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Solitons in Liquid Crystals



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Solitons In Liquid Crystals

**Wai-kai Chen, Jose L Huertas, Rabinder
N Madan**



Solitons In Liquid Crystals:

Solitons in Liquid Crystals Lui Lam, Jacques Prost, 2012-12-06 Solitons are a well known and intriguing aspect of nonlinear behavior in a continuous system such as a fluid a wave propagates through the medium without distortion Liquid crystals are highly ordered systems without a rigid long range structure Solitons in liquid crystals sometimes referred to as walls have a wide variety of remarkable properties that are becoming important for practical applications such as electroluminescent display This book the first review of the subject to be published contains not only surveys of the existing literature but presents new results as well *Nematicons* Gaetano Assanto, 2012-10-16 The first book of its kind to introduce the fundamentals basic features and models potential applications and novel phenomena and its important applications in liquid crystal technology Recognized leader in the field Gaetano Assanto outlines the peculiar characteristics of nematicons and the promise they have for the future growth of this captivating new field *Solitons in Liquid Crystals* Yuan Shen, 2022

Solitons in Liquid Crystals L Lam (ed), 1992 **Modern Topics in Liquid Crystals** Agnes Buka, 1993 This volume contains 19 review articles written by leading experts in the field of neutron scattering NMR dielectric spectroscopy ferroelectricity liquid crystal polymers as well as related subjects The articles cover a broad range of topics which are currently the center of focus and interest in this field The book will be useful for experienced researchers as well as students and those who want to enter the field Apart from the fact that such a publication covers a gap in the literature there is also a personal actuality This volume will be devoted to Professor L Bata who started the liquid crystal research in Hungary some 25 years ago and who is still head of the department at KFKI today He initiated a lot of new subjects in the field and supported many young scientists during these years He is celebrating his 60th birthday this year **Mathematical Methods in Liquid Crystal Optics and Lens Design** Eric Stachura, 2024-08-20 Freeform lens design has numerous applications in imaging aerospace and biomedicine Due to recent advancements in precision cutting and grinding the manufacturing of freeform optical lenses with very high precision is now possible However there is still a significant lack of mathematical literature on the subject and essentially none related to liquid crystals Liquid crystals are appealing for use in imaging due to their flexibility and unique electro optical properties This book fills a gap in mathematical literature and attracts focus to liquid crystals for freeform lens design It provides a rigorous mathematical perspective on liquid crystal optics focusing on ray tracing in the geometric optics regime A mathematical foundation is set to study lens design and ray tracing problems in liquid crystals Additionally it addresses absolute instruments which are devices that image without any optical aberrations These instruments cannot be designed through transformation optics and until recently only a handful of examples were known Mathematically this is a largely untapped area of research yet the applications are profound Finally the book describes several open directions revealing the richness of the intersection of liquid crystal optics and mathematical analysis The content of this book will prove invaluable for researchers of mathematical optics as well as those interested in

liquid crystal theory in addition to those mathematics graduate students aiming to understand the physical basis of light propagation in liquid crystals

Introduction to Topological Defects and Solitons Jonathan V. Selinger, 2024-10-14 This textbook introduces topological defects and solitons at a level suitable for advanced undergraduates and beginning graduate students in physics and materials science It avoids the formal mathematics of topology and instead concentrates on the physical properties of these topological structures The first half of the book concentrates on fundamental principles of defects and solitons and illustrates these principles with a single example the xy model for 2D magnetic order It begins by defining the concept of a winding number and uses this concept to describe the topology of defects vortices or disclinations and solitons domain walls carefully identifying the similarities and differences between these two types of topological structures It then goes on to discuss physical properties of defects and solitons including free energy dynamics statistical mechanics and coupling with curvature It shows how these concepts emerge from a theory with variable magnitude of order and hence how topology can be viewed as an approximation to physics The second half goes on to explore a wider range of topological defects and solitons First it considers more complex types of order 2D nematic liquid crystals 3D magnetic or liquid crystal order 2D or 3D crystalline solids and shows how each type of order leads to specific topological structures Next it discusses defects and solitons that are characterized by 2D or 3D measuring surfaces not just 1D loops including hedgehogs skyrmions and hopfions These structures are more complex but they can still be understood using the same fundamental principles A final chapter describes the formation of phases with regular arrays of defects or solitons

Soliton-driven Photonics A.D. Boardman, A.P. Sukhorukov, 2012-12-06 It is ironic that the ideas of Newton which described a beam of light as a stream of particles made it difficult for him to explain things like thin film interference Yet these particles called photons have caused the adjective photonic to gain common usage when referring to optical phenomena The purist might argue that only when we are confronted by the particle nature of light should we use the word photonics Equally the argument goes on only when we are face to face with an integrable system i.e. one that possesses an infinite number of conserved quantities should we say soliton rather than solitary wave Scientists and engineers are pragmatic however and they are happy to use the word soliton to describe what appears to be an excitation that is humped multi humped or localised long enough for some use to be made of it The fact that such solitons may stick to each other fuse upon collision is often something to celebrate for an application rather than just evidence that after all these are not really solitons in the classic sense Soliton therefore is a widely used term with the qualification that we are constantly looking out for deviant behaviour that draws our attention to its solitary wave character In the same spirit photonics is a useful generic cover all noun even when electromagnetic theory or optics would suffice

The Physics Of Ferroelectric And Antiferroelectric Liquid Crystals Robert Blinc, Igor Musevic, Bostjan Zeks, 2000-07-25 This book presents the basic physics of ferroelectric and antiferroelectric liquid crystals in a simple and transparent way It treats both the basic and the applied aspects of ferroelectric and

antiferroelectric liquid crystal research starting from the discovery of ferroelectricity in liquid crystals in 1975 and ending with the resonant X ray experiment in ferroelectric and antiferroelectric phases in 1998 Particular attention is paid to the optical properties electrooptic effects phase transitions and experimental methods used in liquid crystal research Special chapters are devoted to dielectric spectroscopy light scattering NMR STM and AFM in complex fluids The more than 300 illustrations help to present the basic physics of liquid crystalline ferroelectrics and antiferroelectrics in a way that can be easily followed by students engineers and scientists dealing with liquid crystal research *Liquid Crystals* Pawel Pieranski, Maria Helena Godinho, 2021-08-31 This book on liquid crystals reports on the new perspectives that have been brought about by the recent expansion of frontiers and overhaul of common beliefs First it explores the interaction of light with mesophases when the light or matter is endowed with topological defects It goes on to show how electrophoresis electroosmosis and the swimming of flagellated bacteria are affected by the anisotropic properties of liquid crystals It also reports on the recent progress in the understanding of thermomechanical and thermohydrodynamical effects in cholesterics and deformed nematics and refutes the common belief that these effects could explain Lehmann's observations of the rotation of cholesteric droplets subjected to a temperature gradient It then studies the physics of the dowsy texture which has remarkable properties This is of particular interest in regards to nematic monopoles which can easily be generated set into motion and collided within it Finally this book deals with the spontaneous emergence of chirality in nematics made of achiral molecules and provides a brief historical context of chirality Handbook of Liquid Crystals, 8 Volume Set John W. Goodby, Peter J. Collings, Takashi Kato, Carsten Tschierske, Helen Gleeson, Peter Raynes, Volkmar Vill, 2014-04-14 Much more than a slight revision this second edition of the successful Handbook of Liquid Crystals is completely restructured and streamlined with updated as well as completely new topics 100% more content and a new team of editors and authors As such it fills the gap for a definitive single source reference for all those working in the field of organized fluids and will set the standard for the next decade The Handbook's new structure facilitates navigation and combines the presentation of the content by topic and by liquid crystal type A fundamentals volume sets the stage for an understanding of the liquid crystal state of matter while individual volumes cover the main types and forms with a final volume bringing together the diverse liquid crystal phases through their applications This unrivaled all embracing coverage represents the undiluted knowledge on liquid crystals making the Handbook a must have wherever liquid crystals are investigated produced or used and in institutions where their science and technology is taught Also available electronically on Wiley Online Library www.wileyonlinelibrary.com/ref/holc Volume 1 Fundamentals of Liquid Crystals Volume 2 Physical Properties and Phase Behavior of Liquid Crystals Volume 3 Nematic and Chiral Nematic Liquid Crystals Volume 4 Smectic and Columnar Liquid Crystals Volume 5 Non Conventional Liquid Crystals Volume 6 Nanostructured and Amphiphilic Liquid Crystals Volume 7 Supramolecular and Polymeric Liquid Crystals Volume 8 Applications of Liquid Crystals *Solitons* Mohamed Atef

Helal,2022-11-12 This newly updated volume of the Encyclopedia of Complexity and Systems Science ECSS presents several mathematical models that describe this physical phenomenon including the famous non linear equation Korteweg de Vries KdV that represents the canonical form of solitons Also there exists a class of nonlinear partial differential equations that led to solitons e g Kadomtsev Petviashvili KP Klein Gordon KG Sine Gordon SG Non Linear Schr dinger NLS Korteweg de Vries Burger s KdVB etc Different linear mathematical methods can be used to solve these models analytically such as the Inverse Scattering Transformation IST Adomian Decomposition Method Variational Iteration Method VIM Homotopy Analysis Method HAM and Homotopy Perturbation Method HPM Other non analytic methods use the computational techniques available in such popular mathematical packages as Mathematica Maple and MATLAB The main purpose of this volume is to provide physicists engineers and their students with the proper methods and tools to solve the soliton equations and to discover the new possibilities of using solitons in multi disciplinary areas ranging from telecommunications to biology cosmology and oceanographic studies *Visions Of Nonlinear Science In The 21st Century* Wai-kai Chen,Jose L Huertas,Rabinder N Madan,1999-07-03 Authoritative and visionary this festschrift features 12 highly readable expositions of virtually all currently active aspects of nonlinear science It has been painstakingly researched and written by leading scientists and eminent expositors including L Shilnikov R Seydel I Prigogine W Porod C Mira M Lakshmanan W Lauterborn A Holden H Haken C Grebogi E Doedel and L Chua each chapter addresses a current and intensively researched area of nonlinear science and chaos including nonlinear dynamics mathematics numerics and technology Handsomely produced with high resolution color graphics for enhanced readability this book has been carefully written at a high level of exposition and is somewhat self contained Each chapter includes a tutorial and background information as well as a survey of each area s main results and state of the art Of special interest to both beginners and seasoned researchers is the identification of future trends and challenging yet tractable problems that are likely to be solved before the end of the 21st century The visionary and provocative nature of this book makes it a valuable and lasting reference **Localized States in Physics: Solitons and Patterns** Orazio Descalzi,Marcel Clerc,Stefania Residori,Gaetano Assanto,2011-01-06 Systems driven far from thermodynamic equilibrium can create dissipative structures through the spontaneous breaking of symmetries A particularly fascinating feature of these pattern forming systems is their tendency to produce spatially confined states These localized wave packets can exist as propagating entities through space and or time Various examples of such systems will be dealt with in this book including localized states in fluids chemical reactions on surfaces neural networks optical systems granular systems population models and Bose Einstein condensates This book should appeal to all physicists mathematicians and electrical engineers interested in localization in far from equilibrium systems The authors all recognized experts in their fields strive to achieve a balance between theoretical and experimental considerations thereby giving an overview of fascinating physical principles their manifestations in diverse systems and the novel technical applications on the horizon

All about Science Maria Burguete, Lui Lam, 2014 There is a lot of confusion and misconception concerning science The nature and contents of science is an unsettled problem For example Thales of 2 600 years ago is recognized as the father of science but the word science was introduced only in the 14th century the definition of science is often avoided in books about philosophy of science This book aims to clear up all these confusions and present new developments in the philosophy history sociology and communication of science It also aims to showcase the achievement of China's top scholars in these areas The 18 chapters divided into five parts are written by prominent scholars including the Nobel laureate Robin Warren sociologist Harry Collins and physicist turned historian Dietrich Stauffer Contents Preface About Science 1 Basics OCo Knowledge Nature Science and Scimat Lui Lam About Science 2 Philosophy History Sociology and Communication Lui Lam Philosophy of Science Towards a Phenomenological Philosophy of Science Guo Sheng Wu The Predicament of Scientific Culture in Ancient China Hong Sheng Wang What Do Scientists Know Nigel Sanitt How to Deal with the Whole Two Kinds of Holism in Methodology Jin Yang Liu History of Science Helicobacter The Ease and Difficulty of a New Discovery Robin Warren Science in Victorian Era New Observations on Two Old Theses Dun Liu Medical Studies in Portugal Around 1911 Maria Burguete The Founding of the International Liquid Crystal Society Lui Lam Sociology of Science Three Waves in Science Studies Harry Collins Solitons and Revolution in China 1978 OCo 1983 Lui Lam Scientific Culture in Contemporary China Bing Liu and Mei Fang Zhang Communication of Science Science Communication A History and Review Peter Broks Popular Science Writings in Early Modern China Lin Yin Other Science Matters Understanding Art Through Science From Socrates to the Contextual Brain Kajsa Berg Spy Video Games After 9 11 Narrative and Pleasure Ting Ting Wang Statistical Physics for Humanities A Tutorial Dietrich Stauffer Readership Researchers and laypeople interested in science **Emerging Liquid Crystal**

Technologies, 2007 Focus on Soliton Research L. V. Chen, 2006 Since their discovery a mere thirty years ago solitons have been invoked to explain such diverse phenomena as The long lived giant red spot in the highly turbulent Jovian atmosphere The famous Fermi Pasta Ulam paradox wherein a nonlinearly coupled lattice of particles does not display the expected equipartition of energy among available modes ion acoustic waves in a plasma energy storage and transfer in proteins via the Davydov soliton and the propagation of short laser pulses in optical fibres over long distances with negligible shape change This volume presents important research from around the globe *Liquid Crystal on Silicon Devices* Andrés Márquez, Ángel Lizana, 2019-11-19 Liquid Crystal on Silicon LCoS has become one of the most widespread technologies for spatial light modulation in optics and photonics applications These reflective microdisplays are composed of a high performance silicon complementary metal oxide semiconductor CMOS backplane which controls the light modulating properties of the liquid crystal layer State of the art LCoS microdisplays may exhibit a very small pixel pitch below 4 μm a very large number of pixels resolutions larger than 4K and high fill factors larger than 90% They modulate illumination sources covering the UV visible and far IR LCoS are used not only as displays but also as polarization amplitude and phase only

spatial light modulators where they achieve full phase modulation Due to their excellent modulating properties and high degree of flexibility they are found in all sorts of spatial light modulation applications such as in LCOS based display systems for augmented and virtual reality true holographic displays digital holography diffractive optical elements superresolution optical systems beam steering devices holographic optical traps and quantum optical computing In order to fulfil the requirements in this extensive range of applications specific models and characterization techniques are proposed These devices may exhibit a number of degradation effects such as interpixel cross talk and fringing field and time flicker which may also depend on the analog or digital backplane of the corresponding LCoS device The use of appropriate characterization and compensation techniques is then necessary

Advances in Nonlinear Optics Xianfeng Chen,Guoquan Zhang,Heping Zeng,Qi Guo,Weilong She,2014-12-16 This book presents an overview of the state of the art of the developing topic of nonlinear optics with contributions from leading experts in the field in China ranging from weak light nonlinear optics ultrafast nonlinear optics to electro optical theory and applications In the past decade nonlinear optics has evolved into many different branches depending on the form of the material used for studying the nonlinear phenomena The growth of research in nonlinear optics is closely linked to the rapid technological advances that have occurred in related fields such as ultra fast phenomena and optical communications Nonlinear optics activities range from the fundamental studies of the interaction between matter and radiation to the development of devices components and systems of tremendous commercial interest for widespread applications in optical telecommunications medicine and biotechnology This book reviews the development of some nonlinear optics researches in China not only the discovery of new principles but also potential applications of nonlinear optics for various industries

New Trends In Statistical Physics: Festschrift In Honor Of Leopoldo Garcia-colin's 80th Birthday Alfredo Macias,Leonardo Dagdug,2010-05-20 This volume presents a collection of original and peer reviewed articles related with the applications of Statistical Physics dedicated to Professor Dr Leopoldo Garcia Col in commemoration of his 80th birthday in 2010 Professor Garcia Col n has worked in many different fields of statistical physics and has applied it to biological physics solid state physics relativity and cosmology These are pioneering works of Prof Garcia Col n involved in all various fields which have their roots in Mexico His influence is found in each of these works that cover a wide range of topics including thermodynamics statistical mechanics and kinetic theory applied to biological systems cosmology and condensed matter among others Papers contributed by important experts in the field such as J Lebowitz as well as the latest classical applications of statistical physics can be found in this volume

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Solitons In Liquid Crystals Introduction

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