Reviews.

A Dictionary of Applied Chemistry. Vol. IV.; L—Oxydisilin. By Sir Edward Thorpe, C.B., F.R.S., assisted by Eminent Contributors. Revised and enlarged edition. Pp. 740. London: Longmans, Green & Co. 1922. Price 60s. net.

The four volumes of Thorpe's Dictionary which have appeared embrace the subject matter embodied in three volumes of the 1912 Dictionary; it is evident, therefore, that the work will probably be completed in seven volumes, plus (it is to be hoped) an Index.

This volume shows careful revision of the important articles, and is well up-to-date, but some few of the sub-headings would bear a little expansion. Under "Lead," for example, the new smelting processes are fully described, and there is a most interesting account of the atomic weight of lead in relation to its isotopes and transmutations; there is, however, no new work incorporated on the important subject of the action of water upon lead, but perhaps this may be included when the new article on "Water" appears. Some very valuable additions in the volume are upon Monazite and its analysis, Nephelometry, Nitron, and

Odour and Chemical Constitution; articles on the following are much enlarged:—Margarine, Metallography, Utilisation of Atmospheric Nitrogen, and Nickel. The subject of Micro-Balances has disappeared, having been already adequately dealt with in Volume I. under Balance.

An excellent presentation of Nephelometry is made; the important distinction between a turbidimeter and a nephelometer is noted, and much is made of the increasing usefulness of the latter instrument not only for purposes of research, but for technical methods.

Metallography occupies some twenty-two pages, thoroughly packed with the essentials, but rather suffering from limitation of space. The recent improved methods of taking and recording thermal curves, of heating and cooling specimens at uniform rates, are now included, but some extension under this heading would probably enhance its value to readers who are not quite familiar with the subject; for example, a short resumé of etching reagents and their application, and some few practical instructions in polishing would certainly provide for the initial requirements of the reader wishing to acquire the rudiments of this applied science.

The article on Odour and Chemical Constitution makes interesting reading, and affords a useful synopsis for those who have not specially read this subject.

As a model of what such an article should be, possibly the reference to Lubricants stands out, being up-to-date, short and to the point. In the revised section of Nitrogen much more space is taken for Haber's process, and this, with the oxidation of ammonia, are described as warranted by their importance; it is indeed refreshing to notice the large number of English names quoted in reference to papers and patents, and although the industry is at present depressed, it is to be hoped that English work in this direction will not cease.

The Mond, Orford and electrolytic methods for Nickel refining are all mentioned—in fact, the industrial sections generally show the immense strides made by this country in recent years in chemical industry.

The reviewers would venture, however, to make one criticism, and that is that a few of the articles upon purely chemical subjects are far too long and too academic. Some are reminiscent of the abstracts of the Chemical Society or of "Beilstein"—*e.g.* the article on Naphthalene now extends to 106 pages, and briefly describes over a thousand compounds; a separate index should be given to this article alone. The industrial importance of Naphthalene certainly is very great, but it is doubtful whether it may be necessary to give such detailed information about its countless derivatives in a work of this kind. The articles on Methyl, Malonic acid and some of the dye-stuffs also read like a text book on a special branch of organic chemistry. One curious arithmetical error may be noted for future correction: On page 234, "8 million gross of boxes of sixty each" would contain 69,120 millions of matches, not 480 millions.

The very high standard of the preceeding volumes of this work is well maintained in its general excellence and accuracy throughout.

G. R. Thompson.
H. E. Cox.

THE THEORY OF ALLOTROPY. By A. SMITS, Ph.D. Translated from the German by J. SNEATH THOMAS, D.Sc. Pp. xiii.+397. London: Longmans, Green & Co. 1922. Price 21s. net.

The book under review, which is a translation of the original recently published German edition, is not, as the title might suggest, a critical survey of the subject of allotropy, but is an elaborate treatment of the author's own theory.

The author takes as his starting point the known phase complexity of certain substances, as exemplified by tautomeric compounds, and then making use of the Planck potential, examines all the possible pseudo-binary systems in the light of the phase rule, deducing the ordinary phenomenon of allotropy as a special case of a more general theory. The existence of at least two different molecular species is thus postulated as the starting point, and the general theory is not dependent on their nature.

The book is divided into two sections, namely, Theoretical and Experimental. The theoretical section treats first the phase rule equilibrium relationships and the consequences which can be predicted from the complexity of phase; and secondly, with an extension of the theory to the problems of electrochemistry, in particular of passivity and over-voltage. This section, as well as the later experimental section, is profusely illustrated with diagrams, many of which are, unfortunately, badly reproduced, and far from clear. The treatment given to some of the systems is very brief, and symbols are constantly introduced without an explanation of their meaning, thus making this part of the book somewhat difficult for a reader not actively engaged in this particular field. In the extension to electro-chemistry it is doubtful whether some of the assumptions made are really justified; in particular the application of the mass law directly to the equilibrium between ions, electrons and neutral metallic atoms in the solid state, although it must be admitted that the author views are plausibly stated. Apart from these objections, the theory appears to provide a useful method of investigating the problem of allotropy and of phase complexity.

In the experimental section of the book a great many systems have been examined in the light of the author's theory, and whereas in the domain of the theory proper experiment is in good accord with theory, in the extension to electro-chemistry the agreement is not always so convincing.

The book is not one for the casual reader, since the subject is presented in a manner which necessitates careful reading. Many of the conclusions reached by the author are unlikely to be accepted without considerable opposition, but the book is certain to stimulate interest in this important field, and will serve a useful purpose in indicating future lines of investigation.

C. S. SALMON.

THE THEORY OF EMULSIONS AND EMULSIFICATION. By WILLIAM CLAYTON, D.Sc. Pp. vii.+160. Text-books of Chemical Research and Engineering. London: J. and A. Churchill. 1923. Price 9s. 6d. net.

This book, as its author points out, is the first of its kind in the English language. In view of the theoretical and technical importance of emulsions, our indebtedness to Dr. Clayton for undertaking the task is very considerable. In a sense this treatment of emulsions rounds off the subject of margarine already treated by Dr. Clayton in an earlier work. Emulsions, however, are of peculiarly wide significance, not limited to any individual industry—so much so, indeed, that an adequate knowledge of such systems is now-a-days almost indispensable for any technical chemist. Dr. Clayton's intimate personal knowledge of the subject is a guarantee that the presentation is both well balanced and comprehensive.

The scope of the book is indicated by the chapter headings, which are as follows:—Emulsions and Emulsifying Agents, the Properties of Emulsions, Earlier Theories of Emulsions, Adsorption at liquid/liquid Interfaces, Dual Emulsions and the Inversion of Phases, the Modern Adsorption Film Theory, Physical Measurements in Emulsions, Emulsification, and De-emulsification. In addition to numerous references in the text, a valuable bibliography has been compiled which aims at giving the more important papers relating to the subject since the year 1865.

The book is written in an exceedingly readable style, and the whole exposition is remarkably clear. The treatment is essentially descriptive, as indeed must be the case when an attempt is made to present the whole subject within the limits of a monograph and also because of the fact that, as the author himself points out, a really comprehensive theory of emulsions and emulsification has yet to be worked out.

To read Loeb's book on the Proteins (which was reviewed in THE ANALYST a little time ago) and Clayton's book on Emusions, will give a clear idea of the two most important and distinct paths along which advances in colloid chemistry—using the term in its widest sense—have been, and are being made.

W. C. M. LEWIS.

THE NITROGEN INDUSTRY. By J. R. PARTINGTON, M.B.E., D.Sc., and L. H. PARKER, M.A., D.Sc., F.I.C. Pp. xi.+336. London: Constable & Co. Price 21s. net.

The importance of a self-contained nitrogen industry in every civilised country as an aid both to economic welfare and to effective warfare, has now become evident, even to those whose scientific knowledge is of the most sketchy type. Drs. Partington and Parker have contributed a useful volume in an endeavour to popularise this scientific axiom. Attention is paid to three aspects of the problem—the natural nitre deposits of Chile; the recovery of the nitrogen present in our

national fuel, coal; and the fixation of atmospheric nitrogen in the form of ammonia, cyanamide and nitric acid. A chapter is likewise devoted to the problem of the oxidation of ammonia.

The book is of interest in that, as far as the reviewer is aware, it contains the first published account of some of the activities of the Nitrogen Products Committee's experimental staff and their contributions to the economic solution of the nitrogen problem.

Great attention is paid to the question of cost in the various methods discussed; and although at the present time the figures submitted are by no means valid, an approximation to the comparative values of different processes can be made; it has to be realised, however, that the recent fall in prices is by no means general.

Good but somewhat brief technical descriptions, illustrated by a few good photographs, add to the interest of the book, whilst the chemistry is sufficiently clear and concise not to make the contents unintelligible to the lay reader. It is questionable, however, whether the reactions discussed on p. 270 and 323 follow such a simple course as indicated by the authors; whilst the cyanide process mentioned on p. 231 is certainly worthy of more detailed mention, being, in all probability, the process of the future. Exception to this otherwise admirable volume might be taken in the fact that the authors thread their nitrogenous beads on a twisted double thread. One thread, clearly discernible throughout the book, is that the authors take it as axiomatic that neither government nor technical manufacturer regard the scientific or academic investigator with any pleasure or interest. In reality, it is probably the reverse of true; great interest is taken in pure science, but it is thought that the scientist flourishes most readily in adversity, if not in actual penury. The other thread, discernible at times between the beads, is that apparently the authors consider that the handing of the information collected by the Government during and after the war on the nitrogen problem "lock, stock and barrel" to Messrs. Brunner, Mond & Co. is a breach of faith with the English people in general, and with the Nitrogen Committee in particular. It is, of course, true that the experimental staff are still awaiting their reward in this world and may obtain it in the next, but the effect of Government enterprise in chemistry has in other directions been so inauspicious as to indicate that the policy of transfer was the wisest one to adopt. How far the lucky recipient will utilise or treasure his talent time alone will show, but from all accounts no mean progress has already been made.

ERIC K. RIDEAL.

FLAVOURING MATERIALS, NATURAL AND SYNTHETIC. By A. CLARKE. Oxford Technical Publications. Pp. vii.+166. London: Henry Frowde and Hodder & Stoughton. 1923. Price 8s. 6d. net.

The author of this little volume is to be congratulated on the extent and the accuracy of the information he has compressed into its pages. The introduction on the sense of taste is interesting, and the little bibliography, though not very full, is, at any rate, well up-to-date.

Much care has been given to the "Contents" of each chapter, and a perusal of these pages shows the variety of the materials dealt with; the micrographs in the Section devoted to Spices and Condiments are apparently original and quite good. In the text relating to analytical methods (p. 28) is the statement: "The amount of ash soluble in hydrochloric acid (sand) is estimated . . . ;" surely this might be better expressed.

In Section II., Essential Oils, the descriptions of processes for what the author calls "the recovery of essential oils" are so brief as to be almost useless, though some attempt at detailed information has been made in the paragraph on "Expression." In the consideration of the analytical methods for the examination of essential oils no reference is made to the determination of the solubilities of such oils in alcohol, yet the systematic survey of essential oils (Chapter VI.) contains numerous references to such solubilities. The information on the properties of various essential oils is well written and, though suffering a little from condensation of matter, is comprehensive, accurate and covers a very wide range of oils, whilst the frequent references to current literature add greatly to the utility of this portion of the book.

The recipes (compounded flavours, etc.) are of the type usual in books, but the author apparently realises this, and does not claim that they are anything other than indications of how flavourings and perfumes can be mixed. An abstract of recent articles on the compounding of floral perfumes published in the P.E.O.R. would have added materially to the value of this section.

The odorous chemical products are dealt with in Section IV., and this appears to be the weakest portion of the book, more especially when references are made to the preparation of the various substances, since the author has not introduced a first-hand knowledge of how many of the "Synthetics" are actually made. The information concerning the ionones might well be revised in a future edition and a little slip corrected, *viz.* "Pseudo-ionone, or homologous bodies, is first prepared by shaking with acetone, or homologues of acetone, in presence of baryta . . . for two or three days;" of course, the presence of citral is to be inferred. The method given for the formation of anthranilic acid (p. 144) *viz.* fusing indigo with caustic potash, is merely of scientific interest and never used for making this substance, as the anthranilic acid is manufactured as a stage in the production of synthetic indigotin (artificial indigo). The temperature at which the specific gravity of methyl anthranilate was determined might have been given, as this substance is crystalline, but melts at a low temperature and often remains liquid. The book would be much improved in a future edition by inserting the actual methods, if only in outline, and by the deletion of much useless information; for example, the information on the preparation of indol and skatol is quite useless. It is satisfactory to note that the term "artificial musk" is avoided, but the description "synthetic musk substitutes" might well have been introduced, and the descriptive matter could be amplified considerably.

The book is provided with a comprehensive index and, apart from the few shortcomings mentioned above, is a valuable addition to the library of every

chemist interested in flavouring materials, and both the publishers and the author are to be congratulated on the production of such a well produced book at, in these times, such a moderate price.

L. GUY RADCLIFFE.

CAROTINOIDS AND RELATED PIGMENTS. THE CHROMOLIPOIDS. By LEROY S. PALMER, Ph.D. (American Chemical Society Monograph Series.) Pp. 316. New York: Chemical Catalog Co. Inc. 1922. Price $4.50.

It might at first sight be doubted whether the subject of the chromolipoids is sufficiently advanced either on the chemical or the physiological side to justify its selection for a monograph of this series. The book, however, discloses so many avenues for the investigator and brings together so much interesting information that one feels that the decision of the editors has been justified.

The author gives a history of the development of the subject, beginning with the work of Thudichum. Special attention is paid to the nomenclature adopted by each worker, the student being thereby saved much confusion in consulting the authorities quoted. The nomenclature adopted by the author is that of Tswett.

The distribution of the carotinoids in the organs of plants, and the attempts at their separation culminating in the achievements of Willstätter, are exhaustively dealt with. A vast literature is quoted in this connection, and forms an almost complete work of reference. The treatment of the subject fails somewhat in distinguishing pioneer workers who advanced the subject many stages—such as Stokes and Willstätter—from a countless host of lesser lights. This chapter opens up an immense number of problems, and presents the reader with a store of suggestive facts hitherto buried in the archives.

A particularly interesting section treats of the passage of the carotinoids from plants to animal tissues. In dealing with this subject the author is on familiar ground, since for much of the research he and his co-workers are responsible. The identification of the pigment associated with serum albumin of herbivores with the carotin of the green plant and the history of its subsequent concentration in the corpora lutea and in the milk fat, makes an interesting chemical story still lacking a physiological explanation. It is parallelled by the presence of xanthophyll (or xanthophylls) in the blood of fowls, and the subsequent concentration of this pigment in egg yolk, a subject on which the author's own researches have thrown much light.

The obscure question of the function of the carotinoids in plant tissues is dealt with in Chapter XI. In the same chapter their possible function in animals is also discussed, with especial reference to the question of their identity or association with the fat-soluble vitamin. The author—largely as a result of his own careful investigations—produces strong evidence against such an identity, and regards the association as probably fortuitous. He considers that no evidence is at present forthcoming which throws any light on the function of the carotinoids in the animal body.

The book, regarded as a whole, forms an invaluable work of reference; where so much detail is given it is perhaps a pity that more of the chemical manipulations by which the pigments are separated and identified are not described. The contribution of Willstätter to the chemistry of the subject, showing the necessity for, and methods of, extracting large quantities of plant or animal tissue in order to isolate the pigment in a pure condition and to establish its chemical constitution is hardly sufficiently stressed.

The book contains an excellent bibliography and is fully indexed.

M. STEPHENSON.

THE INLAND LAKES OF WISCONSIN. THE PLANKTON. I. ITS QUANTITY AND CHEMICAL COMPOSITION. EDWARD A. BIRGE AND CHANCEY JUDAY. Wisconsin Geological and Natural History Survey. Bulletin No. 64. Scientific Series No. 13. Pp. 222. Madison: Wisconsin, U.S.A. 1922.

This monograph records the results of a most exhaustive study of the fresh water plankton at the Wisconsin lakes. Most of the space is devoted to the question of the distribution of the various species and their seasonal variations, but large numbers of chemical analyses of the organisms are tabulated. The significance of the plankton as a source of food for larger animals is apparent from an estimate that the mean quantity of dry organic matter in the standing crop of total plankton of Lake Mendota amounted to an average of 214 lbs. per acre.

J. C. DRUMMOND.