Book Review


Planetary rings, the latest in the Planetary Science Series from Cambridge University Press, reminds me of an iPod: it is small (214 pages), elegantly produced, rather expensive (at a list price of $110, that’s more than 50 cents per page), packed with good things . . . and the order in which the contents are assembled seems at times to have been shuffled at random.

Part of the difficulty of providing a clean, linear explication of rings and the theories that explain them is the nature of the rings themselves. Like many corners of our field, understanding the origin, evolution, and current state of planetary rings is a multidisciplinary task, where lots of different techniques interplay. Rings are observed with terrestrial-based telescopes and spacecraft, forward- and back-scattered light, in radar and radio to ultraviolet wavelengths. The phenomena to be described (and, when possible, explained) include waves, spokes, narrow rings, braided rings, ring arcs, dust rings, ring lifetimes, and more. The dynamics can be approached by numerical models of ensembles of particles in a box, or as a hydrodynamic fluid. Perturbing forces range from resonances with major moons, to shepherd moons, to clumps within the rings themselves. (Each of these items is described succinctly in this book, with an excellent bibliography for anyone wanting to follow any topic in further detail.)

And every ring system is different; a technique that works for Saturn may have limited applicability at Neptune. And a technique that we now know cannot serve to explain one ring, may still have applicability for another.

The study of rings is a field that continues to evolve in ways as complex as the evolution of the rings themselves. With so many different phenomena, and so many different approaches, it is inevitable that the history of our understanding is littered with false starts. One of the strengths of this book is that Esposito provides a very readable history of those missteps, so that one gets a flavor both of what has been tried, and how it feels when a particularly clever solution to a given thorny problem is suddenly overturned by the latest data.

These narratives serve the important function of reminding the readers that few of these issues are closed questions, few of the techniques or results described here are the last word on the subject. They also help relieve the book of the inevitable, and unavoidable, passages more heavily laden with mathematical equations. The equations themselves, however, are another positive feature of the book as it is a joy to have them all assembled in one place, with a brief but clear outline of what they mean and how they work.

But this is not a book to be read cover-to-cover; it is a working scientific treatise, not a popular read. Not only does the requisite mathematics slow down the reader, the organization of the material—as shuffled as the songs on an iPod—makes following any given chapter difficult without at least an awareness of material that may not actually be presented until sections much later. For example, a casual reference is made to a ring’s “viscosity” in section 4.1 but this is not defined until section 4.10. Likewise, descriptions of individual rings (and images of those rings) are scattered throughout the book. Thus, for example, the best images of Jupiter’s dust ring are given early in Chapter 3, but not described until Chapter 7, while a description of our scientific approach to understanding them must wait until Chapter 15.
The ring images themselves are also somewhat disappointing. The book is heavily illustrated with spacecraft images of planetary rings but these are not particularly well reproduced. Nor are they particularly well explained in the figure captions, or tied strongly to the text. Why were these particular images chosen? What principles are they supposed to illustrate? After a while, one simply pages past them.

However, this book excels as a reference text for working planetary scientists, especially those of us who are not directly active in ring research but who may need to find an equation or a reference, or be brought up to speed rapidly on a particular concept. It also serves well to remind those of us outside the field that models for ring phenomena that we may have learned just a few years ago (and have been teaching our students ever since) may already have become exploded theories. Its cover price may keep it off the shelves of most individual researchers, but it certainly belongs in every planetary science reference library.

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