

the importance of normal modes and normal coordinates is clearly stressed. The propagation and reflexion of transverse and longitudinal waves are dealt with in separate chapters and propagation in a linear lattice is considered as an important example. The theory introduced in earlier chapters is applied in chapters six and seven to electrical transmission lines and electromagnetic wave propagation. Normal-mode solutions to the three-dimensional wave equation are discussed in chapter eight, which includes a good account of the Debye theory of specific heats. It is a pity that nothing is said about the limitations of the theory and the importance of the linear lattice problem as an introduction to lattice dynamics. There is a very good chapter on Fourier analysis and Fourier transforms and the techniques are applied to optical diffraction in the following chapter. The concluding chapter (chapter eleven) is too short to be a good introduction to non-linear vibration theory, but some of the effects described may stimulate the student's interest in the subject.

The arrangement of material is good and the writing is clear, but the diagrams are sometimes small and indistinct. There are a few errors and ambiguities; for instance, statements made in chapter four give the impression that it is sometimes possible to obtain monochromatic waves. These are minor criticisms, however, and the book is warmly recommended. There are numerous and interesting exercises at the end of each chapter.

W. G. B. BRITTON

ANTENNA PROBLEMS

Antennas in Inhomogeneous Media

By Janis Galejs. (International Series of Monographs in Electromagnetic Waves, Vol. 15.) Pp. xvi+294. (Pergamon Press: London, Oxford and New York, February 1969.) 140s; \$18.

THE aim of this book is to present an introduction to methods analysing antenna performance, particularly the calculation of antenna impedance, in homogeneous media. Most of the analysis is confined to dielectric media, but two of the twelve chapters are devoted to problems in compressible plasmas and magneto-ionic media. The scope of the problems treated is possibly best illustrated by some of the chapter headings—dielectric loading of small antennas, transmission line theory of buried insulated antennas, antennas between two media, cavity backed slot antennas, slot antennas with a stratified dielectric and linear antennas in a stratified dielectric.

The formulation of the various problems is presented very clearly and in most cases the problems are formulated as integral equations and solved by variational methods. The advantage of the variational solution over other methods of solution is also examined in several examples.

In the first section of most of the chapters, a brief account is presented of relevant problems treated by various authors and a separate bibliography is given at the end of each chapter. The general approach of the sections dealing with other work, however, is very much closer to that of a review article than that of a textbook, as hardly any account of the detail of alternative approaches is given. It seems to me that, in a book which presents different analytical approaches in particular, it would have been appropriate to present some detail of the methods used to solve problems for long antennas.

A large number of numerical results for particular problems is presented in graphical form and these should prove useful for design engineers. The inclusion of these results to such an extent and the general approach of the book tend to make it appear more like a handbook

and a source book for references to further work than a textbook for students. It does not seem particularly suitable as a textbook for either undergraduate or post-graduate students (though this possibility is mentioned on the dust cover), but it is, however, a useful reference book for both theoretical and experimental workers concerned with antenna problems. W. E. WILLIAMS

INTO THE ABYSS

Violent Universe

An Eye-witness Account of the Commotion in Astronomy 1968-69. By Nigel Calder. Pp. 160. (British Broadcasting Corporation: London, April 1969.) 25s.

NIGEL CALDER'S universe is a mind-bending experience of catastrophic explosions and crushing gravitational collapse in "the abyss that starts at the top of our hair". This is the book of the television programme prepared by the British Broadcasting Corporation and the Public Broadcast Laboratory of New York, screened last month in Britain and America, which Calder scripted. His book is for those who saw the programme and want to find out more, and for everybody who wants to know why new telescopes are sprouting and why astronomers are so excited about things called pulsars and quasars. He lucidly explains the answers astronomers and physicists are giving in the early months of this year. Subtitled "An eye-witness account of the commotion in astronomy 1968-69", *Violent Universe* pays only lip-service to the painstaking history of astronomy. It is about what is happening now, the Golden Age of astronomy, when the technology of space so laboriously built up in the fifties is at last being harvested. New regions of the spectrum not accessible from beneath the atmospheric blanket are being opened up for the first time, an experience which can never be repeated. If we make exceptions of hypothetical radiations such as gravitons, Calder says, we can now see "everything".

Liberal sprinkled with the most striking photographs of cosmic objects and telescopes, and best of all the astronomers who are setting the pace, the book takes as its theme the realization of the violence in the universe. The guts of *Violent Universe* are three chapters on exploding stars, exploding galaxies and the exploding universe. The fourth chapter questioning the implications astronomy has for the laws of physics shows that Calder has not missed the point. It is contemporary enough to mention the light flashes from the Crab pulsar, and the microwave emission from water molecules in gas and dust clouds, both 1969 discoveries. But radio pulses from pulsars first split the night more than a year ago, too old for Calder to tell the fascinating tale about the discovery again. In *Violent Universe* pulsars are lumped together with quasars, radio galaxies and the microwave relic of the beginning of the universe as discoveries everyone has heard about but which need explaining. At 25s and with umpteen new photographs and diagrams, *Violent Universe* deserves to be read, but now. The pace of discovery in the Golden Age of astronomy means Calder's book has built-in obsolescence.

EDWARD PHILLIPS

SALEABLE KNOWLEDGE

Scienza e Tecnica 69

Annuario della EST, Enciclopedia della Scienza e della Tecnica. Pp. 476. (Mondadori: Milano, 1968.) 14,000 lire

THE series in which this volume is the second to appear serves as an annual supplement to Mondadori's *Enciclopedia della Scienza e della Tecnica*. The object is to provide reviews of the previous year's major developments which