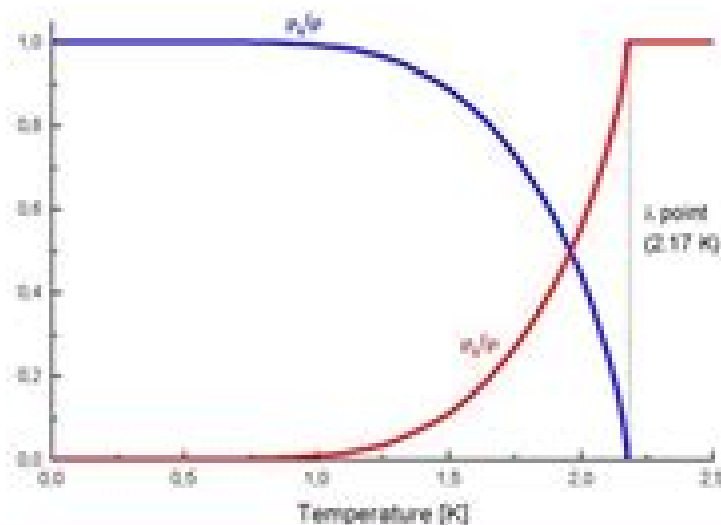


Hydrodynamics of superfluid ^4He - He II

Two-fluid model (Landau)



He II flow is well described only in a limit of low velocities

Thermal counterflow

Second sound prediction – (entropy or temperature waves)

Very low kinematic viscosity of the normal fluid (above appr. 1 K)

Two-fluid model is also applicable to superfluid ^3He phases (talk of Matti Krusius)

Superfluid Hydrodynamics

JR Anderson



Superfluid Hydrodynamics:

Superfluid Hydrodynamics Seth J. Putterman, 1974 *Modern trends in Superconductivity and Superfluidity* M. Yu. Kagan, 2013-12-11 This book concisely presents the latest trends in the physics of superconductivity and superfluidity and magnetism in novel systems as well as the problem of BCS BEC crossover in ultracold quantum gases and high T_c superconductors It further illuminates the intensive exchange of ideas between these closely related fields of condensed matter physics over the last 30 years of their dynamic development The content is based on the author's original findings obtained at the Kapitza Institute as well as advanced lecture courses he held at the Moscow Engineering Physical Institute Amsterdam University Loughborough University and LPTMS Orsay between 1994 and 2011 In addition to the findings of his group the author discusses the most recent concepts in these fields obtained both in Russia and in the West The book consists of 16 chapters which are divided into four parts The first part describes recent developments in superfluid hydrodynamics of quantum fluids and solids including the fashionable subject of possible supersolidity in quantum crystals of ⁴He while the second describes BCS BEC crossover in quantum Fermi Bose gases and mixtures as well as in the underdoped states of cuprates The third part is devoted to non phonon mechanisms of superconductivity in unconventional anomalous superconductors including some important aspects of the theory of high T_c superconductivity The last part considers the anomalous normal state of novel superconductive materials and materials with colossal magnetoresistance CMR The book offers a valuable guide for senior level undergraduate students and graduate students postdoctoral and other researchers specializing in solid state and low temperature physics

An Introduction To The Theory Of Superfluidity Isaac M. Khalatnikov, 2018-03-05 This book covers main properties of the excitation spectrum in superfluid ⁴He and the thermodynamics determined by the spectrum It deals with hydrodynamics and describes that quantitative results should be insignificantly modified with processes of phonon decay taken into account

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 superfluid

Non-equilibrium Thermodynamics of Superfluid Helium and Quantum Turbulence Maria Stella Mongiovì, David Jou, Michele Sciacca, 2025-07-23 This book puts together non equilibrium thermodynamics heat transport properties of superfluid He II and thermodynamic and dynamic aspects of quantum turbulence A one fluid extended model of superfluid helium with heat flux as an additional independent variable is presented and compared with the two fluid model to explore how both models complement each other Important features arise in rotating situations and in superfluid turbulence characterized by quantized vortices leading to strong nonlinearities between heat flux and temperature gradient The dynamics of vortex lines and their interaction with heat dynamics a central

topic in superfluid turbulence is dealt with by introducing the vortex line density as an independent variable and writing its dynamical equations considering the transitions from laminar to turbulent flows and from diffusive to ballistic regimes Classical and quantum turbulence are compared from a mesoscopic view and from their energy spectra The work also explores some parallelisms of quantum vortex thermodynamics with cosmic string thermodynamics and black hole thermodynamics exhibiting duality connections amongst them It emphasizes didactical views over specialistic details and may be used as an introduction to nonequilibrium thermodynamics of superfluid helium and its heat transport properties second sound nonlocal transport nonlinear connections with quantum turbulence The book is useful to researchers in superfluid helium in heat transport and in thermodynamics of cosmic strings and black holes The diversity and complexity of its several physical equations will be inspiring for researchers in mathematical physics

Current Topics In Physics - Proceedings Of The Inauguration Conference Of The Asia-Pacific Center For Theoretical Physics (In 2 Volumes)

Yongmin Cho, Chen Ning Yang, J B Hong, 1998-04-04 This volume is a collection of lectures on the current topics in various areas of physics which were presented at the Inauguration Conference of Asia Pacific Center for Theoretical Physics

Quantum Statistical Mechanics: Selected Works Of N N Bogolubov Nickolai N Bogolubov Jr, 2014-08-14 In this book we have solved the complicated problem of constructing upper bounds for many time averages for the case of a fairly broad class of model systems with four fermion interaction The methods proposed in this book for solving this problem will undoubtedly find application not only for the model systems associated with the theory of superconductivity considered here The theoretical methods developed in Chapters 1 and 2 are already applicable to a much broader class of model systems from statistical physics and the theory of elementary particles

Physics of Neutron Star Interiors D. Blaschke, N.K. Glendenning, A. Sedrakian, 2008-01-11 Neutron stars are the densest observable bodies in our universe Born during the gravitational collapse of luminous stars a birth heralded by spectacular supernova explosions they open a window on a world where the state of the matter and the strengths of the fields are anything but ordinary This book is a collection of pedagogical lectures on the theory of neutron stars and especially their interiors at the forefront of current research It addresses graduate students and researchers alike and should be particularly suitable as a text bridging the gap between standard textbook material and the research literature

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

Nuclear Science Abstracts, 1975

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