

volume as did each of the equivalent quantities, hydrogen and chlorine, out of which it was compounded, and it appeared that accordingly double the number of atoms were condensed into the same volume. To explain this, and yet maintain his original hypothesis, Avogadro was forced into the conception of compound atoms or particles—*i.e.*, into the assumption that the smallest independent particles need not be the elementary atoms of hydrogen and chlorine themselves, but might be made up of two or more of such atoms, chemically connected in such a way that the expansion of the gas under increasing temperature or decreasing pressure did not affect this complex of elementary particles.<sup>1</sup> Such a compound

<sup>1</sup> Avogadro published his memoir in the 'Journal de Physique' in 1811, and Ampère expounded similar views three years later in the form of a letter to Berthollet in the 'Annales de Chimie.' Neither the celebrity of Ampère nor the exhaustive explanations of Avogadro, who was then an unknown author, prevented this hypothesis, which is now looked upon as a cornerstone of the atomic view, from falling into oblivion. Whewell does not mention it. Even Kopp, whose labours for many years covered a field little cultivated by most other chemists, that of physical chemistry, makes no mention of Avogadro's and Ampère's hypothesis in his great work on the History of Chemistry, published between the years 1843 and 1847. In his later work ('Die Entwicklung der Chemie,' 1873) he enters elaborately into the causes which made chemical philosophers overlook so valuable a suggestion (p. 353, &c.) Like Whewell's History, Poggen-dorf's Dictionary (1863) was silent about Avogadro. The distinc-

tion between molecules and atoms seemed to complicate matters; besides, the new hypothesis was not launched in conjunction with any new experimental discoveries, as had been the case with Dalton's, Davy's, and Gay-Lussac's theories. The first who again drew attention to the subject was Dumas, who in 1826 began his investigations regarding the specific weight of vapours—*i.e.*, of bodies in a gaseous state. He there drew attention to the necessity of distinguishing between chemical and physical particles, but he does not yet consistently use the terms atom and molecule to denote the former and the latter. In the meantime, however, a very important step had been taken in the development of the atomic view. In 1819 Dulong and Petit published their experimental researches concerning the specific heat of a large number of elementary bodies—*i.e.*, the measured quantities of heat (compared with a standard substance) which were required to raise a number of metals by one degree in tempera-