

BOOK REVIEW

Physics of the Solar System by Bruno Bertotti, Paolo Farinella and David Vokrouhlický, Kluwer, Dordrecht, Boston, London, 2003.

This is indeed more than a second edition of the already good book *Physics of the Earth and the Solar System* by B. Bertotti and P. Farinella. As the authors state in the Introduction, after 15 years from that edition, it was time to update the text. D. Vokrouhlický joined the team for this effort. Unfortunately, Paolo Farinella sadly passed away, after a long illness, in the spring of 2000, leaving a great void in all of us, his friends, and in the planetary science community as a whole. So Bertotti and Vokrouhlický rightly decided that ‘it made more sense to rewrite the book anew’. I was lucky enough to be a student of B. Bertotti at the University of Pavia in the early days of the writing of the first book and to be a friend and colleague of Farinella in Pisa. Therefore, the final publication of this book means really something special to me. I am happy to be here reviewing it and to be able to say that the book meets all the expectations we might have on it, leaving aside any possible fear that the departure of Paolo could have somehow weakened it.

If something was feeble with the first book, it was the typesetting and the graphics. Well, the first thing that comes to the eyes of the reader is the improved readability of this book. The LaTeX typesetting makes the text and the mathematics now very readable. The new figures are very informative and clear.

As the new title says, the general focus of the book has moved from the Earth more to the Solar System. Though the table of contents resembles closely the one of the first book, most of the topics have been rewritten and thoroughly updated.

The first part of the book deals with the forces and processes shaping and governing the Solar System bodies: gravity, rotations and magnetism. Chapter 1 introduces the dynamical principles and equations that will be exploited in the following sections of the book. The gravity field and its representation in terms of spherical harmonics are introduced in Chapter 2. The Earth is of course the reference here, but also other planetary bodies are dealt with. Chapter 3 is devoted to planetary rotation and its influence in the shaping of a body. Reference frames and the problem of accurate measurements of time and distances are conveniently introduced here. The perturbations to the rotation and shape of a planet due to torques and tides are treated in Chapter 4.

The next set of chapters goes into the physical description of planetary bodies. We start with an overview of the status of the knowledge about the interior of our planet, in Chapter 5. A general description of the magnetic field of a planet is the core of Chapter 6. Chapters 7 and 8 give an exhaustive treatment of the structure, dynamics and evolution of planetary atmospheres. The Sun, the solar wind and its interaction with the magnetic field of the planets are the subjects of Chapters 9 and 10.

Chapters 11–13 are a good introduction to the theoretical background of Celestial Mechanics (the two and three body problems and the perturbation theory) that will allow the reader to appreciate the following chapters dealing with our planetary system and its dynamics. Chapter 14 gives a very up-to-date and informative overview of the Solar System constituents, from planets to small bodies and dust, with emphasis always on the main physical processes involved. The origin and the dynamical evolution of the Solar System are treated in the next two Chapters, with a nice description of the secular perturbations, stability and chaoticity through resonances. In Chapter 16, an extensive new section makes a good point on the current knowledge on extrasolar planets.

Chapters 17 benefits of Bertotti's (and Vokrouhlický's too) outstanding background as a scholar of Relativity, giving an agile, not formalism dominated, introduction to the principles of Special and General Relativity, needed for understanding the dynamics of the Solar System.

The last set of chapters is devoted to experiments and exploration of space. Chapters 18 and 19 cover spacecraft dynamics, space navigation and telecommunications in space. Closely related with these is the last chapter, on precise measurements in space. Based on the long experience of Bertotti, a brilliant section is also devoted to the testing of relativity in space.

The book is completed with long, informative lists of references for further reading and many problems, with different levels of difficulty, within each chapter.

The book is a very good balance between theory and applications, depth of analysis and synthesis, keeping always the focus on the comprehension of the physics ruling our planetary system.

In summary, this represents both an excellent textbook for advanced students and a fundamental reference, and encyclopedic summary of the current knowledge, for researchers in the Solar System field.

Alessandro Rossi
ISTI-CNR
Area della Ricerca di Pisa
Via Moruzzi, 1, 56124 Pisa, Italy
E-mail: Alessandro.Rossi@isti.cnr.it