

different topics of physical chemistry treated that several branches of physics and chemistry of special interest in combustion, explosion and detonation are not even mentioned, *e.g.*, propellant technology, the physics of rocketry, aerodynamics, hydrodynamics, and the physics and chemistry of ionized gases. The dearth in this volume of fundamental and detailed discussions and descriptions of ignition, flames, combustion, explosion and detonation is disappointing, especially in light of these extensive reviews, the title and subtitle, "Eine Einführung in die Grundlagen," the objectives stated in the preface of the book, and the tremendous general interest in these matters in our present era of propellants, rocketry, satellites, and space technology. It is, moreover, disappointing that practically none of the general principles discussed is applied specifically either to combustion technology or "Brandschutz." One may wonder, therefore, why so much of the book was devoted to these general subjects, *e.g.*, the electron structure of atoms, thermodynamics, reaction kinetics and the fundamentals of rate processes, the physics of radiation and absorption, Gibbs adsorption and certain aspects of atomic physics. All of these topics are, of course, available in excellent treatments elsewhere whether in elementary form for the beginner, more detailed and descriptive treatments for more advanced students, or comprehensive treatises for specialists. Certainly, one would not object to such introductory treatments, had they been applied directly to the particular technology treated in the volume.

The interests of this reviewer have not extended a great deal to considerations of ways and means of fireproofing substances, and controlling or extinguishing fires. The elementary considerations of the last two sections of this book treating "Brandschutz" were therefore of considerable interest to him and probably would be also to others whose main interests are combustion and explosives, and perhaps to scientists in general. In this light the parts of the book pertaining to this subject are valuable contributions to our scientific literature.

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Laboratory Distillation Practice. By E. A. COULSON, M.A., D.Sc. and E. F. G. HERINGTON, D.Sc., A.R.C.S. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1958. x + 166 pp. 14 × 22 cm. Price, \$4.50.

This small book takes a useful practical non-theoretical approach toward its subject. Within this scope the treatment is quite complete, including columns and packings, associated equipment, simple theory, selection of operating conditions and practical considerations. The usual treatment on determination of the height of a theoretical plate is given, and a specific distillation unit is described in detail. Separate chapters deal with low temperature, low pressure, azeotropic distillation, measurement of vapor liquid equilibria, continuous laboratory distillation, extractive distillation, stripping, and fractionation of a reactive mixture. The discussion of azeotropes is more extensive than would be expected in a book of this kind. The British background of the authors is apparent in spots, such as the omission of any mention of widely used protruded packing. Some of the descriptions of specific pieces of equipment will be of limited utility because the devices mentioned are available only in the authors' country. Some packings of lesser importance and utility are included. The figures are excellent. The references are extremely limited in number and scope. The presentation is almost uniformly clear and suited particularly for new or occasional users of distillation techniques. The book is not intended for those already well versed in the subject. Items and subjects whose treatment is unusually good are manostats, thermocouple junction welding and the explanation and nomograph of the Fenske equation. The discussion on boilers and boilup rate measurement is weak. There might have been more emphasis on the increase in HETP with diameter in a packed column, a mention of the desirability of a holding device at the top of a packed column, a mention of electric heating mantles, and more about head temperature measurement and test mixtures. Nevertheless every laboratory that has occasion to do any distillation whatever should have this book at

hand, and time spent in reviewing its clear discussions will be much more than saved in improved apparatus and operation.

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The Chemistry of Natural Products. Volume II. Mono- and Sesqui-terpenoids. By P. DE MAYO, Imperial College of Science and Technology, London, England. K. W. Bentley, Editor. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1959. vii + 320 pp. 16 × 23.5 cm. Price, \$7.50.

The Chemistry of Natural Products. Volume III. The Higher Terpenoids. By P. DE MAYO, Imperial College of Science and Technology, London, England. K. W. Bentley, Editor. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1959. vii + 239 pp. 16 × 23.5 cm. Price, \$6.00.

The original purpose of this series of books under the general editorship of K. W. Bentley is to provide reasonably priced and reasonably sized introductory monographs to various areas of natural products chemistry. The two volumes under review are intended to cover the terpene field. This should be particularly welcome among American academic circles, where this subject is greatly neglected. Indeed, de Mayo's preface to these two volumes should be compulsory reading, because it states succinctly and convincingly the case for the enormous pedagogic and scientific value of terpenoids. The general approach is indicated in the preface by an apt quotation from Milne's *Winnie-The-Pooh* and the fact that the author has not succeeded completely is due largely to his publisher and to a certain extent also to unfortunate timing. If these books had been written toward the latter part of 1958 rather than in early 1957, they could have covered a very considerable number of recent advances, but more about this later.

To quote again A. A. Milne, "nobody—nobody could call me a fussy man BUT" this reviewer considers it unforgivable that two short books of this type took the publisher two years to produce. This is particularly preposterous in this instance where all structural formulas have been drawn by hand (at times a rather shaky one) and reproduced directly. Such books could be issued in less than six months or else additions should be made in proof to bring them up to date. In the final analysis, it is up to authors to bring pressure upon publishers to reduce the time interval to a reasonable limit, and this certainly was not done here. As a result, several recent advances are not included and this is precisely the material which would make the uninitiated student and his professor look up and pay notice. All of the classical studies can be found in Simonsen's "The Terpenes" and other compendia; the purpose of a short introductory book should, therefore, not be a condensation of the historical literature but rather to emphasize the most recent advances, using modern approaches, and to place the earlier literature (without disrespect, indeed often with admiration) into its proper perspective. With one unfortunate exception, de Mayo attempted and largely succeeded in accomplishing this (especially in Vol. II) and it is a pity that circumstances prevented him from carrying the literature coverage to late 1958 as could so easily have been done.

The introductory chapter aptly contains reference to various physical methods which have been used so extensively in recent times in structure studies of terpenoids. The coverage of ultraviolet and infrared methods is quite adequate, but immediately thereafter, the long publication time interval or the unfortunate timing becomes apparent. There is very brief mention of nuclear magnetic resonance, even less of rotatory dispersion and as far as the reviewer could determine, none of mass spectrometry. The last omission may be due to modesty since one of the important papers has been published by de Mayo and Reed.

The discussion of monoterpenoids is on the whole very satisfactory, especially chapter 4 dealing with the intricate rearrangements of bicyclic monoterpenes through non-classical carbonium ions. The least satisfactory portion is the one dealing with absolute configurations, the two pages starting on p. 174 representing really only a reprint of Birch's list (ref. 40). This will not teach a student how these stereochemical conclusions were really arrived at

and he is not going to find this by looking at ref. 40. This becomes particularly confusing in the section dealing with menthone and the menthols. For instance, the structural formulas on p. 79 for menthone and isomenthone are misleading (absolute configurational representations being used for the racemates) since they imply an inversion of the configuration of the methyl rather than the isopropyl group. It would have been much simpler to combine this with a discussion of the absolute configurations of these compounds using the appropriate antipodes, which would demonstrate the stereochemical relationships existing in this class (*e.g.*, (+)-menthone being related to (-)-isomenthone, etc.) and this would also have clarified the situation among the menthols (p. 81); these are ambiguous in the absence of absolute configurational assignments. The sections dealing with the cinenic acid rearrangement (p. 68) and umbellulone (p. 108) would have gained appreciably by inclusion of more recent work by Meinwald and by Eastman.

The sesquiterpenoid chapters are excellent, especially the last one dealing with more recent studies in which all physical methods are employed to their fullest. From a pedagogic viewpoint, this is the type of work that will most effectively stimulate interest on the part of the "non-terpene" chemist: the total synthesis of cedrene, the transannular reactions of caryophyllene, etc. Here again, improved up-to-dateness by only one year would have made quite some difference. The more recent cyclization studies by Eschenmoser, the latest photochemical studies in the santonin series, the complete structure proof and absolute configuration of iresin, the structure of drimenol (by one of Dr. de Mayo's colleagues)—all these and several other pertinent investigations culminated between 1957-1958 and could have been included. Finally, more extensive mention of absolute configurational assignments among sesquiterpenoids would also have been justified, but this is admittedly a matter of opinion. Clearly, a book of this size cannot include everything and the ultimate choice must rest upon the author, who has really done amazingly well in the space of 300 pages.

Volume III attempts to cover the enormous field of di- and triterpenes. The diterpene chapter is rather successful in this respect, most of the deficiencies again being due to the long publication interval. Thus, the most recent studies on dextro- and isodextro-pimaric acids could have been included, the correct structure (CXXII on p. 51) for cafestol (rather than CXXIII on p. 53) appeared in early 1958, the structure of gibberellic acid could have been illustrated and so on. The last omission is unfortunate as well as the lack of any mention of the diterpenoid alkaloids (also absent from Vol. I).

The triterpenes are discussed in three chapters of which the first (largely tetracyclic triterpenes) is the best and also includes a great deal of the recent stereochemical correlations. To this reviewer, the second chapter has been the most disappointing one. As mentioned by de Mayo in the preface, "the *parvenu* triterpenoids (are considered by the student as) really too complex and bizarre to be of interest to any but the specialist." This is an unfortunate state of affairs, which is not greatly changed by this chapter. This criticism applies particularly to the discussion of the β -amyrin class of triterpenes.

All but three pages of this section are occupied with the structure proof and stereochemistry of β -amyrin and oleanolic acid. This is comparable to writing a modern book on steroids and discussing largely cholesterol and cholic acid. Historically, this work is of the utmost importance and represents the basis on which the rest was built. However, in a book of this type which cannot possibly be exhaustive, would it not be preferable to illustrate to the student how the structure of a triterpene would be established in say, 1957, rather than ten years ago? Nowadays, this means largely recognition—by suitably chosen reactions—of the unknown substance's membership in a given class of triterpenes, followed by interrelationship with a known member (*e.g.*, β -amyrin or oleanolic acid). The processes—intellectual as well as experimental—are of extreme interest and de Mayo could have been the perfect author for a personal telling of this fascinating story, since so much of it has been performed by him and other collaborators of Barton. For instance, if the structural portion of β -amyrin chemistry had been relegated to fewer pages, it would have been possible to spend a correspondingly

larger part on illustrating this type of work. Many examples come to mind, but one which encompasses a great deal of interesting chemistry as well as a number of diverse triterpenes could have been the sequence oleanolic acid—echinocystic acid—maniladiol—icterogenin—rehmannic acid—macluraic acid.

The last chapter deals separately with biogenetic relationships, thus emphasizing correctly what may well be the most impressive justification for work in the terpene field. It would be unfair, as well as repetitious, to indicate that the value of this section might have been greater if it had been prepared in September, 1958 (and thus still appearing in early 1959 under a reasonable publication schedule), since the enormous amount of active research in this area will make any book out-dated within a very short period of time. Nevertheless, two subjects might have added to the value of this chapter. One is the structure elucidation of hydroxyhopanone—another prophetic triumph of the biogenetic isoprene rule—and the other, more recent detailed information at the stage of the five-carbon fragment.

The various minor reservations brought out in the above paragraphs should probably not be taken very seriously; they simply illustrate that books of this type cannot satisfy everybody in every respect, largely because they cannot be exhaustive. On the whole, Dr. de Mayo has performed a noble deed and these two books should be bought by many students as well as professors. There is no doubt that they fill an important gap in the chemical literature and they constitute convincing proof that de Mayo has real talent for the king's English—so rare among authors of technical books. One can only hope that many other books will follow from his pen, and in that connection only one piece of advice seems pertinent: the next time, select another publisher or insist on a reasonable publication schedule.

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Structure Reports. Supplementary Volume and Cumulative Index for 1940-1950. Volume 14. General Editor, A. J. C. WILSON; Section Editors, N. C. BAENZIGER and C. S. BARRETT (Metals); J. M. BIJVOET and J. WYART (Inorganic Compounds); and J. MONTEATH ROBERTSON (Organic Compounds). Assistant Editor, O. EISNER. N. V. A. Oosthoek's Uitgevers Mij., Domstraat 1-3, Utrecht, The Netherlands. 1959. viii + 215 pp. 16.5 X 25 cm. Price, \$9.50.

Roughly 75% of this volume represents a cumulative index to Vols. 8-13, "Structure Reports" covering the years 1940-1950. Otherwise, there are some 35 pages of reports to repair omissions for structural investigations dating from this period, and 15 pages of detailed corrigenda to Vols. 8-13. Granting also a thorough job during revision and the result is an index which adds up to substantially more than the sum of the parts earlier published. A report on any particular study should be readily found on the basis of author, of subject, or of pertinent formula. An additional index for organic compounds, grouped according to the number of carbon atoms, provides an unnecessary but highly convenient touch of luxury. For anyone who cannot afford the complete "Structure Reports," the present volume must still seem an attractive investment.

Although virtually indispensable, the "Structure Reports" must often be supplemented by careful examination of the paper(s) abstracted. Doubtless this will always be so when one takes more than cursory interest in the accuracy, method and background material of the structural investigation. It is rare for any gross inconsistency or error in an original paper to be reproduced unchallenged in "Structure Reports." However, in the report on biphenyl (p. 50) it is certainly not true that . . . "The space-group symmetry requires a planar molecule." Presumably what is meant is that the required molecular symmetry, $\bar{1}$, does not allow an assumed planar configuration to be distorted in the most obviously significant fashion, a rotational twist about the bond joining the two phenyl groups.

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