

lier writers. Elaborate claims to priority have thus been set up for persons to whom it is said the credit of modern discoveries should be given. I do not intend to contribute to this controversial literature, except by a general remark, which will explain how it has come to pass that ideas and principles now recognised as useful instruments of thought and research have only recently attained this importance, while they have frequently been the property of many ages of philosophical thought, and familiar even to the writers of antiquity. It is the scientific method, the exact statement, which was wanting, and which raises the vague guesses of the philosophical or the dreams of the poetic mind to the rank of definite canons of thought, capable of precise expression, of mathematical analysis, and of exact verification. Obscure notions of the attractive and repulsive forces of nature have floated before the minds of philosophers since the time of Empedocles, but they did not become useful to science till Galileo and Newton took the first step to measure the intensity of those forces. Lucretius's poem introduces to us the early speculations on the atomic constitution of matter, but the hypotheses of his school only led to real knowledge of the things of nature when Dalton, following Lavoisier and Richter, reduced this idea to definite numbers; still more so when, through the law of Avogadro and Ampère, and the calculations of Joule, Clausius, and Thomson, the velocities, the number, and sizes of atoms became calculable and measurable quantities. Descartes, and after him Malebranche, filled space with vortices which were to explain the constitution of matter and the movements of its parts; but the notion was abandoned and ridiculed till Helmholtz