

ing the advent of a new era in consequence of the appearance of the first volume of the *Zeitschrift für physikalische Chemie*. This year affords, no doubt, an excellent point of departure; but to qualify it as "the beginning of the transition from a system into a science of chemistry" (p. 17) is surely incorrect. Granted the profound development which has taken place in the direction of physical chemistry during this period, it would be a gross misconception of the word "science" to deny the term to chemistry during the greater part of last century. If, as the author truly remarks, it is the generalisations or laws which transform chemistry from a system into a science, he assuredly contradicts his assertion when, for example, he develops the laws connected with the history of mass action. But, apart from this, there are many other statements which are equally inaccurate. One would scarcely venture to describe Stas's method as "crude" (p. 3), or to regard Prout's hypothesis as correlating atomic weights with the physical and chemical properties of the elements (p. 4), or to represent Kekulé's benzene formula as a triangle with the carbon and hydrogen groups occupying the corners and middle points of the sides (p. 12), or to state that Le Bel's advance on Pasteur's theory consisted in showing "that optical activity is the expression of asymmetry, but that this asymmetry is of the chemical molecule"; for it was precisely what Pasteur did suggest, as anyone who has read his lectures on molecular asymmetry can scarcely fail to remember.

Sufficient has been stated to show a certain amount of carelessness in the handling of historical details; and, in regard to the elucidation of complex problems, we doubt whether any student who was not already familiar with the subject would follow the account of, for example, Berthollet's contribution to the law of mass action, or Le Chatelier's rule (p. 80), or the explanation of osmotic pressure (p. 90). The expressions "to arrest attention to the importance of," "the method was to cut and try to see what result was obtained," are not exactly elegant English, and the frequent repetition of the same word, such as "generalisation," which occurs twenty times in seven pages, point to hurried and slovenly compilation. The book is, on the whole, disappointing.

(3) The first edition of Sir William Tilden's book on the progress of scientific chemistry is too well known and appreciated for any special recommendation of the new edition, which merely brings the subject up-to-date, to be necessary. For those who may not have seen or read the earlier volume, it may be stated that it sets forth the main facts

and theories of chemistry in historical sequence, and traces the development of the various branches of the science down to the present time. The subjects are not discussed with any great detail or elaboration, but the style is fresh and attractive, and the explanations clear and incisive, so that the merest tyro in chemistry can easily follow all that he reads. With one notable exception it would be difficult to find anyone at the present day whose long association with chemistry both as teacher and investigator, and whose personal contact with many of the great chemists of this and the latter part of last century, could better fit him for the task of a historian, and the volume will furnish not the least valuable of the many contributions to chemistry of its distinguished author.

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OUR BOOKSHELF.

The Makers of Modern Agriculture. By Dr. W. Macdonald. Pp. 82. (London: Macmillan and Co., Ltd., 1914.) Price 2s. 6d. net.

IN this little book Dr. Macdonald has given a very pleasant and readable account of five of the makers of modern agriculture, viz., Jethro Tull, Coke of Norfolk, Arthur Young, John Sinclair, and Cyrus H. McCormick. He has carefully examined the best biographies available, and has given a summary of the lives and works of his subjects, which cannot fail to be of wide interest to all concerned in the development of agricultural science. If we have a fault to find, it is that the title is too comprehensive: Lawes and Gilbert are not mentioned, yet they must surely stand among the makers of modern agriculture, for it was they who worked out the application of artificial manures to agricultural practice. Three of the five are Englishmen, one is Scotch, and one American. Tull and Coke are in some ways the most interesting of the five.

Tull was born at Basildon in Berkshire in 1674, and did his best work in the same county. His claim to fame is that he invented the method of drilling seed, which has now displaced the older method of broadcasting or dibbling. He was thus able to secure an opportunity for cultivating land even while the crop was growing. In consequence, bare fallow could be dispensed with, and the land could be utilised throughout the whole of the rotation. The principles that he laid down are wonderfully accurate, while his methods have changed only in detail and not in essentials.

Coke of Norfolk is well known for his remarkable work in the development of light, sandy soils. It is unfortunate that no satisfactory account of his agricultural experiments has yet been published, and one can only hope that this oversight on the part of agricultural writers will soon be remedied. His experiments at any rate were well known in his own day, and the practices he introduced have been widely followed ever since.