speak of autoreproduction of the integrated unit which is the cell, but it would be more correct not to speak of autoreproducing particles". The journey from the earlier view to the later not only exhibits a fascinating panorama of facts, but also is of the greatest intellectual interest and stimulus. Ephrussi's book should certainly be read and deeply pondered by all who are interested in the fundamental questions of biology. C. H. WADDINGTON

EXPERIMENTAL DESIGN IN BIOLOGY

The Design and Analysis of Experiment

By M. H. Quenouille. Pp. xiii+356. (London: Charles Griffin and Co., Ltd., 1953.) 36*s*. net.

THIS book, according to the author's preface, "is aimed at those wishing to acquire a working knowledge of experimental design and an understanding of the principles governing it". The subject is approached from the point of view of biological experimentation, and all the examples are drawn from this field. The book is designed for readers with a comparatively slight mathematical background, and the results are for the most part presented without proof. It is divided into four sections: elementary principles and designs; incomplete block designs; long-term policy; and experimental complications.

The reader is assumed to possess some knowledge of statistical method up to analysis of variance and regression, and also of the basic principles of experimentation; these topics are summed up in a somewhat indigestible first chapter. The remainder of the first two sections is devoted to the more familiar experimental designs, the account of the construction and analysis of each type of design being generally followed by a clearly worked example. These examples are drawn from a wide range of biological experiments—they are discussed in some detail and are well chosen to illustrate the suitability of the particular designs used.

In the third section, the planning and analysis of groups of experiments are discussed. In particular, detailed consideration is given to methods of design and analysis for estimating residual effects of treatments, and to the combination of results from experiments with differing precision. The topics of this section have been comparatively neglected, and many of the methods described should prove useful both to statisticians concerned with planning groups of experiments, and to the experimenters themselves, although the treatment requires more familiarity with statistical techniques than most experimenters may possess. This is perhaps also true of the fourth section, in which, among other things, are discussed a number of special designs which may be required in peculiar circumstances (for example, $p \times p$ factorial designs with missing diagonals), and the transformation of experimental observations. These sections are useful in collecting together the results of researches which have been carried out in various fields in recent years. There is an extensive and useful bibliography with many references to both theoretical and practical sources.

The author has, perhaps, tried to include too many topics in one volume. This results in the first half containing insufficient detail for those entirely new to experimental design, while in the latter half are included some sections (such as that on sequential analysis) in which the treatment is too brief to be of much value. It is difficult to recommend this book whole-heartedly to experimenters or to statisticians; however, it contains material which should be interesting and useful to both groups.

INTERPRETATION OF NUCLEAR DATA

Theoretical Nuclear Physics

By Prof. John M. Blatt and Prof. Victor F. Weisskopf. Pp. xiv+864. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1952.) 100*s*. net.

PROFS. BLATT AND WEISSKOPF have written an excellent account of the present interpretation of nuclear data, and their book will doubtless become a standard work. Nevertheless, it does not pretend to contain a complete nuclear theory: in addition to the inevitable complexity of the many-body problem we still do not know the elementary law of force between nuclear particles or how the forces between individual particles add up, and some physicists doubt whether the concept of a potential energy between nucleons is valid. In this situation it is a merit of the book that much of the discussion is in terms of general concepts rather than of special models. For example, in the two-body problem considerable use is made of the theory of 'effective range' which does not need to assume any specific shape for the potential between nucleons.

Three chapters, totalling about 250 pages, are devoted to nuclear reactions, mainly to the discussion of the dispersion formula. Some powerful theorems on angular distributions and correlations are included. Chapter 10, on the formal theory of nuclear reactions, also contains a clear account of the relationship between the principles of reciprocity and detailed balance for the transitions of a quantum mechanical system; a matter which has often been confused in the literature through undue reliance on simple perturbation theory. These chapters will be very useful to the experimental worker, though Chapter 8 makes heavy reading. Together with so much general theory it would have been helpful to include a simple explicit example of how analysis of angular distributions can lead to assignment of spins and parities.

An indication of the experimental progress of recent years is that Profs. Blatt and Weisskopf, unlike most previous authors, make no attempt to include a table of nuclear species and their elementary properties; this task now occupies a special publication of telephone directory dimensions. The shell model of low-lying nuclear states, which represents the consequent theoretical progress, is treated in the last chapter of the book. It is a pity that this model was not available to the authors when the earlier chapters on nuclear spectroscopy were written, as a few apparent inconsistencies with the last chapter might have been avoided.

The authors wisely avoid meson theory, so the text can be read by anyone who understands simple quantum mechanics; even the relativistic Dirac equation appears only in connexion with the theory of β-decay. K. J. LE COUTEUR

© 1953 Nature Publishing Group