

THE PRINCIPLES OF CHEMISTRY. BY D. MENDELÉEFF. Second English edition, translated from the sixth Russian edition by G. KAMENSKY, edited by T. A. LAWSON. 2 vols. pp. xviii + 621 and 518. New York : Longmans, Green & Co. 1897. Price \$10.00.

Since its discovery by Mendeléeff, the Periodic System has been made the basis of several treatises on chemistry. A book in which it is rigidly adhered to, like Ramsay's "System of Inorganic Chemistry," may be valuable to the advanced student for reference and comparison, but would be but poorly suited to teaching chemistry to beginners, even of mature age. Some familiarity with a few of the typical elements and their compounds, and with the more important laws, is necessary, before the student is in the position to grasp the idea of periodicity. Mendeléeff does not carry his favorite idea too far; his book affords an admirable illustration of the proper method of adapting the Periodic System to the requirements of beginners, and it is difficult to conceive how it could be improved in this respect. The writer of this review has had the opportunity of learning by practical experience how admirably his method works in the classroom, and can heartily recommend the work as a model both to writers of text-books and to those who are arranging courses of lectures in general chemistry.

After an introductory chapter treating of combination, decomposition, reactions, elements and compounds, and other preliminary matter, the reader takes up the study of water, its properties, composition, and compounds. This leads to the consideration of hydrogen and oxygen, acids, bases, and salts, which are followed by nitrogen, the air and the compounds of hydrogen, oxygen, and nitrogen. This has the advantage not only of introducing typical elements at the start, but also of calling the beginner's attention to some of the substances most familiar in every-day life, which are much more likely to interest him than unheard-of objects. Not until the 299th page does the author begin the consideration of the atomic theory and Avogadro's hypothesis, from which it will be seen that it is his custom to state first the facts, then the generalizations, and last of all the hypotheses based on these—a most admirable course, which it is to be wished all writers of text-books would follow. Carbon compounds are considered next, after which follows a chapter on

sodium chloride, hydrochloric acid, and the law of mass action, the importance of which is much more strongly emphasized than is usual. Chapters on halogens, the alkali and alkaline earth metals and on valency and specific heat bring the first volume to a close, leaving the student in a position to understand the Periodic Law, which takes up the first chapter of the second volume. The remaining elements, which are treated in a strictly systematic way, take up the remainder of the volume. The work is supplemented by three appendices, consisting of two lectures delivered in London on "An Attempt to Apply to Chemistry One of the Principles of Newton's Natural Philosophy," and on "The Periodic System," and an essay on "Argon, a New Constituent of the Atmosphere," which are good illustrations of the style and speculative tendencies of the author. Argon was discovered after the revision was practically finished, and therefore appears only in foot-notes and in the appendix, while helium was found too late to be taken note of.

The book is therefore not a treatise on theoretical chemistry, but a descriptive work in which an unusual degree of attention is given to the principles of the science. The author has endeavored to adapt it to both beginners and advanced students, and has therefore placed the most important material in the text, supplementing this with numerous foot-notes, which constitute at least one-half of the book, and which contain more detailed information as well as numerous digressions. He recommends beginners to omit the foot-notes on the first reading.

The treatment throughout is highly original, and in few works of the kind are the personal views of the author so apparent on every page. This renders the book peculiarly attractive and suggestive to the mature chemist, but it may be questioned whether it is desirable for the younger student to find important subjects treated in as one-sided a way as is sometimes the case—for example, in a book on the Principles of Chemistry one would look for some statement of current ideas of molecular structure, yet this is not to be found. The author uses no structural formulas and does not even explain what they are—at most, he admits that they may have some application to carbon compounds, but does not hesitate to say that the day of structural chemistry (in its present sense) is past (vol. 2, p. 466). He

frequently compares molecules to planetary systems. His inclination to speculate and generalize is everywhere evident, and while it often leads to valuable and suggestive results, it is occasionally carried to an extreme, as when we are told that "gases which are easily liquefied (by pressure and cold) are more soluble than those which are liquefied with difficulty," or when he states his opinion that there is a possible mysterious connection between the *eight* groups of the Periodic System, the *eight* major planets, and the *eight* satellites of Saturn (vol. 2, p. 463), a view which may be pardoned in the mind which perceived the Periodic Law, but which would certainly be ridiculed in any lesser.

A physical chemist of the new school would probably find fault with the treatment of the subject of solutions. As is well known, Mendeléeff is an adherent of the "hydrate theory." It is one of his favorite subjects and he alludes to it on every possible occasion. He defines a solution as an "homogeneous liquid system of unstable dissociating compounds of the solvent with the substance dissolved" (vol. 1, p. xiii) and elsewhere in similar terms (vol. 1, pp. 106, 111, etc.). Cryohydrates are regarded as definite compounds and nothing is said of eutaxy. The theory of electrolytic dissociation in solution is barely alluded to and then only to condemn it (vol. 1, pp. 92, 108), while its real nature is not set forth. The new edition mentions the more important investigations on the influence of dissolved substances on the freezing-point and boiling-point, but without any serious effort to explain the different behavior of electrolytes and non-electrolytes. For these reasons the student should consult at the same time some work in which the newer views are more fully stated. In general, the new edition takes sufficient account of recent investigations, but in a few instances these have been overlooked, as in the case of the atomic weight of oxygen (given as 15.96), and the sulphur and nitrogen compounds of phosphorus. The translation is generally clear and idiomatic, and the book is practically free from typographical errors, except that names of persons are frequently misspelled (Staas for Stas, Ebelmann for Ebelman, Schönebein for Schönbein, Clark for Clarke, etc.). The index contains many errors of omission and commission.

We conclude with a quotation from the author's preface: "Knowing how contented, free, and joyful is life in the realm of science, one fervently wishes that many would enter its portals. On this account many pages of this treatise are unwittingly stamped with the earnest desire that the habits of chemical contemplation which I have endeavored to instil into the minds of my readers will incite them to the further study of science. Science will then flourish in them and by them, on a fuller acquaintance not only with that little which is enclosed within the narrow limits of my work, but with the further learning which they must imbibe in order to make themselves masters of our science and partakers in its further advancement."

H. N. STOKES.

INCOMPATIBILITIES IN PRESCRIPTIONS, FOR STUDENTS IN PHARMACY AND MEDICINE, AND PRACTICING PHARMACISTS AND PHYSICIANS. BY EDSEL A. RUDDIMAN, PH.D., M.D. 1897. New York: John Wiley & Sons. v + 264 pp. 8vo. Price \$2.00.

This is a book for the pharmacist, rather than a book for chemists, as the author states in his title-page. It is divided into two parts:

Part I details the principal reactions and physical properties of the medicinal substances most used in compounding prescriptions. It deals chiefly with solubilities and precipitants, changes of color, and behavior when mixed dry or rubbed up in a mortar. This part of the book is essentially a compilation from drug journals, and pharmaceutical and chemical works. The author has, however, confirmed many of the statements. The compilation has involved a large amount of work, and references have been given, in most cases, to the sources of information. The author does not tell us how many of these statements he has confirmed, but in some cases he records his own results, when they contradict the statement he quotes, leaving us to infer that he has found the rest of the statements correct as quoted. The substances are taken up alphabetically, and only the Latin names are used, which might with propriety have been followed by the chemical name. Another very important omission, which greatly lessens the value of the book, is that it does not give the degree of solubility of the substance in water, alcohol, or diluted alcohol. These facts are especially of service to the pre-