

volumes will be issued in order to keep this work up to date. The author suggests that organic photochemistry may be divided into three parts—theory, instrumentation and preparation—and, except for the final chapter (22 pages) by G. O. Schenck on light sources and light filters, he chooses to confine himself exclusively to the last of these. This is the major limitation of the book because there is an almost complete lack of any mechanistic discussion nor is any guidance given on the theoretical and practical requirements necessary for carrying out preparative organic photochemistry.

This edition of the book, like its predecessor, is basically an uncritical catalogue of reported photochemical preparations of a wide variety of organic compounds arranged in a systematic manner. The layout is admirable and at the end of each subsection experimental details are given for selected compounds as in the original references. The first seven chapters deal with photoisomerization of various compounds including unsaturated hydrocarbons, aldehydes, ketones, esters, aldoximes and heterocyclic compounds containing oxygen and nitrogen atoms. There are three chapters which describe photodimerization, two which report photolysis leading to cycloadditions and retro-cycloadditions and four chapters on photodehydrogenation in one form or another, for example, photochemical dehydrodimerization by oxygen, carbonyl compounds and by dyes. Photochemical addition reactions feature strongly in at least four chapters including reactions of 1,4 and 1,2-quinones, aldehydes and ketones. Chapters 26–36 are about photochemical reactions of nitrogen containing compounds including *N*-halogenated amines, organic nitrites, diazoalkanes, diazirines, diazoketones, quinone diazides, iminoquinone diazides, diazonium salts, azides, pyrazolines, 1,2,3-thiadiazoles, *p*-benzoquinone diimine, *N,N*-dioxides and compounds containing unsaturated nitro groups. Other chapters describe the photochemistry of deoxybenzoin derivatives, furans, carboxylic acids, organic sulphur, organophosphorus, organoarsenic and organometallic compounds with an emphasis on both formation and reactions. Photohalogenation and photochemical conversions of organic halides are the titles of other chapters.

This list of contents illustrates the wealth of information available in this book which makes it a reference book which synthetic chemists are likely to find most useful and to which most organic photochemists will want access. Information retrieval is rendered easy by the extensive author, reaction and compound indexes as well as by the references given at the end of each short chapter.

F. WILKINSON

## CHEMICAL PROCESSING

### Chemical Process Development

Part 1. By Donald G. Jordan. (Interscience Library of Chemical Engineering and Processing, Vol. 6.) Pp. xxiii + 404. (Interscience (Wiley): New York and London, 1968.) 255s.

THIS is the first part of a two part volume in which it is intended to discuss problems of chemical process development, ranging from research planning, economic appraisal and scale up to the unit operations and the physical properties of the materials processed. The first part considers the general problems of research and development, problems in the design of reaction vessels such as residence time, and the choice and design of reactors, and ends with a chapter on vapour-liquid equilibrium. The second part, not yet published, will deal with such topics as distillation, absorption, solvent extraction, crystallization and filtration, and will contain the index.

The author addresses a somewhat limited audience. He says that the book is not intended as a textbook, nor

is it directed at the academic worker or the professor; rather it is designed for the practical worker in the laboratory or pilot plant. He also says that "the emphasis is on small-scale work: large scale designs are set aside as being the province of the plant designer".

It is clear that the author is anxious to pass on the benefit of his experience and to show his wide reading of information published in the English language. Unfortunately, this often leads to statements familiar in annual reviews, for example, "a more recent treatment . . . is given by", or " . . . has written two excellent articles discussing these matters. The illustrations are particularly good . . .".

I suppose, however, that the purpose of the book is to bring to the notice of the development chemist the things he must consider if a process is to be brought successfully to full scale production, and to give him guidance on the problems of scale-up so that he can direct his small scale studies to fruitful ends. The first chapter, for example, discusses the general problems of research and development, the techniques of economic appraisal and the scale up problem. It introduces "venture-worth" and "discounted cash flow". I cannot agree that the first step in calculating costs is an engineering flowsheet from which the materials balance is developed: most people would start from a materials flow diagram. In fact the flowsheet approach is so important that more should have been made of it.

I fear the criticism outweighs the praise, but there are some shrewd observations; for example, underlying the chapter on vapour-liquid equilibrium must be some bitter experiences.

I found the book interesting to read but I could not see it as a working tool. Moreover, by any standards it is an expensive book, even allowing for dollars at 2:4 to the pound sterling; and I believe that most people in process development would prefer Perry's *Chemical Engineering Handbook* as a better and more useful buy, even though the fourth (1963) edition is a little dated now.

A. S. WHITE

## LINEAR ALGEBRA

### Linear Algebra

By R. R. Stoll and E. T. Wong. Pp. x + 326. (Academic Press: New York and London, 1968.) 79s. 4d.

THIS book is designed to meet the needs of those students who are preparing for advanced study in mathematics, as well as of those students whose interest will eventually be in the application of the theory. This objective is sought for by adopting the abstract point of view from the beginning while stressing non-trivial computation and techniques. Included in this book are the standard properties of vector spaces, inner product spaces, linear transformations, matrices, algebraic properties of linear transformations such as characteristic values, bilinear forms and quadratic forms and decomposition theorems for normal transformations. In the final chapter some applications of linear algebras are given to economics, chemistry and physics.

This book would be suitable for a third year undergraduate course but would be too difficult for a first year course. Part of this difficulty is because the authors consider infinite dimensional vector spaces in part for which Zorn's lemma is used. This and the abstract style makes the book difficult to read and because no hints or answers to questions are given it would be virtually impossible to teach oneself from this book without attending a lecture course which followed from the book. The applications at the end are a novel feature and will help convince students that linear algebra is worthwhile.

There are misprints on pages 137 and 239, ( $\alpha T$ ,  $\alpha T$ ) should read ( $\alpha T$ ,  $\beta T$ ) and exercise 1-9 should read  $f(\gamma, \alpha) \neq 0$ .

ROGER FENN