
String Theory Methods For Condensed Matter Physics

Introduction to Conformal Field Theory

Introduction to Quantum Field Theory

Integrability: From Statistical Systems to Gauge Theory

Beyond the Standard Model

Holographic Quantum Matter

Boundary Conformal Field Theory and the Worldsheet Approach to D-Branes

Condensed Matter Field Theory

Field Theory of Non-Equilibrium Systems

Introduction to the AdS/CFT Correspondence

Bang to Eternity and Betwixt

A First Course in String Theory

Introduction to Quantum Field Theory

Supersymmetry and String Theory

The Little Book of String Theory

Quantum Mechanics

String Cosmology

TASI 2010, from MeV to the Planck Scale : Proceedings of the 2010 Theoretical Advanced Study Institute in Elementary Particle Physics

String Theory and M-Theory

A Modern Primer

String Theory Methods for Condensed Matter Physics

Markov Chain Monte Carlo Methods in Quantum Field Theories

Holographic Entanglement Entropy

Field Theories of Condensed Matter Physics

Cosmology and String Theory

AdS/CFT Correspondence in Condensed Matter

Introduction to Effective Field Theory

Lecture Notes of the Les Houches Summer School: Volume 106, June 2016
A Concise Introduction
Strongly Coupled Field Theories for Condensed Matter and Quantum Information Theory
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String Theory Methods for Condensed Matter Physics
Field Theories in Condensed Matter Physics
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Proceedings, International Institute of Physics, Natal, Rn, Brazil, 2–21 August 2015
Modern Quantum Field Theory
String Theory in a Nutshell

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BARTLETT MADILYNN

Introduction to Conformal Field Theory Springer

For most of the last century, condensed matter physics has been dominated by band theory and Landau's symmetry breaking theory. In the last twenty years, however, there has been the emergence of a new paradigm associated with fractionalisation, topological order, emergent gauge bosons and fermions, and string condensation. These new physical concepts are so fundamental that they may even influence our understanding of the origin of light and fermions in the universe. This book is a pedagogical and systematic introduction to the new concepts and quantum field theoretical methods (which have fuelled the rapid

developments) in condensed matter physics. It discusses many basic notions in theoretical physics which underlie physical phenomena in nature. Topics covered are dissipative quantum systems, boson condensation, symmetry breaking and gapless excitations, phase transitions, Fermi liquids, spin density wave states, Fermi and fractional statistics, quantum Hall effects, topological and quantum order, spin liquids, and string condensation. Methods covered are the path integral, Green's functions, mean-field theory, effective theory, renormalization group, bosonization in one- and higher dimensions, non-linear sigma-model, quantum gauge theory, dualities, slave-boson theory, and exactly soluble models beyond one-dimension. This book is aimed at teaching graduate students and bringing them to the frontiers of research in condensed matter physics.

Introduction to Quantum Field Theory Cambridge University Press

This relatively new field applies equations from string theory to solve the questions of early cosmology, since the standard picture of our universe emerging from a 'big bang' leaves many fundamental issues unanswered. String theory, on the other hand, postulates that fundamental ingredients of nature are not zero-dimensional point particles but tiny one-dimensional filaments. This theory harmoniously unites quantum mechanics and general relativity -- the previously known laws of the small and the large -- which are otherwise incompatible. The field of string cosmology has matured considerably over the past few years, attracting many new adherents. Due to the multidisciplinary nature of the topic, it is difficult for practitioners to be conversant with all the many different aspects. This book thus fills a huge gap by bringing together all the different strains of research into one single volume. The resulting collection of selected articles presents the latest, ongoing results from renowned experts currently working in the field. From the contents: * Introduction to Cosmology and String Theory * String Inflation: Brane Inflation and Inflation from Moduli * Cosmic Superstrings * The CMB as a Possible Probe of String Theory * String Gas Cosmology * Gauge-gravity Duality and String Cosmology * Heterotic M-theory and C A welcome addition to the literature for graduate students, students in astronomy, astronomers, mathematicians and theoretical physicists.

Integrability: From Statistical Systems to Gauge Theory Springer Nature

A pioneering treatise presenting how the mathematical techniques of holographic duality can unify the fundamental theories of physics.

Beyond the Standard Model Cambridge University Press
Explores the early stages of the development of string theory; essential reading for physicists, historians and philosophers of science.

Holographic Quantum Matter Princeton University Press
This book provides a comprehensive overview of developments in the field of holographic entanglement entropy. Within the context of the AdS/CFT correspondence, it is shown how quantum entanglement is computed by the area of certain extremal surfaces. The general lessons one can learn from this connection are drawn out for quantum field theories, many-body physics, and quantum gravity. An overview of the necessary background material is provided together with a flavor of the exciting open questions that are currently being discussed. The book is divided into four main parts. In the first part, the concept of entanglement, and methods for computing it, in quantum field theories is reviewed. In the second part, an overview of the AdS/CFT correspondence is given and the holographic entanglement entropy prescription is explained. In the third part, the time-dependence of entanglement entropy in out-of-equilibrium systems, and applications to many body physics are explored using holographic methods. The last part focuses on the connection between entanglement and geometry. Known constraints on the holographic map, as well as, elaboration of entanglement being a fundamental building block of geometry are explained. The book is a useful resource for researchers and graduate students interested in string theory and holography, condensed matter and quantum information, as it tries to connect these different subjects linked by the common theme of quantum

entanglement.

Boundary Conformal Field Theory and the Worldsheet

Approach to D-Branes Springer Science & Business Media

String theory made understandable. Barton Zwiebach is once again faithful to his goal of making string theory accessible to undergraduates. He presents the main concepts of string theory in a concrete and physical way to develop intuition before formalism, often through simplified and illustrative examples. Complete and thorough in its coverage, this new edition now includes AdS/CFT correspondence and introduces superstrings. It is perfectly suited to introductory courses in string theory for students with a background in mathematics and physics. New sections cover strings on orbifolds, cosmic strings, moduli stabilization, and the string theory landscape. Now with almost 300 problems and exercises, with password-protected solutions for instructors at www.cambridge.org/zwiebach.

Condensed Matter Field Theory John Hussey

Presenting the physics of the most challenging problems in condensed matter using the conceptual framework of quantum field theory, this book is of great interest to physicists in condensed matter and high energy and string theorists, as well as mathematicians. Revised and updated, this second edition features new chapters on the renormalization group, the Luttinger liquid, gauge theory, topological fluids, topological insulators and quantum entanglement. The book begins with the basic concepts and tools, developing them gradually to bring readers to the issues currently faced at the frontiers of research, such as topological phases of matter, quantum and classical critical phenomena, quantum Hall effects and superconductors.

Other topics covered include one-dimensional strongly correlated systems, quantum ordered and disordered phases, topological structures in condensed matter and in field theory and fractional statistics.

Field Theory of Non-Equilibrium Systems Cambridge University Press

A comprehensive, graduate-level textbook introducing quantum field theory, giving equal emphasis to operator and path integral formalisms.

Introduction to the AdS/CFT Correspondence Cambridge University Press

The discovery of a duality between Anti-de Sitter spaces (AdS) and Conformal Field Theories (CFT) has led to major advances in our understanding of quantum field theory and quantum gravity. String theory methods and AdS/CFT correspondence maps provide new ways to think about difficult condensed matter problems. String theory methods based on the AdS/CFT correspondence allow us to transform problems so they have weak interactions and can be solved more easily. They can also help map problems to different descriptions, for instance mapping the description of a fluid using the Navier-Stokes equations to the description of an event horizon of a black hole using Einstein's equations. This textbook covers the applications of string theory methods and the mathematics of AdS/CFT to areas of condensed matter physics. Bridging the gap between string theory and condensed matter, this is a valuable textbook for students and researchers in both fields.

Bang to Eternity and Betwixt String Theory Methods for Condensed Matter Physics

This book presents a selection of advanced lectures from leading researchers, providing recent theoretical results on strongly coupled quantum field theories. It also analyzes their use for describing new quantum states, which are physically realizable in condensed matter, cold-atomic systems, as well as artificial materials. It particularly focuses on the engineering of these states in quantum devices and novel materials useful for quantum information processing. The book offers graduate students and young researchers in the field of modern condensed matter theory an updated review of the most relevant theoretical methods used in strongly coupled field theory and string theory. It also provides the tools for understanding their relevance in describing the emergence of new quantum states in a variety of physical settings. Specifically, this proceedings book summarizes new and previously unrelated developments in modern condensed matter physics, in particular: the interface of condensed matter theory and quantum information theory; the interface of condensed matter physics and the mathematics emerging from the classification of the topological phases of matter, such as topological insulators and topological superconductors; and the simulation of condensed matter systems with cold atoms in optical lattices.

A First Course in String Theory OUP Oxford

Based on class-tested notes, this text offers an introduction to Conformal Field Theory with a special emphasis on computational techniques of relevance for String Theory. It introduces Conformal Field Theory at a basic level, Kac-Moody algebras, one-loop partition functions, Superconformal Field Theories, Gepner Models and Boundary Conformal Field Theory. Eventually, the

concept of orientifold constructions is explained in detail for the example of the bosonic string. In providing many detailed CFT calculations, this book is ideal for students and scientists intending to become acquainted with CFT techniques relevant for string theory but also for students and non-specialists from related fields.

Introduction to Quantum Field Theory Springer

Recent developments in theoretical physics include new instances of the unification of quite different phenomena. The theoretical community is challenged by the growing interactions between high-energy physics, statistical physics, and condensed matter physics. The common language, though, is exact solutions of two-dimensional and conformable field theories. This volume is a faithful representation of this interdisciplinary domain. Conformable and integrable field theories have been active research topics for several decades. The main recent developments concern the boundary effects and applications to disordered systems. The number of applications of the exact methods to condensed-matter problems has been growing over the years. Nowadays it is widely recognized that strongly interacting systems in low dimensions can be successfully described by integrable and conformable theories. This volume is an indispensable aid to those seeking to find their way in this domain.

Supersymmetry and String Theory CRC Press

The physics of non-equilibrium many-body systems is one of the most rapidly expanding areas of theoretical physics. Traditionally used in the study of laser physics and superconducting kinetics, these techniques have more recently found applications in the

study of dynamics of cold atomic gases, mesoscopic and nano-mechanical systems. The book gives a self-contained presentation of the modern functional approach to non-equilibrium field-theoretical methods. They are applied to examples ranging from biophysics to the kinetics of superfluids and superconductors. Its step-by-step treatment gives particular emphasis to the pedagogical aspects, making it ideal as a reference for advanced graduate students and researchers in condensed matter physics.

The Little Book of String Theory World Scientific

String Theory Methods for Condensed Matter Physics Cambridge University Press

Quantum Mechanics Cambridge University Press

This advanced, accessible textbook on effective field theories uses worked examples to bring this important topic to a wider audience.

String Cosmology Springer

The essential introduction to modern string theory—now fully expanded and revised *String Theory in a Nutshell* is the definitive introduction to modern string theory. Written by one of the world's leading authorities on the subject, this concise and accessible book starts with basic definitions and guides readers from classic topics to the most exciting frontiers of research today. It covers perturbative string theory, the unity of string interactions, black holes and their microscopic entropy, the AdS/CFT correspondence and its applications, matrix model tools for string theory, and more. It also includes 600 exercises and serves as a self-contained guide to the literature. This fully updated edition features an entirely new chapter on flux

compactifications in string theory, and the chapter on AdS/CFT has been substantially expanded by adding many applications to diverse topics. In addition, the discussion of conformal field theory has been extensively revised to make it more student-friendly. The essential one-volume reference for students and researchers in theoretical high-energy physics Now fully expanded and revised Provides expanded coverage of AdS/CFT and its applications, namely the holographic renormalization group, holographic theories for Yang-Mills and QCD, nonequilibrium thermal physics, finite density physics, and entanglement entropy Ideal for mathematicians and physicists specializing in theoretical cosmology, QCD, and novel approaches to condensed matter systems An online illustration package is available to professors

TASI 2010, from MeV to the Planck Scale : Proceedings of the 2010 Theoretical Advanced Study Institute in Elementary Particle Physics Oxford University Press

Quantum Field Theory provides a theoretical framework for understanding fields and the particles associated with them, and is the basis of particle physics and condensed matter research. This graduate level textbook provides a comprehensive introduction to quantum field theory, giving equal emphasis to operator and path integral formalisms. It covers modern research such as helicity spinors, BCFW construction and generalized unitarity cuts; as well as treating advanced topics including BRST quantization, loop equations, and finite temperature field theory. Various quantum fields are described, including scalar and fermionic fields, Abelian vector fields and Quantum ElectroDynamics (QED), and finally non-Abelian vector fields and

Quantum ChromoDynamics (QCD). Applications to scattering cross sections in QED and QCD are also described. Each chapter ends with exercises and an important concepts section, allowing students to identify the key aspects of the chapter and test their understanding.

[String Theory and M-Theory](#) Springer

The goal of this text is to introduce, in a very elementary way, the concept of anti-de Sitter/Conformal Field Theory (AdS/CFT) correspondence to condensed matter physicists. This theory relates a gravity theory in a $(d+1)$ -dimensional anti-de Sitter space

[A Modern Primer](#) Cambridge University Press

Describing the physical properties of quantum materials near critical points with long-range many-body quantum entanglement, this book introduces readers to the basic theory of quantum phases, their phase transitions and their observable properties. This second edition begins with a new section suitable for an introductory course on quantum phase transitions, assuming no prior knowledge of quantum field theory. It also

contains several new chapters to cover important recent advances, such as the Fermi gas near unitarity, Dirac fermions, Fermi liquids and their phase transitions, quantum magnetism, and solvable models obtained from string theory. After introducing the basic theory, it moves on to a detailed description of the canonical quantum-critical phase diagram at non-zero temperatures. Finally, a variety of more complex models are explored. This book is ideal for graduate students and researchers in condensed matter physics and particle and string theory.

String Theory Methods for Condensed Matter Physics Princeton University Press

The book is based on lectures given at the TASI summer school of 2010. It aims to provide advanced graduate students, postdoctorates and senior researchers with a survey of important topics in particle physics and string theory, with special emphasis on applications of methods from string theory and quantum gravity in condensed matter physics and QCD (especially heavy ion physics).

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