

panying the presence of two stratifying agents of different diffusivities (when one is stabilizing and the other destabilizing) receive an entire chapter. Mixing across interfaces separating regions of different density by external turbulence as well as purely internal mixing are the final topics covered; necessarily these are less complete than the former ones.

Despite an overall emphasis on physical description rather than heavy analysis, this book is subtle and advanced. Nonetheless careful reading and study by graduate students and professionals alike will amply repay anyone interested in understanding phenomena such as atmospheric hydraulic jumps and mountain lee waves (including rotor overturnings, the appearance of billow clouds, and the production of clear air turbulence), internal seiches in lakes, the structure (both macro- and micro-) of and processes prevalent in and above the oceanic thermocline, and the intrusion of a nose or wedge of heavier fluid into lighter fluid as in atmospheric cold fronts, estuaries, avalanches or turbidity currents.

EDWARD R. BENTON
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Boulder

The World of Walther Nernst, The Rise and Fall of German Science 1864-1941

K. Mendelssohn

191 pp. U. of Pittsburgh Press,
Pittsburgh, Pa., 1973. \$11.95

Mendelssohn has attempted to weave a biography of the great physicist Walther Nernst through the social history of the German state from the period known as the "Founder Years" in the middle of the 19th century to the zenith of the Third Reich in 1941. The book is written for the science and history layman. Mendelssohn, whose field is low-temperature physics is editor of *Cryogenics* and was a student of Nernst in the 1920's.

The author has assumed the responsibility for presenting a social history of Germany, a social history of the German scientific community, the relationship between developments in both, an account of Nernst's life (including his social and intellectual achievements and contributions) and popular explications of Nernst's scientific contributions. In addition the book includes thumbnail sketches of more than a half dozen important scientific figures of the last hundred years including F. A. Lindemann, Albert Einstein, Wolfgang Pauli, Max Planck,



NERNST

Fritz Haber, and Max von Laue. Even though the style of the book clearly indicates that it was not written for a scholarly audience there is no way that all of these subjects could have been adequately treated in 184 pages of text. The tragedy is that almost none of the issues Mendelssohn has addressed himself to are explored satisfactorily.

The portrait of Nernst himself is a mere shadow of what the man must have been. While we learn that Nernst probably used a self-studied image of a simple, open, trusting soul to mask the incisive questioning mind of a man with quick wit, a ruthless business sense and fierce loyalties, we are never able to penetrate the surface and there is never any attempt by Mendelssohn to explore the dynamics of Nernst's interactions with his family, his colleagues or his political and business associates. The reader must read between the lines, and very often the paucity of information provided in the book leads to contradictions and puzzlements.

The book has two major strengths. First, it contains a number of personal anecdotes concerning Nernst and other well known physicists of the last hundred years. Unfortunately, there is no documentation of the sources of these stories. This detracts somewhat from their attractiveness for scholars in the history of physics. Second, Mendelssohn's sense of the shifting political scene in Germany during the last hundred years, especially during the period between 1900 and 1930, is impressive.

Taken for what it is, the book should make a worthwhile evening's reading for the layman or for the scientist wanting to know something about the general flow of the physics community in Germany during the period treated.

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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.

STANLEY GOLDBERG
Hampshire College
Amherst, Massachusetts

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 non-symmetric 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 non-perturbative 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.

JOHN D. DOW
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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.



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.

J. J. BIKERMAN
Shaker Heights, Ohio

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