

## SHORTER NOTICES

*An Introduction to the Theory of Statistics.* By G. Udney Yule.  
6th Edition. London, C. Griffin, 1922. xv + 415 pp.

A noteworthy development of recent years has been an increasing use in various fields—economics, education, public health work, biometry, etc.—of a varied assortment of methods which are called statistical. Those general habits of statisticians which have a merely empirical foundation are not of interest to mathematicians; but certain principles and methods have been brought within the sphere of mathematics by theoretical development and discussion. The book under review was originally prepared (published, 1910) to meet the demand of those who possess only a limited knowledge of mathematics for a systematic elementary exposition of such statistical methods, especially of those developed by Galton, Pearson, Yule, and their collaborators. It has proved so serviceable in carrying out this purpose that five editions after the first have been called for, and the book has won general recognition as in a sense *the* book on statistical method, excluding the technique of gathering data and of graphic presentation.

The general experience of statisticians with earlier editions has been that it has been very difficult for a beginner to get the point of view and that even a person with considerable practical statistical experience found it necessary to read with great care, in order to get at the meaning of the unfamiliar terms and forbidding notation. One difficulty appears to be that the significance of the general principle back of a method or formula is not discussed from the standpoint of the uninitiated. The chapter on dispersion, for instance, begins: "The simplest measure of the dispersion of a series is the actual range" without discussing why any measure of dispersion is desirable or useful. But those who are willing to read and reflect, to come back again and again to the book as their statistical knowledge increases, have found it a veritable gold mine of careful and useful statistical thought.

The book, aside from introduction and appendices, is divided into three parts, the theory of attributes (68 pages), the theory of variables (179 pages), and the theory of sampling (103 pages). The first part, which deals with the methods of determining consistence and association of characteristics of individuals which are discrete in nature, has not entered vitally into current statistical thought, and is of minor interest to mathematicians because it gives no opportunity for the use of continuous variables. The second part discusses frequency distributions, averages, measures of dispersion, and correlation, both single and multiple. Yule's careful and detailed treatment of these subjects has

been an important factor in the increasing use of more advanced statistical methods in many fields. His exposition of multiple correlation especially has been the recognized source of information on this topic. In the opinion of the reviewer, however, the treatment of this topic could be made more comprehensible by a full discussion of three-variable correlation before the general case is considered. More attention should be paid also to the limitations of a method which assumes that the functional relationship of  $n$  variables is linear. The third part discusses simple sampling, the binomial distribution and the normal curve, the normal correlation surface, and the derivation of probable errors. This part of the work is most hampered by the attempt to keep the difficulties within range of those with limited mathematical equipment.

The most noticeable omissions of the book as a whole are a full treatment of index numbers and the equations of skew frequency curves. The former topic has often been considered as important almost entirely for the economist, and the latter could hardly be discussed without more mathematics than the author assumes.

For the sixth edition, and for the fifth, published in 1919, no extensive revision of the text has been made. Aside from the corrections of minor errors, the changes consist of the addition of supplements and additional references. The supplements deal with I: *Direct deduction of the formulae for regressions* (by means of calculus rather than the  $\Delta$  method, as in the text). II: *The Poisson law of small chances*, and III: *Goodness of fit*, with discussion and tables for the Pearsonian function  $\chi$  used in testing goodness of fit of a theoretical to an actual distribution. These supplements appeal especially to the mathematical statistician, and the third one, which covers twenty pages, is of special value as a summary of several highly technical articles. The additional references strengthen the book in what was already one of its strongest points, as the lists of references are very full and well classified, and brief comments often indicate the general nature of the article.

In the opinion of the reviewer, mathematicians who desire to secure familiarity with the notions of statistics should surely include this book in their reading. It is true that many of the discussions could be much abbreviated by the use of higher mathematics, and that some points have to be passed over completely, but Mr. Yule has given a semi-mathematical version of the argument at many points where some other textbooks merely say "the formula is" so and so or "it may be shown that . . .". Until we have a series of statistical textbooks which cover statistical method from all the possible different points of view, Yule will continue to be an essential part of every statistician's library.

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