de la matière pondérable au mouvement s'il n'y a pas concordance entre les oscillations imprimées à chaque molécule de cette matière et celles de l'éther qui l'environne." It was the problem of the continuity at the interface of reflecting and refracting substances and the problem of absorption which the older simple ether theories could not explain. In Germany a similar impulse was given to the study of the interaction of elastic systems—as indeed to many problems of mathematical physics—by Franz Neumann, who was the centre of a numerous and influential school. He taught at Königsberg together with Richelot and Bessel. His lectures have been edited by his pupils. Prof. Karl Pearson, in his continuation of Todhunter's 'History of the Theory of Elasticity,' does ample justice to the labours of Neumann, who, "in his investigations on photo-elasticity and the elasticity of crystals, breaks almost untrodden ground, which both physicists and mathematicians have hardly yet exhausted" (*loc. cit.*, vol. ii. 2, p. 183). "Neumann was among the first (1841, 'Abh. der Berliner Akademie') to attribute dispersion to the influence of the ponderable particles on the particles of the ether" (ibid., p. 31). The most important original contributions of Neumann's pupils are the researches of Sellmeier, who had been led by theoretical considerations in 1866 to expect certain anomalies in the phenomena of dispersion, such as were in 1870 actually discovered by Christiansen, and fully investigated by Kundt. Surface coloration was shown to be intimately connected with the absorptive powers in substances showing these anomalous phenomena. A full report on these and other theories, based upon what has been termed abroad the "Bessel-Sellmeier hypothesis" (see Ketteler, 'Theoretische Optik,' 1885), will be found in Prof. Glazebrook's "Report on Optical Theories," Brit. Assoc. Reports, 1885.