Review of the book:

BPS179 **The Frenkel-Kontorova Model. Concepts, Methods, and Applications.** (Texts and Monographs in Physics). O. M. Braun and Y. S. Kivshar. Springer, Berlin, 2004. 472 pp. Hbk. Euro 79,95. ISBN 3-540-40771-5.

The *Frenkel-Kontorova (FK) model* is a long established, widely used paradigm in Nonlinear Science, with applications in fields as diverse as Solid State Physics, Biological Physics, Field Theory, Material Science and Tribology. Known test-bed contexts include dislocation theory in metals, charge transport in hydrogen-bonded materials, DNA dynamics, and charged particle ("plasma") Wigner-type quasi-crystals, to mention only a few.
The FK model essentially amounts to the description of a (discrete) one-dimensional chain of linear oscillators, "sitting" on a periodic substrate (on-site) potential (initially taken to be of sinusoidal form, although more elaborate forms have later been suggested). Its continuum analog, the integrable Sine-Gordon (SG) equation, is a favorite paradigm among mathematical physicists, while its generalization, the nonlinear Klein-Gordon equation, has already enjoyed a long trajectory in Field Theory.

The authors of the book have contributed a good deal of original research work in Nonlinear Science and Soliton Theory, including a well-known Review Article on the FK model in *Physics Reports*. Holding the book, I was pleased to find out that it was much more than (or, let me say, not at all) a collection of the authors' published texts.
The book starts with a brief formulation of the FK model, in Chapter 1, and an overview of its occurrence in real physical systems, in Ch. 2. The kink/antikink and breather localized solutions are then presented and analyzed in Chs. 3 and 4. Adding to the merit of the book, the authors formulate the analysis in a generic fashion (going beyond the analytically solvable Sine-Gordon model), allowing for a general on-site potential form and enabling one to tailor fit any new problem in the description. Also, recent work on Discrete Breather excitations (intrinsic localized lattice modes) is reviewed in the latter Chapter (although the topic would rather deserve a Chapter of its own). The rest of the book, is dedicated to an exhibition of the toolbox used in the analysis of FK related problems. Analytical Methods and numerical results are exposed in ascending complexity, including the modelisation of (in)commensurability (in Ch. 5), FK excitation Statistical Mechanics (Ch. 6) and thermal noise- (diffusion-)related theories (Ch. 7). The behavior of FK chains with respect to external forcing, substrate asymmetry ("ratchets") and finite-size effects is reviewed in Chs. 8, 9 and 10, respectively. The two-dimensional extension of the FK model is then introduced, in Ch. 11, and further directions of study, not covered in the book, are outlined in the concluding Ch. 12. The manuscript is closed with a (most interesting *per se*) historical testimony of the foundations of the FK model (80 years ago) by Alfred Seeger, who witnessed the rise of the model in the beginning of his graduate years, in the late 40's.

Concluding, the book of Oleg Braun and Yury Kivshar deserves one's close attention and provides thorough insight into a well-known physical paradigm. The sheer fact of providing all this information (previously dispersed among numerous technical articles) in one piece of work deserves its own merit, and the contribution of the authors' own work bears its own value. The volume will undoubtedly prove to be a valuable source of information to researchers who are familiar with soliton theories, and will provide inspiration to those less familiar.

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