

manner which might almost be called studied, as if the author held that it was quite enough to note the entrance and exit of an electron or hole from the oxide without worrying very much about what happened to it while in this medium, except to note an activation energy for the process. This extends even to the chapters on zinc oxide, aluminium oxide and silicon dioxide, for which, in fact, a rich literature on defect structure exists. Other subjects which one would expect to be treated in a book of this title are carrier trapping (no mention at all); band and hopping conduction models (glancing references only); the role of the d orbitals in defect and band structure in the transition metals (orbitals mentioned only occasionally in passing); and the applications of oxide semiconductors (not even a bibliographical reference given). A subject which is treated well in the explanatory chapters is the law of mass action applied to interactions between oxide and oxygen at high temperatures, in which defects are treated as an active participant in the chemical reaction.

There seems somehow to be a gulf between the kind of defect science described here and the world of 'frozen-in' defects typical of radiation damage and mechanical deformation; the latter science uses a wide range of spectroscopic and scattering measurements to build structural and wave-mechanical pictures of defects, while the former relies largely on measurements of the transport of electrons or atoms in the solid. This book, while it can be read without difficulty, perhaps even with profit, by one of the 'frozen-in' community, does not bridge that gulf. Moreover, those who wish to use this book as a quick summary of the field should note that the references do not, except for a few cases, extend past 1970.

A. G. HOLMES-SIEDLE

The chemical industry

The Chemical Economy: A Guide to the Technology and Economics of the Chemical Industry. By B. G. Reuben and M. L. Burstall. Pp. xix+530. (Longman: London, February 1974.) £6.95.

THAT chemistry courses must become more relevant has been the anguished cry of students and a source of frustration for many teachers of that subject for the past decade. Drs Burstall and Reuben have demonstrated what sort of effort is required if a beginning is to be made. They have written a long book crammed full of information directly related to their title. The book is well organised and the data in it are clearly presented so that prospective

readers are guided step by step through the complexities of chemical technology without undue fatigue. The primary objective of the book is to answer the question "How do we put chemistry to work for us?". As a second objective they intend to do something, in the concrete, to improve the spirit of university-industry cooperation. By providing such a lively and contemporary account of the ways in which chemical technology is used by the industry, the authors have achieved both of them. The book is aimed at an audience of first year university students having an A-level qualification in chemistry but no previous training in economics is presupposed.

This work is not an introductory course in chemistry juxtaposed with an elementary introduction to economics. Quite the contrary. The greater part of the book discusses a wide range of chemical reactions and processes but sight is never lost of the socioeconomic setting in which they function. By describing petroleum, natural gas, heavy organic chemicals, polymers, soaps and detergents, dyes and pigments, pharmaceuticals and heavy chemicals in relation to the firms, predominantly those in the United Kingdom, which utilise them, one is led, albeit in a piecemeal manner, to build up a picture of the chemical industry. A further section attempts to set the UK chemical industry into the world-wide complex of chemical industries. A disappointing feature of the presentation—though it would be difficult to remedy—concerns the historical description of the factors that have led up to the application of a particular process. These descriptions tend to be rather too brief and, consequently, may give the impression that chemical technology develops largely from discoveries in chemistry which appear, somewhat fortuitously, a little while before they are actually needed. None the less for students, who presumably know very little about this sector of industrial activity, it is perhaps a reasonable compromise to ensure that at least a little history is included with the technical and economic factors in the description of the industry.

The book also explores, in a descriptive manner, the economics of the firm. The aspects of microeconomics which are discussed include the decision of management to invest money in a new process and a very interesting section entitled "How do you know you are making money?". In a further chapter the authors discuss some of the problems of scaling up a laboratory experiment to industrial production. This leads to a discussion of the problems of disposing of the wastes from these processes and thence to some of the problems associated with pollution by in-

dustrial effluents.

The authors have produced a book which is doubly useful. It will certainly be useful for students of the growing number of broad-based science courses who are demanding that their curricula be relevant both to the society they live in and the sorts of jobs they may expect. For them it will provide more than a set of introductory materials because the authors have so organised the book that by following up the many references and footnotes, the student will be able to approach more closely the core of many contemporary technical and social problems. Also for the academic who is being asked to prepare more socially relevant course material this book should provide a useful guideline.

MICHAEL GIBBONS

Computer techniques

Operating Systems. By D. C. Tsichritzis and Philip A. Bernstein. Pp. xviii+298. (Computer Science and Applied Mathematics: a Series of Monographs and Textbooks.) (Academic: New York and London, March 1974.) \$13.50; £6.36.

OPERATING systems research seems to have become a popular line with computer scientists, perhaps from a desire to put their own house in order before dealing with more general techniques. Most books about it fall into a middle range, assuming basic knowledge and providing abstracts of the more subtle techniques described in journals.

The authors of this book are clearly competent in their subject, so it is unfortunate that the book is not more readable. The volume is best described as loosely written, and the authors themselves felt compelled to apologise (page 121) for the incoherence of the first five chapters. In particular, the frequent cross references embedded in the text are particularly difficult to follow. Footnotes would have been much easier to scan, and would have helped maintain a continuity within the main text. The entire work carries an air of editorial neglect, and falls into the trap of collaborative work, repetition. Although the book starts at a low level, it would be very difficult for a student to follow.

Apart from the problems at the end of each chapter, and the admirable bibliography, the most worthwhile chapters cover design and implementation principles, dealing with problems of project management plus a collection of the authors' solutions. The book could be worth buying for these chapters alone; in fact the width of scope leaves me wondering why they did not publish three well organised volumes, instead of trying to cram the entire subject into 300 pages.

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