1995) and clearly enjoys writing and teaching. His text clearly fits into the standard undergraduate curriculum and can be used by students as early as their second-year.

Baierlein is an experienced teacher and author, who has written the innovative texts, *Atoms and Information Theory* (Freeman, 1971), *Newtonian Dynamics* (McGraw-Hill, 1983), and *Newton to Einstein: The Trail of Light* (Cambridge, 1992). So it is no surprise that his *Thermal Physics* is very well written and a pleasure to read. What makes this text stand out is the quality, clarity, and conciseness of the writing. However, many of the arguments are rather abstract and would be best appreciated by students who are already familiar with the subject or who are very bright and well prepared. To some extent, Baierlein's *Thermal Physics* is similar in style to his *Newtonian Dynamics*, and to *The Feynman Lectures* (Addison-Wesley, 1991)—great texts for those who are already familiar with the subject. The book is advertised as suitable for both undergraduates and graduates in physics and astronomy, but I suspect that it will fall into a crack between the two levels, being too difficult for most undergraduates and not sufficiently sophisticated for most graduate courses.

I strongly recommend that instructors adopt one of these two texts for their undergraduate courses on thermal physics. I would choose Schroeder's text because it is written at a lower level and hence easier to supplement. However, I would refer frequently to Baierlein's text for supplementary material for my class discussions. Both texts belong in the library of anyone teaching thermal and statistical physics. They are beautifully written and convey the feeling that physics is a discipline to be studied with devotion and love.

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ITEP Lectures on Particle Physics and Field Theory, Vols. 1 and 2

M. A. Shifman
World Scientific, River Edge, N.J., 1999. 875 pp. $141.00 (set) hc ISBN 981-02-2639-X; $84.00 (set) pb ISBN 981-02-2640-3

Mikhail A. Shifman's two-volume *ITEP Lectures* . . . are of great interest as more than presentations of theoretical physics: They are a monument to a remarkable community of creative physicists who managed to flourish intellectually, under conditions that were materially difficult and cognitively surreal, during the declining years of the Soviet Union. Shifman was at the center of the ITEP group, intellectual descendants of Lev Landau and Isaac Pomeranchuk, which made major contributions to high energy theory. (This was recognized, for example, by the APS's 1999 Sakurai Prize, which was awarded jointly to Shifman, Arkady Vainshtein, and Valentine Zakharov). In a charming introduction, Shifman describes some aspects of the way the group functioned. He gives a sense of the joy the members managed to find in their work—and in each other—in an often sinister and sometimes hostile environment.

The bulk of the book is a series of short monographs that grew out of research-oriented courses given as part of a regular tradition at ITEP. The range of topics, within high energy theory, is quite diverse. It includes heavy quark physics, quantum chromodynamics sum rules (also called ITEP or SVZ—for Shifman, Vainshtein, Zakharov—sum rules), instantons, conformal field theory, supersymmetric quantum mechanics, and supersymmetric quantum field theory. There is also a final course on a fascinating but comparatively sparsely studied (and at present rather isolated) chapter of mathematical physics—what Shifman calls quasi-exactly solvable models. In these models some, but not all, of the low-energy states and their wavefunctions can be found algebraically.

The treatment of each topic is clear and rigorous, expounded in vigorous prose and leavened from time to time with strong opinions frankly expressed. They put me in mind of Sidney Coleman's legendary series of Erice lectures, *Aspects of Symmetry* (Cambridge, 1988). Exalted company, indeed!

The common thread that ties most of these courses together is Shifman's expressed desire to do justice to "quantum chromodynamics, *the* theory of our world." The first two courses, on heavy quarks and sum rules, present approximation techniques that are firmly rooted in the microscopic theory and can be applied to describe specific experimental situations in a detailed quantitative fashion, as Shifman discusses. The third, on instantons (in the QCD context), discusses an aspect of QCD that is quite fundamental—without its instantons, QCD would possess symmetries that are not observed in nature—but not part of any controlled approximation. In the later courses, the emphasis shifts from approximate results in real QCD to exact results for (one would hope) instructive models.

Shifman expresses his philosophy in a striking passage (one of many):

> As time passes, the hope that the full analytic solution of QCD will be found, fades away. . . . theorists whose philosophy is 'all or nothing' abandoned the field. [The 'all or nothing' philosophy is widespread and, unfortunately, not only in theoretical physics. This is a favorite child of the so-called revolutionaries in all times and in all countries. The misfortunes it brought to our world are innumerable.] (In the original, the material in brackets is a footnote.)

In light of this comment, it is somewhat ironic that he puts so much emphasis on exact results for unrealistic models featuring supersymmetry and/or conformal symmetry. For these have made, in practice, extremely little impact on the application of QCD to the physical world. As Shifman concludes, somewhat ruefully: "It remains to be seen whether the remarkable discoveries and the elegant, powerful methods . . . will prove to be helpful in solving the messy problems of real-life particle physics."

However, woefully underplayed here are such tangibly significant developments as:

▷ Ever more sophisticated factorization methods, better algorithms, and gritty calculations that have sculpted perturbative QCD into a versatile and indispensable tool for the analysis and design of accelerator experiments;

▷ Numerical work using lattice QCD that has proved the fundamental nonperturbative results (confinement, chiral symmetry breaking) directly, given good quantitative results for the low-energy spectrum, and produced many impressive results for heavy-quark systems;

▷ Weak-coupling but nonperturbative methods that have been used to describe the high-density phase in a controlled approximation, with confinement and chiral symmetry breaking as demonstrable, analytic consequences; and

▷ The high-temperature frontier (also partially accessible to weak coupling methods) now being explored in heavy ion collisions.

The material Shifman presents on

supersymmetry and conformal symmetry is potentially of great interest in connection with attempts to describe particle physics beyond the Standard Model, critical and other condensed-matter phenomena, and string/M theory. In view of their extraordinary virtues, mentioned above, I can enthusiastically recommend Shifman's monographs as essential supplementary reading for any of the topics they touch. But don't expect a balanced description of QCD.

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Introduction to Stellar Winds

Henny J. G. L. M. Lamers and Joseph P. Cassinelli
Cambridge U. P., New York, 1999. 438 pp. $74.95 hc ($29.95 pb)
ISBN 0-521-59398-0 hc (0-521-59565-7 pb)

Stellar winds play a role in the evolution of nearly all stars at some point in their history. Stellar winds also pump energy into the material surrounding the stars, and they return chemically reprocessed material to and create many of the visible structures in the interstellar medium. Some of the physical processes that are involved in driving stellar winds are also important in accretion disks in, for example, binary stars and active galactic nuclei. Although the subject has been at the forefront of astronomical research for more than 30 years (more than 50 years for the Sun), no one has written an overview of the subject suitable for classroom teaching or for self-learning. Both theory and observational results are widely scattered through the literature and take some effort to find. Henny Lamers and Joseph Cassinelli have now solved this problem with *Introduction to Stellar Winds*, an elegant book about stellar winds and mass loss that is a masterpiece of thoroughness, organization, and clarity.

The book can be divided into four parts: The first part is a very short chapter on the history of the field. The second is a very clear chapter on the observations of stellar winds and mass loss. The third part, the bulk of the book, describes the basic concepts (chapters 3 and 4), the mechanisms for driving winds from stars (chapters 5 through 10), and mechanisms for driving disks from rotating stars (chapter 11). In the fourth part, the authors describe the interactions between winds and the interstellar medium and the effects of mass loss on stellar evolution.

Most chapters begin with a short summary of the pedagogical aims and contents of the chapter and end with a clear summary of the results derived in the chapter. Line drawings are used liberally and very effectively to illustrate the concepts. There is a short list of relevant review papers at the end of each chapter. References in each chapter are collected in a master reference list at the end of the book. A few problems are provided for each chapter.

Each of the chapters, except chapters 3 and 4, stands alone. However, anyone interested in a chapter later than chapter 4 would benefit from reading chapters 2 through 4 first. The book could be used as the text for a full graduate course, or part of it could be used for a graduate minicourse.

Introduction to Stellar Winds is sure to be a classic of the astronomical literature and should be on the shelves of every astronomy library. Many individual astronomers will also find it a useful addition to their personal libraries.

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