tion. In addition, nuclear models have to be used to analyze the data. Different models result in strengths for a given transition that can differ by as much as a factor of 2.

The monograph appears to have been produced directly by photocopy from material provided by the authors. It suffers from having a rather large number of deficiencies that could have been caught and corrected by careful copy-editing. These include the presence of only one reference list when two systems of reference notation are used, words with missing letters, missing symbol definitions, sentences that refer back to statements or terms in equations that do not exist and a figure with at least two misprints on the energy scale.

For someone working in the field this monograph provides a good brief summary of the theory of the excitation of giant resonance states by a wide range of probes. Unfortunately the discussion is limited almost exclusively to one model and no attempt is made to present a critical review of either the theoretical or experimental aspects of the field. As a result, a somewhat superficial picture emerges of the successes and failures of theory to synthesize the wide body of data that exists. Someone not working in—or close to—the field could very well come away from this book with a somewhat distorted picture of our present state of knowledge on the nuclear giant resonances.

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Theories of Spectral Line Shape

R. G. Breene Jr.
344 pp. Wiley, New York, 1981. $32.95

The subject of spectral line shape in gases is an old one, but it has enjoyed a renaissance during recent years, partly due to enormous improvements in the techniques of high resolution spectroscopy. The scope of the problem is fairly wide—from the microwave spectrum to ultraviolet, and from the linear response of a weak exciting field to nonlinear phenomena. Obviously, it would be difficult to cover the entire field in a single volume. While the literature on this subject has grown rapidly during last 20 to 30 years, very few books have been published in this area. *Theories of Spectral Line Shape* fills part of the gap by presenting the recent theoretical developments in the linear regime. It primarily deals with neutral monatomic gases. It considers neither applications to molecular gases and plasmas nor line shapes in light scattering. The author is well known from his earlier (1961) book *The Shift and Shape of Spectral Lines.* The more recent books on the subject—*Plasma Spectroscopy* (1964) and *Spectral Line Broadening by Plasmas* (1974), both by H. R. Grien—primarily deal with plasmas.

The presentation here consists of summaries of selected works together with appropriate introductions. Three general techniques that have gained prominence in line shape theory are emphasized. These techniques are based on resolvent operators, Liouville spaces, and Feynman diagrams and Green's functions. In these discussions the author has attempted to introduce the theoretical techniques without going into the details of rigorous mathematical developments.

After an introduction that provides a good overview of the field, the book opens with a chapter on natural line broadening caused by the interaction of an atom with its own electromagnetic field. The next four chapters develop the necessary theoretical framework and present various theories of line shape. The last three chapters deal with applications to three problems of current interest: the synthesis of Doppler-pressure broadening, including collisional narrowing; resonance broadening caused by the perturbers of the same species as radiators; satellites in the wings of spectral lines.

As is often the case in a first printing, there are some typographical errors and other minor inaccuracies. The reviewer was also able to spot at least one example of a possible misinterpretation of his own work on collisional narrowing.

Though the author makes no claim to the completeness of the bibliography, the reference list appears to be fairly representative of the literature up to about 1975, with a few exceptions. The omissions are more serious for work after 1975. For example, a further development of the theory of resonance broadening for high-density gases is not mentioned.

In spite of these shortcomings, the book is a very useful addition to the literature. The collection and presentation of a large number of diverse and often complex theoretical works in a compact volume is commendable. The book should be a useful reference for most workers in the field and should be suitable for graduate students and others who are trying to enter the field.

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External hair cells seen in an electron micrograph of a cross section of the organ of Corti (magnification 1500X). The photograph appears in *Medical Physics*, Vol. 2, *External Senses*, by A.C. Damask (274 pp. Academic, New York, 1981. $29.50), the second volume of a set of three designed to provide a common background for students of medical physics. The picture first appeared in an article by G. Bredberg in *Psychophysics and Physiology of Hearing* edited by E.F. Evans and J.P. Wilson.

Introduction to the Magnetic Properties of Solids

A. S. Chakravarty
711 pp. Wiley, New York, 1980. $65.00

This book does not deliver on the promise of its title. Its scope is far smaller than "the magnetic properties of solids," and it fails to provide an acceptable introduction to the topics it does treat. By ignoring almost completely magnetic phenomenology and the theory and practice of measurements on magnetic systems, it gives its theoretical analyses little connection with the physical world. On many topics it is hopelessly out of date, as can be seen from the most cursory glance at the reference lists. Indeed, on the evidence of the text and these lists, the author seems to have little familiarity with much of the literature of magnetism that has appeared since 1967, the year he took his present position as reader at Calcutta's Saha Institute. His judgments of the current status of various fields of study are thus highly suspect.

Chakravarty notes in his preface that he has omitted discussion of rare earths, relaxation phenomena and magnetic resonance. Among other topics he did not include are critical phenomena, electronic structure, and magnetomechanical effects. The Kondo effect is mentioned once, the Hubbard hamiltonian not at all. There is nothing in the book about most of the modern probes of magnetic materials: de Haas–van Alphen effect, Hall effect, photoemission, field emission, Mössbauer effect and so on. Neutron scattering is mentioned only briefly. Thus most things of current interest in the physics of magnetism are left out. Since no phenomena are discussed, there is nothing here of any direct technological interest either.

What, then, is the book about? The heart of the book, Chapters 6 through 12, deals with the energy levels of isolated transition-metal ions in various crystal field environments. This is clearly the author's field of expertise, as there are numerous references to him and to his collaborators. These chapters are written in the style of a review article, heavily footnoted, and, in my opinion, opaque to the nonspecialist. They are preceded by introductory material on quantum mechanics, atomic structure, and group theory. The introductory chapters, written with no clear sense of audience, vacillate between explaining too much or too little. Thus the reader is assumed to need a demonstration of the raising and lowering character of angular momentum operators (page 13), yet to be already familiar with the idea of completeness and able to grasp readily the significance of Clebsch–Gordan coefficients (page 20). The axioms for a group are spelled out, but the idea of a group representation and its connection with physical observables are hastily and badly presented. I can think of no audience for whom these chapters would serve as a useful introduction or review.

The remainder of the book deals with collective phenomena (molecular field theories of ferromagnetism and antiferromagnetism, spin waves, spin glasses, the use of Green's functions) and (aside from the spin-glass chapter, which does refer to recent work) it is here that the lack of modern material is most felt. For example, in Chapter 13 the Heisenberg and Stoner models are compared, the latter treated in nearly-free-electron and tight-binding one-band approximations. Modern band theory calculations that provide an accurate realization of the Stoner model are simply ignored. The most recent band calculations mentioned are those of John Slater in 1957. Of the 47 references to this chapter, the most recent are to books published in 1966 and 1967.

New physical resources (fast computers and high flux reactors) and attendant theoretical advances have revolutionized this field in just these last fifteen years. By ignoring recent work the author renders his judgments (for example, "very little is understood regarding the elementary excitations . . . in magnetic solids," page 553) unworthy of serious attention. I am afraid the same applies to much of this book.

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Electrons at the Fermi Surface

M. Springford, ed.
556 pp. Cambridge U. P., New York, 1980. $85.00

This book, written in honor of David Shoenberg of Cambridge University, contains articles on subjects ranging from Shoenberg's specialty, the de Haas–van Alphen effect, to general principles of electrons in metals and provides interesting accounts of the current understanding of properties of metals involving the Fermi surface.

In the part of the book dealing with general principles, the first chapter, I. M. Lifshitz and M. I. Kaganov explain the semiclassical approach to electron motion and describe the different electron orbits used in determining the shape and topology of the Fermi surfaces of metals. It is an excellent review that will be useful to those who feel that there is some mystery in-