SHORTER NOTICES

Vorlesungen über die Grundzüge der mathematischen Statistik. 2d edition. By C. V. L. Charlier. Lund, Verlag Scientia. 125 pp.

During the past two decades there has been a considerable advancement in the mathematics of statistics by workers in the countries of northern Europe. The results of their activity have been rather slow in coming to the attention of Americans because most of the work has been published in one of the Scandinavian languages or at least in Scandinavian journals. Of these workers, Charlier is one of the best known. In his published memoirs he goes back to pre-Gaussian times and builds up a logical science of statistics from a few principles from Laplace, making much use of the theory of the superposition of small errors.

The little book under review sums up the results of his work. It is not a treatise or a text-book but simply a book of directions for applying his methods to statistical data with many problems worked out in detail. For mathematical details the reader is referred to the original articles. The book begins with the usual discussion of the arithmetic mean, measures of dispersion and probable error, using Charlier's own self-checking plan of computation. Then follows a very clear discussion, well illustrated by examples, of the series of Bernoulli, Poisson and Lexis leading to the notions of "übernormal" and "unternormal" dispersion of Lexis and to Charlier's "coefficient of disturbancy," a measure of the effect of causes which cannot be explained by the theory of probability.

To American readers the most interesting part of the book is that dealing with Charlier's two representations of frequency curves. Type I curves are represented by

$$f(x) = \beta_0\varphi_0(x) + \beta_3\varphi_0'''(x) + \beta_4\varphi_0^{\text{IV}}(x) + \cdots,$$

where

$$\varphi_0(x) = \frac{1}{\sqrt{2\pi}}e^{-x^2/2}$$

and the prime marks denote differentiation. Type II curves are given by

$$F(x) = N[\psi(x) + \gamma_2\Delta^2\psi + \gamma_3\Delta^3\psi + \cdots],$$

where

$$\psi(x) = \frac{e^{-\lambda}\lambda^x}{x!} \qquad \text{and} \qquad \Delta\psi = \psi(x) - \psi(x-1).$$

In the text Charlier outlines plans of the numerical work for calculating the constants β, λ, and γ, and carries out the computations for two frequency distributions. One of the most interesting questions in mathematical statistical circles at present is the analytical representation of frequency distributions. In this country and in England Pearson's methods have long held sway, and now comes a rival, Charlier. It seems logical to think that Charlier's methods should give a better fit than the more empirical and pragmatic methods of Pearson, but actual tests do not always bear this out. Experience alone will tell us which method is best in actual service.

The last three chapters in the book are devoted to the theory of corre-