

illustrative problems. The printing and production are of a high standard.  
D. P. CRAIG

### Nuclear Reactor Kinetics

By M. Ash. (Series in Nuclear Engineering.) Pp. xiv + 415. (New York, London and Sydney: McGraw-Hill Book Company, 1965.) 156s.

THIS book is written for the graduate student or the control systems specialist with a good mathematical background. It discusses the application of a wide range of mathematical techniques to the solution of problems in reactor kinetics. The standard material on the development of the basic equations and on the application of Laplace transform techniques to linearized perturbation problems occupies about a third of the text. The middle section of the book presents more advanced topics such as the application of non-linear techniques, dynamic programming and spatial effects. Finally, many of the classic problems which have arisen in reactor design are briefly discussed, such as stability problems in boiling-water reactors and Bethe-Tait type explosions in fast reactors and pulsed reactors. A notable omission is any discussion of the application of variational methods; this could, with advantage, have replaced the discussion of Monte Carlo techniques, the relevance of which is doubtful.

The treatment is inevitably condensed, but it is not superficial and successfully demonstrates the rich variety of the subject. Extensive references are provided and each chapter is provided with a list of illustrative problems.

The book is valuable as an introduction to the field, particularly to those working on dynamic and control problems in other engineering disciplines who wish to obtain an appreciation of the relevance of these topics in the design of nuclear reactors. Those interested in particular reactor projects should note that the illustrative material presented is not always up to date and that it is advisable to supplement the information given in this volume from more recent references dealing with specific problems of reactor design.  
J. FELL

### Methoden der Organischen Chemie

Von Houben-Weyl. Vierte, völlig neu Gestaltete Auflage. Herausgegeben von Eugen Müller. Unter besonderer Mitwirkung von O. Bayer, H. Meerwein und K. Ziegler. Band VI, Teil 3: Sauerstoffverbindungen I/3. Bearbeitet von G. Dittus, H. Kröper und H. Meerwein. Pp. xlviii + 832. (Stuttgart: Georg Thieme Verlag, 1965.) 212 D.M.

THIS volume, in spite of its size, deals only with certain classes of organic oxygen compounds, and the remainder are discussed in the other volumes which will together make up Volumes 6-8, all devoted to organic oxygen derivatives.

The present volume contains four chapters by Professor H. Meerwein on ethers, acetals, orthocarbonic acid esters and oxonium salts respectively: two chapters by Dr. G. Dittus on three-membered and four-membered cyclic ethers, that is, the 1,2-epoxides and the oxetanes; and finally two chapters by Dr. H. Kröper on five-membered cyclic ethers and on  $\alpha$ -hydroxydihydro- and -tetrahydrofurans.

As in earlier volumes in this fourth edition, the main emphasis (as the title implies) is on the methods of synthesis of the members, both simple and substituted, of each class. The reactions of these members, such as methods for opening the ring systems, are also discussed in very considerable detail. The treatment is virtually exhaustive, for it is difficult to believe that more than a very occasional reference has evaded the authors.

The price of the book is necessarily high, but it should be remembered that each of the eight chapters could well have been published independently, each as a very solid monograph. Furthermore, the contents (as in earlier volumes) are remarkably clearly and attractively printed, and the book is excellently bound.  
F. G. MANN

## MEETINGS

### GAS CHROMATOGRAPHY

A SYMPOSIUM organized by the Gas Chromatography Discussion Group of the Institute of Petroleum was held in April this year in London with Dr. C. G. Scott as chairman.

Mr. K. Jones (Petrocarbon Developments Limited) read a paper by himself, Mr. A. O. McDougall (Manchester University Institute of Science and Technology) and Mr. R. C. Marshall (G. Kent and Sons, Ltd.) on the problem of converting signals into digital form with the help of computers. He explained his own need to process the information arising from the gas chromatography of the oxidation of *n*-hex-1-ene in propionic acid. Mr. Jones described four ways of presenting to the computer a digital equivalent of the chromatograph record. By means of a mechanical shaft linked with the potentiometric recorder and presentation on punched paper tape, continuous attenuation of 1,000:1 is possible using a manual attenuator; a ratio of  $5 \times 10^6$  is possible with an automatic attenuator. Digital records can also be obtained by a technique of successive approximations or by converting voltage variations to frequency variations. This system with a dynamic range of 2,000:1 is suitable for use with a katharometer but lacks the attenuation necessary for the more sensitive detectors although the range can again be extended by manual or automatic attenuators. Mr. Jones also explained how this system can be extended by recording the analogue frequency signal on 0.25 in. magnetic tape followed by translation to a central unit and presentation on 1 in. computer tape. A variant of this method, and the fourth of those used by Mr. Jones, is the use of an on-line link to a computer.

The first system is simple, but its dynamic range and sampling rate are limited. The second method is faster, and experience has shown that, with a solartron converter and 5-hole code, fast punches permit sampling at a rate from 4 to 10 samples a second. On-line links with computers will accept a dozen or more independent signals with virtually no limitation of sampling rate or dynamic range. Mr. Jones has worked with the ICT *Atlas* computer at the University of Manchester; he is developing methods of avoiding repetitive functions, of reducing demands on the computer store, and the compensation for base line drift.

Dr. S. G. Perry (Esso Research Limited, Abingdon) described experiments which he has carried out, with three commercially available chromatographs, to find what factors influence the accuracy and reproducibility of retention measurements. The effect of column temperature on retention time is described by the Kovats Index, and the inaccuracy of temperature measurement in commercial ovens will obviously affect the retention time. Such inaccuracies have been found to be most marked on systems with large heats of solution as, for example, with markedly polar materials.

Dr. Perry also said that the nature of the support has a marked influence on retention, particularly in the system of benzene and polyethylene glycol. In measurements with both toluene and benzene using polyethylene glycol 400 on different supports, it appeared that benzene is most strongly retained on the column usually regarded as the most inert—'Chromasorb' G—and that the opposite is true with the support considered to be the most active—'Silocel' C-22. The interaction between the support and the solvent is also demonstrated by the relative heats of adsorption of polyethylene glycol 400 on a number of adsorbents, where measurement showed conclusively that the interaction is most pronounced with 'Silocel'. Dr. Perry showed, on the basis of studies of the separation of benzene and 3-methylhexane on squalane, that with