

It may be agreed, therefore, that the aims of the book are sound, and that the choice of topics is sufficiently wide to make it applicable to most metallurgical materials. The only matter which calls for detailed comment is how the methods proposed by the authors are likely to work in the laboratory. Chapters on mineral analysis, electro-metric titrations, and spectrographic methods have been contributed by specialists, from which we may conclude that such methods are not yet in common use in the metallurgical laboratory, since otherwise they would have fallen within the experience of the main authors, who, nevertheless, consider them "to be of the greatest interest and value to metallurgical chemists". The reviewer has tested the remaining text by looking up a few problems in quantitative analysis in which he has been interested and which are not dealt with in the ordinary books. In all cases, a method was described which had every appearance of reliability. The details given in nearly all the descriptions reveal a familiarity with the actual methods on the part of the authors which inspires confidence.

The book contains a large amount of material, well arranged and with useful cross-references. Qualitative analysis of the common metals and acid radicals and rare metals, preparation of solutions, sampling, selected methods for the quantitative analysis of the elements (arranged in alphabetical order with bibliographies), analysis of commercial metals, non-ferrous alloys, iron and steel and ferro-alloys, ores, slags, metallurgical products (drosses, ashes, scrap, and so on), including assaying, refractory materials, and coal, are all dealt with in a very practical manner, and the chemist who follows the clear directions of the authors may hope to carry out the operations with success. The book is well printed and provided with a good index. It should commend itself to a large number of chemists.

J. R. P.

Chemistry of Sulphur and Selenium.

A Comprehensive Treatise on Inorganic and Theoretical Chemistry. By Dr. J. W. Mellor. Vol. 10 : *S, Se.* Pp. x+958. (London, New York and Toronto : Longmans, Green and Co., Ltd., 1930.) 63s. net.

IT is more difficult to write an adequate review of the tenth volume of Mellor's "Comprehensive Treatise" than it was to review the earlier volumes, since the author's methods of presentation have long since become standardised and are now quite

well known. Indeed, an intelligent reader might hope to predict the general characteristics of the volume on sulphur and selenium by studying those on the related elements, in the same way that Mendeléeff predicted the properties of *eka-* and *dwi-*manganese from those of contiguous elements in his Periodic Classification. From this point of view, the new volume is 'true to type' and presents no marked contrasts with those which have preceded it. An inspection of the paragraphs dealing with subjects with which the reviewer is most familiar compels him, however, to pay a tribute of admiration to the almost uncanny way in which even the most obscure researches have been included in the author's survey.

The volume on sulphur and selenium includes many interesting topics, perhaps because sulphur shows some tendency to mimic carbon by forming chains of atoms, leading to the formation of hydrides, chlorides, and oxy-acids containing several atoms of sulphur. Both sulphur and selenium also present interesting phenomena of allotropy. Subjects such as these, as well as the vast range of data that have resulted from the intensive study of compounds such as sulphur dioxide and sulphuric acid, are adequately covered in the new volume. On the other hand, it is difficult to discover any reference to the 'parachor', since references to molecular volume and surface tension are not followed by data for this derived function. The retention of formulæ which represent sulphur and oxygen as being joined by a non-polar double bond follows naturally from this point of view, but is definitely misleading in view of the evidence provided by Sugden and by Phillips that this link is semi-polar—a rule to which no exception has yet been found. The formulæ thus retained are historically correct, but create a 'pre-War' atmosphere, which is not justified by the up-to-date character of the text.

Dr. Mellor is to be congratulated on the progress which he has made, since he has now covered nearly all the elements except those which occupy the eighth column of Mendeléeff's table. These interesting and important elements will, however, probably call for two, if not three, additional volumes, before the task which the author has set himself can be finished. Even at this late stage, it may perhaps be useful to suggest that the page headings might be employed to indicate the contents of the sections into which each chapter is divided, instead of repeating the name of the element at the head of each page—for example, more than 300 times in the case of sulphur.

T. M. L.