

very small distances—to explain the refraction and inflection of light passing from empty space, or from the

referring to attractive forces acting only at small distances, he proceeds: "And as in algebra, when the positive quantities disappear and cease, negative quantities begin; so in mechanics, where attraction stops, there a repelling force must come in. But that such a force exists, seems to follow from the reflection and inflection of the rays of light. For the rays are repelled by bodies in both these cases, without the immediate contact of the reflecting or inflecting body. And if all this is so, then the whole of nature will be very simple and similar to herself; performing all the great motions of the heavenly bodies by the attraction of gravity, which exists between all those bodies, and almost all the smaller motions of their particles through some other attracting and repelling force, which exists mutually between those particles" ('Optice,' MDCCVI., p. 341). The suggestions of Newton regarding forces of molecular dimensions were taken up by other contemporary writers and experimentalists, and the 'Philosophical Transactions' during the early years of the last century contain several memoirs touching on this subject, notably by John Keill (1708), who refers to Newton's 'Opticks,' and enlarges, as does also John Freind ('Prelectiones Chymicæ'), on the usefulness of the idea of molecular attraction in explaining chemical and physiological phenomena. In the later editions of the 'Opticks,' evidently in consequence of the elaborate experiments of Hauksbee, Newton enters more fully into the question of molecular, especially capillary, action; and his last query, No. 31, is quoted by Laplace in his 'Théorie

de l'Action capillaire,' which forms the supplement to the tenth book of the 'Mécanique céleste.' I may here mention that as some confusion exists in the different editions of the 'Opticks' regarding the numbering of the "Queries," it is best to refer to Horsley's Collected Edition of the Works of Newton, where the latest English edition is reprinted, and all the variations and additions noted from the first (English) edition through the subsequent ones. The first edition breaks off with query 16; the first Latin one with query 23, and this was in later editions numbered 31, a number of new queries being inserted, Nos. 18 to 24, referring to the "probability of a medium more subtle than air" and the "mechanical efficient of gravity." This was added "to show" (Newton's words in preface dated 16th July 1717) "that I do not take gravity for an essential property of bodies, . . . choosing to propose it by way of a question, because I am not yet satisfied about it by way of experiments." We may note that this was written a few years after the second edition of the 'Principia' was published by Cotes, whose preface did a good deal to occasion the misunderstanding regarding Newton's views on gravitation as a primary quality of matter. From his correspondence with Cotes, edited by Eddleston (1850), we know that Newton is composing the "Scholium generale," which is added to the second and later editions of the 'Principia,' had intended to say "much more about the attraction of the small particles of bodies," but that on second thoughts he abandoned this intention (p. 147).