

Superconductivity and Superfluidity

John Scognamiglio
and Dan McLaughlin



Superfluidity And Superconductivity Superfluidity And Superconductivity

David R. Tilley, John Tilley



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Superfluidity and Superconductivity D.R. Tilley, J. Tilley, 1990-01-01 Superfluidity and Superconductivity Third Edition introduces the low temperature phenomena of superfluidity and superconductivity from a unified viewpoint The book stresses the existence of a macroscopic wave function as a central principle presents an extensive discussion of macroscopic theories and includes full descriptions of relevant experimental results throughout This edition also features an additional chapter on high temperature superconductors With problems at the end of most chapters as well as the careful elaboration of basic principles this comprehensive survey of experiment and theory provides an accessible and invaluable foundation for graduate students studying low temperature physics as well as senior undergraduates taking specialized courses

Superfluid States of Matter Boris V. Svistunov, Egor S. Babaev, Nikolay V. Prokof'ev, 2015-04-15 Covers the State of the Art in Superfluidity and Superconductivity Superfluid States of Matter addresses the phenomenon of superfluidity superconductivity through an emergent topologically protected constant of motion and covers topics developed over the past 20 years The approach is based on the idea of separating universal classical field superfluidity and

Superfluidity and Superconductivity David R. Tilley, John Tilley, 1974 index **Superfluidity and Superconductivity** David Reginald Tilley, John Tilley, 1974 index **Superconductivity, Superfluids and Condensates** James F. Annett, 2004-03-25 This textbook series has been designed for final year undergraduate and first year graduate students providing an overview of the entire field showing how specialized topics are part of the wider whole and including references to current areas of literature and research

Superconductivity and Superfluidity T. Tsuneto, 1998-12-10 This graduate level text describes the physics of superconductivity and superfluidity macroscopic quantum phenomena found in many conductors at low temperatures and in liquid helium 4 and helium 3 In the first part of the book the author presents the mean field theory of generalized pair condensation This is followed by a description of the properties of ordinary superconductors using BCS theory The book then proceeds with expositions of strong coupling theory and the Ginzburg Landau theory The remarkable properties of superfluid helium 3 are then described as an example of a superfluid with internal degrees of freedom Recent topics in the field such as the copper oxide high temperature superconductors and exotic superconductivity of heavy fermion systems are discussed in the final chapter This book will be of interest to graduate students and researchers in condensed matter physics especially those working in superconductivity and superfluidity

Introduction to Superfluidity Andreas Schmitt, 2014-07-15 Superfluidity and closely related to it superconductivity are very general phenomena that can occur on vastly different energy scales Their underlying theoretical mechanism of spontaneous symmetry breaking is even more general and applies to a multitude of physical systems In these lecture notes a pedagogical introduction to the field theory approach to superfluidity is presented The connection to more traditional approaches often formulated in a different language is carefully explained in order to provide a consistent picture that is useful for students and researchers in all fields

of physics After introducing the basic concepts such as the two fluid model and the Goldstone mode selected topics of current research are addressed such as the BCS BEC crossover and Cooper pairing with mismatched Fermi momenta

Introduction to superfluidity and superconductivity Сергей Рябчун, 2018-08-31 These notes have appeared as a result of a one term course in superfluidity and superconductivity given by the author to fourth year undergraduate students and first year graduate students of the Department of Physics Moscow State University of Education The goal was not to give a detailed picture of these two macroscopic quantum phenomena with an extensive coverage of the experimental background and all the modern developments but rather to show how the knowledge of undergraduate quantum mechanics and statistical physics could be used to discuss the basic concepts and simple problems and draw parallels between superconductivity and superfluidity

Superfluids and Superconductors Roberto Zivieri, 2018-05-30 This book covers some of the most recent advances in the field of superfluids and superconductors More specifically it presents some of the most advanced theoretical formulations of superfluidity and superconductivity with special regard to their topological properties and vortex dynamics together with a description of the main experiments carried out via experimental techniques at the forefront to study these two such important phenomena in condensed matter physics Special emphasis is given to ultracold Fermi gases to clean liquid helium and to vortex membranes and knots for the class of superfluids and to the emerging superconductivity to intermediate states in type I superconductors and to heat treatments to modulate the critical temperature for the class of superconductors

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High Temperature Superconductors And Other Superfluids A S Alexandrov, Nevill Mott, 1994-11-24 Written by eminent researchers in the field this text describes the theory of superconductivity and superfluidity starting from liquid helium and a charged Bose gas It also discusses the modern bipolaron theory of strongly coupled superconductors which explains the basic physical properties of high temperature superconductors This book will be of interest to fourth year graduate and postgraduate students specialist libraries information centres and chemists working in high temperature superconductivity

Understanding Bose-Einstein Condensation, Superfluidity, and High-Temperature Superconductivity Phil Attard, 2024-12-17 Bose Einstein condensation superfluidity and superconductivity are quantum mechanics made visible They mark the boundary between the classical and the quantum worlds and they show the

macroscopic role of quantum mechanics in condensed matter This book presents these phenomena in terms of particles their positions and their momenta giving a concrete visualisation and description that is not possible with traditional wave functions A single approach that bridges the classical quantum divide provides new insight into the role of particle interactions in condensation the nature of collisions in superfluid flow and the physical form of Cooper pairs in high temperature superconductors High temperature superconductivity is explored with quantum statistical mechanics which links it to Bose Einstein condensation Identifying a new mechanism for Cooper pairing this explains the differences between the low and high temperature superconducting regimes and the role of the molecular structure of the conductor The new perspective offered by this book on Bose Einstein condensation superfluidity and high temperature superconductivity gives particle based explanations as well as mathematical and computational methods for these macroscopic quantum phenomena so that readers understand the role of particle interactions and structure in the physics of these phenomena This book will appeal to undergraduate and graduate students lecturers academics and scientific researchers in the fields of Bose Einstein condensation and condensates superfluidity and superconductivity It will also be of interest to those working with thermodynamics statistical mechanics statistical physics quantum mechanics molecular dynamics materials science condensed matter physics and theoretical chemistry

Key Features Explores Bose Einstein condensation with new evidence for multiple condensed states and novel Monte Carlo simulations for interacting bosons Establishes the thermodynamic nature of condensed bosons from an analysis of fountain pressure measurements including that they carry energy and entropy and the thermodynamic principle of superfluid flow Derives equations of motion for condensed bosons and performs molecular dynamics simulations of the viscosity with molecular trajectories that give rise to superfluidity Identifies the mechanism for electron pairing in high temperature superconductivity

On Superconductivity and Superfluidity Vitaly L. Ginzburg, 2008-11-20 A Nobel Laureate presents his view of developments in the field of superconductivity superfluidity and related theory The book contains Ginzburg's amended version of the Nobel lecture in Physics 2003 as well as his expanded autobiography

BOSE LIQUID THEORY FOR UNCONVENTIONAL SUPERCONDUCTORS AND SUPERFLUIDS. SAFARALI. DJUMANOV, 2024

Research on Superfluidity and Superconductivity on the Basis of the Fermi Liquid Concept Aleksandr I. Achiezer, 1994

Modern Trends in Superconductivity and Superfluidity M. Yu Kagan, 2013-08-31

Macroscopic Theories of Superfluids G. Grioli, 1991-09-26 This book is based on lectures delivered at a meeting organised by the academia Nazionale dei Lincei with contributions from some of the leading research workers in the field They deal with topics of contemporary interest such as solitons hydrodynamic and nonlinear problems in superfluids turbulence thermodynamics first and second sound and the comparison between superconductivity and superfluidity Experimental results and theoretical considerations are included Thus the book will be an invaluable survey for research workers in superfluidity

Novel Superfluids K. H. Bennemann, John Boyd Ketterson, 2014 Volume 2 of Novel Superfluids

continues the presentation of recent results on superfluids including novel metallic systems superfluid liquids and atomic molecular gases of bosons and fermions particularly when trapped in optical lattices Since the discovery of superconductivity Leyden 1911 superfluid 4He Moscow and Cambridge 1937 superfluid 3He Cornell 1972 and observation of Bose Einstein Condensation BEC of a gas Colorado and MIT 1995 the phenomenon of superfluidity has remained one of the most important topics in physics Again and again novel superfluids yield surprising and interesting behaviors The many classes of metallic superconductors including the high temperature perovskite based oxides MgB2 organic systems and Fe based pnictides continue to offer challenges The technical applications grow steadily What the temperature and field limits are remains illusive Atomic nuclei neutron stars and the Universe itself all involve various aspects of superfluidity and the lessons learned have had a broad impact on physics as a whole

Novel Superfluids K. H. Bennemann, John B. Ketterson, 2013-02-28 This book reports on the latest developments in the field of Superfluidity one of the most fundamental interesting and important problems in physics with applications ranging from metals helium liquids photons in cavities excitons in semiconductors to the interior of neutron stars and the present state of the Universe as a whole

Studies in the theory of superfluidity and superconductivity Charles Goethe Kuper, 1964

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