

“...There are books that can change your life, and this is one of them.”

– Lorraine Daston, *Isis*

This is a new edition of a classic work that began modern studies of chance determinism, and at the same time was the first work in English that used Michel Foucault's methods. A dazzling new introduction by the author explains the book's relation to Foucault's archaeology, and the force of his own radical theses about probability in light of recent research.

During the twentieth century, probabilities invaded every kind of thought and action: sport, health, drugs, travel, sex, and sleep, not to mention sociology, politics, and physics. How did the world become a world of probabilities? There was no real concept of probability before mid-seventeenth century. Why not? This book analyzes events in politics, theology and economics that made possible the emergence of a new family of ideas about induction and statistical inference. It argues that the transformations that made it possible for these concepts to emerge have constrained all subsequent developments, and that they determine the space within which philosophical arguments about probability and induction are still conducted.

Ian Hacking is Professor Emeritus at the Collège de France (Chair of philosophy and history of scientific concepts) and University Professor Emeritus at the University of Toronto. His many books include *Representing and Intervening*, *Probability and Inductive Logic*, *Rewriting the Soul*, *Mad Travelers*, *Historical Ontology*, and *The Social Construction of What?* The Modern Library included Hacking's *The Taming of Chance* – a sequel to *Emergence* – in its list of 100 best non-fiction works published in the twentieth century.

Ian Hacking won the 2009 Holberg International Prize for
‘outstanding scholarly work in the fields of the arts and humanities,
social sciences, law and theology’.

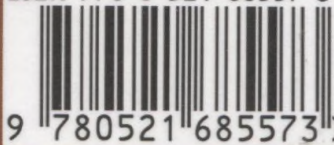
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91.5 x 128 cm.

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1 An absent family of ideas 1

Although dicing is one of the oldest of human pastimes, there is no known mathematics of randomness until the Renaissance. None of the explanations of this fact is compelling.

2 Duality 11

Probability, as we now conceive it, came into being about 1660. It was essentially dual, on the one hand having to do with degrees of belief, on the other, with devices tending to produce stable long-run frequencies.

3 Opinion 18

In the Renaissance, what was then called 'probability' was an attribute of opinion, in contrast to knowledge, which could only be obtained by demonstration. A probable opinion was not one supported by evidence, but one which was approved by some authority, or by the testimony of respected judges.

4 Evidence 31

Until the end of the Renaissance, one of our concepts of evidence was lacking: that by which one thing can indicate, contingently, the state of something else. Demonstration, versimilitude and testimony were all familiar concepts, but not this further idea of the inductive evidence of things,

5 Signs 39

Probability is a child of the low sciences, such as alchemy or medicine, which had to deal in opinion, whereas the high sciences, such as astronomy or mechanics, aimed at demonstrable knowledge. A chief concept of the low sciences was, that of the sign, here described in some detail. Observation of signs was conceived of as reading testimony. Signs were more or less reliable. Thus on the one hand a sign made an opinion probable (in the old sense of Chapter 3) because it was furnished by the best testimony of all. On the other hand, signs could be assessed by the frequency with which they spoke truly. At the end of the Renaissance, the sign was transformed into the concept of evidence described in Chapter 4. This new kind of evidence conferred

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probability on propositions, namely made them worthy of approval. But it did so in virtue of the frequency with which it made correct predictions. This transformation from sign into evidence is the key to the emergence of a concept of probability that is dual in the sense of Chapter 2.

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Some problems solved by Pascal set probability rolling. From here until Chapter 17 Leibniz is used as a witness to the early days of probability theory.
- 8 The great decision (1658?) 63
'Pascal's wager' for acting as if one believed in God is the first well-understood contribution to decision theory.
- 9 The art of thinking (1662) 73
Something actually called 'probability' is first measured in the Port Royal *Logic*, which is also one of the first works to distinguish evidence, in the sense of Chapter 4, from testimony. The new awareness of probability, evidence and conventional (as opposed to natural) sign, is illustrated by work of Wilkins, first in 1640, before the emergence of probability, and then in 1668, after the emergence.
- 10 Probability and the law (1665) 85
While young and ignorant of the Paris developments Leibniz proposed to measure degrees of proof and right in law on a scale between 0 and 1, subject to a crude calculation of what he called 'probability'.
- 11 Expectation (1657) 92
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Hudde and de Witt used Dutch annuity records to infer a mortality curve on which to work out the fair price for an annuity.

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14 Equipossibility (1678) 122

The definition of probability as a ratio among 'equally possible cases' originates with Leibniz. The definition, unintelligible to us, was natural at the time, for possibility was either *de re* (about things) or *de dicto* (about propositions). Probability was likewise either about things, in the frequency sense, or about propositions, in the epistemic sense. Thus the duality of probability was preserved by the duality of possibility.

15 Inductive logic 134

Leibniz anticipated Carnap's notion of inductive logic. He could do so because of the central place occupied by the concept of possibility in his scheme of metaphysics. Within that scheme, a global system of inductive logic makes more sense than Carnap's does in our modern metaphysics.

16 The art of conjecturing (1692[?] published 1713) 143

The emergence of probability is completed with Jacques Bernoulli's book, which both undertakes a self-conscious analysis of the concept of probability, and proves the first limit theorem.

17 The first limit theorem 154

The possible interpretations of Bernoulli's theorem are described.

18 Design 166

The English conception of probability in the early eighteenth century, guided by the Newtonian philosophy espoused by members of the Royal Society, interprets the stability of stochastic processes proven by the limit theorems as evidence of divine design.

19 Induction (1737) 176

Hume's sceptical problem of induction could not have arisen much before 1660, for there was no concept of inductive evidence in terms of which to raise it. Why did it have to wait until 1737? So long as it was still believed that demonstrative knowledge was possible, a knowledge in which causes were proved from first principles, then Hume's argument could always be stopped. It was necessary that the distinction between opinion and knowledge should become a matter of degree. That means that high and low science had to collapse into one another. This had been an ongoing process throughout the seventeenth century. It was formalized by Berkeley who said that all causes were merely signs. Causes had been the prerogative of high science, and signs the tool of the low. Berkeley identified them and Hume thereby became possible.

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