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PACS numbers: 01.30.Vv; 42.65.Tg
DOI: 10.1070/QE2006v036n04ABEH013156

Review of the book 'Optical Solitons: from Fibres to Photonic Crystals' by Yu.S. Kishvar and G.P. Agraval

Translated from English, Rozanov N.N., Ed. (Moscow: Fizmatlit, 2005, 648 pp)

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The Fizmatlit publishing house issued the translation of the book of two prominent specialists in nonlinear optics, professors Yu.S. Kishvar and G.P. Agraval – the authors of hundreds of spectacular papers and reviews on the key problems of soliton physics. The book was published by Academic Press (Boston) in 2003. Yurii Kishvar began his studies in theoretical physics in Kharkov and published a few papers in Soviet journals. At present he works successfully at the Nonlinear Physics Center at the Australian National University. The name of Govind Agraval, a staff member of the Institute of Optics at the Rochester University became widely known in Russia after the publication of the translation of his monograph 'Nonlinear Fiber Optics' by Mir publishing house.

The object of this book is optical solitons, i.e., the localised light structures in which the dispersion or diffraction spread is compensated by nonlinear focusing. Due to the dynamic balance, the soliton regime provides the stable propagation of light pulses and beams over large distances. This field of physics, which is important both in the scientific and applied aspects, was studied in many papers. However, only individual types of solitons were considered in all these papers. In addition, the results obtained by many research groups actively working in this rapidly developing field were not reported in them.

The monograph of Kishvar and Agraval possesses a number of advantages which make it especially valuable for a broad scope of both specialists and beginning researchers and students. The book is of an encyclopaedic nature, presenting the recent advances in experimental and theoretical studies of virtually all the known types of optical solitons and localised structures in related physical wave systems. In addition, the book contains many references to original papers, which gives the notion on the modern state of soliton physics. The systematic presentation of the material and the possibility to use the book as a handbook is undoubtedly attractive for beginning researchers and students.

The book consists of 14 chapters. The first chapter is the introduction, in which the history of the problem is presented and optical solitons are characterised in general. Then, the properties of optical solitons of different types (spatial, temporal, Bragg, two-dimensional, spatially-temporal, vortex, vector, parametric, discrete, and solitons in photonic crystals and incoherent solitons) are successively (by chapters) described. In this main part of the book, the authors conclusively demonstrate the unique possibilities of various applications of solitons, first of all for optical data processing. In the last chapter, based on general approaches, the related problems such as optical solitons in liquid crystals, photoinduced waveguides, dissipative and resonance solitons, magnetic solitons and solitons in a Bose – Einstein condensate are considered. Thus, the knowledge obtained in the field of optical solitons can be used to analyse localised structures in a variety of systems of a quite different physical nature.

The book is issued with great care. A number of misprints and inaccuracies were corrected in the translation and notes explaining and refining the original text were presented. As a result, in opinion of one of the authors (Yu.S. Kishvar), the Russian edition proved to be more rigorous and complete than the original. Undoubtedly, this book will become a reference book for many specialists and a popular handbook for researchers beginning to study this important and interesting subject.

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Received 4 February 2006
Kvantovaya Elektronika **36** (4) 392 (2006)
Translated by M.N. Sapozhnikov