JGSP **20** (2010) 107–109

JOURNAL OF
Geometry and Symmetry
in Physics

BOOK REVIEW

Stability and Chaos in Celestial Mechanics, by Alessandra Celletti, Springer, Berlin • Heidelberg • New York 2009, xi+257 pp., Published in Association with Praxis, Chichester, UK, ISBN 978-3-540-85145-5.

The author of this book is a Professor at mathematics department, University of Rome "Tor Vergata", Rome, Italy.

The fact that the last decades have marked the beginning of a new era in Celestial Mechanics is a good reason for a new book in the field. The challenges came from several different directions. The stability theory of nearly-integrable systems (a class of problems which includes many models of Celestial Mechanics) profited from the breakthrough provided by the Kolmogorov-Arnold-Moser theory, which also ensures tools for determining explicitly the parameter values allowing for stability. A confinement of the actions for exponential times was guaranteed by Nekhoroshev's theorem, which gives much information about the geography of the resonances. Performing ever-faster computer simulations allowed us to have deeper insights into many questions of Dynamical Systems, most notably chaos theory. In this context several techniques have been developed to distinguish between ordered and chaotic behaviors. In this framework Chapter 1 is devoted to the interplay between conservative and dissipative dynamical systems, their linear stability, the definition of attractors and the discussion of some paradigmatic models, both conservative and dissipative. These concepts are made clear by means of paradigmatic examples, like the logistic map, the standard mapping both in its conservative and dissipative version, and Hénon's mapping.

Chapter 2 presents a qualitative analysis of dynamical systems based on numerical investigations which provide the description of the phase space. Nowadays there exists a large number of numerical tools, some of which are described in this chapter. The Poincaré mapping allows to reduce the analysis of a continuous system to that of a discrete mapping. The stable or chaotic character of the motion can be investigated through the computation of the Lyapunov exponents. Whenever an attractor exists, it is useful to evaluate its dimension. To estimate the attractor's