

ments of Richer, Halley, and many others, the measurements of the arc of the meridian, and Cavendish's and Maskelyne's experiments, were some of the direct results of the discovery.

It was natural that, having explained the cosmical, and subsequently many terrestrial phenomena, successfully by the formula of attraction, Newton himself, and still more Laplace and his school, should have attempted the explanation of molecular phenomena by similar methods.

31.  
Astronomical view of molecular phenomena.

The astronomical view spread into molar and molecular physics. Newton himself made use of the notion of molecular attraction<sup>1</sup>—*i.e.*, of attraction existing only at

<sup>1</sup> In the fourteenth section of the first book of the 'Principia' Newton is, however, careful to speak always of "attractio vel impulsus," leaving it open to the reader to form his own opinion whether it is an action at a distance or a "vis a tergo," a push. He says also that the particles of light approaching solid bodies with a definite velocity are bent, "quasi attracti in eadem (*i.e.*, corpora)." And in the twenty-third query to the first Latin edition of the 'Opticks' (1706) he says: "May not the small particles of bodies have certain virtues, powers, or forces by which they act at some distance, not only on the rays of light, reflecting, refracting, or inflecting them, but also on each other, producing various natural phenomena? For it is sufficiently known that bodies mutually act on each other through the attraction of gravity and through magnetic and electric virtue. And these examples show what is the order and reason of nature, so that it becomes very probable that there may be other attractive forces. For nature is very similar and agreeing to her-

self. Through what efficient cause these attractions are brought about I do not inquire here. What I here call attraction may well be produced by an impulse or in some other way unknown to us. I take this word attraction here in this way, that it be understood merely to mean some universal force with which bodies try to approach each other, whatever cause this force may have to be attributed to. For from the phenomena of nature it behoves us first to be taught which bodies attract each other, and what are the laws and properties of this attraction, before we inquire by what efficient cause this attraction is brought about. The attraction of gravity and of the magnetic and electric virtue extend to sufficiently large distances, so that they fall under the notice of the vulgar senses; but it may be that there are others which are contained in such narrow limits that they have so far escaped all observation." And he goes on to speak of the deliquescence of some salts and of chemical combinations of finely powdered substances. And further on in the same query, after