But the potential reader is warned that Mendelssohn has not written a social or scientific history. Rather he has produced a sentimental, sympathetic, surface account of the life and times of his beloved teacher.

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The Jahn–Teller Effect in Molecules and Crystals

R. Englman
350 pp. Wiley, New York, 1972. $24.95

Few theorems of mathematical physics have had as much impact on the physics of condensed matter as the Jahn–Teller theorem, which, crudely formulated, states that any degenerate electronic state of a non-colinear molecule is linearly coupled to the phonons and that molecules with degenerate ground-electronic states normally undergo lattice distortion in order to remove the degeneracy. Yet, even today, most proofs of the theorem employ Jahn's and Teller's method of exhaustion, simply enumerating all the lattice symmetries and proving the theorem in each case. The physical basis of the theorem is that wavefunctions of a degenerate electronic state can be chosen corresponding to nonsymmetric charge distributions; these distributions give rise to lattice-distorting electric fields. A simple, concise, non-enumerative, group-theoretical proof of the theorem is needed, however.

Wading into this morass of proof by exhaustion, R. Englman has attempted to produce a unifying monograph on the Jahn–Teller effect, without becoming bogged down in the quagmire of excessive enumeration. The initial impression one has after inspecting only the book's table of contents—which contains frightening lists of symmetry groups and Greek characters—is that Englman has not avoided the quicksand. However, a more careful reading (with pencil in hand) reveals that the author has indeed been remarkably successful in synthesizing the diffuse elements of nonperturbative electron–phonon interaction theory.

Only an active electron–phonon expert like Englman could bring a measure of unity to subjects as diverse as color centers in solids, vibronic transitions in organic and inorganic molecules, spin-lattice relaxation, the spectroscopy of transition-metal ions in liquid and solid matrices, models of ferroelectrics and theories of displacive phase transitions. To assist one's passage through the maze, concise summaries begin each chapter, relevant data illustrate theoretical derivations and tables of useful symmetry information abound in the appendices.

Overall, Englman's ambitious effort to produce an advanced monograph on the physics and chemistry of nonperturbative electron–ion interactions must be rated a success; he has indeed identified a unifying theoretical path through a complex field. *The Jahn–Teller Effect in Molecules and Crystals* will be a welcome addition to the libraries of institutions engaged in condensed matter research. Experimenters and theorists who are fluent in group theory, and whose research goes beyond the Born–Oppenheimer approximation, will also enjoy reading and perhaps owning this book.

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The Solid–Liquid Interface

D. P. Woodruff
182 pp. Cambridge U. P., New York, 1973. $10.95

The book's title is somewhat misleading. The first sentence of the preface refers to "our knowledge of the solid–liquid (ie solid–melt) interface"; "The Solid–Melt Interface" would have been a more representative name for this volume. Perhaps, an even more restrictive title would be adequate for almost the entire text, namely "Theories of the Growth of Metal Crystals from Melts."

It appears that the author, whose earliest paper on crystal growth was published in 1967, felt the need to commit to paper a digest of the popular theories of his adopted branch of science. It is a pleasure to emphasize the critical attitude often displayed by the author. Thus it is noted that the equality of surface tension and surface free energy "is not always true for solid surfaces"; the Young equation of wetting is said to be "not strictly valid"; "the apparent success of broken-bond models is not really very significant"; and "it cannot be said that the branching of dendrites is completely understood."

However, a reader whose area of interest is wider than that of metal crystal growth from melt may feel that the criticism is not incisive enough. Most scientists mentioned in the book believe that crystal shape is determined by the values of the interfacial tensions while the volume effects may be disregarded. In many publications on solid surfaces, capillary pressure is neglected or not treated correctly. Several models discussed in this book are crude and based on uncertain premises.

ROBERT SAAB

Thus it may be doubted whether the subject is really ripe for a book representation. We may be reasonably sure that a treatise on, say, thermodynamics, published in the year 2000 will not be fundamentally different from one available today, but a 2000 AD review of the growth of metal-crystal growth will, perhaps, rely on totally different ideas.

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Fundamentals of Plasma Physics

S. R. Seshadri
545 pp. Elsevier, New York, 1973. $24.50

Principles of Plasma Physics

N. A. Krall, A. W. Trivelpiece
674 pp. McGraw-Hill, New York, 1973. $25.00

In 1961, "Rose and Clark" appeared—the first textbook for graduate instruction in modern-day plasma physics. My shelf of texts and monographs on this subject now reaches nearly two meters wide, and many are missing by dint of random purchases or absent-minded borrowers. The point is that many authors have correctly sensed the need for instructional materials and research references in plasma physics. Why then yet two more books?

One can provide two answers to this

query. First, the ideal text has yet to appear, and the challange stands for every teacher in the field to mold his lecture notes into book form. Second, the field is surely evolving at a tremendous pace, and the new concepts need to be joined in careful expository style to what has come before. The pair of books under review here follow these principles, each succeeding in its own way.

S. R. Seshadri's *Fundamentals of Plasma Physics* is at a level appropriate for bright undergraduate seniors with introductory mechanics and electromagnetic theory behind them or for introductory graduate use. Six chapters cover particle motions and collisions, linearized waves in unbounded plasmas, Vlasov theory for waves, and some transport theory. The two introductory chapters cover the rudiments of kinetic theory and plasma notions. Seshadri's style is quite readable, and the text is generally attractive if a bit bulky. My strongest criticism is that no single experimental result is cited to confirm or challenge the theoretical material. But there are about 150 problems (with solutions appended) and useful mathematical appendices. This book carries itself; it could be used by many of my undergraduates in a reading course.

Principles of Plasma Physics by N. A. Krall and A. W. Trivelpiece stems from their two-semester graduate course at Maryland. The scope here is rather broader than the Seshadri text, and a number of more advanced topics is treated, such as bounded plasmas, plasma stability, applications to CTR, Fokker–Planck theory, plasma kinetic theory, nonlinear Vlasov theory of waves, and correlations and radiation. The material is quite meaty and is of sufficient depth to prove useful to researchers, as well as students. Problems are provided, and a very useful bibliography is included. The material alternates nicely between theory and experiment, and the variation in style between the two authors provides a welcome change-of-pace. This book is an impressive addition to the distinguished McGraw-Hill International Series in Pure and Applied Physics.

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Relativistic Quantum Mechanics

I. J. R. Aitchison
260 pp. Barnes and Noble, New York, 1973. $18.50

In the early 1960's the slender volume by F. Mandl met the requirements of a text in quantum field theory at an introductory level. *Relativistic Quantum Mechanics*, written by a particle theorist experienced in two- and three-body scattering and resonances, is based on the propagator approach and is likewise intended to be an introduction to relativistic quantum mechanics.

The book uniquely opens with a review of non-relativistic quantum mechanics, including time-dependent perturbation theory. A brief discussion of special relativity precedes the Klein–Gordon equation. The electromagnetic scattering of pions and kaons serves as an application of the K–G equation and concepts such as Feynman graphs, crossing symmetry and current operators are introduced fairly early. There are exclusive chapters on relativistic kinematics and propagators before the quantum mechanics of spin 1/2 and spin 1 particles is taken up. After going over some of the well known problems in quantum electrodynamics, the author discusses PCT invariances. The book concludes with chapters on strong and weak interactions. Significant omissions from the topics discussed are solutions of the Dirac equation for the hydrogen atom and the Foldy–Wouthuysen Transformation, both of which legitimately belong to relativistic quantum mechanics. Fock's equation for the Coulomb field could, by way of illustration, have helped remove the ambiguity in the author's momentum space Schrödinger equation. The Dalitz plot could have been incorporated into the chapter on kinematics instead of being relegated as a homework problem.

The presentation of the material is lucid and helpful to the student. However, the frequency with which the author refers the student to the book by J. D. Bjorken and S. D. Drell for further details or a fuller discussion deprives some of the topics of a physical motivation. Explaining the possible physical processes first and following them up with appropriate Feynman graphs, as is done for instance by S. S. Schweber, H. A. Bethe and F. Hoffmann in their introduction of Compton scattering, is not always done. This may be one of the advantages of conventional field theory and its systematic perturbation expansions. It would have been better if the Feynman diagrams were written in pictorial agreement with those found in other texts; there are places where the beginning student can misinterpret the diagrams, especially in regard to antiparticles or negative energy states. The section on vacuum polarization is rather sketchy, and no attempt has been made to introduce the Lamb shift—at least in terms of the degeneracy of the relativistic energy levels of the hydrogen atom. Although the author has