

not surer to us now than is the atomic or molecular theory in chemistry and physics—so far, at all events, as its assertion of heterogeneousness in the minute structure of matter, apparently homogeneous to our senses, and to our most delicate direct instrumental tests.”¹

This side of the atomic view of matter has been developed by the study of the properties of bodies in the gaseous state, and, in its modern form, goes back to the experiments of Gay-Lussac, which were almost simultaneous with those of Dalton.² It is interesting to note how little the latter recognised the importance of these researches, when he rejected the so-called law of volumes, according to which gases, under the same pressure, and at equal temperatures, enter into, or separate out of, chemical combination in definite and very simple proportions of their volume. As, according to the law of definite proportions, bodies (including gases) combine only

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The kinetic
theory of
gases.

¹ Lord Kelvin on “Capillary Attraction,” 1886. See ‘Popular Lectures and Addresses,’ vol. i. p. 4.

² The first results referring to the combining volumes of oxygen and hydrogen gas in forming water were given by Gay-Lussac and Humboldt in a joint memoir. Their experiments were carried on in 1805. Gay-Lussac continued the experiments alone, extended them to gaseous compounds, and published his results in 1809 in the second volume of the ‘Mémoires d’Arcueil.’ This was one year after the publication of Dalton’s ‘New System of Chemical Philosophy,’ and two years after Thomas Thomson had published a sketch of the atomic theory in his text-book on Chemistry. The law of equal expansion of all gases with temperature was published by Dalton in 1801; the

law of pressures—that the volume of a gas, at the same temperature, is inversely as the pressure—was published by Boyle in 1662. It goes on the Continent under the name of Mariotte, who first made it generally known about twelve years later (see on this the fourth appendix to the 2nd edition of Tait’s ‘Properties of Matter,’ 1890). The law of temperatures was published in 1802 by Gay-Lussac in the ‘Annales de Chimie et de Physique’ (vol. xliii. p. 137), where he remarks that Charles, Professor of Physics at the “Conservatoire,” had fifteen years earlier noted the property indicated by this law. Both these so-called laws of gases are only accurate within certain [not very wide limits of temperature and pressure.