BOOK REVIEWS

Nonstoichiometry

Problems of Nonstoichiometry. Edited by A. Rabenau. Pp. viii+292. (North-Holland: Amsterdam and London, 1970.) Hfl. 54; 126*s*; $15.

NONSTOICHIOMETRIC systems are of great theoretical interest and practical utility, and their study now covers a wide field which demands the techniques of several disciplines. Partly for this reason, the literature of the subject is not well developed, and new contributions are to be welcomed. This volume is a rather mixed bag of review articles which cover a range of subjects chiefly of an academic nature, and with little indication of the rationale behind the way in which they were selected. There is, however, much which is new and valuable here.

The first two reviews are excellent. They are wide in scope and critical in the best sense of the word. Anderson (Oxford) gives a broad and thorough treatment of the thermodynamics of defect structures, starting with relatively simple systems and progressing to those of greater complexity. Repeated inquiry is made into the true nature of non-stoichiometry. The section concludes with a new treatment of the microdomain theory, which seems to suggest that the microdomains are considerably smaller than originally proposed. Jeannin (Toulouse) then gives a rapid, qualitative review of the application of thermodynamic models to real systems, emphasizing the dangers of failure to reach a true equilibrium, and concluding with a detailed treatment of short-range and long-range defect ordering.

The remaining reviews are considerably more specialized. Jagodzinski (Munich) discusses the detection of defects by X-ray diffraction methods and gives a general treatment of the energetics of defect lattices. These optics are illustrated by consideration of spinel structures. Joubert, Berthet and Bertaut (Grenoble) describe a general method for the production of spinels with ordered vacancies on the octahedral sites. All the phases are metastable and decompose by cation diffusion which proceeds readily at relatively low temperatures. X-ray data for the new systems are given, but there is, unfortunately, no indication of the possible application of these products. Bénard (Paris) gives a short discussion of the formation of single chemisorbed layers of sulphur on clean metal surfaces. These films are regarded as two-dimensional nonstoichiometric compounds, which can be examined by low-energy electron diffraction. A theoretical discussion of the flow of vacancies from a pore during the sintering of a metal oxide is given by Reijnen (Eindhoven), who shows that the rate of sintering should increase when the concentration of the slowest moving defects is increased. This is demonstrated by experimental results for some mixed oxide systems.

In most of the studies, diffraction methods (X-ray, electron) are used to characterize the phases encountered. For the final review, Greenwood (Newcastle upon Tyne) describes the application of Mössbauer spectroscopy to the study of nonstoichiometric compounds. A brief description of the technique is given, and its use both in the determination of site distributions and oxidation states, and in the investigation of band structures, is illustrated. Equally important, the limitations of the technique are also indicated.

The stated aim of this book is to "disclose the problems (of nonstoichiometry) and to make evident the trends". In this the book is only partly successful, but sufficient new and thoughtful material is included to make it a worthwhile acquisition for those working in this field.

R. V. PARISH

Laser Topics

Advances in Quantum Electronics. Vol. 1. Edited by D. W. Goodwin. Pp. xii+274. (Academic: London and New York, October 1970.) 84*s*; $12.

Advances in Quantum Electronics is the newest of the new generation of review journals which have been appearing over the past few years. Taking the same form as the long established *Reports on Progress in Physics*, the idea is to provide long review articles written by experts in specialized areas to provide compact statements of the present state of affairs in those areas.

The first volume deals with quantum electronics, that somewhat uneasy hybrid born of an alliance between theoretical physics and electronic engineering, and embracing masers, lasers, semiconductor solid state devices, and more or less anything that has to be analysed by the application of quantum mechanics to a physical system larger than an atomic nucleus. The field to be covered by the journal is presumably roughly defined by the four articles contributed to Volume 1.

In this volume, two articles are devoted to laser systems, neodymium in yttrium aluminium garnet, and carbon dioxide. These are workmanlike expositions of the present state of the art in these two devices, severely practical and with very brief theoretical exposition. An article on quantum counters, a subject with which I am not acquainted, is similarly down to earth. The final article reviews applications of the technique of interference holography. These articles, although individually very satisfactory, form rather a mixed bag when taken together. Each would probably have found a home in one of the present review journals, and one is left wondering whether the new publication can justify itself.

Furthermore, it is a little worrying that all six authors in this volume work in British laboratories. Certainly, they are all well to the fore in their chosen topics, but a glance at the table of references at the end of any of the articles would show that Britain is only one among the first half dozen countries in this field.

Review journals play an important part in communication in physics, increasingly so now that the information explosion makes a comprehensive reprint and filing system a full time job for the average working physicist. Nevertheless, it seems a pity if physics has become so atomized that a specialist review journal is required for applications of laser systems. *Advances in Quantum Electronics* has certainly got a future, but that future might be brighter if it considered its terms of reference more broadly.

D. G. C. JONES

Geological Simulation

Computer Simulation in Geology. By John W. Harbaugh and Graeme Bonham-Carter. Pp. xiv+575. (Wiley Interscience: New York and London, November 1970.) 235*s*.

GEOLOGICAL hypotheses tend to be crude and unquantified compared with the exact and detailed data on which they are based. Experimental methods are limited by the difficulties of physically representing the conditions of the geological past, and mathematical analysis cannot normally disentangle the interactions of geological processes. Mathematical experiment by computer simulation is one promising approach to refining geological hypotheses, but with possible exceptions in geophysics and hydrogeology, surprisingly little progress has been made. The chief problem, of course, has been the difficulty of collating all the widely dispersed information, and