formalism chapter describing mean field theories, Langevin equations, and renormalization group calculations, complete with exercises.

This book overall is eminently pleasing to read. The level is appropriate for graduate students in condensed matter, though the organization of the text is geared to self-study. The pace seems to me to be appropriate, and though I have not actually field-tested it, I have reports that graduate students quite like it.

I find somewhat wanting only the description of numerics. Perhaps the author felt a deeper discussion of numerics would have been a distraction from the main ideas. However, given that the subject matter concerns systems that, by definition, have highly anomalous statistics requiring serious care, the book is not entirely self-contained in this regard. The chapter on computer models does describe the models in such a way that any reader already competent at setting up and analyzing simple condensed matter models will easily know what to do. It also includes appendices with code snippets for avalanche and evolution models (written—*gasp*!—in FORTRAN). However, the more computationally naive reader may have a bit of a harder time.

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Classical Electrodynamics

Walter Greiner
Springer-Verlag, New York, 1998.
555 pp. $49.95 pb
ISBN 0-387-94799-X

It is not clear just where Walter Greiner's *Classical Electrodynamics* would fit into a typical US physics curriculum. In mathematical sophistication, the book (which first appeared in German in 1991) is roughly comparable to Jack Vanderlinde's *Classical Electromagnetic Theory* (Wiley, 1993) and somewhere between David Griffiths's *Introduction to Electrodynamics* (Prentice-Hall, 1999) and John David Jackson's *Classical Electrodynamics* (Wiley, 1999).

The level of physics in the book is somewhat harder to characterize. For my money, all three of the other books just mentioned are more successful in conveying a contemporary understanding of classical electrodynamics. Vanderlinde, in particular, stresses the fundamental connection between electric and magnetic fields from the outset, whereas Greiner chooses to introduce the magnetic field by way of the torque exerted by one magnetic dipole on another. Greiner's is also the only book of these four that is devoid of any discussion of radiation reaction.

Like the other volumes in Greiner's comprehensive series on theoretical physics, this one is full of worked examples, but unlike the other volumes, it does not have a table of contents for these examples. (It should be noted that there are no other problems in the book, so readers must look elsewhere to test their understanding.) The most useful of the worked problems present the nuts and bolts of calculations, as in exercises 1.8 and 1.9, in which the electrostatic potential of a uniformly charged rod is translated into elliptic coordinates and then used to find the capacitance of an ellipsoid of revolution. Where fundamental physics is at stake, though, as in example 13.8 on magnetic monopoles, the presentation is apt to be garbled. (Neither Greiner nor Vanderlinde mentions the alteration of the Lorentz force law, without which the fields have no physical meaning, in the presence of magnetic monopoles. Their discussions of invariance under duality transformations are therefore incomplete.)

In fact, the text too often reads as though one of the original German editions (which one?) had been fed into a computer program designed to churn out a word-for-word English translation. On those pages dense with equations, the results are mostly comprehensible. But in too many places the prose runs from the merely quaint ("the method of smallest squares," page 99) to the ambiguously neologistic ("unifrequent," page 395) to the truly cryptic ("The discovery of an amazingly simple law . . . has justly been praised as a relieving feast," page 517). The book's readability is further compromised by a lack of attention to notational consistency: The Laplacian is (archaically) written as "Δ" through most of the text (even though this symbol is also used to denote a difference of two quantities), but at the beginning of chapter 2, it appears ephemerally as "∇^2." By equation 2.6, it reverts to "Δ," only to reappear as "∇^2" in equation 2.16. This change of costume occurs again between equations 20.18 and 20.19. The diagrams, too, are apt to be unclear. Thus, for example, it was only by consulting the equations in the text above it that I could figure out which way the y-axis is supposed to be pointing in figure 8.20. Figure 3.12 offers me a depiction of a model of the ^{234}U nucleus, but not a clue as to the meaning of the various shadings in the drawing. The skimpy index and an assortment of typographical errors contribute further to my sense that the redaction was a bit careless.

The biographical notes with which Greiner graces his books are intriguing (although it's disconcerting to read that Nikola Tesla, born in 1856, emigrated to the US in 1844). In this volume, he has added a chapter "About the History of Electrodynamics." Given its modest price, this volume contains more than enough worthwhile material to earn a place in any physics library. Regrettably, it is not yet free enough of bugs to justify my recommendation for use as a text or for self-study.

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Asymptotic Theory of Separated Flows

Vladimir V. Sychev, Anatoly I. Ruban, Victor V. Sychev and Georgi L. Korolev
Translated by Elena V. Maroko
Cambridge U. P., New York, 1998.
334 pp. $49.95 hc
ISBN 0-521-45530-8

The Reynolds number, which is a measure of the ratio of inertial to viscous forces, is arguably the most important parameter in fluid mechanics. The two major subfields of fluid mechanics, aerodynamics and hydrodynamics, are primarily concerned with flows at large values of this parameter. While these flows might be expected to behave inviscidly, viscous effects invariably play an important (but often subtle) role in determining their overall behavior.

Significant progress was made when Ludwig Prandtl introduced his concept of a boundary layer in 1904. Prandtl's idea was that, while viscous effects can frequently be neglected in the main body of these flows, they invariably become important in thin viscous (or boundary) layers at the bounding surfaces (usually the surfaces of a solid body) of the flow. These layers frequently separate from the surfaces and thereby produce global changes in the overall flow field.

Asymptotic Theory of Separated Flows, by Vladimir V. Sychev, Anatoly I. Ruban, Victor V. Sychev, and Georgi L. Korolev, is an in-depth theoretical treatment of this separation phenomenon for the relatively narrow class of two-dimensional incompressible laminar flows. It is an English translation of an earlier Russian edition, and its four Russian authors have all made significant contributions to the subject. In fact, one of my relatively minor criticisms is that the book places too much emphasis on the authors' contributions and, with the exception of the last chapter, provides only summary descriptions of the contributions of other investigators. This is especially true in chapter 5, which does not discuss some important ideas about the subsequent stages of unsteady flows over blunt bodies impulsively set into motion from a state of rest (that is, the eventual development of an interactive flow structure).

Another minor criticism is that the writing style and level of detail are somewhat uneven between sections. For example, the treatments in chapters 1, 4, and 5 and in most of chapter 2 are extremely detailed, whereas all of section 2.4 and certain parts of chapter 3 are much less detailed and therefore tend to be somewhat cryptic. Also, while section 3.3, on the influence of angle of attack, is well coordinated with preceding sections, the authors were not completely successful in coordinating some of the other sections. For example, Goldstein's wake equation is derived in great detail (as equation 1.64) in chapter 1 and reappears in chapter 3 as equation 3.1.11, but with very little explanation and no mention of the earlier derivation. There is also a certain amount of repetition, with ideas reintroduced as if they had not been previously discussed, and with results rederived from different points of view in different parts of the text. This is not necessarily a deficiency, because it allows the individual sections of the text to be read independently of each other. Moreover, the authors were not completely successful in their attempt to unify the notation.

Having said all that, I should also point out that the book is very clearly written, with scrupulous attention to analytical detail—somewhat surprising in view of the cryptic style that many Russian authors seem to prefer. The book is also amazingly free of typographical errors, which is especially laudable in a text containing so much mathematical analysis. The authors also do an excellent job of pointing out connections between different types of flow separations, and they even show how one type of separation can evolve from another. This information is not readily gained by simply reading the literature.

While the high-Reynolds-number theory of laminar separation discussed in this book is certainly of great theoretical interest, it is important to note that it is very difficult to maintain such flows at the large values of the Reynolds number where the theory applies—especially near a trailing edge, where the flow has ample opportunity to become turbulent. And, while laminar separations are quite common in the vicinity of a leading edge, the resulting separated flows are highly unstable and tend to become turbulent before they reattach—which then affects the laminar flow in the vicinity of the separation point. The hope is that the asymptotic analyses developed in this book will apply at Reynolds numbers for which laminar flow can be maintained in the laboratory—and the authors give a number of experimental comparisons to suggest that this may be the case.

More than half of the book is concerned with steady separations, which (except for the marginal separations considered in chapter 4) usually exhibit the well-known "triple-deck" structure that was independently discovered by Art Messiter, Keith Stewartson, and Victor Neiland. Many of the developments described in the first half of the book were enabled by this breakthrough discovery (even though triple-decks were originally introduced to deal with unseparated flows).

Some aspects of supersonic (compressible) triple-deck theory, which is allegedly not the subject of this book, are actually covered in chapter 7, which is ostensibly devoted to numerical methods for solving triple-deck problems. The inclusion of this chapter is a very good idea, but its connection to the preceding chapters leaves something to be desired. However, the advice about the relative merits of the various methods (and other matters), which is given in its last few paragraphs, should be very helpful to any reader interested in carrying out numerical computations of separated flows.

In conclusion, I believe that this book, written by some of the top contributors to the field, will be an invaluable reference for anyone who wants to learn about the asymptotic theory of laminar separations.

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