



METHODS OF QUANTUM FIELD THEORY IN STATISTICAL PHYSICS

A. A. Abrikosov, L.P. Gorkov, & I. E. Dzyaloshinski

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Functional Methods in Quantum Field Theory and Statistical Physics A.N. Vasiliev, 2019-01-22 Providing a systematic introduction to the techniques which are fundamental to quantum field theory this book pays special attention to the use of these techniques in a wide variety of areas including ordinary quantum mechanics quantum mechanics in the second quantized formulation relativistic quantum field theory Euclidean field theory quant

Quantum Field Theory in Condensed Matter Physics Alexei M. Tsvelik, 2007-01-18 This book is a course in modern quantum field theory as seen through the eyes of a theorist working in condensed matter physics It contains a gentle introduction to the subject and therefore can be used even by graduate students The introductory parts include a derivation of the path integral representation Feynman diagrams and elements of the theory of metals including a discussion of Landau Fermi liquid theory In later chapters the discussion gradually turns to more advanced methods used in the theory of strongly correlated systems The book contains a thorough exposition of such non perturbative techniques as 1 N expansion bosonization Abelian and non Abelian conformal field theory and theory of integrable systems The book is intended for graduate students postdoctoral associates and independent researchers working in condensed matter physics

Introduction to Quantum Field Theory V.I.G. Kiselev, Ya.M. Shnir, A.Ya. Tregubovich, 2000-11-17 This text explains the features of quantum and statistical field systems that result from their field theoretic nature and are common to different physical contexts It supplies the practical tools for carrying out calculations and discusses the meaning of the results The central concept is that of effective action or free energy and the main technical tool is the path integral although other formalisms are also mentioned The author emphasizes the simplest models first then progresses to discussions of real systems before addressing more general and rigorous conclusions The book is structured around carefully selected problems which are solved in detail

Quantum Field Theory for the Gifted Amateur Tom Lancaster, Stephen Blundell, 2014-04 Quantum field theory provides the theoretical backbone to most modern physics This book is designed to bring quantum field theory to a wider audience of physicists It is packed with worked examples witty diagrams and applications intended to introduce a new audience to this revolutionary theory

Quantum Field Theory in a Nutshell A. Zee, 2010-02-21 A fully updated edition of the classic text by acclaimed physicist A Zee Since it was first published *Quantum Field Theory in a Nutshell* has quickly established itself as the most accessible and comprehensive introduction to this profound and deeply fascinating area of theoretical physics Now in this fully revised and expanded edition A Zee covers the latest advances while

providing a solid conceptual foundation for students to build on making this the most up to date and modern textbook on quantum field theory available This expanded edition features several additional chapters as well as an entirely new section describing recent developments in quantum field theory such as gravitational waves the helicity spinor formalism on shell gluon scattering recursion relations for amplitudes with complex momenta and the hidden connection between Yang Mills theory and Einstein gravity Zee also provides added exercises explanations and examples as well as detailed appendices solutions to selected exercises and suggestions for further reading The most accessible and comprehensive introductory textbook available Features a fully revised updated and expanded text Covers the latest exciting advances in the field Includes new exercises Offers a one of a kind resource for students and researchers Leading universities that have adopted this book include Arizona State University Boston University Brandeis University Brown University California Institute of Technology Carnegie Mellon College of William Mary Cornell Harvard University Massachusetts Institute of Technology Northwestern University Ohio State University Princeton University Purdue University Main Campus Rensselaer Polytechnic Institute Rutgers University New Brunswick Stanford University University of California Berkeley University of Central Florida University of Chicago University of Michigan University of Montreal University of Notre Dame Vanderbilt University Virginia Tech University Nonequilibrium Quantum Field Theory Esteban A. Calzetta, Bei-Lok B. Hu, 2023-02-09 This 2008 book reissued as OA captures the essence of nonequilibrium quantum field theory graduate students and researchers

Methods of quantum field theory in statistical physics Aleksey Alekseevic Abrikosov, Lev P. Gorkov, Igor E. Dzyaloshinski, 1963 Scientific Realism and the Quantum Steven French, Juha Saatsi, 2020-02-13 Quantum theory is widely regarded as one of the most successful theories in the history of science It explains a hugely diverse array of phenomena and is a natural candidate for our best representation of the world at the level of fundamental physics But how can the world be the way quantum theory says it is It is famously unclear what the world is like according to quantum physics which presents a serious problem for the scientific realist who is committed to regarding our best theories as more or less true The present volume canvasses a variety of responses to this problem from restricting or revising realism in different ways to exploring entirely new directions in the lively debate surrounding realist interpretations of quantum physics Some urge us to focus on new formulations of the theory itself while others examine the status of scientific realism in the further context of quantum field theory Each chapter is written by a renowned specialist in the field and is aimed at graduate students and researchers in both physics and the philosophy of science Together they offer a range of illuminating new perspectives on this fundamental debate and exemplify the fruitful interaction between physics and philosophy **Introduction to Effective Field Theory** C. P. Burgess, 2020-12-10 Using examples from across the sub disciplines of physics this introduction shows why effective field theories are the language in which physical laws are written The tools of effective field theory are demonstrated using worked examples from areas including particle nuclear atomic condensed matter and gravitational

physics To bring the subject within reach of scientists with a wide variety of backgrounds and interests there are clear physical explanations rigorous derivations and extensive appendices on background material such as quantum field theory Starting from undergraduate level quantum mechanics the book gets to state of the art calculations using both relativistic and nonrelativistic few body and many body examples and numerous end of chapter problems derive classic results not covered in the main text Graduate students and researchers in particle physics condensed matter physics nuclear physics string theory and mathematical physics more generally will find this book ideal for both self study and for organized courses on effective field theory

Bogoliubov-de Gennes Method and Its Applications Jian-Xin Zhu, 2016-06-21 The purpose of this book is to provide an elementary yet systematic description of the Bogoliubov de Gennes BdG equations their unique symmetry properties and their relation to Green's function theory Specifically it introduces readers to the supercell technique for the solutions of the BdG equations as well as other related techniques for more rapidly solving the equations in practical applications The BdG equations are derived from a microscopic model Hamiltonian with an effective pairing interaction and fully capture the local electronic structure through self consistent solutions via exact diagonalization This approach has been successfully generalized to study many aspects of conventional and unconventional superconductors with inhomogeneities including defects disorder or the presence of a magnetic field and becomes an even more attractive choice when the first principles information of a typical superconductor is incorporated via the construction of a low energy tight binding model Further the lattice BdG approach is essential when theoretical results for local electronic states around such defects are compared with the scanning tunneling microscopy measurements Altogether these lectures provide a timely primer for graduate students and non specialist researchers while also offering a useful reference guide for experts in the field

Mathematical Tools for Physicists George L. Trigg, 2006-08-21 Mathematical Tools for Physicists is a unique collection of 18 carefully reviewed articles each one written by a renowned expert working in the relevant field The result is beneficial to both advanced students as well as scientists at work the former will appreciate it as a comprehensive introduction while the latter will use it as a ready reference The contributions range from fundamental methods right up to the latest applications including Algebraic analytic geometric methods Symmetries and conservation laws Mathematical modeling Quantum computation The emphasis throughout is ensuring quick access to the information sought and each article features an abstract a detailed table of contents continuous cross referencing references to the most relevant publications in the field and suggestions for further reading both introductory as well as highly specialized In addition a comprehensive index provides easy access to the vast number of key words extending beyond the range of the headlines

Particles And Quantum Fields Hagen Kleinert, 2016-05-30 This is an introductory book on elementary particles and their interactions It starts out with many body Schrödinger theory and second quantization and leads via its generalization to relativistic fields of various spins and to gravity The text begins with the best known quantum field theory so far the quantum

electrodynamics of photon and electrons QED It continues by developing the theory of strong interactions between the elementary constituents of matter quarks This is possible due to the property called asymptotic freedom On the way one has to tackle the problem of removing various infinities by renormalization The divergent sums of infinitely many diagrams are performed with the renormalization group or by variational perturbation theory VPT The latter is an outcome of the Feynman Kleinert variational approach to path integrals discussed in two earlier books of the author one representing a comprehensive treatise on path integrals the other dealing with critical phenomena Unlike ordinary perturbation theory VPT produces uniformly convergent series which are valid from weak to strong couplings where they describe critical phenomena The present book develops the theory of effective actions which allow to treat quantum phenomena with classical formalism For example it derives the observed anomalous power laws of strongly interacting theories from an extremum of the action Their fluctuations are not based on Gaussian distributions as in the perturbative treatment of quantum field theories or in asymptotically free theories but on deviations from the average which are much larger and which obey power like distributions Exactly solvable models are discussed and their physical properties are compared with those derived from general methods In the last chapter we discuss the problem of quantizing the classical theory of gravity

Thermoelectricity D. K. C. MacDonald, 2013-02-21 This introductory treatment provides an understanding of the fundamental concepts and principles involved in the study of thermoelectricity in solids and of conduction in general Aimed at graduate level students and those interested in basic theory it will be especially valuable to experimental physicists working in fields connected with electron transport and to theoreticians seeking a survey of thermoelectricity and related questions Chronicling the early history of thermoelectricity from its discovery to modern times this text features a considerable amount of experimental data and discusses these findings at length wherever they bear a particular relevance to theory The author a well known authority in this field draws heavily from his own work on thermoelectrical phenomena as they are observed in the study of metals Numerous illustrative figures appear throughout the text Condensed Matter Field Theory Alexander Altland, Ben Simons, 2006-06 Primer including problems and solutions for graduate level courses on theoretical quantum condensed matter physics *Fundamentals of Picoscience* Klaus D. Sattler, 2013-09-26 Now ubiquitous in public discussions about cutting edge science and technology nanoscience has generated many advances and inventions from the development of new quantum mechanical methods to far reaching applications in electronics and medical diagnostics Ushering in the next technological era Fundamentals of Picoscience focuses on the instrumentation and experiments emerging at the picometer scale One picometer is the length of a trillionth of a meter Compared to a human cell of typically ten microns this is roughly ten million times smaller In this state of the art book international scientists and researchers at the forefront of the field present the materials and methods used at the picoscale They address the key challenges in developing new instrumentation and techniques to visualize and measure structures at this sub nanometer level

With numerous figures the book will help you Understand how picoscience is an extension of nanoscience Determine which experimental technique to use in your research Connect basic studies to the development of next generation picoelectronic devices The book covers various approaches for detecting characterizing and imaging at the picoscale It then presents picoscale methods ranging from scanning tunneling microscopy STM to spectroscopic approaches at sub nanometer spatial and energy resolutions It also covers novel picoscale structures and picometer positioning systems The book concludes with picoscale device applications including single molecule electronics and optical computers Introductions in each chapter explain basic concepts define technical terms and give context to the main material

Optical Generation and Control of Quantum Coherence in Semiconductor Nanostructures Gabriela Slavcheva,Philippe Roussignol,2010-06-01 The fundamental concept of quantum coherence plays a central role in quantum physics cutting across disciplines of quantum optics atomic and condensed matter physics Quantum coherence represents a universal property of the quantum systems that applies both to light and matter thereby tying together materials and phenomena Moreover the optical coherence can be transferred to the medium through the light matter interactions Since the early days of quantum mechanics there has been a desire to control dynamics of quantum systems The generation and control of quantum coherence in matter by optical means in particular represents a viable way to achieve this longstanding goal and semiconductor nanostructures are the most promising candidates for controllable quantum systems Optical generation and control of coherent light matter states in semiconductor quantum nanostructures is precisely the scope of the present book Recently there has been a great deal of interest in the subject of quantum coherence We are currently witnessing parallel growth of activities in different physical systems that are all built around the central concept of manipulation of quantum coherence The burgeoning activities in solid state systems and semiconductors in particular have been strongly driven by the unprecedented control of coherence that previously has been demonstrated in quantum optics of atoms and molecules and is now taking advantage of the remarkable advances in semiconductor fabrication technologies A recent impetus to exploit the coherent quantum phenomena comes from the emergence of the quantum information paradigm

Quantum Electron Liquids and High-Tc Superconductivity Jose Gonzalez,Miguel A. Martin-Delgado,German Sierra,Angeles H. Vozmediano,1995-12-12 This book originated from a course given at the Universidad Aut6noma of Madrid in the Spring of 1994 and in the Universidad Complutense of Madrid in 1995 The goal of these courses is to give the non specialist an introduction to some old and new ideas in the field of strongly correlated systems in particular the problems posed by the high Tc superconducting materials As theoretical physicists our starting viewpoint to address the problem of strongly correlated fermion systems and related issues of modern condensed matter physics is the renormalization group approach applied both to quantum field theory and statistical physics In recent years this has become not only a powerful tool for retrieving the essential physics of interacting systems but also a link between theoretical physics and modern condensed matter physics Furthermore once we

have this common background for dealing with apparently different problems we discuss more specific topics and even phenomenological aspects of the field. In doing so we have tried to make the exposition clear and simple without entering into technical details but focusing on the fundamental physics of the phenomena under study. Therefore we expect that our experience may have some value to other people entering this fascinating field. We have divided these notes into three parts and each part into chapters which correspond roughly to one or two lectures. Part I: Chaps 1-2. A. H. V.

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