

For 80 read 81. Page 105, line 3 from bottom: Omit  $x$  and the two commas following. Page 107, line 4: For V read VI and for VI read VII. Page 108, line 1: For VII read VIII. Page 121, line 4 from bottom: For  $\frac{y'_i}{\sigma_y}$  read  $\frac{y_i}{\sigma_y}$ ; i. e., delete the prime. Page 126, formula (9): For  $\frac{2}{x}$  read  $\sigma_x^2$ . Page 142: The last line should begin with  $\beta_{12.34}$ . Page 149, line 2: For (13) read (19). Page 187, formula (8): Insert  $\Sigma$  before parenthesis in the denominator.

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## FOUR BOOKS ON PROBABILITIES

*Éléments de la Théorie des Probabilités.* Third edition. By Emile Borel. Paris, J. Hermann, 1924. vii + 266 pp.

*Probabilités, Erreurs.* By Emile Borel and Robert Deltheil. Paris, Librairie Armand Colin, 1923. vi + 197 pp.

*Wahrscheinlichkeitsrechnung.* By Otto Knopf. Sammlung Göschen. Berlin, Walter de Gruyter and Co., 1923. Two volumes, 112 and 112 pp.

*Grundlagen der Wahrscheinlichkeitsrechnung und der Theorie der Beobachtungsfehler.* By F. M. Urban. Leipzig, B. G. Teubner, 1923. vi + 274 pp.

The present time is a time of decided activity in the publication of books on the theory of probability. While two or three works of considerable originality and merit have appeared, the majority are merely text-book rearrangements of the traditional course in probability adapted to various classes of readers.

The first of the books in this review is the third edition of Borel's *Théorie des Probabilités*. This well known work has been before the public since 1909. The chief change in this third edition is the addition of four notes at the end of the book on applications to radio-activity, on a problem leading to a Stieltjes integral, on games of chance in which the ability of the players is taken into consideration, and on what Borel calls a differential method in statistics.

The book by Borel and Deltheil is number 34 of the series of little books known as the "Collection Armand Colin". The purpose of the series is to present to the educated person readable monographs on special topics in philosophy, history, science, mathematics, literature and other branches of learning. As might be expected, the book covers much the same ground as the more extended work of Borel.

It emphasizes the applications to statistics, biology and physics. The last chapter is on the method of least squares and the theory of errors from the Gaussian standpoint. A number of interesting exercises and problems, including some of the well known problems in the theory of probability, are given at the ends of the chapters. The work is a very readable little book for the non-specialist, although the reader must have some knowledge of calculus.

The third work is one of the series of books well known as the SAMMLUNG GÖSCHEN. Two volumes of the series are used. This work covers the traditional topics in the orthodox formal manner of many English and German text books. It seems to replace the one volume work on probability by Hack in the SAMMLUNG GÖSCHEN.

The work by Urban is an attempt to present to students of the sciences the fundamentals of the theory of probability. The book has rather a curious history. It was originally written in English while the author was connected with the faculty of the University of Pennsylvania, and the intention was to publish in the United States a rather complete treatise on the theory of probability. The war intervened and the author returned to Germany and published in German this abridged work emphasizing the underlying principles and the theory of errors. This was a distinct loss to the English reading student. It still seems easier to find a publisher in Germany than in the United States. The reviewer feels that the more complete book would have been much more acceptable than the part finally published. The book is not like a formal text book on the theory of probability. It is the aim of the author to make clear the fundamental notions underlying his subject, and in doing so he uses the "wordy" method, using the term in a good sense. He is not always successful in this clearing process, especially when one considers the layreader, but he does thoroughly discuss the debatable topics in probability from all points of view. For example, he devotes many pages to the word *Wahrscheinlichkeit*, and reviews the definitions, views, objections and remarks of various writers on this fundamental word. It is an interesting and valuable discussion but many objections could be raised to the author's insistence upon his Mengenlehre definition of probability, especially when the non-technical student is considered. The chapter on the theory of errors is unique. It is not the type of chapter which tells the student how to handle errors of observation but one which discusses the hypotheses and notions at the foundation of the theory in an informal, open-minded manner.

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