

Reviews.

ALLEN'S COMMERCIAL ORGANIC ANALYSIS. Fifth edition. Vol. IV. Entirely rewritten. Edited by S. A. SADTLER, S.B., E. C. LATHROP, A.B., Ph.D., and C. A. MITCHELL, M.A., F.I.C. 8vo. Pp. x.+648. London: J. & A. Churchill, 1926. Price 30s. net.

This volume, as in the previous edition, deals with Resins, Indiarubber, and Essential Oils and their Constituents, rather more than two-thirds of its pages being devoted to the subject of Essential Oils. The number of contributors has on this occasion been reduced to four, Mr. E. J. Parry being responsible for sections on Resins, and on the Constitution and Analysis of Essential Oils, Messrs. E. K. Nelson and G. A. Russell for one on the Special Characters of Essential Oils, whilst the subject of Indiarubber is dealt with by Mr. J. B. Tuttle. It is difficult to see what reason there can be for the arrangement of the book adopted, the first section, on the special characters of essential oils, being separated from the other portions of the book dealing with essential oils by those on Resins and Indiarubber.

The first section consists chiefly of more or less complete monographs on some seventy essential oils, those of cassia, cinnamon, wintergreen and bitter almond being now included for the first time. The allocation of space to the different oils appears rather out of proportion, 42 pages being given to turpentine oil, as compared with only $2\frac{1}{2}$ pages to the various geranium oils, and not quite 4 pages, of which one is almost entirely taken up with a table, to citronella oils. Most of the errors in this section pointed out by the reviewer of the previous edition have now disappeared, but under Sandalwood oil one still finds the work of Potlivet attributed to Potoliet, and European pennyroyal oil (*Mentha pulegium*) again appears under *Hedeoma*, though the two genera are quite distinct. No reference is made to the great improvement in character which has taken place in recent years in West Australian sandalwood oil, and the figures given do not in the least represent present-day oil, which contains 90–95 per cent of total alcohols (calculated as santalol), and has a laevo-rotation up to $-15^{\circ} 30'$. The practice now usually adopted in this country of referring to the oil from *Mentha arvensis* as Japanese *Mint* oil, rather than *peppermint* oil, has not been followed, and no figure is given for the pulegone-content of pennyroyal oil. Shiu oil, which has recently been renamed "Ho oil," deserves more notice than the bare mention of the fact that it is sometimes used as an adulterant of linaloe oil. In the description, under eucalyptus oil, of Schimmel's resorcinol method for the determination of cineol it is stated that 100 c.c. of oil should be taken, whereas this should be 10 c.c.

This section closes with a short reference of $1\frac{1}{2}$ pages to terpeneless oils, a tabular list of source, characters, and known constituents of the better-known oils, and a solubility table of the most used odoriferous substances, in alcohol, glycerol, olive oil, and paraffin oil. Many of the limits given for genuine oils would

not find universal acceptance, and some calling for special criticism are a minimum gravity at 30°C. for otto of rose of 0.848 instead of 0.850, and a range of specific gravity for spike lavender oil of 0.905–0.920, instead of 0.900–0.915. It is rather unfortunate that the whole of these tables appear under the page heading of Terpeneless Oils.

The section on Resins is extremely good, and embraces the more important resins, gum resins, oleo-resins and balsams, together with certain "resinous substances," such as ambergris, civet, and castor, which, though one would hardly expect to find them here, are very conveniently included in a book so largely concerned with perfumery materials. The treatment of each substance is, in general, the same, the points dealt with comprising occurrence, chemical composition, uses and adulterants, and general properties, together with special information in the more important cases, such as colophony, copal, shellac, copaiba, and asafoetida. Following the monograph on colophony, nine pages are devoted to a full account of rosin oil, but it is rather surprising to find no figures given for the heated or "run" resins used in varnish-making. No reference at all is made to the important Indian gum oleo-resin obtained from *Boswellia serrata*, and under colophony hardly sufficient prominence seems to have been given to the more recent work, such as that of Tschirch and Studer, Fahrion, and Seidel, on the constitution of abietic acid. This section overlaps at certain points Vols. II and III, e.g. methods for the separation of fatty and resin acids in soaps and varnishes, and the examination of benzoin, storax and the balsams of Peru and Tolu. With regard to the former the long description of a combination of Twitchell and Gladding's methods appears somewhat unnecessary, but in the case of benzoin, etc., this seems the proper place to have included a more complete account of their evaluation, and under Tolu balsam it is regrettable to find no reference to the work of Cocking and Kettle. The resin esters or ester gums hardly receive adequate treatment in view of their considerable technical importance, and to class these under "Hardened Rosin" is liable to lead to confusion.

In the following section, on Indiarubber, are considered not only indiarubber, but also gutta percha, balata, chicle, reclaimed rubber, and rubber substitutes. This section has been somewhat extended, but even now only covers 62 pages. Some obsolete and little used methods of analysis have been eliminated, and the section brought well up to date. The great development in the use of "accelerators" is referred to, and a number of the substances used are mentioned, but the author points out the difficulty of identifying these owing to the very small quantities employed, and deplores the lack of analytical work published on the subject.

Of the remaining sections, that on the Constituents of Essential Oils gives a useful summary of the occurrence, constitution, and properties of the different constituents, classified as hydrocarbons, alcohols, phenols, aldehydes, ketones, esters, and nitrogen compounds. Here, also, is included information regarding many of the more important commercial synthetic perfumes, among them the artificial musks, which are not strictly constituents of any essential oils. This is

a great improvement on the last edition, where in place of this section there were two separate articles dealing with the hydrocarbons and ketones only.

The last section, on the Analysis of Essential Oils, deals with a subject which has for some time past engaged the attention of a Sub-committee of our Society, whose labours are still far from complete. Most of the usual methods for the determination of constituents and detection of adulterants are clearly described, but no method is given for the determination of thymol when admixed with carvacrol, and the recommendation, in the acetylation process for determination of alcohols, to dry the acetylated oil with *potassium* sulphate is most unusual. The author's criticism of the formylation process for the determination of citronellol appears rather too severe, especially in view of the prominence given to the process in Section I, and the reproduction *verbatim*, at the end of this section, of all the monographs on the essential oils of the British Pharmacopoeia, 1914 is redundant, as in most cases these figures are already given in the first section of the book. Probably where two parts of a book on the same subject are dealt with by different authors, a certain amount of overlapping and lack of cohesion is inevitable, but quite a considerable amount of matter given in Section I is again repeated in Sections III and IV.

The book positively bristles with misprints, some of which make rather amusing reading, and its index is so incomplete as to be practically useless, even the table of contents being more helpful. In spite of these blemishes, however, the book should prove a most valuable work of reference to all interested in the analysis of the materials dealt with.

W. H. SIMMONS.

THE CHEMISTS' YEAR-BOOK, 1926. Eleventh Edition. Edited by F. W. ATACK, D.Sc. Pp. 1180 and Index. Manchester: Sherratt & Hughes. Price 21s.

This book has now been reviewed so often and is so well-known that any detailed account of its contents is unnecessary. The volume under review, which is the eleventh edition, marks a further increase in size, and includes a new chapter dealing with "Lubricants," which gives a good general account of the subject, when allowance is made for the fact that it occupies only six pages, and it includes an extremely useful conversion table for Redwood, Saybolt and Engler viscometers. The value of this section would be much enhanced if it included a bibliography, and the same criticism applies to certain of the other sections.

The chapter on Oils and Fats includes a section on Adulteration, which requires drastic revision, because many of the statements made are only partly true, and some of the others are not very informative. It is stated, for instance, that turpentine may be detected by its dextro rotation, but no mention is made that castor oil is often as strongly rotatory as is turpentine, nor that much of the turpentine sold nowadays is either laevo-rotatory or optically inactive. The property of fish oils to yield ether-insoluble bromides is suggested as a means for their detection, but no caution is given regarding the behaviour of some of the vegetable oils in this respect. Arachis oil is to be detected by the separation of arachidic acid (m.pt. 75° C.), but, as no references are given, nor any precise details

as to how this separation is to be attained, the information is not very helpful. The paragraph under Soap Analysis dealing with the determination of rosin acids gives only one method, with no reference to any of the newer methods, and the whole of the section dealing with oils and fats lacks both references and a bibliography.

In the section dealing with Agricultural Chemistry, there is a useful chapter on methods used in American practice, but under the Analysis of Feeding Stuffs no details are given of the American method for the determination of fibre, and, as this differs somewhat from the English procedure, outlined on page 823, a reference to it seems desirable. In the section on Dairy Products, one is surprised to see no reference to the findings of the recent Committee on Preservatives, particularly as the recommendations of the previous Departmental Committee are mentioned.

The chapter dealing with the Volumetric Determination of Sugars should contain some reference to Eynon and Lane's methylene blue method which has recently come into extensive use, and a reference to the various iodimetric methods would also be useful. The word "commercial" appears so frequently in the carbohydrate section that one is disappointed that some of the common expressions used in commercial sugar analyses, such as "Net Sugars," receive no mention.

The book, as a whole, is remarkably free from misprints, and the information contained in it is fairly up-to-date, but on page 662, there is a reference to Vol. I.; in the index the Weights and Measures conversion tables are referred to as being on page 1124 instead of 1138; and on page 581 a table of Limits of Impurities allowed in the Drugs of the United States Pharmacopoeia 9th revision is given, but no mention is made of the 10th revision, copies of which were available in the autumn of 1925, and which came into force on January 1st of this year.

In a work of reference such as this volume, which deals with a variety of subjects, one can scarcely expect all the sections to be of equal merit, and while some of them may be a little disappointing, others are extremely good, and there are very few books on technical subjects which contain, in such a concise and easily available form, the variety of information that this volume does. The more one consults this book, the more is one impressed with its value, and, despite certain imperfections, it is, in the opinion of the reviewer, one of the few books that should find a place in every technical library.

M. S. SALAMON.

INTRODUCTION A L'ÉTUDE DES COLLOIDES (ÉTAT COLLOIDAL ET SES APPLICATIONS).

Par W. KOPACZEWSKI, M.D., D.Sc. Avec 36 figures dans le texte, et 2 portraits hors-texte. Pp. vii. +226. Paris: Gauthier-Villars et Cie. 1926.

Professor Kopaczewski has written several volumes dealing with colloid chemistry, the present being intended as an elementary introduction to the science. His aim is "to facilitate the spread of knowledge concerning the colloidal state of matter, not only for academic teaching, but for application in technical practice."

Seventeen pages are devoted to a historical survey, forty-seven pages to general properties of colloids, seventy-one pages to industrial applications, and seventy-seven pages to the colloid state in relation to biology and medicine, and to colloids in therapeutics.

Professor Kopaczewski writes clearly and vigorously, and covers a very wide field. As a medical man, he devotes most attention to the biological side; indeed, he enjoys a considerable reputation as a colloid investigator in this connection.

The book covers too many points to deal with any really deeply. But little of it is useful to the general scientific student, whereas the medical student interested in the relations between physical chemistry and his own studies will find considerable food for thought. To the colloid chemist, the book is interesting, in reviewing the many applications of modern colloid chemistry, but the treatment is essentially elementary and brief.

WILLIAM CLAYTON.

MITTEILUNGEN DES CHEMIKER-FACHAUSSCHUSSES DER GESELLSCHAFT DEUTSCHER METALLHÜTTEN- UND BERGLEUTE, e.V., BERLIN. AUSGEWÄHLTE METHODEN FÜR SCHIEDSANALYSEN UND KONTRADIKTORISCHES ARBEITEN BEI DER UNTERSUCHUNG VON ERZEN, METALLEN, UND SONSTIGEN HÜTTENPRODUKTEN. In two Volumes. Vol. I. (1924): Pp. xii. + 155. Vol. II. (1926): Pp. x. + 146. Berlin: Selbstverlag der Gesellschaft Deutscher Metallhütten- und Bergleute, e.V.

As the sub-title indicates, these volumes contain the methods recommended for reference and contradictory analyses of non-ferrous metals, their ores, alloys, salts, and important metallurgical products. The methods have been tested and selected by a Committee of chemists appointed by the *G.D.M.B.*, and each important metal has been dealt with by a sub-committee of specialists. Volume I. contains a chapter on the routine to be followed in sampling, and the analytical methods for lead, copper, tin, antimony, arsenic, aluminium, noble metals, and metals for alloy steels (tungsten, vanadium, molybdenum, chromium, but not manganese); Volume II. gives the methods for zinc, cadmium, nickel, cobalt, bismuth, magnesium, corundum, and carborundum. Analytical methods for impurities and constituents other than the principal metal are described in the great majority of cases.

The reviewer's task has been a pleasant one, as the book is the result of collaboration between a number of prominent authorities on metallurgical analysis, who have enriched the literature on the subject with a typical product of German thoroughness and efficiency.

There is one subject, however, the treatment of which proved disappointing to the writer: the brief chapter on arsenic consists merely of the description of Pearce and Low's method, preceded by the bare remark that it is uniformly suitable (*gleichmässig brauchbar*) for all ores containing appreciable (*nennenswerte*) quantities of arsenic. This statement requires qualification, as the accuracy of the method is conditional upon the absence of other acid-forming elements giving insoluble

silver salts under the conditions of the assay. In fact, the reviewer has known it to give erroneous results due to the above cause, and has discontinued its use.

In the chapter on lead, Alexander's molybdate titration, with tannin as external indicator, is described as equal in accuracy to the gravimetric method. The writer is not prepared to contradict this statement, which is made as the result of a series of careful tests; but he would advise those not thoroughly familiar with Alexander's method to use a gravimetric process for reference work.

The chapter on antimony having been compiled in 1924, the stoichiometric calculations are based on the old atomic weight 120.2; at the same time the principle is laid down that the volumetric solutions should be standardised against metallic antimony of known purity. It is satisfactory to note that the permanganate titration for antimony is declared to be as accurate as the bromate method, and to possess distinct advantages over the latter process.

In the volumetric zinc assay the iron is eliminated by a single precipitation with ammonia, and an approximately equal amount of iron (which has to be determined) is added to the standard; the latter is treated in exactly the same manner as the assay.

The volumetric determination of nickel has not been included; the reason given is, that, though the process gives perfectly accurate results in many cases, it is not always applicable. (This criticism might have been extended to Pearce and Low's method for arsenic.) However, it is added that the nickel titration will be included in a future volume devoted to Rapid Methods. Those acquainted with the two books under review will look forward with interest to the publication of the next volume.

W. R. SCHOELLER.

THREE CENTURIES OF CHEMISTRY. PHASES IN THE GROWTH OF A SCIENCE. By IRVINE MASSON, M.B.E., D.Sc., F.I.C., Professor of Chemistry, University of Durham. Pp. vi.+191. London: Ernest Benn, Ltd. 1925. Price 10s. 6d. net.

Not only knowledge but also sympathy is required from a historian, and there is no other summary of the phlogiston theory in which knowledge is so well tempered with sympathy as the one presented by Professor Masson. Many writers have tried to give an unbiassed view of this much-despised chapter of chemistry, but it seems nowhere to have been done with so much success as in the book under review. However, not only the phlogiston theory, but also the development of chemistry as a whole from Bacon to Lavoisier has been dealt with in the same manner, and the frequently obscure concepts of the English, German and French schools of chemical philosophy until 1800 are developed on lines which command admiration.

Professor Masson as a historian is naturally more attracted by the chemistry of the past than of the present. This is evident from the part of the book which summarises our knowledge from Lavoisier onwards and which is, at best, very

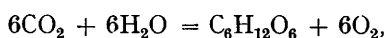
sketchy, perhaps due to lack of space. We must, however, look forward to Professor Masson's further publications on early chemistry, which, to judge from the book under review, are sure to be valuable additions to the history of science in general and of chemistry in particular.

M. NIERENSTEIN.

PHOTOSYNTHESIS. THE ASSIMILATION OF CARBON BY GREEN PLANTS. By WALTER STILES, Sc.D., Professor of Botany in University College, Reading. Pp. vi. + 268. London: Longmans, Green & Co. 1925. Price 16s. net.

Photosynthesis has been much in prominence lately, and one must therefore welcome a summary of our present knowledge of the subject, as given by Prof. Stiles in his perfectly unbiassed digest of 870 chemical and botanical papers on the assimilation of carbon by the green plant.

The study of this book makes it clear that we have no definite chemical knowledge how this very simple reaction, which is generally written:—



takes place in the living plant. Two main hypotheses have been put forward:— (1) The acid theory of Liebig, which assumes the intermediate formation of oxalic acid-like substances from carbon dioxide, by which means the carbon atoms are joined and subsequently formed into $\text{C}_6\text{H}_{12}\text{O}_6$. (2) The formaldehyde theory of Baeyer, according to which CO_2 is at first reduced to CH_2O and then polymerised to $\text{C}_6\text{H}_{12}\text{O}_6$. The latter theory is the more favoured one, but, to quote from p. 199 of the book under review, "though alluring on account of its simplicity, [it] is by no means as well established as many writers of the subject would have us believe." Whereas the conversion of formaldehyde into carbohydrates was established beyond doubt so far back as 1861, there is no evidence that CO_2 is reduced to CH_2O by the living plant. Even the presence of formaldehyde in aqueous suspension of chlorophyll which has interacted with carbon dioxide in sunlight is no proof of the formation of formaldehyde from carbon dioxide, since chlorophyll itself may be disintegrated under these conditions into formaldehyde, as is evident from the classical researches of Willstätter on chlorophyll.

Whereas the chemical methods of attack have so far been more or less abortive, many valuable data have been accumulated by the botanists, and the summary of their researches, as given by Prof. Stiles, should be most valuable reading to chemists who venture into the field of photosynthetical research. Blackman's investigations, which are exceptionally well summarised in pp. 44–161, are most suggestive, and many a chemist would be well advised to study these pages with care. It is for this part of the book that chemists to whom botanical literature is not easily accessible have particularly to be thankful to Prof. Stiles.

Photosynthesis affects humanity in general, and there is no branch of science which is not directly or indirectly concerned with this problem. Much gratitude is therefore due to Prof. Stiles for collecting such a vast amount of material and presenting it in such an unbiassed form.

M. NIERENSTEIN.