

## OSTWALD'S INORGANIC CHEMISTRY.

*The Principles of Inorganic Chemistry.* By Wilhelm Ostwald. Translated by Alexander Findlay. Pp. xxvii + 785. (London: Macmillan and Co., Ltd.) Price 18s. net.

VIEWES differ regarding the best method of presenting the facts and theories of chemistry to a beginner. Prof. Ostwald takes the view that "if the present-day chemistry makes greater demands on the power of rational thinking, it also renders the purely memory work of mastering the subject considerably more easy for the student. The growth of the scientific interpretation and elucidation of the separate facts of chemistry facilitates in the highest degree the impression of them on the mind and their application, and at the same time affords an incomparably greater intellectual enjoyment than the study of the older, essentially descriptive, chemistry could offer." Acting on this opinion, Ostwald has introduced physical theories, applicable to chemical facts, "in his stride," as it were. Beginning with some simple metaphysical statements, he develops the fundamental laws of classification and treats of homogeneous substances, mixtures and solutions; he next proceeds to consider the law of the conservation of weight and mass, and of work and energy, treating incidentally of the units in which these magnitudes are measured. The next chapter is devoted to "combustion," the existence of oxygen and the constancy of proportions; and the next to a rapid survey of the elements and their properties. The subsequent treatment is, in a restricted sense, systematic; the remaining chapters treat of oxygen, ozone, hydrogen, water, hydrogen peroxide, chlorine and hydrochloric acid, oxides of chlorine; bromine, iodine and fluorine, sulphur and its compounds, and, in short, the elements generally termed non-metals and their compounds; the metals and their salts complete the list.

But the discursive nature of treating the subject may be gauged by the amount of space—92 pages—devoted to the consideration of oxygen, hydrogen and water. Under the heading "Oxygen," not merely are the preparation and properties of the element considered, but also velocity of combustion, the influence of temperature on that rate, Boyle's and Gay-Lussac's laws, the temperature scales, degrees of freedom of a gas, the construction of curves, the liquefaction of gases, the solubility of gases, and ozone; the condition of allotropy is also shortly discussed. Under "Hydrogen" come methods of drying gases, molecular weights (here termed "molar" weights), the compressibility of gases at high pressures, diffusion, the law of partial pressures, the law of effusion of gases and spectrum analysis; also, *à propos* of the combustion of hydrogen, the law of mass action, chemical equilibrium and the influence of solid substances thereon; and lastly, catalysis, introduced by the catalytic action of platinum in causing combination between oxygen and hydrogen. Under the heading "Water," we find the law of continuity, graphic interpolation, coefficient of expansion, degrees of freedom of liquids, supercooling, heats of fusion, heat-units, vapour-pressures, heats of vaporisation, supercooled vapours, phases of water, ice and steam, and the triple point; next water as a solvent,

and the relations between lowering of freezing point and depression of vapour pressure caused by salts; volume relation of gases, "combining" weights, symbols and formulæ, equations, and the atomic and molecular hypotheses.

Now Prof. Ostwald's style is excellent, and full justice is done to it by Dr. Findlay's translation; hence the book is most readable and interesting; the theoretical disquisitions are most clearly stated and arranged in an orderly manner, each point being taken up when its turn has come, but the reviewer doubts whether a beginner would gain much from a perusal of the book. For a teacher who is already familiar with the facts of chemistry, innumerable hints are to be found, almost on every page. But after all, the young chemical student has to familiarise himself with the facts of chemistry, and gilding the pill, even with fine gold, is apt to interfere with its assimilation. For a man of advanced years, even though he be no chemist, who can appreciate the logical arrangement of the book, much enjoyment may be obtained from it; but from long experience of the powers of mind of junior students, the reviewer doubts whether more than two or three specially gifted individuals out of a large class would retain much in their memories.

Just as in learning a language it is absolutely necessary to acquire the common verbs, prepositions and adverbs by heart, and to have at least some idea of the syntax before analytically parsing the sentences, attending to every subtlety, so with chemistry. A large number of facts and their experimental demonstration must become familiar, and it is then time to build up laws on these facts.

However, as stated at the outset, there are many methods of presenting such facts; and if the young student has energy to follow two or three methods of presentment, he will be a gainer. It appears to the reviewer that it would be better to reserve this method of considering the subject until a year, or perhaps more, has been spent in the more usual course of study. The effect of reading such a book at that stage is sure to be most stimulating, and will enable the reader, not only to revise his knowledge, but to enrich it by many necessary additions.

It is unnecessary to mention that the work is entirely up to date, and that the translator, as an old pupil and friend of the author, has completely entered into the spirit of the matter; he has left no trace of its German origin in the excellent English of which he is a master.

W. R.

## A NEW THEORY OF THE UNIVERSE.

*On an Inversion of Ideas as to the Structure of the Universe.* By Prof. Osborne Reynolds, F.R.S. Pp. 44. (Cambridge: University Press, 1902.) Price 1s. 6d. net.

THIS is a short description of a new theory of the universe which formed the subject of the Rede lecture last June. All such theories must satisfy two conditions. The structure must be dynamically possible, and the results deduced by dynamical reasoning from the