

techniques well established before 1940. But they are none the worse for that; indeed, it is one of the weaknesses of present-day astrophysics that insufficient effort is being put into basic measurements such as are dealt with in several of these articles; for example, stellar masses and radii from visual and eclipsing binaries, atomic abundances from stellar spectra.

Ch. Fehrenbach has given a full account of the classification of normal stellar spectra. P. C. Keenan has written briefly of stars with peculiar spectra, in a useful although not comprehensive article which contains material not readily obtainable elsewhere, for example, on high-velocity stars. P. Swings's contribution on molecular bands in stellar spectra deals with a complicated subject in which much remains to be done and in which there is a scarcity of other publications. Two useful contributions by K. Wurm on planetary nebulae are widely separated in the book, although intended to complement each other. I find it difficult to understand why they were not united. J. L. Greenstein has written an important original paper on white dwarf spectra which is essential reading for anyone working in this field.

P. van de Kamp's article on visual binaries is to be commended. It deals with a woefully neglected subject on which there is no modern text-book. There follow accounts of eclipsing binaries by S. Gaposchkin and of spectroscopic binaries by O. Struve and Su-Shu Huang. Eclipsing binaries are usually also spectroscopic binaries; both classes are very important sources of data for checking theoretical models, but the complications shown by their light curves and spectra have led to speculative ideas for which we have as yet no adequate check.

The article by D. Barbier is virtually a short text-book, giving a good systematic exposition of what may be called the conventional theory of stellar atmospheres and its very solid achievements.

The articles are in English, French or German. Each includes a brief general bibliography, in some cases with short comments. Adequate attention has been given to other references also. The index is in three parts: German with an English translation, English with a German translation, and French only for the three articles written in French.

As in every "Handbuch" of this character, the contributions vary a great deal in merit; the better ones are excellent. Present indications are that this is to be one of the cheaper volumes, although its price is more than £8.

R. O. REDMAN

ELECTRONICS IN BIOLOGY

Electronic Apparatus for Biological Research

By P. E. K. Donaldson. With contributions by Dr. J. W. L. Beament, F. W. Campbell, Dr. D. W. Kennard, Dr. R. D. Keynes, Dr. K. E. Machin and Dr. I. A. Silver. Pp. xii+718. (London: Butterworths Scientific Publications; New York: Academic Press, Inc., 1958.) 120s.; 20 dollars.

TO be able to use and interpret correctly the results obtained by using electronic apparatus, the biologist requires some understanding of electronics—a secondary subject which may have little direct appeal to him—and for this reason, a book explaining concisely the principles and functions of electronic apparatus used in biological research could

be of great value. The author of the book has had the needs of the biologist primarily in mind and he and his associate contributors, as members of the staff of the Department of Physiology at Cambridge, ought to be well qualified to look after his needs.

The book is divided into four parts: Part 1, principles of electronics (277 pp.); Part 2, practical use of components (48 pp.); Part 3, articles by specialist contributors on transducers, electrodes, indicators and measurement of temperature, light and radioactivity (249 pp.); Part 4, complete apparatus (127 pp.). The first part is of standard text-book form, with the exclusion of subjects considered to be of little interest to the biologist. The treatment is brief, and in some cases, unfortunately, it is insufficient to permit one to follow applications which are given later. The section on filters is too detailed for the reader wishing to be acquainted with, rather than fully to understand, the subject. On the other hand, the application of the valve as a switching element is covered very briefly, and no mention is made of the pulse response of networks with reference to differentiation and integration. The various sources of noise are analysed, this chapter being particularly useful in quoting orders of magnitude. The graphs here are excellent and self-explanatory but could have been more conveniently placed in relation to the text, as has been done elsewhere. In separating the information on batteries in Part 2 from the section dealing with stabilized power supplies, the opportunity to discuss their relative merits is missed.

There are nine chapters in Part 3 dealing with specific subjects, all of which should prove useful to anyone concerned with biological instrumentation. The theoretical treatment of light sources and detectors is well done, as also is the assay of radioactivity, but circuit applications would have improved both chapters. The articles on electrodes, transducers and the use of relay circuits are valuable contributions, but that on temperature measurement could have been improved by a recapitulation of the physical principles.

The important section of Part 4 dealing with apparatus is unfortunately condensed into only one-sixth of the book. Stimulus artefact is explained very well, as is also the subject of interference, and all readers interested in design would benefit from the author's design procedure. A chapter on transistors gives a useful introduction to the principles, but an assessment of their possible future in biological research would have helped to define their importance.

The book is well written, and the practical advice given shows that the author writes from experience. Its value could have been increased by linking the biological specifications to appropriate designs, an important feature of biological instrumentation. The failure to achieve this linkage makes the book of rather limited value to the engineer who is designing apparatus for biologists. However, in helping to satisfy the requirements of the physiologist, the aim of the author has been achieved, albeit at a high price. In the preface the author expresses doubts about the suitability of the title, and since the emphasis is so much on physiological applications, the reviewer is of the opinion that "Electronic Apparatus for Physiological Research" would convey more precisely the nature of the subject-matter.

W. J. PERKINS