

MR2977706 (Review) [37-02](#) ([37-04](#) [37J40](#) [37N05](#) [70-02](#) [70Fxx](#))

Cordani, Bruno (I-MILAN-NDM)

★ **Geography of order and chaos in mechanics.**

Investigations of quasi-integrable systems with analytical, numerical, and graphical tools.

Progress in Mathematical Physics, 64.

Birkhäuser/Springer, New York, 2013. *xviii+332 pp.* ISBN 978-0-8176-8369-6; 978-0-8176-8370-2

This book is concerned with the analysis, from different points of view (analytical, numerical and visual), of the dynamics of nearly-integrable Hamiltonian systems.

The book comes with a CD (not available to the reviewer) containing five MATLAB (a non-free MathWorks numerical computing environment) interactive programs aimed at allowing readers (not necessarily expert in computer programming) to visualize the results of several interesting numerical experiments.

The book is organized in ten chapters. Chapter 1 is an introduction to the rest of the book. Chapters 2 and 3 may be considered as an introduction to the analytical perturbation theory of nearly integrable Hamiltonian systems. They include a quite thorough discussion of the proof(s) of Kolmogorov's theorem on the persistence, under perturbation, of quasi-periodic motions and a (shorter) discussion of Nekhoroshev's techniques for proving exponential stability of steep Hamiltonians. Chapters 4 and 5 are devoted to general tools of numerical integrations of ODEs and of more specific numerical methods related to Hamiltonian structures. Chapters 6, 7, 8, and 9, which may be considered as the core of the book, are devoted to applications; namely, certain perturbed Keplerian problems (the Stark-Quadratic-Zeeman problem, the circular restricted three-body problem, and the motion of a satellite around an oblate primary). Finally, Chapter 10 contains final remarks and perspectives.

Reviewed by [Luigi Chierchia](#)

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My reply

I reply to two statements of the reviewer.

- (i) “The book comes with a CD (not available to the reviewer) ...”

Also the reviewer (as every other reader) can download the ISO image of the CD from the `extras.springer.com` site.

- (ii) “...containing five MATLAB (a non-free MathWorks numerical computing environment) interactive programs ...”

That MATLAB is a non-free software is a true (and well known) fact, but the reviewer has forgotten to add that a compiled (stand-alone) version of the five programs is furnished, which allows to use the software without a MATLAB license. Of the five compiled programs, only KEPLER suffers some limitations with respect to the the true version.

Bruno Cordani