

the "atomicity" or "valency" of chemical substances—be they elements or compounds. This most recent development of chemical systematisation originated in England,¹ whereas the "radicle" theory belonged more to the

the view that an understanding of chemical reactions must ultimately depend upon a study of the nature and degree of chemical affinity, and maintained that so far the connection of chemical with electrolytic phenomena afforded the only clue to the comprehension of the nature of chemical affinity. The atomic theory had now absorbed all interest, to the detriment of a physical theory of chemical affinity such as Berthollet had attempted. It was held that by ignoring the electro-chemical differences, the "modern" school lost the only remaining chance of explaining, and not merely classifying, chemical phenomena. A good exposition of the latter argument will be found in A. Rau, 'Die Theorien der modernen Chemie.'

¹ The number is small of the English names which about the middle of this century figured prominently in the discussions by which, in the German and French annals of science, correcter views on the constitution of chemical compounds were gradually elaborated. Kane's work was overlooked, but Williamson, Odling, and Frankland have had a very marked influence; and, as in so many other sciences, pioneer work in modern chemistry was done in this country, notably by Frankland. Liebig, after his visit to England in 1837, wrote to Wöhler: "I have traversed England, Ireland, and Scotland in all directions, have seen much that is astonishing, but have learnt little: whence is scientific knowledge to come in England, as the teachers are so inferior? Among older men, Thomson is still the best; among younger men,

Graham: modest and unassuming, he makes the most beautiful discoveries. Nevertheless, a splendid nation," &c. &c. ('Liebig's und Wöhler's Briefwechsel,' vol. i. p. 113.) From what I stated above (chapter iii. p. 296, &c.), we are, however, quite prepared to find that the idea which more than any other has brought some order and system into modern chemical theory, and which has united the diverging currents of the foreign schools, has come from England. Frankland more than any other must be looked upon as the originator of the modern theory of the atomicity or valency of chemical elements and compounds. The history of this conception can be well studied in the collection of scientific papers which he published with valuable introductions in 1877 ('Experimental Researches in Pure, Applied, and Physical Chemistry,' London, van Voorst). His researches commenced in those years when great confusion existed in organic chemistry, "when the wildest theories of the constitution of organic compounds created but little surprise; the assertion, for instance, that an atom of carbon was united with four atoms of hydrogen and two of chlorine would scarcely have been considered intrinsically improbable, and certainly not impossible" (*loc. cit.*, p. 26). The idea existed that bodies could enter into combination with other bodies, notably organic radicles, and could still retain in such combination their original affinities unimpaired; a new term, that of "conjugate," "copulated," or "paired" compounds, had been invented and adopted by Berzelius.