

The Probabilistic Revolution
Volume 2: Ideas in the Sciences

edited by Lorenz Krüger, Gerd Gigerenzer, and Mary S. Morgan

A Bradford Book
The MIT Press
Cambridge, Massachusetts
London, England

Contents of Volume 2

Contents of Volume 1	xi
List of Contributors to Volumes 1 and 2	xv
Preface to Volumes 1 and 2 Lorenz Krüger	xvii
Introduction to Volume 2	1
John Beatty, Nancy Cartwright, William Coleman, Gerd Gigerenzer, and Mary S. Morgan	
I PSYCHOLOGY	
The Probabilistic Revolution in Psychology—an Overview Gerd Gigerenzer	7
1 Probabilistic Thinking and the Fight against Subjectivity Gerd Gigerenzer	11
Probabilistic ideas were used in experimental psychology to serve the traditional ideals of classical natural science: determinism and objectivity. In particular, inferential statistics provided the illusion of an objective, mechanized form of inductive inference. This illusion was created by the neglect of controversies and alternative theories and by institutionalization.	
2 Statistical Method and the Historical Development of Research Practice in American Psychology Kurt Danziger	35
Rapid adoption of analysis of variance techniques by psychologists depended on a prior shift of research practice promoted by the requirements of applied psychology, from individuals to group data. The treatment group concept was introduced in order to permit causal inferences from group data.	
3 Survival of the Fittest Probabilist: Brunswik, Thurstone, and the Two Disciplines of Psychology Gerd Gigerenzer	49
Egon Brunswik made the uncertainty of perceptual cues the basis of a Darwinian view of perception, and considered the brain as an intuitive statistician. However, his ideas deviated so far from those of his contemporaries with respect to the questions “What to look for?” and “How to proceed?” that they were misunderstood and rejected.	

- 4 A Perspective for Viewing the Integration of Probability Theory into Psychology** 73
 David J. Murray
 Probabilistic models in psychology arose in reaction to dissatisfaction with the deterministic models that had been in vogue since Herbart and Fechner. The history of this reaction is traced, and its contemporary scenario is addressed in a discussion of the concept of "memory strength."
- II SOCIOLOGY**
- 5 The Two Empirical Roots of Social Theory and the Probability Revolution** 103
 Anthony Oberschall
 Nineteenth-century social theory dealt with the conditions for social order and the origin and change of institutions. Two bodies of data informed theorists: ethnographic accounts of non-European peoples and contemporary moral statistics. A synthesis within a single theory was attempted by Durkheim. He and his circle became absorbed with the study of collective representations. Because of their evolutionary approach, they came to neglect moral statistics, contemporary Europe, and quantitative techniques.
- III ECONOMICS**
- The Probabilistic Revolution in Economics—an Overview** 135
 Mary S. Morgan
- 6 Why Was There No Probabilistic Revolution in Economic Thought?** 139
 Claude Ménard
 Mathematical economics developed in the nineteenth century under the influence of eighteenth-century mechanics. Under this influence, economists have ignored probability in model building, and so theoretical economics has been, and largely still is, couched in deterministic terms.
- 7 The Rise of Macroeconomic Calculations in Economic Statistics** 147
 Robert A. Horváth
 The theoretical and practical development of statistical measurements of the economy and of index numbers of value—both on deterministic and probabilistic bases—took place between the 1860s and the 1930s. These developments were a precondition for the statistical verification of economic theories.

- 8 Statistics without Probability and Haavelmo's Revolution in Econometrics** 171
 Mary S. Morgan
 Statistical methods were used in economics from the early twentieth century, but probability theory was thought inapplicable to economic data. This belief was overturned in the 1940s and probability theory became an essential element in the measurement and testing of economic laws.
- IV PHYSIOLOGY**
- 9 Experimental Physiology and Statistical Inference: The Therapeutic Trial in Nineteenth-Century Germany** 201
 William Coleman
 The nineteenth-century physiologist demanded a science both experimental and deterministic. The efforts of the mathematician Gustav Radicke to solve the formidable problems of statistical inference were largely ignored; statistical tools began to assist physiology only after 1900.
- V EVOLUTIONARY BIOLOGY**
- The Probabilistic Revolution in Evolutionary Biology—
 an Overview** 229
 John Beatty
- 10 Natural Selection as a Causal, Empirical, and Probabilistic Theory** 233
 M. J. S. Hodge
 In Darwin's theory, natural selection is not a probabilistic law or principle, but a probabilistic causal process, definable as the nonfortuitous differential reproduction of hereditary variants. As an empirical theory, it asserts the existence of this process and its competence and responsibility for evolution.
- 11 Dobzhansky and Drift: Facts, Values, and Chance in Evolutionary Biology** 271
 John Beatty
 During the 1940s, evolutionists deemphasized the previously significant role of stochastic evolutionary changes. The case of Theodosius Dobzhansky suggests that this shift was due only in part to the empirical grounds.

- 12 Random Genetic Drift, R. A. Fisher, and the Oxford School of Ecological Genetics** 313
 John R. G. Turner
 Fisher and the Oxford School of evolutionists disputed the role of stochastic processes in evolution, not because of any fundamental opposition to probabilistic thinking—Fisher was indeed a leading statistician—but because they did not accept that order and adaptation could be generated by disorder and chaos.
- 13 On the Prior Probability of the Existence of Life** 355
 Bernd-Olaf Küppers
 The problem of the origin of life is analyzed from a probabilistic point of view. Three models are discussed: (1) the hypothesis of singular chance, (2) the vitalistic hypothesis, and (3) the molecular-Darwinian approach. It is shown that only the Darwinian approach yields an explanation that meets epistemological standards.
- VI PHYSICS**
- The Probabilistic Revolution in Physics—an Overview** 373
 Lorenz Krüger
- 14 Probabilistic Physics the Classical Way** 379
 Jan von Plato
 The fascinating development of the time average interpretation of probability is traced. It led to a probabilistic physics through classical theory. Emphasis is on foundational questions, including Einstein's views on probability, von Mises's physical statistics, and the probabilistic character of ergodic theory.
- 15 Max Born and the Reality of Quantum Probabilities** 409
 Nancy Cartwright
 Max Born is often said to have held a naive "ignorance interpretation" of the probabilities he introduced into quantum mechanics. But in fact on Born's view these probabilities are as real as particles themselves, for the probabilities are the objects in nature on which the quantum laws operate.

16 Philosophical Problems of Quantum Theory: The Response of American Physicists	417
Nancy Cartwright	
In Europe the physicists who originated and developed the quantum theory were perplexed and troubled by it. But in the United States few of the young physicists who took up the theory had serious philosophical anxieties about it. Their attitude was entirely rational given the operationalist-oriented philosophy of science that most of them shared.	
Name Index for Volumes 1 and 2	437
Subject Index for Volumes 1 and 2	447