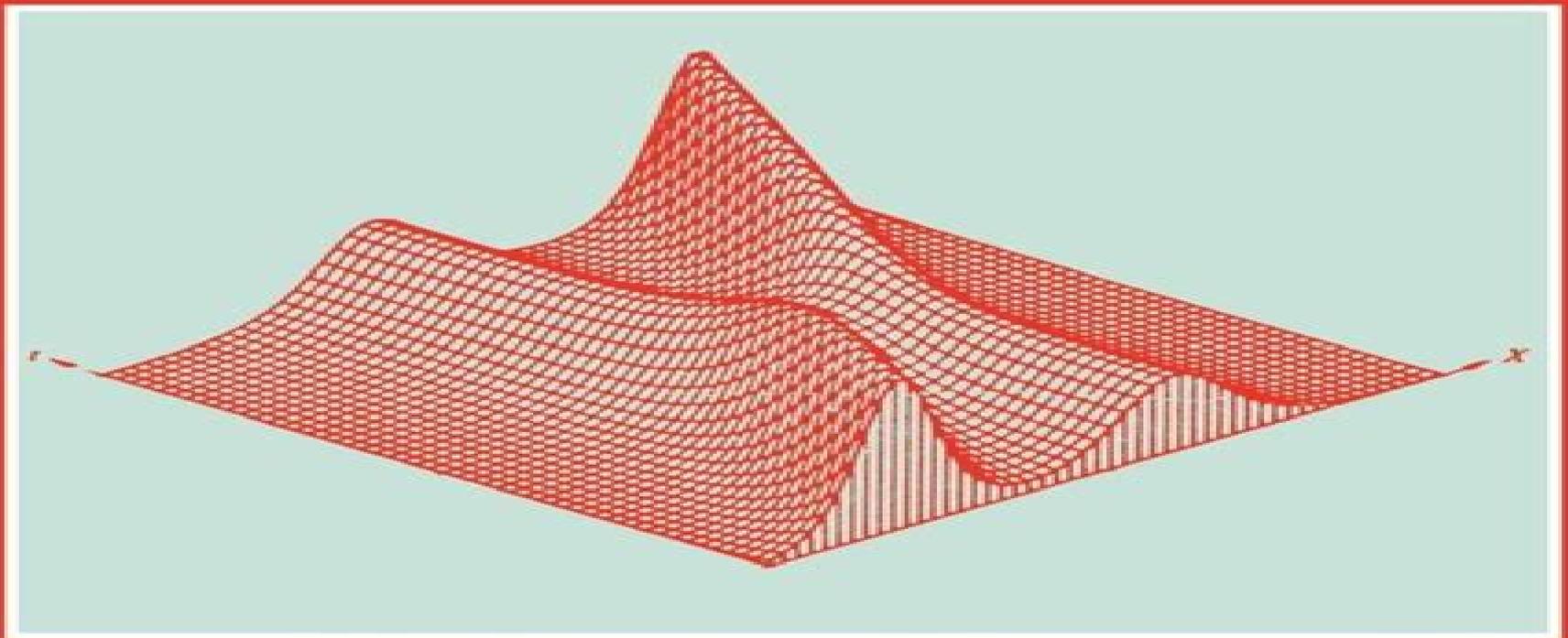


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# Solitons: an introduction



P. G. DRAZIN & R. S. JOHNSON

# Dibipative Solitons

**Natasha Natalia Devine**



## **Dibipative Solitons:**

**Dissipative Solitons: From Optics to Biology and Medicine** Nail Akhmediev, Adrian Ankiewicz, 2008-12-14 The dissipative soliton concept is a fundamental extension of the concept of solitons in conservative and integrable systems. It includes ideas from three major sources: namely, standard soliton theory developed since the 1960s, nonlinear dynamics theory, and Prigogine's ideas of systems far from equilibrium. These three sources also correspond to the three component parts of this novel paradigm. This book explains the above principles in detail and gives the reader various examples.

**Dissipative Solitons** Nail Akhmediev, Adrian Ankiewicz, 2005-04-25 This volume is devoted to the exciting topic of dissipative solitons, i.e. pulses or spatially localised waves in systems exhibiting gain and loss. Examples are laser systems, nonlinear resonators, and optical transmission lines. The physical principles and mathematical concepts are explained in a clear and concise way suitable for students and young researchers. The similarities and differences in the notion of a soliton between dissipative systems and Hamiltonian and integrable systems are discussed, and many examples are given. The contributions are written by the world's leading experts in the field, making it a unique exposition of this emerging topic.

*Dissipative Optical Solitons* Mário F. S. Ferreira, 2022-09-23 This book introduces the basic concept of a dissipative soliton before going to explore recent theoretical and experimental results for various classes of dissipative optical solitons: high energy dissipative solitons and their applications, and mode-locked fiber lasers. A soliton is a concept which describes various physical phenomena ranging from solitary waves forming on water to ultrashort optical pulses propagating in an optical fiber. While solitons are usually attributed to integrability, in recent years the notion of a soliton has been extended to various systems which are not necessarily integrable. Until now the main emphasis has been given to well-known conservative soliton systems, but new avenues of inquiry were opened when physicists realized that solitary waves did indeed exist in a wide range of non-integrable and non-conservative systems, leading to the concept of so-called dissipative optical solitons. Dissipative optical solitons have many unique properties which differ from those of their conservative counterparts. For example, except for very few cases, they form zero-parameter families and their properties are completely determined by the external parameters of the optical system. They can exist indefinitely in time as long as these parameters stay constant. These features of dissipative solitons are highly desirable for several applications, such as in-line regeneration of optical data streams and generation of stable trains of laser pulses by mode-locked cavities.

*Dissipative Solitons: From Optics to Biology and Medicine* Nail Akhmediev, Adrian Ankiewicz, 2009-08-29 The dissipative soliton concept is a fundamental extension of the concept of solitons in conservative and integrable systems. It includes ideas from three major sources: namely, standard soliton theory developed since the 1960s, nonlinear dynamics theory, and Prigogine's ideas of systems far from equilibrium. These three sources also correspond to the three component parts of this novel paradigm. This book explains the above principles in detail and gives the reader various examples.

Dissipative Solitons Nail Akhmediev, Adrian

Ankiewicz,2009-09-02 This volume is devoted to the exciting topic of dissipative solitons i.e pulses or spatially localised waves in systems exhibiting gain and loss Examples are laser systems nonlinear resonators and optical transmission lines The physical principles and mathematical concepts are explained in a clear and concise way suitable for students and young researchers The similarities and differences in the notion of a soliton between dissipative systems and Hamiltonian and integrable systems are discussed and many examples are given The contributions are written by the world's leading experts in the field making it a unique exposition of this emerging topic

**Dissipative Solitons** Natasha Natalia Devine,2010 The notion of dissipative solitons is a useful concept that allows us to describe in general terms a variety of phenomena in physics chemistry biology and medicine Some specific features of these formations are common for all of them independent of the problem that we are solving and the model we are using Many problems in optics involving gain and loss can be formulated in terms of a single master equation that is in one or another form of the complex cubic quintic Ginzburg Landau equation CGLE type

**Dissipative Solitons in Reaction Diffusion Systems** Andreas Liehr,2013-03-27 Why writing a book about a specialized task of the large topic of complex systems And who will read it The answer is simple The fascination for a didactically valuable point of view the elegance of a closed concept and the lack of a comprehensive disquisition The fascinating part is that field equations can have localized solutions exhibiting the typical characteristics of particles Regarding the field equations this book focuses on the field phenomenon of localized solutions can be described in the context of a particle formalism which leads to a set of ordinary differential equations covering the time evolution of the position and the velocity of each particle Moreover starting from these particle dynamics and making the transition to many body systems one considers typical phenomena of many body systems as shock waves and phase transitions which themselves can be described as field phenomena Such transitions between different level of modelling are well known from conservative systems where localized solutions of quantum field theory lead to the mechanisms of elementary particle interaction and from this to field equations describing the properties of matter However in dissipative systems such transitions have not been considered yet which is adjusted by the presented book The elegance of a closed concept starts with the observation of self organized current filaments in a semiconductor gas discharge system These filaments move on random paths and exhibit certain particle features like scattering or the formation of bound states Neither the reasons for the propagation of the filaments nor the laws of the interaction between the filaments can be registered by direct observations Therefore a model is established which is phenomenological in the first instance due to the complexity of the experimental system This model allows to understand the existence of localized structures their mechanisms of movement and their interaction at least on a qualitative level But this model is also the starting point for developing a data analysis method that enables the detection of movement and interaction mechanisms of the investigated localized solutions The topic is rounded off by applying the data analysis to real experimental data and comparing the experimental observations to the

predictions of the model A comprehensive publication covering the interesting topic of localized solutions in reaction diffusion systems in its width and its relation to the well known phenomena of spirals and patterns does not yet exist and this is the third reason for writing this book Although the book focuses on a specific experimental system the model equations are as simple as possible so that the discussed methods should be adaptable to a large class of systems showing particle like structures Therefore this book should attract not only the experienced scientist who is interested in self organization phenomena but also the student who would like to understand the investigation of a complex system on the basis of a continuous description Dissipative Solitons and Their Applications Wonkeun Chang,2009 **Nonlinear Optics**

**Applications** Mirosław A. Karpierz,2005 Proceedings of SPIE present the original research papers presented at SPIE conferences and other high quality conferences in the broad ranging fields of optics and photonics These books provide prompt access to the latest innovations in research and technology in their respective fields Proceedings of SPIE are among the most cited references in patent literature *Journal of Experimental and Theoretical Physics* ,2006 *Nonlinear Waves* Emmanuel Kengne,WuMing Liu,2023-02-23 This book highlights the methods to engineer dissipative and magnetic nonlinear waves propagating in nonlinear systems In the first part of the book the authors present methodologically mathematical models of nonlinear waves propagating in one and two dimensional nonlinear transmission networks without with dissipative elements Based on these models the authors investigate the generation and the transmission of nonlinear modulated waves in general and solitary waves in particular in networks under consideration In the second part of the book the authors develop basic theoretical results for the dynamics matter wave and magnetic wave solitons of nonlinear systems and of Bose Einstein condensates trapped in external potentials combined with the time modulated nonlinearity The models treated here are based on one two and three component non autonomous Gross Pitaevskii equations Based on the Heisenberg model of spin spin interactions the authors also investigate the dynamics of magnetization in ferromagnet with or without spin transfer torque This research book is suitable for physicists mathematicians engineers and graduate students in physics mathematics and network and information engineering **Journal of the Physical Society of Japan** ,2013 *Conference Proceedings* ,2004 **Nonlinear Guided Waves and Their Applications** ,2002 **Optical Information, Data Processing and Storage, and Laser Communication Technologies** Jean-Pierre Goedgebuer,2003 **Semiconductor Lasers and Optical Communication** Sergei A. Gurevich,Nikolay N. Rosanov,2001 **Acta Physica Polonica** ,2007 **Laser Physics** ,2009 *Optics and Spectroscopy* ,2007 **Fundamentals of Laser-matter Interaction** Konstantin N. Drabovich,Nikolai Ivanovich Koroteev,1996

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