

Reviews.

POTENTIOMETRIC TITRATIONS. By I. M. Kolthoff and N. H. Furman. Pp. 345.
New York: John Wiley & Sons, Inc. 1926; London: Chapman and Hall.
Price 22s. 6d.

The ordinary methods of volumetric analysis depend on the choice of an indicator which will change colour when the end-point of the reaction between the solutions under examination is reached. Frequently an external indicator has to be used, and hence the results obtained are subject to appreciable errors. It is also well known that the observed end-point of a reaction depends on the indicator used, and an initially coloured solution often presents insuperable difficulties. Further, even with an indicator which is theoretically suitable the personal equation of the analyst must be taken into account. All these difficulties may be overcome by the use of an appropriate potentiometric method for determining the end-point of the reaction; the method is no panacea, however, since it brings a certain number of difficulties in its train, but its chief advantage is that it can often be used in cases where ordinary indicators are inapplicable.

The method of potentiometric titration has justly assumed very great importance within recent years, but until the appearance of the book under review the only account of any length, in the English language, of the subject was

that contained in the chapter by Furman in *Taylor's Treatise on Physical Chemistry* (1924, Vol. II, chap. xiii). This author and Kolthoff, the well-known Dutch investigator in the field of electrometric analysis, have now collaborated in the production of a very valuable English text-book on the subject of Potentiometric Titrations.

The book is divided into two parts; Part I, entitled "Fundamental Principles," deals with the theoretical basis of the potential changes which may occur in neutralisation, precipitation and oxidation or reduction reactions, and with the subject of titration errors, whilst Part II—"Practical Applications"—treats of the technique of the electrometric measurements involved in potentiometric titration and describes a large number of applications of this method of analysis. The theoretical portion is very well done, and in fact, somewhat overdone in places; this is a good fault, however, as the book is by no means "heavy" reading. A good selection of numerical examples helps to clothe with flesh the skeletons of mathematical formulae, which might otherwise be fearsome, and adds greatly to the value of the book.

In the second half of the book various types of apparatus, some of them very simple, are described and discussed, and ample references are given for those who desire further information; there is no mention, however, of the electrode apparatus designed by Garner and Waters (*J. Soc. Chem. Ind.*, 1922, **41**, 337). The work is concluded with a very comprehensive summary of a large number of actual analytical determinations covering a wide field. A number of small misprints have been noted, but these are readily detectable; the footnote to page 124 might well be left out, as a similar footnote appears on page 68.

The value of the book is enhanced by an excellent bibliography, in addition to author and subject indexes, and altogether this work forms a valuable contribution to the literature of both analytical and electro-chemistry.

S. GLASSTONE.

INDICATORS. By I. M. KOLTHOFF. English translation of the second German edition, revised and enlarged, by N. H. FURMAN. New York: John Wiley and Sons, Inc. 1926. London: Chapman & Hall, Ltd. Pp. 269. Price 17s. 6d.

The French translation of this work has already been reviewed and praised (*ANALYST*, 1926, **51**, 218), and the English translation now issued is an advance on the French version. Not only is the general "get-up" of the book very much better, but an omission, which has already been deplored, has now been remedied by the translator's addition of subject and author indexes. Kolthoff has supplied material for further improvements and for a new chapter on amphoteric electrolytes; the bibliographies have also been brought up to date—the end of 1925, apparently. There appears to be no mention, however, of Washburn's early work on the theory of buffer mixtures, although the subject is dealt with very fully.

The translation is, on the whole, very good, although in some cases a little more licence might have been taken and the literary style improved; two peculiarities, among others, noted were "much used" (p. 12) instead of "common," and "table salt" (p. 33) for "common salt." A few misprints were observed, chiefly in the spelling of the titles of German works quoted in the bibliographies; it is interesting to note that the same misprints occur in the French translation, and so may have originated, curiously enough, in the German edition. That is, however, no reason for their perpetuation. Another error which occurs in both English and French translations is the omission of the negative sign in the value of $\frac{1}{2} \log c$ on the fifth line of page 113 (English edition). Kolthoff, who is usually so meticulous in his choice of terms, has surely made an error in suggesting "ampholyte" as an alternative to "buffer." It might be well to point out, too, that the translator frequently uses the word "iogen" instead of "ionogen."

Apart from these minor points, the book is excellent and can be heartily recommended to English readers.

S. GLASSTONE.

CHEMISTRY OF DYEING. By JOHN KERFOOT WOOD. Pp. iv + 104. 2nd edition. 1926. London: Gurney and Jackson. Price 3s. 6d. net.

The problem of dyeing is one of the most complex in the large field of Dyestuff Chemistry, and Mr. J. K. Wood has been well advised to give a very concentrated survey which enables the reader to form an opinion as to the value of conflicting views. The little book contains practically every possible reference (over 90 items) and it is shown in the different parts of the work how ideas and theories are still shifting according to the momentary standpoint of physics, chemistry and their allied branches—colloid chemistry and physical chemistry. All the many theories concerning the chemical composition and properties of the textile fibres, the properties of dyes and the nature of the dyeing process are discussed. It seems remarkable that the author should not have missed any of the more important theories, if one recalls the fact that his communications cover only 100 pages.

After describing the different theories of dyeing, the author comes to the "General Conclusion" (page 92 *et seq.*) that the electrical theory is the best, but I should like to point out that this view can only be satisfactory to the physical chemist who is satisfied with the statement that electrification is the cause of the absorption of the dyestuff by the fibre. This theory is practically identical with that which Marcel Bader has brought forward in his little book, *Le Problème la Teinture* (1920), and which is to the effect that it is essential that there should be an "Electrophore." It seems evident that the electromagnetic field must play a rôle in some way, but chemists are not satisfied with a word which is meant to include everything and yet does not tell us enough. Probably Bader's work has escaped attention because it is written in French and has never been reviewed in an English journal, so far as I am aware.

Mr. Wood's work must be very welcome to all who are interested in the important problem of dyeing, and that there is still much work to be done is proved

by the excellent experimental publication of K. H. Meyer in the *Naturwissenschaften* (1927, Heft 6, page 129),* where he shows that very many phenomena can be explained by salt formation on the one hand, and by solubility on the other. It is clear that these two processes have some relation to the "electron," but everything is in such a relation, and the question arises: In which way does the electric field make itself manifest?

H. E. FIERZ-DAVID.

DYESTUFFS AND COAL-TAR PRODUCTS. By BEACALL, CHALLENGER, MARTIN, and SAND. Manuals of Chemical Technology, 4th edition. Pp. xii + 168. Edited by GEOFFREY MARTIN, D.Sc., F.I.C. London: Crosby Lockwood & Son. 1926. Price 16s. net.

This little work is not a textbook in the ordinary sense, but is comparable with the sections of articles in, for instance, the *Encyclopaedia Britannica* or a *German Konversationslexikon*. Therefore, only the most important products are dealt with, and, all things considered, the object has been very well attained. Not only are the intermediates of coal-tar dyes included, but practically all the more important modern dyes (indigo, indanthrene, flavanthrene, etc.) are described and the formulae given. In addition to the dyestuffs, the natural colouring matters, modern inks, saccharin, drugs, and photographic chemicals are dealt with.

It is evident that such a survey can only be of use to a man who wants to obtain information on a substance without going into any details, and traders and engineers will profit much more than a good chemist from such a concentrated extract. There is one thing which ought to be corrected in the next edition, namely the paper. Some of the illustrations have suffered through the softness of the paper, and the "Fourteen-Colour Printing Machine" on page 113 is, in my copy at any rate, only a black spot, which does not convey any idea as to what such a machine can look like. I know, of course, what a Mather and Platt printing machine does look like, but that is not the question. H. E. FIERZ-DAVID.

THE CALENDER EFFECT AND THE SHRINKING EFFECT OF UNVULCANISED RUBBER.

By Dr. W. De Visser. Pp. viii + 152. London: Crosby Lockwood & Sons. 1926. Price 15s. net.

When uncured masticated rubber is subjected to calendering under certain conditions, an anisotropic system ensues, which manifests itself (for instance) by the fact that test pieces cut longitudinally to the direction of calendering possess stress/strain characteristics markedly different from those obtained from pieces cut at right angles to the said direction. De Visser has found that there is a further characteristic, namely, stress/strain curves derived from longitudinally cut specimens show no clearly defined vertical direction at any part of the curve, and he proposes to define calender effect on these lines. The author has also observed that calendered sheet from which the "effect" has been removed by warming may still shrink if accorded free movement, and hence differentiates between calender effect proper and "shrinking."

* *Zur Physik und Chemie der Färbeporgänge*, 129, 134.

The volume under review is a record of the results of an investigation carried out with much skill and ingenuity, and, inasmuch as calender and "grain" problems are of considerable practical importance, Dr. De Visser deserves the thanks not only of his scientific colleagues, but also of those engaged in practical work in the rubber industry.

It may be mentioned that rubber showing the calender effect is doubly refractive, displays dichroism and has a higher specific gravity than isotropic rubber. The various theories as to the cause of calender effect are reviewed and criticised by the author, who comes to the conclusion that it is due to an alteration of internal structure arising from a regular and definite particle orientation.

It is highly probable—in view of modern X-ray work on rubber—that the modification of internal structure takes the form of a partial crystallisation or of a phenomenon on all fours with crystallisation.

The translation of the book leaves something to be desired and suggests that a work on such a highly technical subject should not be translated except by an expert familiar with its scientific and technological aspects.

PHILIP SCHIDROWITZ.

SOIL CONDITION AND PLANT GROWTH. By Sir E. J. RUSSELL, F.R.S. Pp. vi. + 516. London: Longmans, Green & Co. 1927. Price 18s. net.

Originally a comparatively small work on biochemistry, each new edition has increased in size until the present one, the fifth, has extended to rather more than 500 pages. The term "monograph" can be applied to the present volume in its fullest sense, inasmuch as it contains an elaborate account of the scientific investigation of the soil. The author frankly admits that it is not possible for one person to read the mass of papers pertaining to agriculture which now appear in journals and in reports, and he therefore had recourse to the help of a number of colleagues, the outcome being a work of unquestionable merit.

The first chapter is certainly not the least interesting, as it is devoted to a historical review of the science of agriculture, commencing with an allusion to a work of Roman origin and ending with a summary of the modern methods of research as applied at Rothamsted. Attention is drawn to the fact that methods of soil investigation now in vogue, particularly on a field scale, are designed to obviate unwarranted conclusions, for in the past it has frequently been found that the results obtained from a certain line of experiments were good, but deductions were made without the vital influencing factor being considered.

The succeeding chapter deals with the soil conditions which affect plant growth, and at once the reader becomes aware of the difficulty of distinguishing between the factors which in any given field experiment were probably mostly concerned with the result obtained. Of the elements needed to build up plant tissue, carbon is the first to be discussed. It is somewhat remarkable that French investigators are still said to hold the view that plants absorb more than negligible traces of carbon from the soil; however, no proof appears to exist that plant life actually does obtain all its carbon from the atmosphere. The effect of nitrogen,

phosphorus and potassium on the yield of many plants is discussed, and the influence of several other elements is more or less briefly mentioned. A reference follows to the characteristics exhibited by plants suffering from the lack of certain elements. These characteristics, which are often diagnostic, are finally tabulated, and this table should be of service to soil analysts, because when an abnormality of a plant is known, a possible soil deficiency is indicated.

A short article on the effect of radium on plant growth is of interest, because a few fertiliser merchants have advertised particular fertilisers as being specially effective owing to their radio-activity. The investigations of Sutton, and also of Wallis, conducted in pot and field experiments, failed to give an increased yield, though a variety of crops were grown to which radium residues and also minute dressings of radium bromide had been applied.

The composition of the soil occupies an important portion of the book. The varied aspects of this subject are ably dealt with, and as soon as the opening paragraphs on "Soil formation" have been passed, the extremely complicated nature of this branch of study becomes apparent. The physical fractionation of the soil is followed by the properties of these fractions and their influence on the soil. Probably few people could write with the experience of the author on this particular subject. It is now about 20 years since he was first engaged on a soil survey of Kent and of Surrey, and subsequently of Sussex, and his knowledge of the agricultural practices and the results obtained in these counties enables him to draw valuable deductions. The information regarding the influence of soil fractions on the chemical and physical properties of a soil is therefore written largely as the result of actual observation.

The carbon and nitrogen cycles in the soil are represented diagrammatically, and for this there is much to be said, because the possible sequence of the formation of various substances found in the soil, as decomposition products, can readily be followed.

As a companion volume deals with the micro-organisms occurring in the soil, this subject has not received any extended attention, but, nevertheless, 54 pages are devoted to this study and the relationship of soil organisms to plant growth.

Present day knowledge is ably summarised in the chapter on "Soil relationship to plant growth" and on "The fertility and exhaustion of soils." The book concludes with an account of the processes used in the chemical and mechanical analysis of soils and a short interpretation of the results so obtained.

The one complaint which might be offered is that a considerable number of results are represented graphically, and the description of the representations is often inadequate, with the result that some time may have to be given if the significance of some of the graphs is to be understood.

From the knowledge of several works by Sir E. J. Russell, it would be anticipated that the book would be carefully written, contain information of recent date, and that results would be ably summarised, and this is certainly the case.

F. W. F. ARNAUD.