BOOK REVIEWS

Fast Assemblies

Techniques in Fast Reactor Critical Experiments. By W. G. Davey and W. C. Redman. (Monograph Series on Nuclear Science and Technology.) Pp. xvii+314. (Gordon and Breach: New York, London and Paris, September 1970.) \$16; 132s 6d.

ONE of the less controversial activities of the United States Atomic Energy Commission in recent years has been its sponsorship, jointly with the American Nuclear Society, of an important series of monographs on nuclear science. Intended as reviews in depth of fairly restricted areas of the field, these monographs are aimed primarily at scientists and engineers directly involved with the sometimes thankless task of developing the nuclear reactor as a source of energy. In each case, the authors are workers of long experience in the area under review, and this is particularly true of the authors of the present volume, who have played a prominent part in the development of the US programme of fast critical measurements. Advised as they have been by a number of other specialists in particular techniques, this can therefore be accepted as an authoritative account of the diverse experimental methods involved. While many of these are not greatly different from those used to measure the same parameters in thermal assemblies, others have required extensive development to meet the different and usually more exacting requirements of fast assemblies.

The first chapter outlines very briefly the physics problems which arise in the design of fast reactors, and which have necessitated the use of fast critical assemblies for their solution. There follows a brief account of the design problems of fast critical facilities, and a survey of the characteristics of the chief examples in use at the present time. After a discussion of the most fundamental and perhaps easiest measurements to be made with a critical assembly, namely the critical mass determination, the authors proceed to a detailed account of the techniques employed for very accurate reactivity worth measurements. The crucial part that these measurements play in the whole programme is clearly brought out in the discussions on the Doppler and sodium density coefficients which follow. Further material pertinent to reactivity measurement is given in a chapter on kinetics and control, which also includes a concise review of the various methods of deducing the values of kinetics parameters by statistical

analysis of the fluctuation in neutron population. Most of the remainder of the book is given over to two chapters describing the techniques for measuring neutron energy spectra within a critical assembly. Finally, after considering the extent to which critical assemblies can accurately serve as models for large fast reactors, the authors discuss the directions in which improvements might be expected in the future.

As a review the book is in general well up to date, and adequate references are given, but there are a few sections where more recent work might have been quoted. In particular, one might have expected a more extensive discussion of integral methods for the determination of the important capture-to-fission ratio α . The book is well produced, and I noticed very few misprints.

Judging the book in terms of the objectives outlined in the preface, it is an excellent description of the techniques used for the measurement of fast reactor parameters, and as such I can highly recommend it. It is perhaps less successful in its explanation of the reasons why these quantities are important to an understanding of the performance of fast reactors.

J. SCOBIE

Cool Stars

Interpretation of Spectra and Atmospheric Structure in Cool Stars. By Yoshio Fujita. Pp. 145. (University of Tokyo: Tokyo; University Park: Baltimore, Maryland and Manchester, July 1970.) \$10.

THE spectra of the cool stars are very complex, for not only is there the same multitude of absorption lines present from the neutral and once-ionized atoms which is seen in the Sun, but there is also a complex overlay of absorption lines from molecular bands. This slim book summarizes the present state of affairs in the study of the atmospheres of the cool stars.

First the problem of line identification is presented, and a lucid description is given of how to disentangle the complicated blends of lines from the Earth's atmosphere and other stellar lines. Many valuable observational data are presented to demonstrate solution of the line identification problem in carbon stars in the near infrared and for lines from the neutral elements in the blue spectral region. Next, the dissociation of molecules in the atmospheres of cool stars is studied, and illustrations are given of how the relative abundances of

hydrogen, carbon, nitrogen and oxygen affect the resulting relative abundances of various molecules. Condensation of matter into solid or liquid particles is considered, as well as the various possible sources of opacity in the atmospheres of cool stars.

Spectral classification of the cool stars is discussed and quantitative evaluations are given of the various criteria used and how they vary with assigned type whether M, S or C (R and N). An attempt is made to relate the assigned types to temperature in the atmosphere. Quantitative analysis by means of the curve of growth is used to back up the qualitative arguments used in obtaining a first estimate of the physical conditions in the atmosphere. In keeping with the scientific rectitude of the whole book, attention is carefully drawn to the limitations of any curve of growth analysis owing to the fact that most lines are blends and that a fictitious continuous spectrum must be drawn. Some applications are given to long period variables. The book is completed with a survey of model atmosphere methods as applied to cool stars. A summary of the results obtained on chemical abundances and the $^{12}\text{C}/^{13}\text{C}$ ratio in cool stars is given.

The book concludes with the author's well weighed evaluation of the future prospects for the study of cool stars. He expects remarkable progress as spectra of higher and higher resolution become available for study and as spectra further into the infrared are obtained free from serious distortion by the Earth's atmosphere.

ANNE B. UNDERHILL

Geometrical Approaches

Hyperbolic Manifolds and Holomorphic Mappings. By Shoshichi Kobayashi. (Pure and Applied Mathematics: a Series of Monographs, Vol. 2.) Pp. ix+148. (Dekker: New York, October 1970.) \$11.75; 112s.

A SERIES of lectures given in Berkeley in the academic year 1968-69 formed the basis for this book. Its object is to give a coherent account of intrinsic pseudodistances on complex manifolds and their applications to holomorphic mappings. The publishers claim that graduate students and research mathematicians interested in differential geometry, complex analysis and related fields will find the book of great value. I do not dispute this claim but would emphasize that this is a book for specialists written by a specialist.