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 Many-Body Quantum Theory in Condensed Matter Physics
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KODY CANTRELL

[Quantum Field Theory of Non-equilibrium States](#) Courier Corporation

Self-contained treatment of nonrelativistic many-particle systems discusses both formalism and applications in terms of ground-state (zero-temperature) formalism, finite-temperature formalism, canonical transformations, and applications to physical systems. 1971 edition.

[Condensed Matter Field Theory](#) Cambridge University Press

The discovery of Bose-Einstein condensation (BEC) in trapped ultracold atomic gases in 1995 has led to an explosion of theoretical and experimental research on the properties of Bose-condensed dilute gases. The first treatment of BEC at finite temperatures, this book presents a thorough account of the theory of two-component dynamics and nonequilibrium behaviour in superfluid Bose gases. It uses a simplified microscopic model to give a clear, explicit account of collective modes in both the collisionless and collision-dominated regions. Major topics such as kinetic equations, local equilibrium and two-fluid hydrodynamics are introduced at an elementary level. Explicit predictions are worked out and linked to experiments. Providing a platform for future experimental and theoretical studies on the finite temperature dynamics of trapped Bose gases, this book is ideal for researchers and graduate students in ultracold atom physics, atomic, molecular and optical physics and condensed matter physics.

[Fundamentals of Many-body Physics](#) Courier Corporation

Based on an established course, this comprehensive textbook on advanced quantum condensed matter physics covers one-body, many-body and topological perspectives. Discussing modern topics and containing end-of-chapter exercises throughout, it is ideal for graduate students studying advanced condensed matter physics.

[Application of Green's Functions in Science and Engineering](#) World Scientific

For physics students interested in the mathematics they use, and for math students interested in seeing how some of the ideas of their discipline find realization in an applied setting. The presentation strikes a balance between formalism and application, between abstract and concrete. The interconnections among the various topics are clarified both by the use of vector spaces as a central unifying theme, recurring throughout the book, and by putting ideas into their historical context. Enough of the essential formalism is included to make the presentation self-contained.

[The Casimir Effect](#) HarperCollins

Joel Beath and Elizabeth Price explore this question drawing inspiration from a diverse collection of apartment designs, all smaller than 50m²/540ft². Through the lens of five small-footprint design principles and drawing on architectural images and detailed floor plans, the authors examine how architects and designers are reimagining small space living. Full of inspiration we can each apply to our own spaces, this is a book that offers hope and inspiration for a future of our cities and their citizens in which sustainability and style, comfort and affordability can co-exist. Never Too Small proves living better doesn't have to mean living larger.

[Quantum Theory of Many-Particle Systems](#) Cambridge University Press

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[Quantum Dissipative Systems](#) Cambridge University Press

The Green's function method is one of the most powerful and versatile formalisms in physics, and its nonequilibrium version has proved invaluable in many research fields. This book provides a unique, self-contained introduction to nonequilibrium many-body theory. Starting with basic quantum mechanics, the authors introduce the equilibrium and nonequilibrium Green's function formalisms within a unified framework called the contour formalism. The physical content of the contour Green's functions and the diagrammatic expansions are explained with a focus on the time-dependent

aspect. Every result is derived step-by-step, critically discussed and then applied to different physical systems, ranging from molecules and nanostructures to metals and insulators. With an abundance of illustrative examples, this accessible book is ideal for graduate students and researchers who are interested in excited state properties of matter and nonequilibrium physics.

[Green's Functions and Condensed Matter](#) Princeton University Press

The highly anticipated cookbook from the immensely popular food blog Minimalist Baker, featuring 101 all-new simple, vegan recipes that all require 10 ingredients or less, 1 bowl or 1 pot, or 30 minutes or less to prepare Dana Shultz founded the Minimalist Baker blog in 2012 to share her passion for simple cooking and quickly gained a devoted worldwide following. Now, in this long-awaited debut cookbook, Dana shares 101 vibrant, simple recipes that are entirely plant-based, mostly gluten-free, and 100% delicious. Packed with gorgeous photography, this practical but inspiring cookbook includes: • Recipes that each require 10 ingredients or less, can be made in one bowl, or require 30 minutes or less to prepare. • Delicious options for hearty entrées, easy sides, nourishing breakfasts, and decadent desserts—all on the table in a snap • Essential plant-based pantry and equipment tips • Easy-to-follow, step-by-step recipes with standard and metric ingredient measurements Minimalist Baker's Everyday Cooking is a totally no-fuss approach to cooking for anyone who loves delicious food that happens to be healthy too.

[Quantum Field Theory and Condensed Matter](#) Cambridge University Press

This book presents the Green's function formalism in a basic way and demonstrates its usefulness for applications to several well-known problems in classical physics which are usually solved not by this formalism but other approaches. The book bridges the gap between applications of the Green's function formalism in quantum physics and classical physics. This book is written as an introduction for graduate students and researchers who want to become more familiar with the Green's function formalism. In 1828 George Green has published an essay that was unfortunately sunken into oblivion shortly after its publication. It was rediscovered only after several years by the later Lord Kelvin. But since this time, using Green's functions for solving partial differential equations in physics has become an important mathematical tool. While the conceptual and epistemological importance of these functions were essentially discovered and discussed in modern physics - especially in quantum field theory and quantum statistics - these aspects are rarely touched in classical physics. In doing it, this book provides an interesting and sometimes new point of view on several aspects and problems in classical physics, like the Kepler motion or the description of certain classical probability experiments in finite event spaces. A short outlook on quantum mechanical problems concludes this book.

[The Alchemist](#) World Scientific

This book discusses in depth many of the key problems in non-equilibrium physics. The origin of macroscopic irreversible behavior receives particular attention and is illustrated in the framework of solvable models. An updated discussion on the linear response focuses on the correct electrodynamic aspects, which are essential for example, in the proof of the Nyquist theorem. The material covers the scaling relationship between different levels of description (kinetic to hydrodynamic) as well as spontaneous symmetry breaking in real time in terms of nonlinear dynamics (attractors), illustrated using the example of Bose-Einstein condensation. The presentation also includes the latest developments ? quantum kinetics ? related to modern ultrafast spectroscopy, where transition from reversible to irreversible behavior occurs.

[Nonequilibrium Many-Body Theory of Quantum Systems](#) Oxford University Press

This graduate-level textbook is the first pedagogical synthesis of the field of topological insulators and superconductors, one of the most exciting areas of research in condensed matter physics. Presenting the latest developments, while providing all the calculations necessary for a self-contained and complete description of the discipline, it is ideal for graduate students and

researchers preparing to work in this area, and it will be an essential reference both within and outside the classroom. The book begins with simple concepts such as Berry phases, Dirac fermions, Hall conductance and its link to topology, and the Hofstadter problem of lattice electrons in a magnetic field. It moves on to explain topological phases of matter such as Chern insulators, two- and three-dimensional topological insulators, and Majorana p-wave wires. Additionally, the book covers zero modes on vortices in topological superconductors, time-reversal topological superconductors, and topological responses/field theory and topological indices. The book also analyzes recent topics in condensed matter theory and concludes by surveying active subfields of research such as insulators with point-group symmetries and the stability of topological semimetals. Problems at the end of each chapter offer opportunities to test knowledge and engage with frontier research issues. Topological Insulators and Topological Superconductors will provide graduate students and researchers with the physical understanding and mathematical tools needed to embark on research in this rapidly evolving field.

Emergent Phenomena in Correlated Matter Cambridge University Press

This book presents basic theory on static Green's functions in general anisotropic magnetoelastic media including detailed derivations based on the complex variable method, potential method, and integral transforms. Green's functions corresponding to the reduced cases are also presented including those in anisotropic and transversely isotropic piezoelectric and piezomagnetic media, and in purely anisotropic elastic, transversely isotropic elastic and isotropic elastic media. Problems include those in three-dimensional, (two-dimensional) infinite, half, and biomaterial spaces (planes). While the emphasis is on the Green's functions related to the line and point force, those corresponding to the important line and point dislocation are also provided and discussed. This book provides a comprehensive derivation and collection of the Green's functions in the concerned media, and as such, it is an ideal reference book for researchers and engineers, and a textbook for both students in engineering and applied mathematics.

Many-Body Quantum Theory in Condensed Matter Physics Courier Corporation

Advances in semiconductor technology have made possible the fabrication of structures whose dimensions are much smaller than the mean free path of an electron. This book gives a thorough account of the theory of electronic transport in such mesoscopic systems. After an initial chapter covering fundamental concepts, the transmission function formalism is presented, and used to describe three key topics in mesoscopic physics: the quantum Hall effect; localisation; and double-barrier tunnelling. Other sections include a discussion of optical analogies to mesoscopic phenomena, and the book concludes with a description of the non-equilibrium Green's function formalism and its relation to the transmission formalism. Complete with problems and solutions, the book will be of great interest to graduate students of mesoscopic physics and nanoelectronic device engineering, as well as to established researchers in these fields.

Dyadic Green Functions in Electromagnetic Theory Springer

Quantum field theory is the application of quantum mechanics to systems with infinitely many degrees of freedom. This 2007 textbook presents quantum field theoretical applications to systems out of equilibrium. It introduces the real-time approach to non-equilibrium statistical mechanics and the quantum field theory of non-equilibrium states in general. It offers two ways of learning how to study non-equilibrium states of many-body systems: the mathematical canonical way and an easy intuitive way using Feynman diagrams. The latter provides an easy introduction to the powerful functional methods of field theory, and the use of Feynman diagrams to study classical stochastic dynamics is considered in detail. The developed real-time technique is applied to study numerous phenomena in many-body systems. Complete with numerous exercises to aid self-study, this textbook is suitable for graduate students in statistical mechanics and condensed matter physics.

Quantum Statistical Field Theory Cambridge University Press

This comprehensive textbook on the quantum mechanics of identical particles includes a wealth of valuable experimental data, in particular recent results from direct knockout reactions directly related to the single-particle propagator in many-body theory. The comparison with data is incorporated from the start, making the abstract concept of propagators vivid and accessible. Results of numerical calculations using propagators or Green's functions are also presented. The material has been thoroughly tested in the classroom and the introductory chapters provide a

seamless connection with a one-year graduate course in quantum mechanics. While the majority of books on many-body theory deal with the subject from the viewpoint of condensed matter physics, this book emphasizes finite systems as well and should be of considerable interest to researchers in nuclear, atomic, and molecular physics. A unified treatment of many different many-body systems is presented using the approach of self-consistent Green's functions. The second edition contains an extensive presentation of finite temperature propagators and covers the technique to extract the self-energy from experimental data as developed in the dispersive optical model. The coverage proceeds systematically from elementary concepts, such as second quantization and mean-field properties, to a more advanced but self-contained presentation of the physics of atoms, molecules, nuclei, nuclear and neutron matter, electron gas, quantum liquids, atomic Bose-Einstein and fermion condensates, and pairing correlations in finite and infinite systems, including finite temperature.

Bose-Condensed Gases at Finite Temperatures OUP Oxford

For non-specialist students and researchers, this is a broad and concise introduction to the many-body theory of condensed-matter systems.

Modern Aspects Of Superconductivity: Theory Of Superconductivity (Second Edition) Prentice Hall

In recent years there has been a huge increase in the research and development of nanoscale science and technology. Central to the understanding of the properties of nanoscale structures is the modeling of electronic conduction through these systems. This graduate textbook provides an in-depth description of the transport phenomena relevant to systems of nanoscale dimensions. In this textbook the different theoretical approaches are critically discussed, with emphasis on their basic assumptions and approximations. The book also covers information content in the measurement of currents, the role of initial conditions in establishing a steady state, and the modern use of density-functional theory. Topics are introduced by simple physical arguments, with particular attention to the non-equilibrium statistical nature of electrical conduction, and followed by a detailed formal derivation. This textbook is ideal for graduate students in physics, chemistry, and electrical engineering.

Many-body Theory Exposed! Propagator Description Of Quantum Mechanics In Many-body Systems (2nd Edition) Penguin

An introduction to the application of Feynman diagram techniques for researchers and advanced undergraduate students in condensed matter theory and many-body physics.

Static Green's Functions in Anisotropic Media Forschungszentrum Jülich

This book is devoted to superconductivity, which is one of the most interesting problems in physics. In accordance with the outline of the book, it treats the key problems in the field of superconductivity, in particular, it discusses the mechanism(s) of superconductivity. This book is useful for researchers and graduate students in the fields of solid state physics, quantum field theory, and many-body theory.

Quantum Field Theory of Many-Body Systems Cambridge University Press

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.

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