

BOOKS

Chemistry in nuclear technology, by S. Peterson and R. G. Wymer (Oxford, Pergamon Press Ltd., 1963 ; 94 s.).

Anyone who has attempted to instruct postgraduate students possessing little knowledge of chemistry in the essential role played by that scientific discipline in the development of nuclear energy will be grateful for this book. It has its shortcomings: for example the early chapters, covering such topics as the fundamentals of chemistry, radiochemistry, nuclear reactions and the detection of radiation, are rather over-compressed. There are a few small inconsistencies: many elementary concepts, both in chemistry and radioactivity, are introduced in italics, with a few explanatory words, whereas the important phenomenon of pile poisoning is allowed to slip in unobtrusively as if the reader can be expected to know all about it already. The authors confess to a difficulty in defining 'radiochemistry' and seem to come down in favour of the chemistry of very dilute systems studied with the aid of radioactive tracers. This definition does not harmonize with the rest of the book and I think most people would take a broader view, even if they would not go all the way with Edward Bruninx in saying that radiochemistry is 'nuclear physics for plumbers'.

But these are minor criticisms. The remainder of the book deals authoritatively with the basic chemistry of nuclear fuels and the technology of fuel production and processing, the disposal of radioactive wastes, and the principles of isotope separation, ending with a brief chapter on the chemistry of some important non-radioactive reactor components. Here the authors write with admirable style and present a wealth of facts and figures which justifies their hope that the book will become a useful addition to the bookshelf of the practising nuclear technologist.

Each of the seventeen chapters is followed by a few useful illustrative problems and a good selection of references, and there is an adequate index. The number of misprints is very close to zero. There have been far too many recent books in the nuclear-energy field which would have been better compressed into half their size, but all 374 pages of the one under review are good ones and the whole is at least equal to the sum of its parts.

K. F. Chackett

Nuclear reactor control engineering, by Joseph M. Harrer (London, D. Van Nostrand Company Ltd, 1963 ; 128 s.).

The physical theory of neutron chain reactors has been described by many authors and an excellent literature exists on the subject. Important aspects of reactor technology, such as reactor control, reactor shielding, and nuclear radiation detection, have also been treated in numerous books.

In the case of the book under review, the author set out on a new path, with the intention of transmitting to engineers the experience obtained so far in reactor control ; to stress the state of the art rather than the basic theory.

To avoid possible confusion, it may be useful to point out that the inclusion in this section of reviews of books dealing with nuclear power engineering and other aspects of the uses of nuclear energy does not mean that CERN, as an organization, is concerned with such activities. It is just that these books are made available to us for review, the subjects are sometimes of interest to members of the CERN staff, and we assume that many readers of CERN COURIER have interests other than in fundamental research.

Besides reactor control, a number of related subjects are dealt with. There is a comprehensive introduction, covering reactor physics, instrumentation, feedback control systems, and computer techniques, which is advantageous to the engineer just entering the reactor field, although in consequence some aspects of the main subject of the book are not covered in as much detail as they could have been. For example, control-rod calibration techniques could have been described more fully, perhaps enclosing loose calibration charts; the information on the effects of irradiation on lubricants, cables and connectors is limited; more could have been said on pre-operational and operational check on the control rods.

The following résumé of the contents of the fourteen chapters will, however, give a better idea of the scope of the book :

- compilation of elementary reactor concepts ; description of different types of reactors ;
- reactor physics ; the thermal-neutron diffusion equation, buckling, reactivity effects ;
- reactor kinetics, theory of control-rod calibration ;
- control-rod design considerations, discussion of the properties of control-rod materials ;
- neutron detectors, neutron-flux measuring channels ;
- control-rod drive mechanisms, descriptions of the various types employed on reactors ;
- feedback control systems; stability and feedback analysis, the meaning and use of transfer functions ;
- the specific transfer functions of reactors, techniques for measuring reactor transfer functions ;
- rod-control systems, discussion on rod speeds, start-up and steady-state requirements ; the effects of xenon and samarium (3 chapters in all) ;
- reactor safety ; discussion of the SL-1 reactor accident ; ultimate reactor shut-down devices ; fail-safe and reliability concepts ;
- miscellaneous topics, such as spectral-shift control and solid-state fission counters ;
- elementary explanation of analogue and digital computers ; reactor simulators.

Each chapter is followed by an extensive list of references, although these date generally from before 1961. It should also be noted that the reactors and commercial firms mentioned in the book are practically all situated in the U.S.A.

To sum up, the transmission of 'know-how' on paper is difficult, but here the author has succeeded, at least in part. The frequent reference to experience and the clear definitions of basic concepts make the book a valuable addition to the literature on nuclear reactors.

J.H.B. Madsen

The theory of superconductivity, edited by N. N. Bogoliubov, (New York, Gordon and Breach Science Publishers Inc., 1963 ; \$ 4.95).

This book is the fourth volume of the *International Science Review Series*, devoted to collecting the pioneering papers in rapidly developing fields of the physical sciences — established classical material as well as articles representing more recent progress — selected from the world literature. Since the selection of papers in each anthology is made by an investigator actively engaged in the field, it is only natural to expect a bias in the direction in which the editor's interests lie.

The present volume is no exception. As Prof. Bogoliubov mentions in his preface, the purpose of this collection of papers is to acquaint the reader with the basic works on the microscopic theory of superconductivity *published in the foreign literature* (reviewer's italics), mainly during the period of 1957-1958. This means that the reader will look in vain for the extensive contributions of the Russian School to the theory of superconductivity ; Prof. Bogoliubov's very important own work forms the subject matter of the last article in the book, albeit in a rather shortened translation. By way of compensation, some of the more important of Fröhlich's papers, dating from the period 1950-1954, as well as Kuper's review article are included in the collection.

It is fortunate that this latter paper has found its way into the book, as it will help the reader to orientate himself in the mathematical maze that is the theory of superconductivity. In fact it is suggested that the reader tackles this book by studying Kuper's review, turning to the other articles only when a reference so requires it. He will then find that he has all the basic material neatly parcelled up under one cover, and that only the more esoteric publications will have to be looked for in the library.

Since an incidental by-product of an anthology of this type is a formidable bibliography, the reviewer will permit himself the perennial tirade against the editor and publisher. When will these misguided gentlemen realise that a book even remotely connected with science needs an index, and a good index at that, and at least some form of bibliographical summary!

This much said, the reviewer has nothing but praise for the splendid idea behind this series, for the choice, and for the presentation. A veritable boon for the busy physicist who must have his information from the horse's mouth, yet who prefers to keep his search of the literature down to a minimum.

St. L.

Also received

The rare-earth elements, by D. N. Trifonov (Oxford, Pergamon Press Ltd., 1963 ; 25 s.) — describes the properties of the rare earths, methods of separating them and obtaining the pure metals, and the history of their discovery ; translated from the Russian edition of 1960.

Enriched uranium processing, by F. S. Patton, J. M. Goo-
gin and W. L. Griffith (Oxford, Pergamon Press Ltd., 1963 ; 70 s.) — covers basic data, chemical, metallurgical and

ceramics operations, radiation safety, uranium control, plant design, economics and management.

Analytical chemistry : volume 3, parts 1-3 of series IX of *Progress in nuclear energy*, edited by C. E. Crouthamel (Oxford, Pergamon Press Ltd., 1962 ; 30 s.) — articles on radiochemical separations of low-level radioactivity, the determination of atom per cent fission in uranium fuel, and radiation problems associated with the handling of the actinide elements.

Scientific words, their structure and meaning, by W. E. Flood (London, Oldbourne Book Co. Ltd., 1960 ; 18 s.) — introduction describing the structure of scientific words, followed by some 1150 word 'elements' (roots, prefixes and suffixes) most likely to be encountered in scientific vocabulary, with many examples of their combination and meaning ; a useful reference book taking much of the mystery out of the specialized language of scientists.

Out of my later years, by A. Einstein (New York, Philosophical Library Inc., 1950) — a collection of essays written during the years 1934 to 1950, on philosophical, political and social, as well as scientific topics.

Treasury of world science, edited by D. D. Runes (New York, Philosophical Library Inc., 1962 ; \$ 15.00) — a collection of so-called 'classic' scientific papers published over the last 2400 years, from Agricola to Volta — in alphabetical order ; interesting, but superficial editorial introductions and lack of proper references to the original sources make this a highly misleading example of scientific writing ●

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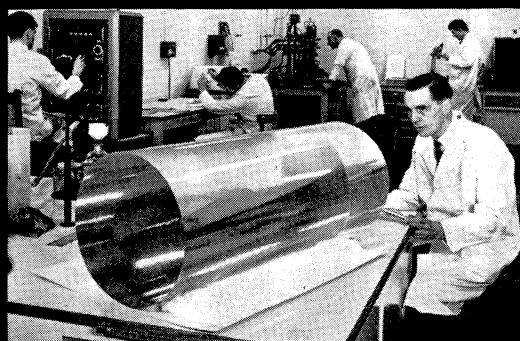
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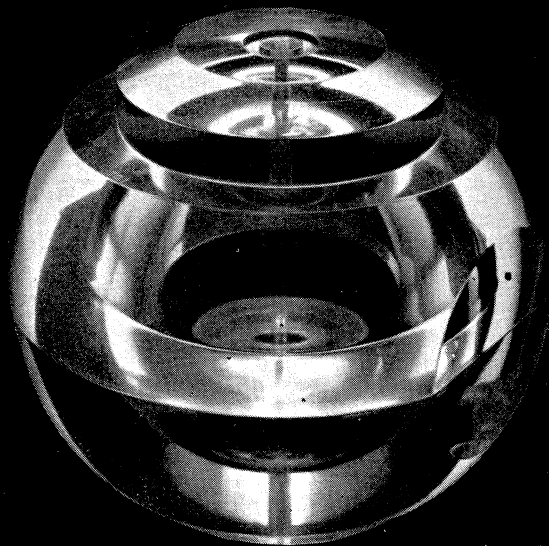
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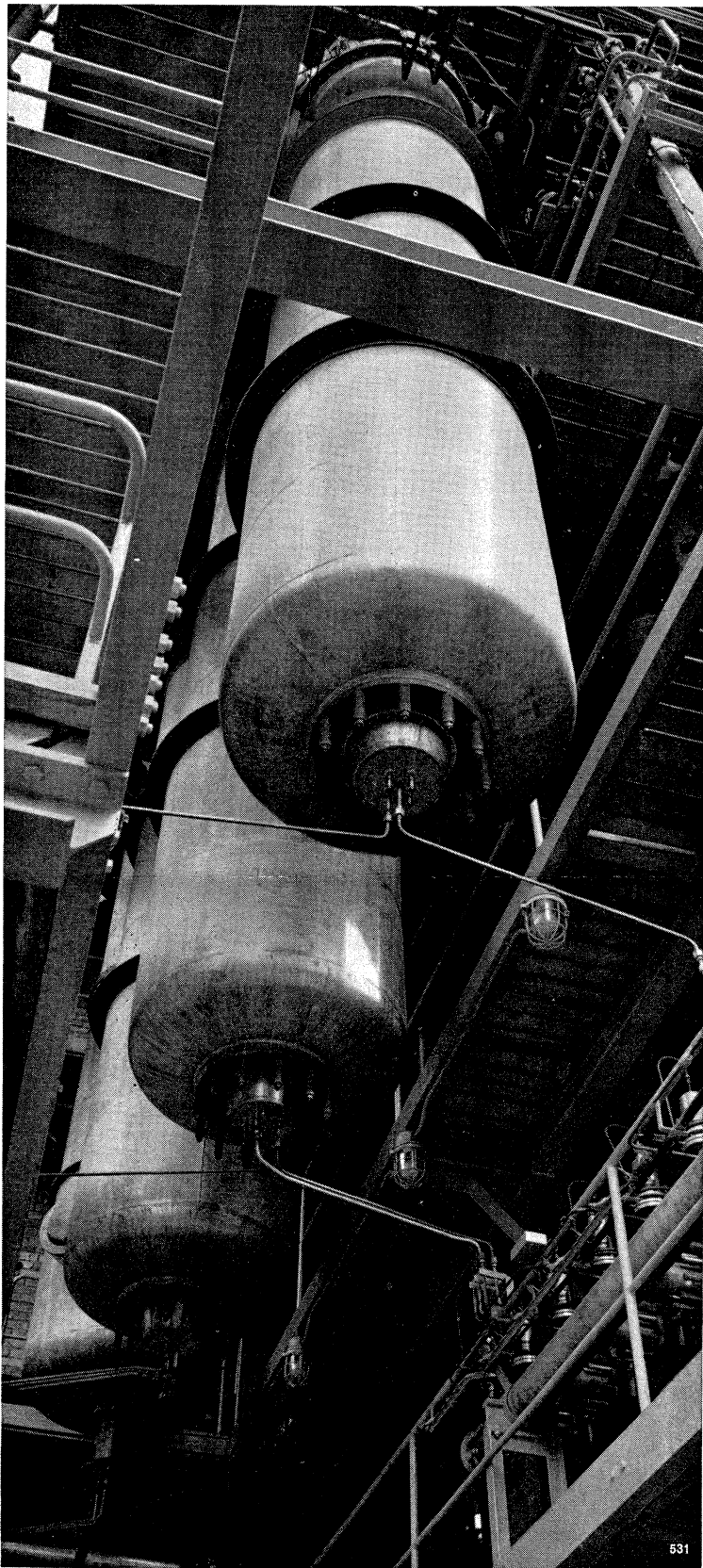
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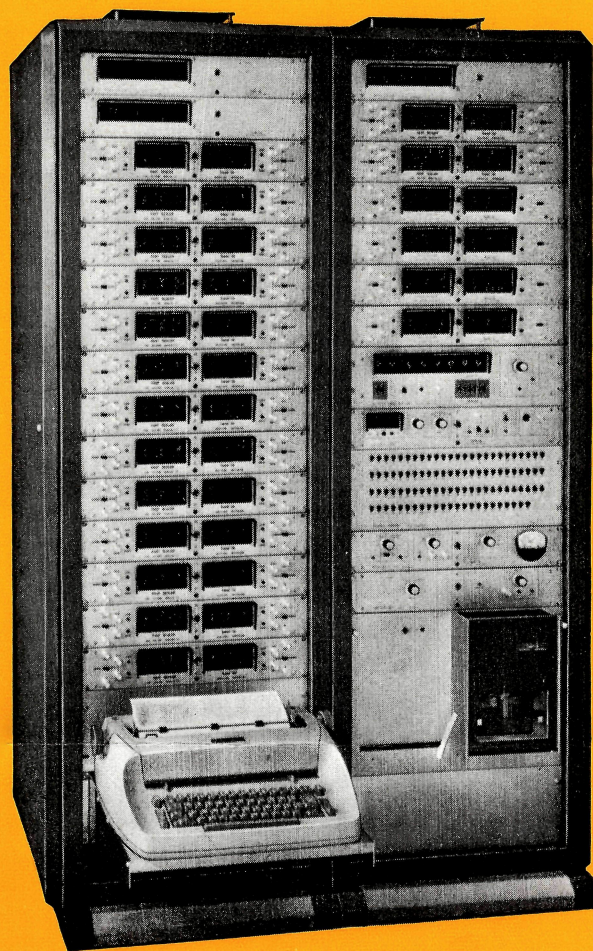
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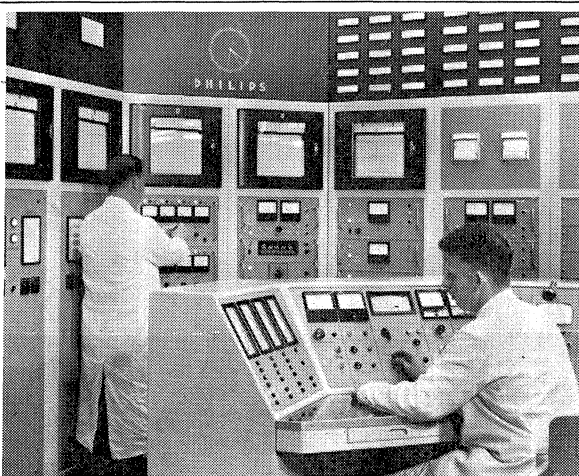
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