

THE LAW OF SUBSTANCE

of the kinetic theory is Newton, the famous discoverer of the law of gravitation. In his great work, the *Philosophiæ Naturalis Principia Mathematica* (1687), he showed that throughout the universe the same law of attraction controls the unvarying constancy of gravitation; the attraction of two particles being in direct proportion to their mass and in inverse proportion to the square of their distance. This universal force of gravity is at work in the fall of an apple and the tidal wave no less than in the course of the planets round the sun and the movements of all the heavenly bodies. Newton had the immortal merit of establishing the law of gravitation and embodying it in an indisputable mathematical formula. Yet this *dead mathematical formula*, on which most scientists lay great stress, as so frequently happens, gives us merely the *quantitative* demonstration of the theory; it gives us no insight whatever into the *qualitative* nature of the phenomena. The action at a distance without a medium, which Newton deduced from his law of gravitation, and which became one of the most serious and most dangerous dogmas of later physics, does not afford the slightest explanation of the real causes of attraction; indeed, it long obstructed our way to the real discovery of them. I cannot but suspect that his speculations on this mysterious action at a distance contributed not a little to the leading of the great English mathematician into the obscure labyrinth of mystic dreams and theistic superstition in which he passed the last thirty-four years of his life; we find him, at the end, giving metaphysical hypotheses on the predictions of Daniel and on the paradoxical fantasies of St. John.

In fundamental opposition to the theory of vibration, or the kinetic theory of substance, we have the