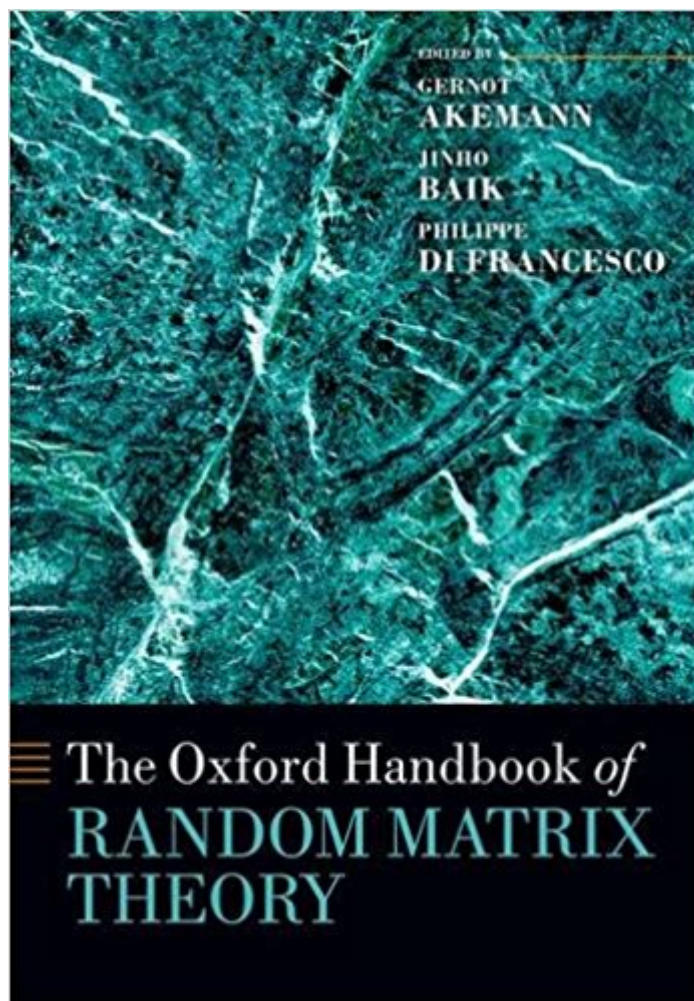# The Oxford Handbook Of Random Matrix Theory (Oxford Handbooks)

Synopsis

With a foreword by Freeman Dyson, the handbook brings together leading mathematicians and physicists to offer a comprehensive overview of random matrix theory, including a guide to new developments and the diverse range of applications of this approach.In part one, all modern and classical techniques of solving random matrix models are explored, including orthogonal polynomials, exact replicas or supersymmetry. Further, all main extensions of the classical Gaussian ensembles of Wigner and Dyson are introduced including sparse, heavy tailed, non-Hermitian or multi-matrix models. In the second and larger part, all major applications are covered, in disciplines ranging from physics and mathematics to biology and engineering. This includes standard fields such as number theory, quantum chaos or quantum chromodynamics, as well as recent developments such as partitions, growth models, knot theory, wireless communication or bio-polymer folding. The handbook is suitable both for introducing novices to this area of research and as a main source of reference for active researchers in mathematics, physics and engineering.

Book Information

Series: Oxford Handbooks

Paperback: 952 pages

Publisher: Oxford University Press; Reprint edition (November 10, 2015)

Language: English

ISBN-10: 0198744196

ISBN-13: 978-0198744191

Product Dimensions: 9.6 x 1.8 x 6.7 inches

Shipping Weight: 12.6 ounces (View shipping rates and policies)

Average Customer Review: 5.0 out of 5 starsÂ Â See all reviewsÂ (1 customer review)

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Customer Reviews

In the 1950s the great Hungarian-American physicist Eugene Wigner introduced the concept of random matrix, a Hermitian matrix whose elements are random variables. The distribution of eigenvalues of such random matrices are useful models in studying the properties of nuclear spectra whereby the Hamiltonian that govern the interaction among nuclear energy levels is

unknown. Random matrix theory (RMT) and energy level statistics were further developed in the 1960s when physicists were investigating nuclear spectra but only in the early 1970s it gained the interest of mathematicians who discovered a connection between RMT and the Riemann zeta function.This 900+ pages handbook is a multi-author volume containing 43 chapters: chapters 1-2 (Part I) are introductory, chapters 3-23 (Part II) discuss about the properties of random matrices while chapters 24-43 (Part III) are concerned with the applications (mainly in physics) of RMT. Among the chapters of Part III, interesting applications of RMT that go beyond physics are those concerned with RNA folding, information theory, and financial markets. It is hoped that in the near future RMT will find interesting applications in other fields of science, particularly chemistry and biology. The standard text on RMT is Mehta's Random Matrices, now in its 3-rd edition (2004). An overview of energy level statistics and its application to the study of nuclear spectra can be found in Porter's book Statistical Theories of Spectra: Fluctuations (1965).

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