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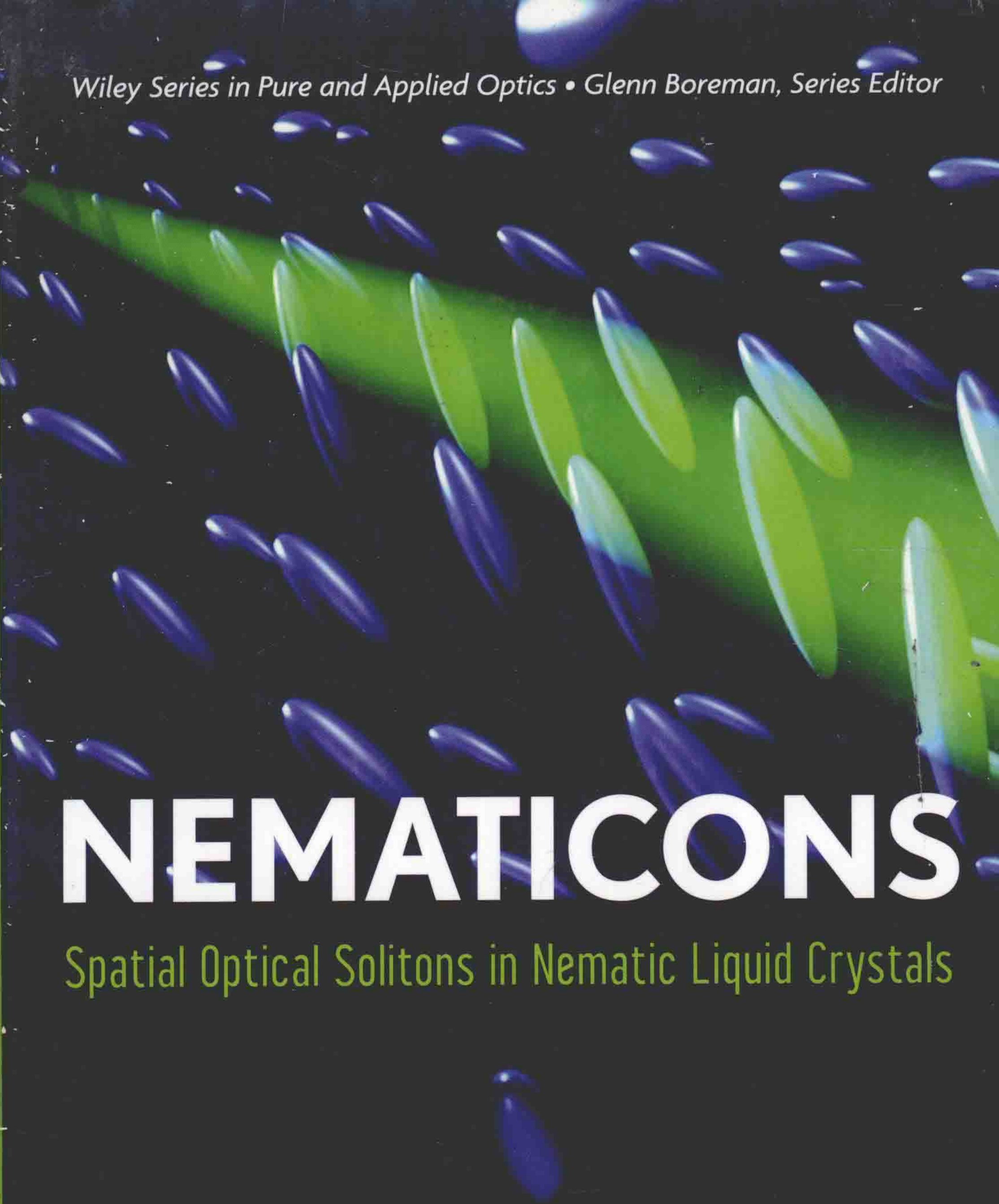

NEMATICONS

Spatial Optical Solitons in Nematic Liquid Crystals

Edited by
GAETANO ASSANTO

WILEY

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Nematicons

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To my parents

Preface

Solitons in physics and solitons in optics are well-established contemporary topics, addressed in a large number of scientific papers and several books. Spatial optical solitons form a specific class, as optics in space is characterized by diffraction rather than dispersion, beam size rather than pulse duration, one or two transverse dimensions rather than one in the temporal domain. For a long time, the available experimental observations of optical solitons in space were limited by the magnitude of the material nonlinearities, until molecular and photorefractive media allowed investigating them at low power and with continuous-wave sources, including incoherent ones. Among the well-known molecular dielectrics exhibiting a large optically nonlinear response were liquid crystals, typically employed in thin samples. It was realized in the early days of both nonlinear optics and liquid crystals that the reorientational response of nematic liquid crystals could lead to quite impressive effects, both in the electro-optic and all-optical domains. Later on, beam propagation over extended distances in nematic liquid crystals was exploited to demonstrate self-focusing and related phenomena, until it became clear that optical spatial solitons could be supported by such a response at the molecular level. I came across light self-localization in nematic liquid crystals during international meetings, where I attended the inspiring presentations by Prof. M. Karpierz (Poland) and Prof. M. Warenghem (France) on light self-confinement in nematic liquid crystals, and decided to get involved in research on nematicons. The discussions with Prof. I. C. Khoo were enlightening and the collaboration with Prof. C. Umeton allowed the program to get started on the right foot. The term "nematicon" was actually coined during a car trip in Poland as I was having a conversation on the topic with M. Karpierz and G. I. Stegeman. The Greek root $\nu\epsilon\mu\alpha\tau\iota\kappa o\sigma$ means "filament-like" or "spaghetti-like," appropriate to both the topic and the culinary culture of someone like me, of Italian birth and upbringing.

This is the first book specifically dealing with spatial optical solitons in nematic liquid crystals. It is a multiauthor contribution to the field and contains review as well as original (previously unpublished) material, from theoretical models to advanced numerical simulations and from experimental observations to applications. The various contributors and chapters have been selected and invited in order to cover most of the relevant activities in this field over the past 12 years.

G. Assanto

Italy
February 2012

Acknowledgments

Prof. Glenn Boreman and his wife, Maggie, friends since my PhD studies at the University of Arizona in Tucson, Arizona, encouraged me to consider preparing a Wiley book on nematicons. George Telecki soon joined them in keeping up the necessary pressure. Thanks a lot. I hope you were right and that readers will enjoy this book.

I thank all the authors who kindly accepted my invitation to contribute one or more chapters, and to subject themselves to a number of requests concerning contents, style, mode of presentation, and deadlines. I express my gratitute to all the students and colleagues who do not appear as book contributors but are coauthors of papers and precious actors inspiring various portions of the scientific activities. They include R. Asquini, R. Barboza, I. Burgess, O. Buchnev, G. Coschignano, D. Christodoulides, A. d'Alessandro, A. de Luca, R. Dabrowski, A. Dyadyusha, A. Fratalocchi, M. Kaczmarek, I. C. Khoo, M. Kwasny, L. Lucchetti, R. Morandotti, E. Nowinowski-Kruszelnicki, A. Pasquazi, K. A. Rutkowska, S. V. Serak, F. Simoni, G. I. Stegeman, N. Tabiryan, M. Trotta, and C. Umeton.

Finally, I pay a special tribute to Alessandro Alberucci and Armando Piccardi for greatly supporting me in the no less important task of arranging, organizing, managing, and editing the manuscript.

GA

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