

as to fixed and multiple proportions, expressed himself with great reserve as to the value of the atomic hypothesis, and when drawing up a table of atomic weights, he preferred to call them equivalents—a term used already by Cavendish—as implying no other meaning than that they fix the proportions in which bodies combine into, or separate out of, compounds. Davy was hesitating and reluctant to admit any hypothesis as to the ultimate constitution of matter. Liebig<sup>1</sup> and Faraday,<sup>2</sup> at a somewhat

<sup>1</sup> “In endeavouring to develop the theory which at present prevails respecting the cause of the unchangeableness of chemical proportions, let it not be forgotten that its truth or falsehood has nothing whatever to do with the natural law itself. The latter is the expression of universal experience; it remains true, invariably and immutably, however our notions respecting its cause may from time to time vary and change.” Thus wrote Liebig (*Familiar Letters on Chemistry*, 1844) at a time when great confusion existed as to the real atomic or smallest combining weights which should be assigned to the chemical elements; when in consequence many chemists preferred to discard the word “atomic weight” altogether, and to revert to the term equivalent (see Kopp, *Entwicklung der Chemie*, p. 718, &c.) Dumas in 1840 declared that the term atomic weight did not deserve the confidence with which chemists made use of it: if he could he would banish the word atom from chemistry, convinced as he was that science should not transgress the limit of that which could be known by experience. Liebig, in 1839, about the time when his important memoirs on the constitution of organic bases and acids appeared in his *Annals*, em-

phasised likewise the fact that equivalents never change; but he doubted whether chemists would ever agree as to the relative atomic weights, and he hoped the time was not far distant when they would all return again to equivalents (*ibid.*, p. 438). In France an influential school, headed by the eminent M. Berthelot, up to the present day limits itself to the use of equivalents. See Berthelot, *La Synthèse chimique*, 7<sup>me</sup> éd., p. 164 n.

<sup>2</sup> The objections which Faraday urged against the notion of atom and atomic weight seem to come from a different quarter. In 1834, when explaining his researches on electro-chemical action, he says (*Exper. Res.*, No. 869): “If we adopt the atomic theory or phraseology, then the atoms of bodies which are equivalents to each other in their ordinary chemical action have equal quantities of electricity naturally associated with them. But I must confess I am jealous of the term *atom*; for though it is very easy to talk of atoms, it is very difficult to form a clear idea of their nature, especially when compound bodies are under consideration.” Ten years later, in his *Speculation touching Conduction and the Nature of Matter* (see *Exper. Res.*, vol. ii. p. 285),