

SHORTER NOTICES

An Elementary Treatise on Frequency Curves and their Application in the Analysis of Death Curves and Life Tables. By Arne Fisher. Translated from the Danish by E. A. Vigfusson. With an introduction by Raymond Pearl. American Edition. New York, Macmillan, 1922. xv + 244 pp.

This work is divided into two chapters. The first, "An Introduction to the Theory of Frequency Curves", is practically the same as Chapters XIV–XVIII of *Mathematical Theory of Probabilities*, by the same author. This chapter takes up the treatment of frequency curves associated with the names of Laplace, Poisson, Charlier, Thiele and Gram, and serves as the theoretical introduction to the second chapter entitled "The Human Death Curve." In this chapter the author presents a method of constructing mortality curves from death lists by age and cause without knowledge of the number exposed to risk. In the United States this method has been received with various degrees of enthusiasm—from that of the extremely eulogistic introduction to the book down to utter condemnation by several well known actuaries whose views carry much weight. It is an axiom in actuarial science, often repeated and emphasized, that a mortality curve cannot be constructed from death lists alone. Some criticisms seem to imply that Fisher had done just this thing and a man of straw is created and warmly pelted. But he does not claim to get a mortality curve from death lists alone. It is true that he does not have the exposed to risk, but he has a substitute in something biologists and physicians have told him about the frequency distribution of deaths according to age from various classes of causes.

Dispensing with actuarial technicalities, the problem in the language of the theory of probabilities is as follows:

A bag contains a large number of black and white balls. Each ball has a number stamped upon it which may be any integer from 0 to 105. The black balls are also stamped with one of the letters a, b, c, d, e, f, g, h . Balls are drawn from the bag one at a time and replaced. A record is kept of the numbers and letters on the black balls, but no attention is paid to the numbers on the white balls. Later it is found desirable to construct a table of d_x/l_x , where d_x is the number of black balls, marked with the number x , and l_x is the total number of observed balls so marked. It is of course impossible to make such a table from the black ball records. But there is available information about the distribution of the balls in other bags

or of balls in the pile from which bags are filled with justifies one in making an assumption as to the laws of the frequencies in the bag in question. A table constructed upon this hypothesis may be tested by experience and found correct. The whole matter depends upon the validity of the assumption.

The method of the book assumes a given list of deaths according to sex, age and cause, and to this is added the biological hypothesis:

"The frequency distribution of deaths according to age from certain groups of causes of death among the survivors in a mortality table tend to cluster around certain ages in such a manner that the frequency distribution can be represented by either a Laplacean-Charlier or a Poisson-Charlier frequency curve."

With this goes a classification of causes of death according to some seven or eight groups. The mortality curve is considered as a compound curve made up from component frequency curves corresponding to the groups. The characteristics of these components are supposed known a priori.

Upon this foundation, Fisher is able to build up a mortality table. In the book he goes through the actual calculation of several tables that turn out to be satisfactory. In the mind of the reviewer the book marks a step forward in actuarial science in that it points out a method of attack on problems connected with that great mass of data in which the exposed to risk is difficult or impossible to find. There is no claim made that the method supersedes the old conventional method depending upon the number exposed to risk and losses among such exposures. However, it is possible that further experience with the method by the author and by others will show limitations in its applications. Before it is accepted by the conservative actuary, he will require much more evidence in the nature of satisfactory tables computed by many actuaries.

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Analytical Mechanics. Second edition. By Edwin H. Barton. London, Longmans, Green and Company, 1924. 593 pp.

The first edition of this book was published in 1911. The new material in the second edition consists mainly of alternative proofs and more examples. About three hundred examples chosen from London examination questions set in the years 1911-23 have been added, bringing the total number to more than a thousand. To these a complete set of answers is now given separately at the end.

The text, divided into six parts, covers the field of mechanics quite thoroughly. Besides a preliminary survey of the scope of mechanics, the introductory part contains a collection of formulas from algebra, geometry, trigonometry, and the calculus. The second part gives a