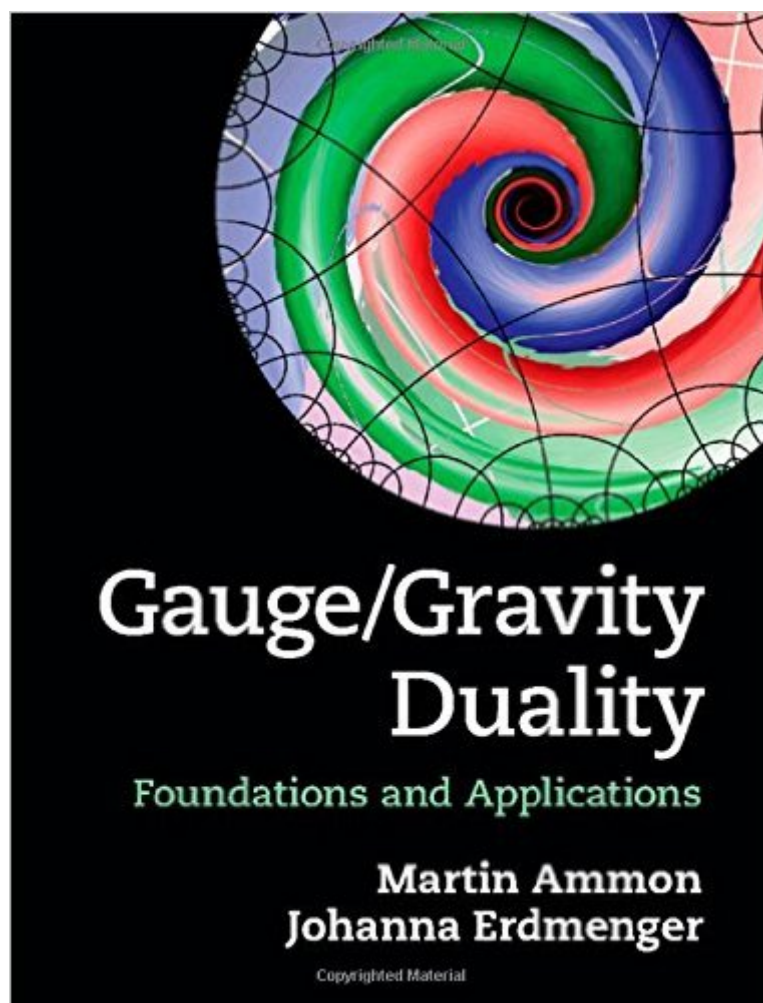


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Gauge/Gravity Duality: Foundations And Applications



Synopsis

Gauge/gravity duality creates new links between quantum theory and gravity. It has led to new concepts in mathematics and physics, and provides new tools to solve problems in many areas of theoretical physics. This book is the first textbook on this important topic, enabling graduate students and researchers in string theory and particle, nuclear and condensed matter physics to get acquainted with the subject. Focusing on the fundamental aspects as well as on the applications, this textbook guides readers through a thorough explanation of the central concepts of gauge/gravity duality. For the AdS/CFT correspondence, it explains in detail how string theory provides the conjectured map. Generalisations to less symmetric cases of gauge/gravity duality and their applications are then presented, in particular to finite temperature and density, hydrodynamics, QCD-like theories, the quark-gluon plasma and condensed matter systems. The textbook features a large number of exercises, with solutions available online at www.cambridge.org/9781107010345.

Book Information

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Customer Reviews

Any methodology for solving difficult problems in string theory or quantum field theory that seems to show some promise is always welcomed by practitioners in these two areas. Historically, most of the emphasis has been in perturbative calculations, which cannot be used for problems that involved strong coupling, such as quantum chromodynamics or the general bound state problem in quantum field theory. This book outlines an interesting approach to these types of problems that is based on a paper that was written by Juan Maldacena in 1998 and which has instigated a

considerable amount of research since then. Marketed (with some justification) as a technique for studying strongly coupled field theories, the AdS/CFT correspondence is described as a map relating gravitational theories on asymptotically Anti-de Sitter spacetimes to conformal field theories. Those readers who want to familiarize themselves with this approach, and the more general methodology that is designated as $\hat{\text{gauge/gravity duality}}^{\text{TM}}$, will find the presentation adequate, as long as they are very familiar with superstring theory, supergravity, the mathematical formalism of general relativity, quantum chromodynamics, and of course conformal field theories in their different guises. The authors do give an overview of some of this background in the first four chapters, but readers who are not familiar with this material may find it heavy-going and too terse. Some readers may be skeptical regarding the claim that $N = 4$ super Yang-Mills theory in $3 + 1$ dimensions is $\text{dynamically equivalent}$ to type IIB superstring theory on $\text{AdS}(5) \times \text{S}(5)$.

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