David Hand: The Improbability Principle, Scientific American and Farrar, Strauss and Giroux in USA; Bantam in UK, 2014. ISBN:978-0593072813, GBP 20, 269 pp.

REVIEWED BY GABRIELLE KELLY

The longer title of this book is The Improbability Principle : Why incredibly unlikely things keep happening. Hand's thesis is that extremely improbable events are commonplace.

The introductory chapters discuss phenomena such as superstitions, prophecies, gods and miracles, parapsychology and the paranormal, psychic powers, synchronicity and morphic resonance. Hand explains these ideas are all inventions designed to explain surprising phenomena and all that is really needed to explain them are the basic laws of probability.

Hand defines five strands (or "Laws") contributing to the Improbability Principle: the law of inevitability, the law of truly large numbers, the law of selection, the law of the probability lever and the law of near enough. Putting the laws together leads to 'extraordinary' events: financial crashes, winning the lottery twice, being struck by lightning seven times etc.

A chapter is devoted to each of the above laws, each of which is derived from and motivated by examples from everyday life. My favourite is in regard to the distribution of market fluctuations. If the distribution is normal a 5-sigma event has probability 1 in 3.5 million. The same probability assuming a Cauchy distribution is 1 in 16. This might explain why financial crashes happen all the time and comes under Hand's law of the probability lever. Most examples are nontrivial and require a subtlety of thought, some touching on principles in physics and finance.

While the above chapters are very entertaining, the penultimate two chapters explore frailties in our ways of thinking about the world and discuss the improbability of our universe. The exposure of our frailty is what makes this book enriching. You will undoubtedly encounter an example that 'corrects' your way of thinking about

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some phenomenon. It will change how you think about coincidences in particular. The final chapter explores how the idea of significance in statistics is based on probability concepts.

There are two appendices, one explaining how large numbers are written in mathematics and the other explaining the axioms of probability.

The book is written in an easy style and all arguments are easy to follow. It is very well written and is both entertaining and informative. It is accessible to a lay person and yet should appeal to anyone working in a numerate discipline. Even statisticians or probabilists accustomed to thinking about probability every day will find something of interest in this book. Several months after reading it I find several of the 'laws' have stayed with me. I strongly recommend it.

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