these matters, which makes it all the more odd that no reference is made to Polanyi's *Personal Knowledge*, involving a passionate element as a precursor of true discovery. Nor is a place found for E. A. Milne's "logical pressure", which seems to act before a major breakthrough occurs, achieved by two or more minds simultaneously. Intellectual coercion at this level almost invariably issues in yet another aesthetic triumph.

Professor Lindsay's own expertise is acoustics, and he gives an illuminating account of the history of that subject, without, however, mentioning Lord Rayleigh's analysis of the Whispering Gallery at St Paul's Cathedral, which somewhat discomfited the then Astronomer Royal. Biographically, he provides a vivid word portrait of the Franciscan Pierre Gassendi (1592–1655), whom most of us know as an authority on gravitation. But he laboured for years to reconcile the atomism of Epicurus with the Catholic religion, rather as St Thomas Aquinas had struggled with Aristotle some four centuries earlier.

In sum, this book conveys the message that there is nothing to stop further wide conquests by physics, provided that they are not regarded as the whole of life and hope for mankind. F. I. G. RAWLINS

SYSTEMS AND DESIGN

Introductory Systems and Design

By W. H. Huggins and Doris R. Entwisle. (Blaisdell Books in the Pure and Applied Sciences.) Pp. xvi + 683. (Blaisdell: Waltham, Mass., 1968.) $14.50.

THE subject matter of the book is roughly what is usually taught as linear systems and has application in electric circuits, control systems, mechanical vibrations, and so on. Traditionally such systems have been modelled by sets of linear differential equations with constant coefficients, but Mrs Entwisle and Professor Huggins use flow-graphs throughout the book. The theory of graphs is not much taught to undergraduate engineers, but all the ideas on graphs that are necessary are developed in the book itself, which goes on to justify the authors' comments that flow-graphs are evolving into a new kind of notation that provides a concise, easily visualized description of system structure and also may be manipulated and solved just as conventional algebraic and functional symbols may be manipulated and solved.

This use of flow-graphs provides systems with a common basis and a common modelling method which is much more satisfactory than asking the mechanical engineer to turn his mechanical systems into LRC circuit models. The flow-graph methods, too, lead naturally into digital and analogue computer methods.

The book is excellently laid out and anyone wishing to teach linear systems in this way could hardly find a better text. Examples throughout the text form a programmed teaching system enabling the student to teach himself, aided only by occasional tutorial sessions. Some of the early, non-mathematical questions would raise difficulties but, at worst, would stimulate discussion with tutors.

The problem to the teacher is whether the subject should be taught in this way. The book is intended to be used early in training, but it has nearly 700 pages and would form so substantial a part of any first year, undergraduate course that some currently taught subject would have to be sacrificed. The physics of the systems is hardly considered, and at this stage of their training, when many students are limited in their ability to apply Newton's laws to real life situations, they are in danger of being taught yet another mathematical tool which they are incapable of applying. Reference to other texts would be necessary to teach the physics and most such texts would tend to lead more to operational calculus than to graphs. We are already producing engineers able to pass examinations in academically respectable mathematics but unable to cope with simple mechanical problems when they enter industry.

Probably the best use for the book is not among the beginning engineering students to whom it is addressed but among those already familiar with the physics of engineering problems who are turning their attention to modelling techniques as such. D. J. LEECH

HOW TO LIKE MATHS

A Guide to Mathematics for the Intelligent Non-mathematician

By Edmund C. Berkeley. Pp. 352. (Souvenir Press: London, May 1968.) 30*s*.

MOST adults dislike mathematics and most of those who do would probably agree that they know very little about the subject, nor of its place in science and society. It is commonly supposed that this situation largely results from deficient methods of teaching the subject, from the very earliest years at school. What can be done to relieve the situation? For the adult who has any residual interest in mathematics the book under review is meant as a guide. It is therefore not a book for the professional mathematician, unless he is interested in, or concerned with, the problem of explaining some of the simplest concepts and purposes of mathematics to those with very little background in the subject—for example, the university lecturer who is called upon to advise and deliver an introductory course of lectures to students of arts and sociology.

The contents list indicates that the author has been at pains to write a book which the "intelligent" man in the street can read. Many arithmetic examples are given in terms of everyday experiences. After a section on arithmetic, in which estimation is emphasized, there is an algebraic part dealing with variables, formulae, functions, graphs and the calculus; and a further part covering equations, angles, logic and statistics. There is a brief reference to computers and the "new mathematics"; and prediction, including some of the author's ideas about the future place of mathematics in society, is discussed.

The book should be useful for evening classes sponsored by departments of adult education. L. S. GODDARD

OBSERVERS' HANDBOOK

Astronomical Objects for Southern Telescopes

With an Addendum for Northern Observatories. A Handbook for Amateur Observers. By E. J. Hartung. Pp. x + 237 + 16 plates. (Cambridge University Press: London, 1968.) 50*s*.; $8.50.

DR HARTUNG'S aim in writing this book has been to extend the scope of Rev. T. W. Webb's classic *Celestial Objects for Common Telescopes*, to cater for the growing number of amateur astronomers who have access to telescopes in the 6–12 inch aperture range, and particularly for those in the southern hemisphere. From numerous objects he has studied himself, the author has selected just over 1,000 interesting galaxies, star clusters, nebulae, and the like. In addition, there are nearly 100 northern objects, inaccessible from Melbourne, where E. J. Hartung is emeritus professor of chemistry. Northern observers should not be unduly concerned by the southern hemisphere bias, as about 600 of the objects should be visible from Britain.

The selected objects are first listed in order of right ascension, with their coordinates and decennial variations and abbreviated descriptions. Detailed descriptions of the objects in each constellation follow in the main section of the book. This arrangement should prove convenient for use both in the armchair and at the telescope.