price already makes it almost impossible for individual research workers, to whom they are well-nigh indispensable, to buy these abstracts.

The work involved might well be less if published papers always contained the data given in "Structure Reports". In the judgment of the editorial board, this particular range of information is thought to be sufficiently important to be inserted even if the abstractors must calculate some of it themselves in order to include it. In these circumstances the International Union of Crystallography might perhaps require all appropriate papers submitted to its own journal, *Acta Crystallographica*, to contain this information in the desired form, and possibly make general recommendations about the publication of papers on structural crystallography.

The amount of work sometimes undertaken by abstractors is indicated by the report on AsCuZn, where the abstractor's comment almost constitutes an original publication on the subject, while the collection of data on a particular topic, such as manganese oxides, is nearly as valuable as a review article; and since these later volumes contain cross-references to earlier ones, and occasionally, as for β -uranium, relevant comments from papers published as recently as 1954, the series does constitute an extremely valuable work of reference.

A general comparison of the two volumes illustrates the rapid development of crystallography since the end of the Second World War. Topics almost if not completely absent from Vol. 10 which have appeared or expanded by 1950 include crystal structure determination by means of electron and neutron diffraction, bond-length and bond-angle determinations by microwave methods, the preparation and elucidation of clathrate compounds of the rare gases, the use of statistical methods in the interpretation of X-ray diffraction data, and the determination of the absolute configuration of an optically active compound.

Mention of the use of etch figures in space-group determination comes as a welcome reminder of the many older physical and morphological techniques which crystallographers of the new generation, conscious of the importance of X-rays, often and perhaps unwisely neglect. On the other hand, crystallographic data for a number of proteins remind us that X-ray diffraction methods have already made a contribution to biochemistry, and now seem competent—at least in principle—to solve structural problems complex beyond all but the wildest dreams of even twenty years ago.

H. J. GRENVILLE-WELLS

ELECTRONICS IN THE PHYSIOLOGICAL LABORATORY

An Introduction to Electronics for Physiological Workers

By Dr. I. C. Whitfield. Pp. ix+236. (London: Macmillan and Co., Ltd.; New York: St. Martin's Press, Inc., 1953.) 18s. net.

THE rapid advances in electronic techniques during the Second World War have influenced research in physiology, so that most laboratories now have a quantity of electronic equipment. Many new research students in biology have to grapple with this equipment, about which they have no know-

ledge. This has inevitably induced the appearance of a number of books intended to make biologists familiar with the new techniques. Some have been merely collections of circuits; those which have attempted to teach electronics have generally begun simply but have quickly become technical in idiom and mathematical, so that the biologist loses contact and flounders on despairingly. This is another book introducing the biologist to electronics, but one in which the author manages throughout to keep at a steady level of treatment comprehensible to its intended reader. It is emphasized that this book is not intended for 'idle hour' reading; and although at the end the reader will not be able to design circuits, he should be able to understand the operation of equipment commonly used in electrophysiology.

The first chapters introduce the simple concepts of direct and alternating current supplies. Apart from a tendency to use alternative terms indiscriminately (for example, voltage and potential), the style is clear. Analogies to commonplace events can be misleading and a considerable number are included; but the consistently skilful treatment makes them informative and attractive. It is surprising that so much ground can be covered in two chapters and still provide an intelligent concept of such topics as load matching, time constant and resonance. The author continues with a brief consideration of thermionic emission, followed by careful descriptions of multi-electrode valves. Particular attention is given to their dynamic characteristics and to equivalent circuits for triodes; but the pentode is dismissed very briefly. A sketchy introduction to simple multi-stage amplifiers precedes a digression to gas-filled tubes and photocells. The various types of photocell are described and their limitations emphasized.

Power supplies and rectification are next considered, and the description of each type of rectifier circuit is very instructive. The practical problems of regulation and ripple attenuation are illustrated numerically; and although the method for estimating smoothing is unusual, it gives a picture without mathematical complication. Stabilization of power supplies comes in a later chapter: the dynamic characteristics of neon stabilizers are described and considerable attention paid to hard-valve stabilization.

The most interesting chapters to the biologist are those concerned with feedback, noise and biological amplifiers. The introduction to feedback is not very helpful, but the 'cathode follower' is explained well; the arithmetic is simple but demonstrates the effects on input and output impedances and hence the circuit applications. Sources of, and reduction of, noise and interference troubles are of practical value to most readers; but there is a surprising absence of information about elimination of stimulus artefacts which are troublesome to many electrophysiologists.

The book finishes with a description of display methods—the types of cathode-ray tubes, their operation and typical distortions. Trigger circuits, oscillators and time-bases are given extensive treatment. Most of the circuits in general use are mentioned, and in particular the flip-flop and the Miller time-base are very clearly defined.

This book does not attempt to attain a high level of technicality. It is intended to be simple and must be thus estimated. Criticism can be made of the lack of detail and of over-simplified explanation and mathematics; but the book keeps to its aim, and in that simplicity has its value.

B. C. ABBOTT