storm-wracked sea. Nor does Milburn ridicule Drexler for touting nanotechnology as a road to physical immortality—a near-religious zealotry that has today convinced mainstream nanoscience to banish Drexler to its margins.

Milburn's profession isn't about judging the truth of nanotechnological hypotheses; it is about teasing out their technoscientific origins and effects. And Drexler, like Richard Feynman a generation before him, was undeniably instrumental in sparking a rigorous scientific scrutiny of the nanocosm. Readers bearing that in mind will find *Mondo Nano* a thoroughly researched, thought-provoking read that offers many points to ponder as well as a few observations that might make some professional scientists grind their teeth.

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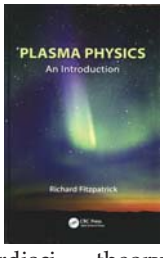
Plasma Physics
An Introduction

Richard Fitzpatrick
CRC Press, 2015. $79.95 (281 pp.).
ISBN 978-1-4665-9426-5

Plasma physics has come of age. Thanks to the impetus from fusion physics, space science, and plasma astrophysics, the core principles of the subject are sufficiently well developed that researchers now routinely make predictions for many configurations and objects, either manmade or naturally occurring. Those predictions are tested by experiments that make use of ground-based instruments, *in situ* detectors aboard satellites, telescopes, and sophisticated diagnostics in the laboratory. Given the highly nonlinear nature of plasma processes, experimental realities often challenge theoretical predictions. Nonetheless, a core of theoretical models at both fluid and kinetic levels of description provides useful points of departure for problems of broad, interdisciplinary interest.



In recent years graduate and advanced undergraduate students with a suitable background in classical mechanics and electromagnetic theory have had the luxury of choosing between several very good textbooks that present the core principles of plasma physics. In that crowded field, Richard Fitzpatrick's *Plasma Physics: An Introduction* distinguishes itself by its excellence. For those of us who have admired Fitzpatrick for his seminal contributions to the subject of magnetohydrodynamic (MHD) instabilities in fusion plasmas, his book is as much a source of pleasure as his papers are for their clarity and rigor.

The scope and layout of the book are fairly standard. Fitzpatrick includes chapters on charged-particle motion, collisions, fluid models, MHD fluids, and kinetic treatments of linear waves and instabilities. Nonetheless, the book has some unique features that make it especially attractive to both students and researchers. Examples include systematic and readable accounts of the Braginskii equations and the Chapman–Enskog method for weakly collisional plasmas. Nice physical explanations for the transport effects that emerge from the baroque complexity of orderings and expansions will help students see the forest for the trees. Another useful chapter deals with wave propagation through inhomogeneous plasmas. Using the WKB (Wentzel-Kramers-Brillouin) method, Fitzpatrick offers a concise treatment of cutoffs, resonances, and pulse propagation, including elegant, self-contained discussions of the relevant mathematical tools.

The various applications of core theoretical principles are drawn primarily from space science and fusion; they make the book an attractive choice for graduate plasma-physics courses taught in a broad range of physics and engineering departments. The Van Allen radiation belts and the ring current in Earth's magnetosphere are discussed in the chapter on charged-particle motion, and Eugene Parker's classic solar-wind theory is handled nicely in the chapter on MHD.

The treatment of MHD dynamo theory is somewhat idiosyncratic. Fitzpatrick provides rigorous treatments of the somewhat dated homopolar disk and Ponomarenko dynamo models, but he does not discuss mean-field turbulent dynamo theory, the dominant focus of the dynamo community for the past two decades. The first-rate sections on magnetic reconnection theory deal with both linear and nonlinear steady-state models based on resistive MHD, but they don't even mention the collisionless reconnection models that have preoccupied the reconnection community during the past 25 years.

I was also quite surprised not to find a longer discussion on the Rutherford theory of tearing modes with applications to fusion plasmas—a subject to which Fitzpatrick has made striking contributions and on which he has given instructive lectures in various summer and winter schools. Fitzpatrick's may be one of a very small number of textbooks in plasma physics that does not carry a single reference to the author's own research papers, an act of self-effacement that is uncharacteristic of the times.

Over the many years that I have taught plasma physics, I have made use of Fitzpatrick's lecture notes, which were posted on his website. Often I wondered why he hadn't published the notes as a textbook, because they read like one. I am glad to see those notes finally out in print in the form of an excellent and compact textbook—complete with problem sets and references—that has earned a permanent place on my bookshelf. Thanks to the several useful and well-presented topics, I would expect the book to endure as a standard text in colleges and universities all over the world.

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