Whilst the "Radicle" theory of Berzelius and Liebig sought to simplify the study of chemical compounds by reducing them to a definite number of complex atoms, the "Type" theory of Laurent and Gerhardt sought to attain the same object by establishing a small number of simple formulæ, corresponding to well-known simple substances, under which the vast number of organic compounds could be grouped.[1] The conception of a "type" exhibiting

20. Type theory.

[1] The type theory was slowly and hesitatingly developed. Dumas, whose researches about 1835 prepared the way, did not himself draw the immediate consequences; this was done by Laurent, "who maintained that the structure and chemical character of organic compounds are not materially altered by the entrance of chlorine and the separation of hydrogen" (E. v. Meyer, 'History of Chemistry,' p. 261). Laurent then elaborated his theory of "Nuclei." They remind one of Berzelius's and Liebig's radicles. The nuclei were the groundwork of organic compounds; they were not unalterable as the radicles had been considered to be. Dumas, who at first repudiated Laurent's ideas, was later on, through his own experimental discoveries, led to adopt similar views. The "radicle," as the permanent constituent in organic compounds—corresponding to the elements in inorganic chemistry—had given way to the changeable nucleus, which only preserved its form; the unchangeable principle was found in the form, the structure or type, instead of in the substance of the simple or composite constituents. This led to an extensive study of the forms of chemical compounds—as expressed by their formulæ, and apart from the study of the properties of the original constituents. Types were invented, frequently in a somewhat arbitrary manner. "The ultimate result was that an empty scheme of formulation carried the day over what was really good in this doctrine" (ibid., p. 264). "The unitary conception was to step into the place of the dualistic. . . . Every chemical compound forms a complete whole, and cannot therefore consist of two parts. The chemical character is dependent primarily upon the arrangement and number of the atoms, and in a lesser degree upon their chemical nature" (p. 265). This is the beginning of the second great step which was taken in the elaboration of the atomic view of matter and nature. The atomic view first became a scientific instrument, when arithmetical relations of a definite and unalterable kind were suggested and proved to exist; it became a yet more useful instrument, when to the arithmetical there were added geometrical conceptions. Position, arrangement, and structure are conceptions which involve ideas of distance and space. It is true that for a long time these terms were used merely symbolically; the ultimate consequences of such conceptions can however not be avoided. The history of chemical theory in the second half of the nineteenth century is a proof of this.