

and its homologues, and the corresponding compounds in the series of hydronaphthalenes. Polynitro compounds appear in impressive array, and the 230 pages taken up by  $\alpha$ - and  $\beta$ -naphthylamines and their derivatives contain a wealth of attractively presented information about these important compounds. The other classes of compounds dealt with include the halogen derivatives of nitronaphthalenes and naphthylamines, polyaminonaphthalenes, nitro-amino compounds, and homologues of all these classes together with corresponding hydronaphthalene derivatives. There are sections dealing with hydrazine derivatives, diazo compounds, azo compounds (including large numbers of azo dyes), azoxy compounds, azides and triazenes.

Classes of compounds which have yet to be treated before Vol. 12B is complete include the naphthalene- and naphthylamine-sulphonic acids, the naphthols and aminonaphthols, and their sulphonic acids. Even then, the carboisocyclic condensed compounds will not have been fully covered, and this is the only section of the *Encyclopædia* of which parts have been issued so far. All this serves to illustrate the magnitude of the task which the publishers and editor have undertaken. Each new part which appears increases the usefulness of the work, but a speeding up is essential if the original purpose is to be achieved.

The volume under review fully maintains the high standard of the earlier issues. It is excellently produced, and the inclusion of references to biological properties, as well as to extensive physical data, is again to be welcomed, especially in regard to the considerable series of bases related to the hydronaphthalenes. Other pleasing features are the tables of data relating to various series of derivatives, such as molecular compounds, salts, acyl derivatives, urethanes, etc. These tables facilitate rapid reference and also give helpful pictures of the extent of the fields covered. The comments and suggestions of the editor directing attention to doubtful structures, inconsistencies in the literature, etc., again illustrate the skill and thoroughness with which the compilation and classification have been carried out. Another useful feature is the formulation (on p. 651) of twenty-four heterocyclic structures which are mentioned in the text as being obtainable from the naphthylamines or their derivatives.

The present volume is based on literature published up to the end of 1944, and there are a few references to publications of 1945-49. Like its predecessors, this volume will be found in all adequate chemical libraries, and it will be consulted frequently by those interested in the chemistry of naphthalene derivatives.

J. W. COOK

## STATISTICAL SAMPLING

Sampling Methods for Censuses and Surveys

By Dr. Frank Yates. Pp. xiv+318. (London: Charles Griffin and Co., Ltd., 1949.) 24s. net.

THE United Nations Sub-Commission on Statistical Sampling held its first session at Lake Success in September 1947 and asked on that occasion for a manual to be prepared to assist in the execution of the projected 1950 World Censuses of Agriculture and Population. This request has been handsomely met by the present publication under the authorship of Dr. Frank Yates, head of the Department of Statistics, Rothamsted Experimental Station, him-

self a member of the Sub-Commission. Dr. Yates took the opportunity to write a general book which is certainly a notable addition to the growing literature on the theory and practice of statistical methods. Quite enough is now known of the particular methods which are suitable for censuses and surveys of all sorts to make a sizable publication in itself, and the book is of particular value in that it makes available in one work of reference what could previously have been gleaned only by painstaking research over a large number of scattered publications.

Before the Second World War it could perhaps have been broadly said that the very lively development of the theory of statistics in relation to the biological sciences, and in particular to agriculture, did not have much in the way of impact on the economic and official statisticians who did much of the census and survey work. The study of sampling in agricultural research received an impetus from the newer experimental designs, due to Prof. R. A. Fisher, which exploited to the full the known methods of mathematical statistics. When for various reasons part only of the experimental produce could be gathered in, an adaptation of the technique produced satisfactory results by enabling the sampling errors to be isolated and measured. It is scarcely surprising, therefore, that this particular aspect of the modern refinements of the statistical method should have been singled out for very wide application, since the sampling method has come to be a potent tool in conducting censuses and surveys over a wide domain. In this way the mathematician and the official census officer have met.

It may surprise the casual reader to find that so much has to be thought about in relation to the problem, and that there are so many facets to this particular jewel. The book has eight chapters, of which the first three deal with the sample itself: first, the place of sampling in census work, in which opportunity is taken to describe the sampling process and to define sampling errors; then, the requirements of a good sample, with emphasis on bias and its avoidance; and lastly, the structure of various types of sample, cataloguing many methods. Two chapters follow on the problems of a survey, one dealing with those that arise in planning it, and the other concerned with its execution and analysis. The technical aspects increase in volume towards the end; two chapters deal with estimation, first of the 'population' values and then of the sampling error; and finally there is a full discussion of the question of 'efficiency' in its statistical meaning.

A book like this cannot in the nature of things be easy reading right through; but it is at any rate broadly non-mathematical, even where it deals with mathematical concepts. This does not mean that there are not plenty of formulæ, but they are not proved, and there is a profusion of arithmetical illustration. The reader who has a general acquaintance with the methods of statistics should be able to follow the author quite well. He will be tempted by the lucid accounts of the practical aspects of sampling procedure to continue reading, when he will find that in spite of himself he is learning quite a lot about the statistical techniques. It is not everyone who will want to master these thoroughly; but they are there for the expert, and it is a good idea that the planner, even if he is not himself the analyst, should see the sound character of the basic methods which are essential to his study.

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