

GAUGE FIELDS IN CONDENSED MATTER

Hagen Kleinert

Vol. I SUPERFLOW AND VORTEX LINES

Disorder Fields, Phase Transitions

Vol. II STRESSES AND DEFECTS

Differential Geometry, Crystal Melting

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Gauge Fields In Condensed Matter

H. Kleinert



Gauge Fields In Condensed Matter:

Gauge Fields in Condensed Matter: Stresses and defects Hagen Kleinert, 1989 **Topology of Gauge Fields and Condensed Matter** M. Monastyrsky, 2014-01-15 Gauge Theory of Stresses and Defects Hagen Kleinert, 1989 **Gauge fields in condensed matter**, 200? **Gauge Fields in Condensed Matter** Hagen Kleinert, 1989 This book is the first to develop a unified gauge theory of condensed matter systems dominated by vortices or defects and their long range interactions Gauge fields provide the only means of describing these interactions in terms of local fields rendering them accessible to standard field theoretic techniques Two particularly important examples superfluid systems and crystals are treated in great detail The theory is developed in close contact with physical phenomena and evolves naturally from conventional descriptions of the systems In addition to gauge fields the book introduces the important new concept of disorder fields for ensembles of line like defects The combined field theory allows for a new understanding of the important phase transitions superfluid normal and solid liquid Apart from the above the book presents the general differential geometry of defects in spaces with curvature and torsion and establishes contact with the modern theory of gravity with torsion This book is written for condensed matter physicists and field theorists It can be used as a textbook for a second year graduate course or as supplementary reading for courses in the areas of condensed matter and solid state physics statistical mechanics and field theory **Topology of Gauge Fields and Condensed Matter** M. Monastyrsky, 1993-05-31 Intended mainly for physicists and mathematicians its high quality will definitely attract a wider audience Computational Mathematics and Mathematical Physics This work acquaints the physicist with the mathematical principles of algebraic topology group theory and differential geometry as applicable to research in field theory and the theory of condensed matter Emphasis is placed on the topological structure of monopole and instanton solution to the Yang Mills equations the description of phases in superfluid ^3He and the topology of singular solutions in ^3He and liquid crystals **Gauge Fields in Condensed Matter** H. Kleinert, 1989 **Methods of Contemporary Gauge Theory** Yuri Makeenko, 2023-07-27 This 2002 book is a thorough introduction to quantum theory of gauge fields with emphasis on modern non perturbative methods **Recent Developments in Gauge Theories** G. 't Hooft, 2013-03-09 Almost all theories of fundamental interactions are nowadays based on the gauge concept Starting with the historical example of quantum electrodynamics we have been led to the successful unified gauge theory of weak and electromagnetic interactions and finally to a non abelian gauge theory of strong interactions with the notion of permanently confined quarks The early theoretical work on gauge theories was devoted to proofs of renormalizability investigation of short distance behaviour the discovery of asymptotic freedom etc aspects which were accessible to tools extrapolated from renormalised perturbation theory The second phase of the subject is concerned with the problem of quark confinement which necessitates a non perturbative understanding of gauge theories This phase has so far been marked by the introduction of ideas from geometry topology and statistical mechanics in particular the

theory of phase transitions The 1979 Cargese Institute on Recent Developments on Gauge Theories was devoted to a thorough discussion of these non perturbative global aspects of non abelian gauge theories In the lectures and seminars reproduced in this volume the reader will find detailed reports on most of the important developments of recent times on non perturbative gauge fields by some of the leading experts and innovators in this field Aside from lectures on gauge fields proper there were lectures on gauge field concepts in condensed matter physics and lectures by mathematicians on global aspects of the calculus of variations its relation to geometry and topology and related topics Gauge Fields in Condensed Matter Hagen Kleinert,1989 *Gauge Fields in Condensed Matter: Stresses and defects : differential geometry, crystal melting [i.e. melting* Hagen Kleinert,1989 **Gauge Fields** L. D. Faddeev,2018-03-05 First Published in 2018 Routledge is an imprint of Taylor Francis an Informa company *Gauge Fields in Condensed Matter/Volume 1* Hagen Kleinert,1987-10

Field Theories of Condensed Matter Physics Eduardo Fradkin,2013-02-28 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 **Background Gauge Fields in Condensed Matter** Donald James Priour,2000 *Conical Intersections in Physics* Jonas Larson,Erik Sjöqvist,Patrik Öhberg,2020-01-31 This concise book introduces and discusses the basic theory of conical intersections with applications in atomic molecular and condensed matter physics Conical intersections are linked to the energy of quantum systems They can occur in any physical system characterized by both slow and fast degrees of freedom such as e g the fast electrons and slow nuclei of a vibrating and rotating molecule and are important when studying the evolution of quantum systems controlled by classical parameters Furthermore they play a relevant role for understanding the topological properties of condensed matter systems Conical intersections are associated with many interesting features such as a breakdown of the Born Oppenheimer approximation and the appearance of nontrivial artificial gauge structures similar to the Aharonov Bohm effect Some applications presented in this book include Molecular Systems some molecules in nonlinear nuclear configurations undergo Jahn Teller distortions under which the molecule lower their symmetry if the electronic states belong to a degenerate irreducible representation of the molecular point group Solid State Physics different types of Berry phases associated with conical intersections can be used to detect topologically nontrivial states of matter such as topological insulators Weyl semi metals as well as Majorana

fermions in superconductors Cold Atoms the motion of cold atoms in slowly varying inhomogeneous laser fields is governed by artificial gauge fields that arise when averaging over the fast internal degrees of freedom of the atoms These gauge fields can be Abelian or non Abelian which opens up the possibility to create analogs to various relativistic effects at low speed

Encyclopedic Dictionary of Condensed Matter Physics Charles P. Poole Jr., 2004-03-11 This volume is a translation and revision of the Original Russian version by Baryahktar It covers all of the main fields involved in Condensed Matter Physics such as crystallography electrical properties fluids magnetism material properties optics radiation semiconductors and superconductivity as well as highlights of important related subjects such as quantum mechanics spectroscopy and statistical mechanics Both theoretical and experimental aspects of condensed matter are covered in detail The entries range from very short paragraphs on topics where definitions are needed such as Bloch's law clathrate compound donor domain Kondo lattice mean free path and Wigner crystal to long discussions of more general or more comprehensive topics such as antiferromagnetism crystal lattice dynamics dislocations Fermi surface Josephson effect luminescence magnetic films phase transitions and semiconductors The main theoretical approaches to Condensed Matter Physics are explained There are several long tables on for example Bravais lattices characteristics of magnetic materials units of physical quantities symmetry groups The properties of the main elements of the periodic table are given Numerous entries not covered by standard Solid State Physics texts o Self similarity o The adiabatic approximation o Bistability Emphasis on materials not discussed in standard texts o Activated carbon o Austenite o Bainite o Calamitics o Carbine o Delat phase o Discotics o Gunier Preston zones o Heterodesmic structures o Heusler Alloys o Stress and strain deviators o Vicalloy Each entry is fully cross referenced to help tracking down all aspects of a topic under investigation Highly illustrated to clarify many concepts

60 Years Of Yang-mills Gauge Field Theories: C N Yang's Contributions To Physics Lars Brink, Kok Khoo Phua, 2016-04-21 During the last six decades Yang Mills theory has increasingly become the cornerstone of theoretical physics It is seemingly the only fully consistent relativistic quantum many body theory in four space time dimensions As such it is the underlying theoretical framework for the Standard Model of Particle Physics which has been shown to be the correct theory at the energies we now can measure It has been investigated also from many other perspectives and many new and unexpected features have been uncovered from this theory In recent decades apart from high energy physics the theory has been actively applied in other branches of physics such as statistical physics condensed matter physics nonlinear systems etc This makes the theory an indispensable topic for all who are involved in physics The conference celebrated the exceptional achievements using Yang Mills theory over the years but also many other truly remarkable contributions to different branches of physics from Prof C N Yang This volume collects the invaluable talks by Prof C N Yang and the invited speakers reviewing these remarkable contributions and their importance for the future of physics *Quantum Field Theory And Its Macroscopic Manifestations: Boson Condensation, Ordered Patterns And Topological Defects* Massimo Blasone, Petr

Jizba, Giuseppe Vitiello, 2011-02-21 Quantum dynamics underlies macroscopic systems exhibiting some kind of ordering such as superconductors ferromagnets and crystals Even large scale structures in the Universe and ordering in biological systems appear to be the manifestation of microscopic dynamics ruling their elementary components The scope of this book is to answer questions such as how it happens that the mesoscopic macroscopic scale and stability characterizing those systems are dynamically generated out of the microscopic scale of fluctuating quantum components how quantum particles coexist and interact with classically behaving macroscopic objects e g vortices magnetic domains and other topological defects The quantum origin of topological defects and their interaction with quanta is a crucial issue for the understanding of symmetry breaking phase transitions and structure formation in a wide range of systems from condensed matter to cosmology Deliberately not discussing other important problems primarily renormalization problems this book provides answers to such questions in a unitary self consistent physical and mathematical framework which makes it unique in the panorama of existing texts on a similar subject Crystals ferromagnets and superconductors appear to be macroscopic quantum systems i e their macroscopic properties cannot be explained without recourse to the underlying quantum dynamics Recognizing that quantum field dynamics is not confined to the microscopic world is one of the achievements of this book also marking its difference from other texts The combined use of algebraic methods and operator and functional formalism constitutes another distinctive valuable feature a *Gauge Theories in Particle Physics, 40th Anniversary Edition: A Practical Introduction, Volume 2* Ian J R Aitchison, Anthony J.G. Hey, 2024-06-19 The fifth edition of this well established highly regarded two volume set continues to provide a fundamental introduction to advanced particle physics while incorporating substantial new experimental results especially in the areas of Higgs and top sector physics as well as CP violation and neutrino oscillations It offers an accessible and practical introduction to the three gauge theories comprising the Standard Model of particle physics quantum electrodynamics QED quantum chromodynamics QCD and the Glashow Salam Weinberg GSW electroweak theory Volume 2 of this updated edition covers the two non Abelian gauge theories of QCD and the GSW theory A distinctive feature is the extended treatment of two crucial theoretical tools spontaneous symmetry breaking and the renormalization group The underlying physics of these is elucidated by parallel discussions of examples from condensed matter systems superfluidity and superconductivity and critical phenomena This new edition includes updates to jet algorithms lattice field theory CP violation and the CKM matrix and neutrino physics New to the fifth edition Tests of the Standard Model in the Higgs and top quark sectors The naturalness problem and responses to it going beyond the Standard Model The Standard Model as an effective field theory Each volume should serve as a valuable handbook for students and researchers in advanced particle physics looking for an accessible introduction to the Standard Model of particle physics

The Top Books of the Year Gauge Fields In Condensed Matter The year 2023 has witnessed a noteworthy surge in literary brilliance, with numerous compelling novels enthralling the hearts of readers worldwide. Lets delve into the realm of top-selling books, exploring the captivating narratives that have charmed audiences this year. Gauge Fields In Condensed Matter : Colleen Hoover's "It Ends with Us" This heartfelt tale of love, loss, and resilience has captivated readers with its raw and emotional exploration of domestic abuse. Hoover expertly weaves a story of hope and healing, reminding us that even in the darkest of times, the human spirit can prevail. Uncover the Best : Taylor Jenkins Reids "The Seven Husbands of Evelyn Hugo" This intriguing historical fiction novel unravels the life of Evelyn Hugo, a Hollywood icon who defies expectations and societal norms to pursue her dreams. Reids compelling storytelling and compelling characters transport readers to a bygone era, immersing them in a world of glamour, ambition, and self-discovery. Discover the Magic : Delia Owens "Where the Crawdads Sing" This mesmerizing coming-of-age story follows Kya Clark, a young woman who grows up alone in the marshes of North Carolina. Owens weaves a tale of resilience, survival, and the transformative power of nature, entrancing readers with its evocative prose and mesmerizing setting. These popular novels represent just a fraction of the literary treasures that have emerged in 2023. Whether you seek tales of romance, adventure, or personal growth, the world of literature offers an abundance of captivating stories waiting to be discovered. The novel begins with Richard Papen, a bright but troubled young man, arriving at Hampden College. Richard is immediately drawn to the group of students who call themselves the Classics Club. The club is led by Henry Winter, a brilliant and charismatic young man. Henry is obsessed with Greek mythology and philosophy, and he quickly draws Richard into his world. The other members of the Classics Club are equally as fascinating. Bunny Corcoran is a wealthy and spoiled young man who is always looking for a good time. Charles Tavis is a quiet and reserved young man who is deeply in love with Henry. Camilla Macaulay is a beautiful and intelligent young woman who is drawn to the power and danger of the Classics Club. The students are all deeply in love with Morrow, and they are willing to do anything to please him. Morrow is a complex and mysterious figure, and he seems to be manipulating the students for his own purposes. As the students become more involved with Morrow, they begin to commit increasingly dangerous acts. The Secret History is a brilliant and thrilling novel that will keep you speculating until the very end. The novel is a cautionary tale about the dangers of obsession and the power of evil.

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