21. Uncertainty in chemical theory about the middle of the century.

middle of the century.[1] It thus happened that a variety of circumstances combined to bring into prominence, and subsequently into general acceptance, the modern view of

industry in Germany was brought about; a creation almost as characteristic of German intellect, and probably more lastingly beneficial, than the political changes which mark the same period in history. More important for a history of Thought is it to note how Kolbe attached himself to the school of Wöhler and Berzelius, and tried to preserve the continuity of thought in developing the fruitful ideas contained in the writings of the latter. "He united the conclusions from his own researches with the declining theory of Berzelius; he endued the latter with new life by throwing aside whatever of it was dead, and replacing this by vigorous principles. From his own and other investigations he came to the conclusion that the unalterability of radicles, as taught by Berzelius, could no longer be maintained, since the facts of substitution had to be taken into account." He especially developed Berzelius's idea of paired compounds. (See E. v. Meyer's 'History of Chemistry,' p. 295.) Kolbe's joint work with Frankland was of the greatest importance to science. The influence of Kolbe was also largely of a polemical nature, inasmuch as he and some others, notably F. Mohr (whose name will have to be mentioned in a later chapter), protested energetically against the formal character of much of the writings and work produced by the French school which opposed the views of Berzelius. This school, of which Dumas, Laurent, and Gerhardt were the founders, and which exerted a very marked and beneficial influence through the teaching and the finished literary productions of Wurtz (1817-84), was closely allied with the school of Kekulé in Germany, who indeed began by logically developing Gerhardt's ideas, being afterwards led to special views and methods of his own, through which he became the real founder of the so-called structural formulæ, and of the doctrine of the linking of atoms. I must here especially record my indebtedness to the admirable historical essays of Wurtz ('Théorie atomique,' 7me ed., 1893, and 'History of Chemical Theory,' transl. by Watts). For clearness and elegance of style, they are quite as marked as are Kopp's historical works for breadth, impartiality, and philosophical insight.

[1] The adherents of the theory of substitution and types, sometimes called the "modern," also the "French," school, urged against the followers of Berzelius, which adhered to the "electro-chemical" or "radicle" view, that since an electro-positive element could be replaced by a contrary one, there was no sense in upholding the polar difference. They pointed out that organic substances were not electrolytic; and they criticised the artificial invention and multiplication of new radicles which had no real existence, as arbitrary. On the other side, the followers of Berzelius objected to the entire ignoring by the new school of the really existing electro-chemical differences, and reproved them for having destroyed the connection between organic and inorganic chemistry, and for having introduced a purely formal systematisation according to merely externa differences. They rightly upheld