thing one should know before becoming a practitioner of micromagnetics: classical exchange, the Landau and Lifshitz wall, magnetostatic energy and the pole avoidance principle, Bloch and Néel walls, Brown's equations, the nucleation problem and analytic and numerical micromagnetics. While he establishes the quantum mechanical origins of micromagnetics, Aharoni emphasizes that the classical aspects are sufficient for almost all applications.

Aharoni remains a principal force in the development of micromagnetics. He retells the story, much of which has been forgotten or never heard, in this age of information overload. He tells what is needed. He guides and warns the reader. He is fun to read. Admitting to a strong bias, I can hear his voice and envision his telling, for I have heard parts of it from him over the decades.

As a text, *Introduction to the Theory of Ferromagnetism* works, if one takes into account the students and the limits on the amount of material that can be absorbed in a one-semester course, at the graduate or advanced undergraduate level for engineers or physicists. The extensive references provide an advanced review of micromagnetics and supply sources for suitable exercises.

By the end of the course, the students should be able to program the equations of micromagnetics and apply them to an endless variety of possible magnetic configurations. Yet, as Aharoni warns, "The computer is a very useful and powerful tool . . . . But it is not a substitute for thinking." He discusses five computational pitfalls to be avoided: inappropriate choice of grid size, approaches to infinity that cannot be well defined numerically, failure to use the self-consistency tests he has developed, results presented in incomprehensible three-dimensional pictures of two-dimensional arrows and being fooled by too large a criterion for convergence.

The Internet (http://cobalt.nist.gov/mumag/prob1/prob1report.html) reveals strong evidence for the need among the practitioners of micromagnetics for Aharoni's book and advice. Six groups worked on the same "standard problem" of micromagnetics, producing hysteresis loops that show little resemblance to one another. At least five of the groups must be doing something incorrectly. And that is the state of the art! Since many of the results in the literature should be doubted, there is much for the student to do with the guidance provided by *Introduction to the Theory of Ferromagnetism.*

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Theory of Nuclear Reactions

Peter Fröbrich
and Reinhard Lipperheide
Oxford U. P., New York, 1996.
476 pp. $115.00 hc
ISBN 0-19-853783-2

To quote from the preface of Herman Feshbach's *Theoretical Nuclear Physics: Nuclear Reactions* (Wiley, 1992): "The development of the experimental and theoretical understanding of nuclear reactions is one of the more important achievements in physics during the last half of this century." Indeed, the study of nuclear reactions is *the* major source of our knowledge of the structure of nuclei as well as being a subject of great richness and interest in its own right.

As a graduate student, I was primed to embark upon a career directed toward understanding nuclear properties in terms of the newly revived nuclear shell model. At the same time, I was constantly reminded that what we knew of those properties frequently arose from nuclear reaction experiments, particularly those involving the so-called direct nuclear reactions that were blossoming during this period. Perhaps we should understand these better, I thought. I never really escaped from that diversion.

Theory of Nuclear Reactions by Peter Fröbrich and Reinhard Lipperheide, distinguished researchers in the field, is the latest addition to the literature on nuclear reaction theory and one that I can endorse unreservedly. Growing out of a decade of graduate-level lectures, it is well suited to its roles as both an introduction to the subject and an aid in leading the reader up to an overview of our present understanding of these reaction processes. Consequently, it contains much of interest to the seasoned researcher as well as to the beginning graduate student.

Of course, as is inevitable in such a broad field, there are subjects not covered, which the authors readily admit. In particular, they mention the omission of the entire field of nuclear reactions at high energies, *R*-matrix and similar low-energy theories, as well as precompound reactions and statistical fluctuations. These omissions are not serious; indeed, they leave space for a more rigorous discussion of such topics as the scattering of wavepackets and their interpretation in terms of experimental cross sections—topics frequently glossed over in treatments of scattering and reactions.

Furthermore, about a third of the book is devoted to discussion of compound-nucleus reactions and deep inelastic scattering. These are subjects not covered in two other books that invite comparison, both entitled *Direct Nuclear Reactions* and both issued in 1983, one by Norman Glendenning (Academic) and one by me (Oxford U. P.). As their titles imply, these books are devoted to the class of direct nuclear reactions, and they could be regarded as elaborations of the corresponding sections of the Fröbrich and Lipperheide book, with particular emphasis on the details of the models that have been developed for direct reactions and their applications.

I would also draw attention to Fröbrich and Lipperheide's succinct discussions of classical and semiclassical descriptions of scattering, including the scattering by complex potentials. These concepts have become increasingly useful as supplements to fully quantal treatments and have provided considerable insights into the physics of many problems, particularly since heavy-ion scattering has become so popular.

The book appears to be remarkably free of misprints. The only one that caught my eye concerns equation 8.144, in which primes have been omitted from the labels a and b in the matrix element of W_β on the final line.

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Cosmology and Controversy: The Historical Development of Two Theories of the Universe

Helge Kragh
Princeton U. P., Princeton, N.J.,
1996. 500 pp. $35.00 hc
ISBN 0-691-02623-8

In 1948, Fred Hoyle, Herman Bondi and Thomas Gold proposed a bold alternative to the evolutionary view of the cosmos. The evolutionary view had enjoyed widespread support since the rise of relativistic interpretations of Edwin Hubble's distance–redshift relation for galaxies in the early 1930s. Hoyle, Bondi and Gold's skillful advocacy of a steady-state universe engendered a vigorous controversy that lasted for two decades. *Cosmology and Controversy* offers the first extended historical analysis of the origins, progress and denouement of this significant controversy which, although it