

*An Introduction to Electromagnetic Fields.* By R. L. Ferrari. Pp. xi+202. (Van Nostrand Reinhold: New York and London, September 1975.) Cloth £7; Paperback £3.95.

THIS is a slim volume which forms a welcome addition to the stock of available texts on electromagnetic fields. Intended for an undergraduate audience, it uses extensively familiar examples of electric and magnetic phenomena to arrive at a clear physical understanding of field theory. Comprehension is also considerably assisted by the liberal use of line drawings and illustrations. Although the mathematical level of this book is comparable to others intended for the same audience, Ferrari's distinguishes itself by not forcing the mathematical pace, but rather by making full use of mathematics as a manipulative tool to assist in physical reasoning. It is well written and eminently readable. As a basis for a course of lectures, it would be desirable to supplement it by a well-chosen reading list of other books and articles, enabling the student to delve more deeply into areas of interest to him, and to pursue in some depths individual topics. If its brevity can persuade a growing circle of engineering students to reach beyond a single volume to study a subject, rather than merely a book, it will have rendered great service.

**P. Silvester**

*Methods of Optimisation.* By G. R. Walsh. Pp. x+200. (Wiley-Interscience: London, September 1975.) Cloth £7.50; Paper £3.75.

THIS text essentially reviews a number of optimisation techniques, more from the algorithmic point of view than that of attempting a unified theoretical picture, but with enough theory given that the reader can establish a certain perspective. In this spirit it runs through Lagrangian methods, non-linear programming (Kuhn-Tucker conditions, quadratic programming), search and gradient methods of optimisation (these sections quite thorough), some special techniques of constrained numerical optimisation, and a study of some special problems in dynamic programming. In treating Lagrangian, Kuhn-Tucker and duality theory, the author regrettably never gets away from local versions of the results, and also misses their geometrical significance, which is so simplifying and illuminating. As a medium-level no-nonsense introduction, however, the book is quite attractive.

**P. Whittle**

*Animal Migration and Navigation.* By Philip Street. Pp. 144. (David and Charles: Newton Abbot, London and Vancouver, March 1976.) £4.95.

A POPULAR book such as this should ideally present a reasonably accurate account of the current state of knowledge in a readable and interesting style. Philip Street's book is certainly readable, but it is sadly inadequate as an account of modern work on migration and navigation. The author often digresses from the advertised subject matter—for example, to discuss infrared eyes in snakes, echolocation of prey in bats and communication in honeybees. Much of the rest of the book consists of a catalogue

## Books brief

of examples of long distance migrations in fish, marine mammals, amphibians, insects and birds. Although in his introduction, the author asserts that long distance navigation is one of the most fascinating aspects of animal behaviour, the book says very little about navigation (the term itself is never explained) and most of the work described is now out of date. For example, the chapter on bird migration and navigation discusses pigeon homing without mentioning any work more recent than about 1955, and the account of stellar orientation refers only to the early work of Sauer. One does not expect a popular book to be right up to date, but any such book should not be as outdated as this one.

**John Krebs**

*Introduction to Liquid Crystals.* Edited by E. B. Priestley, Peter J. Wojtowicz and Ping Sheng. Pp. xi+356. (Plenum: New York and London, 1975.) \$27.

THIS book derives from seminars given at RCA Laboratories in Princeton in 1973 and it is strongly polarised, theoretically and practically, towards the technology of using liquid crystals in electro-optical devices. The preface states this, but the book title is potentially misleading to those expecting an introduction to liquid crystals as a whole. The book is also mainly concerned with the physics of the relevant liquid crystals (nematic, cholesteric, smectic A); the chemical input is small, and, disappointingly,

no analysis of the relative chemical merits of available liquid crystal materials emerges. The book is, however, a valuable and timely text on the physics of liquid crystals in relation to their use in displays and one which will benefit all concerned with this technology.

Being multi-authored, the 18 chapters vary in quality; those on nematic order, continuum theory, electrohydrodynamic instabilities, Landau-de Gennes theory of phase transitions, and the packaging and addressing techniques for liquid crystal displays are very good. The end chapter on lyotropic liquid crystal systems and membranes points to a growing awareness of the possible technological scope for these types of system.

References to the 1974 literature are quite numerous. The presentation of the text, diagrams and equations is clear, and the index provided is adequate.

**G. W. Gray**

*The Seismics of Heterogeneous and Turbid Media.* By A. N. Nikolaev. Translated from Russian. Pp. iv+140. (Israel Program for Scientific Translations: Jerusalem; Wiley: Chichester, February 1976.) £8.25; \$16.50.

THIS is a study of the theory and observations of small-scale variations in the elastic parameters (the turbidity) of the Earth. Fundamental questions arising from the definition of "small-scale", and from the treatment of such variations as random, are unfortunately left largely unresolved; the underlying theory is based on the scalar wave equation and the reader is merely referred to the literature on the question of validity. Ultimately the author defines a "turbidity factor" which is to be integrated along a seismic ray to get the mean square variation in log amplitude—a formula quaintly described as "usually invalid" but "nevertheless . . . useful". Regrettably it is noted later on that its validity is not yet verified by experiment. Some model experiments, however, are described and the design of field experiments and analysis of certain observations are given in some detail. The net results are contained in plots of turbidity against depth for sections of one continental and three oceanic crusts, leaving the reader somewhat in the dark as to the related physical properties of the medium. The book is very hard to read as the result of a rather ham-fisted translation.

**J. A. Hudson**