these points. It will be disappointing to many, as it is to the reviewer, that Fowler has not included a critical discussion of the fundamental postulates of statistical mechanics, especially since the whole subject is approached from a quantum mechanical viewpoint. To be sure, an exposition of the work of von Neumann in this connection would be "somewhat lengthy and would form a portion necessarily out of tune with the rest of this monograph," but the more elementary treatments instigated by Jordan and Pauli would seem to be well worthy of inclusion.

The book itself is a veritable mine of information, the theoretical treatment and the discussion of experimental data being well mixed throughout the work. The author has also ventured somewhat outside the field of statistical mechanics to present the theory of those non-equilibrium flow problems in which many of the results of equilibrium theory can be applied as a good approximation.

In view of the tremendous scope of the book it seems appropriate to outline the contents. After an introductory chapter stating the fundamental assumptions of the theory, the next three chapters are concerned with the equilibria of perfect gases, crystals, and any general system obeying classical laws. Chapter V discusses problems of dissociation and evaporation and Chapter VI treats the connections between statistical mechanics and thermodynamics in detail, merging into the material of the next chapter which presents the Nernst heat theorem and chemical constants. The three following chapters extend the theory of imperfect gases, equations of state, and a survey of intermolecular forces as derived from imperfect gas equations and allied crystal data. Chapter XI covers the field of thermionics and the simpler aspects of conduction of electricity and allied effects in metals, and this is followed by a chapter on magnetic and dielectric properties of matter in bulk, including ferromagnetism. Chapter XIII attempts to develop the theory of liquids. The next three chapters contain the theory as applied to the high temperatures inside and outside the stars, whereas the next three contain detailed studies of the laws to which the mechanisms of interactions must conform in order to preserve the equilibrium laws. The next chapter is devoted to fluctuation phenomena, and the final chapter summarizes some recent work, principally along the lines of cooperative phenomena.

The book has been produced in the superlative style of the University Press and stands as an invaluable contribution to the literature on statistical mechanics.

N. H. FRANK

Généralités sur les Probabilités. Variables Aléatoires. By M. Fréchet. Paris Gauthier Villars, 1937. xvi+308 pp.

This book belongs to the series bearing the general title *Traité du calcul des probabilités et de ses applications*, edited by E. Borel. It is the first book of Fascicule III of Tome I of this series. Tome I is entitled: *Les principes de la théorie des probabilités*, Fascicule III: *Recherches théoriques modernes sur la théorie des probabilités.* This Fascicule III is divided into two books. The first book, which we have here under consideration, is mainly devoted to the "aleatory variables," the second book will deal with the method of arbitrary functions and of the chain theories in probability. We are promised, besides, a treatment of several related investigations in Fascicule III of Tome IV, entitled *Complèments divers*. We thus have the possibility of an extensive and expert discussion of these theoretical aspects of the theory of probability, which have been the object of much recent research. This gives the book a unique and important position.

Fréchet's monograph is divided into two parts. The first covers "généralités sur les probabilités" and is introductory. It contains mainly certain rigorously established theorems on total and compound probabilities for the case of dependent and independent events, finite or infinite in number. The second part, on *Les variables alèatoires*, forms the bulk of the book and is, broadly speaking, a rigorous theory of moments. The starting point is the monotone function $C(x)$, $0 \leqq C(x) \leqq 1$, representing the probability that a numerical event X be less than x. The different moments can be expressed as Stieltjes integrals with the aid of this function $C(x)$; for example, the mean as

$$\overline{X} = \int_{-\infty}^{+\infty} x \, dC(x).$$

Various theorems on moments of independent and dependent aleatory variables receive a rigorous discussion. A chapter is devoted to the inequality of Bienaymé and its generalizations, which gives the author the opportunity to point to the importance of Bienaymé's work of 1853. More than a hundred pages deal with the different ways in which convergence of series of aleatory variables can be understood. A part of this has already appeared in vol. 8 of *Metron*, 1930, by the same author. The reader who has not been able to follow recent work in the different periodicals will find, especially in this part of the book, a veritable treasure of investigations. A supplement deals with monotonic functions, and a note with a new property of Laplace's second law. The book ends with a note by Paul Lévy on the distance of two aleatory variables and the distance of two probability laws.

The type of work discussed and moulded into a unity in this book is characterized by the names of Borel, Cantelli, Copeland, Cramer, Fréchet, Khintchine, Kolmogoroff, P. Lévy, Slutsky, and others. Their approach dates back, essentially, to Borel's paper of 1909 in the Rendiconti del Circolo Matematico di Palermo on the "probabilités dénombrables." This paper placed the mathematical theory of probability definitely in the general framework of Lebesgue's theory of measure, and made it possible to use the results of modern integration theory for the general study of moments and of infinite series of aleatory variables. Fréchet's book is the first of its kind to give us a good survey of the field. But also the more practical statistician, who does not want abstract information so much as a good treatment of the deeper lying theorems of ordinary statistics, such as Tschebychef's theorem, the law of large numbers, the laws of moments for dependent variables, the correlation coefficient, will find ample information in this book, the more so as the only modern books of a similar character in this particular respect, those of S. Bernstein and R. von Mises, are in Russian and German respectively.

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