

his mental exertions, arranged in a manner logical in its sequence and revealing in its sub-sections. An author who does all that and gets it out by the appointed date is an exception.

The present volume does not do badly in some sections. I liked the summary on reactions of π -mesons with nucleons, by E. M. Henley, M. A. Ruderman and J. Steinberger, because the theoretical formalism is lucidly exposed and the experiments chosen for discussion are relevant to our endeavour to understand nuclear forces. Mesons and heavy unstable particles in cosmic rays, by Louis Leprince-Ringuet, is clear and helpful in the maze of 'new events'. A timely and, I feel, important article on extra-nuclear interactions of electrons and gamma-rays comes from D. R. Corson and A. O. Hanson; it is satisfactory to know that all is happy in the interaction of electrons with electromagnetic fields, at least as long as one is satisfied with the degree of accuracy of experiment and theory, admittedly undesirably low in some cases. Neutron optics, by D. J. Hughes, and a good survey by A. Wattenberg on standardization of neutron measurements follow. Photographic emulsions, by Y. Goldschmidt-Clermont, and radiation dosimetry and protection, by L. D. Marinelli, complete the articles on physics, the latter containing a rather good survey and useful graphs for practical purposes. The chemical field is covered by J. L. Magee on radiation chemistry (very clear exposition), chemical effects of nuclear transformations (J. E. Willard), separation techniques used in radiochemistry (P. C. Stevenson and H. G. Hicks) and isotope effects in chemical reactions (P. E. Yankwich). The volume concludes with vertebrate radiobiology—embryology (R. Rugh) and histopathology and carcinogenesis (J. Furth and A. C. Upton); cellular radiobiology (A. H. Sparrow and J. Forro, jun.); and practical aspects of radiation injury (L. H. Hempelmann and J. G. Hoffman).

The production of the volume seems satisfactorily fast: most of the surveys of the literature were concluded during March–July 1953.

E. BRETSCHER

THE UBIQUITOUS ALDEHYDE

Formaldehyde

By J. Frederic Walker. Second edition. (American Chemical Society Monograph Series.) Pp. xvi+575. (New York: Reinhold Publishing Corporation; London: Chapman and Hall, Ltd., 1953.) 96s. net.

THE prodigious expansion of chemical knowledge and technology is well illustrated by the fact that it takes more than five hundred pages to present 'the salient facts and theories' of the chemistry of one organic compound. Ten years only have elapsed since the first edition of "Formaldehyde" appeared, but there is every justification for bringing it up to date. During that decade, the production of formaldehyde in the United States has nearly doubled, improved methods of manufacture have been introduced, its uses have multiplied, and its chemical frontiers have been considerably extended. War-time developments fostered a marked expansion in the uses of formaldehyde, particularly noticeable being the increased volume used for chemical syntheses outside the synthetic resin industry, which is still the major consumer.

In the new edition two chapters out of twenty-one are devoted to the uses of formaldehyde, its polymers

and hexamethylene tetramine; the rest deal with production, properties and chemical reactions. This allocation will please some, but disappoint others. It is very doubtful whether workers in the plastics field would agree that less than twenty pages are adequate to discuss the important role of formaldehyde in their industry. However, in defence of the author it must be pointed out that the fundamental chemical reactions on which the industry is based are very ably dealt with under the reactions of formaldehyde, and, furthermore, numerous recent reference books covering the industrial and technological aspects are available. The treatment of formaldehyde production in the opening chapter represents a very marked improvement over the somewhat paltry discussion in the original volume. The five chapters dealing with the physico-chemical properties of the monomeric aldehyde, its vapour and solutions, contain a wealth of data which will prove invaluable to chemists and chemical engineers.

A welcome addition is a section on toxic hazards and safe handling. Polymer formation, one of the most characteristic properties of formaldehyde, receives full and authoritative treatment, but it is surprising to find the term trioxymethylene, which the author admits to be an erroneous designation for para-formaldehyde, still being used synonymously on several occasions. The two chapters on the qualitative and quantitative analysis of formaldehyde, its polymers and solutions are extremely good. Although a distinct chemical entity, hexamethylenetetramine may be regarded as a special form of formaldehyde, since it behaves as formaldehyde in many of its reactions and therefore rightly deserves special mention. Its general reactions, including nitration, are reviewed, but unfortunately the reader is referred elsewhere for details of the complex and interesting chemistry associated with the war-time development of the high explosive *RDX*. A valuable addition to the new volume is a chapter on the reactions of formaldehyde with heterocyclic compounds.

The monograph is not claimed to be exhaustive, and it is not surprising, therefore, to find a few minor omissions; for example, there is no reference to the reaction of formaldehyde with chloral. What is surprising, however, is to find a major industrial use of formaldehyde for the synthesis of glycolic acid, ethylene glycol and methoxymethoxyethanol dismissed at the mere mention and with no more than a brief reference to the patent literature for details of the basic reaction with carbon monoxide. Admittedly, this is a fairly recent industrial development, but the omission is all the more remarkable because the author's own company was responsible for it and since an earlier monograph in this series (No. 114, "Glycols", 1952) gives prominence to it.

A critical selection of references is appended to each chapter, and a comprehensive index at the end. The latter is not without minor blemishes—qualitative analysis is listed for quantitative, and there are some minor lapses of nomenclature. The selection of photographs adds little to the value of the book.

Let these remarks not be construed to mean that this book has not fully maintained the very high standard we have come to expect from the American Chemical Society Monograph Series. This new edition, despite its high price, will be generally welcomed and will inspire chemists to probe still further into the almost endless ramifications of the chemistry of this ubiquitous and versatile aldehyde.

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