

1 **BOOK REVIEW**

6 *Physics of the Solar System* by Bruno Bertotti, Paolo Farinella and David
7 Vokrouhlický, kluwer, Dordrecht, Boston, London, 2003.
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9 This is indeed more than a second edition of the already good book *Phys-*
10 *ics of the Earth and the Solar System* by B. Bertotti and P. Farinella. As the
11 authors state in the Introduction, after 15 years from that edition, it was
12 time to update the text. D. Vokrouhlický joined the team for this effort.
13 Unfortunately, Paolo Farinella sadly passed away, after a long illness, in the
14 spring of 2000, leaving a great void in all of us, his friends, and in the plan-
15 etary science community as a whole. So Bertotti and Vokrouhlický rightly
16 decided that 'it made more sense to rewrite the book anew'. I was lucky
17 enough to be a student of B. Bertotti at the University of Pavia in the early
18 days of the writing of the first book and to be a friend and colleague of
19 Farinella in Pisa. Therefore, the final publication of this book means really
20 something special to me. I am happy to be here reviewing it and to be able
21 to say that the book meets all the expectations we might have on it, leav-
22 ing aside any possible fear that the departure of Paolo could have somehow
23 weakened it.

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

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

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



44 The next set of chapters goes into the physical description of planetary
45 bodies. We start with an overview of the status of the knowledge about the
46 interior of our planet, in Chapter 5. A general description of the magnetic
47 field of a planet is the core of Chapter 6. Chapters 7 and 8 give an exhaus-
48 tive treatment of the structure, dynamics and evolution of planetary atmo-
49 spheres. The Sun, the solar wind and its interaction with the magnetic field
50 of the planets are the subjects of Chapters 9 and 10.

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

62 Chapters 17 benefits of Bertotti's (and Vockrouhlický's too) outstand-
63 ing background as a scholar of Relativity, giving an agile, not formalism
64 dominated, introduction to the principles of Special and General Relativ-
65 ity, needed for understanding the dynamics of the Solar System.

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

71 The book is completed with long, informative lists of references for fur-
72 ther reading and many problems, with different levels of difficulty, within
73 each chapter.

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

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

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