the various chapters of mathematics.

The author does not attempt to go into technical details that would spoil the book for the layman. Instead, she brings out the grandeur of Hilbert's work by quoting what his contemporaries have thought of it. It is not necessary for the reader to understand every word of such appraisal in order to be deeply impressed by the originality, depth and endeavor in Hilbert's world of mathematics. The physicist who applies many of the concepts and methods shaped by Hilbert, such as Hilbert space, integral equations, direct variational methods and the axiomatic method, will find that his mathematical outlook is widened by a careful reading of this biography, and the lay lover of mathematics will find himself enriched by it.

Paul P. Ewald
New Milford, Conn.

Thermodynamics and Statistical Mechanics

By L. M. Grossman
323 pp. McGraw-Hill, New York, 1969. $13.50

Texts combining thermodynamics and statistical mechanics are numerous enough to form by themselves a respectably populated ensemble. There is an increasing tendency for the characteristics of each new member of the ensemble to approach those of the mean, as organization and examples from earlier texts are taken over and reworked. This interdependence is not necessarily bad. It allows successive authors to draw on the inspiration of their predecessors. New texts may hopefully become, if not more original, then at least more finely textured, more readable, and more closely fitted to the particular group of students for whom they are intended. Unfortunately, such progress is not universal.

Lawrence Grossman (Nuclear Engineering, University of California, Berkeley) directs his concise first-year graduate text, *Thermodynamics and Statistical Mechanics,* at a variety of nonspecialists—engineers, chemists, and physicists—who require a working (as opposed to research) knowledge of the subject. The first quarter of the book is devoted to classical thermodynamics (Carathéodory approach—previous exposure to the Carnot-Clausius approach is assumed). Part 2 opens with a 25-page "course" in quantum mechanics (of marginal value to the noninitiate) and goes on to treat the density matrix and equilibrium ensemble theory. Part 3 discusses some standard diverse applications: perfect and imperfect gases, crystalline solids, and so on. Nonequilibrium processes are not touched upon.

Faced with the difficult dilemma of whether to emphasize methods or physics, the author has chosen the former. The examples in part 3 are chosen to illustrate application of the principles expounded in parts 1 and 2 rather than for their intrinsic physical interest. While this down-to-earth, how-to-do-it orientation has some merit, its effectiveness is often undercut by the style; while not pretending to rigor, the exposition of principles often tends to offputting formality. "If the state of an assembly can be influenced only by varying at least one of the generalized displacement coordinates $x_k \neq x_{n+1}$, we say that the boundary is an adiabatic wall" (x_{n+1} is the temperature).

The result of attempting to serve the needs of such a diversity of students is likely to be that the needs of none are served particularly well. Perhaps this is not a disastrous compromise for the nonspecialist; however, this reviewer prefers the more physical and less formally comprehensive format of a text like Fred Reif's, *Fundamentals of Statistical and Thermal Physics.*

Michael Wortis
University of Illinois at Urbana-Champaign

Physique des Lignes de Haute Fréquence et D'Ultra-Haute Fréquence

By P. Grivet
456 pp. Masson, Saint-Germain, Paris, 1969. $12.00

Microwaves

By A. J. Baden Fuller
289 pp. Pergamon, New York, 1969. Cloth $7.50, paper $5.50

The subjects of the two books, listed above, are close enough to be reviewed jointly. Grivet's book treats the physics of transmission lines at high frequencies; that of Baden Fuller starts with a chapter on transmission lines. By pointing out the differences between the two treatments, the reader may get an idea of the contents of these two books.

Both are aimed at the students of advanced electrical engineering and both can be used with profit by the physicist interested in microwave phenomena and their applications. The difference lies essentially in the personalities of their authors; whereas the first book is written by a physicist, professor at the Sorbonne, with excellent mathematical background, the second is the product of an electrical engineer, teaching at the University of Leicester. The remark about the mathematical background does not mean that Fuller's book is devoid of mathematics, but it is less detailed and avoids in many cases the derivations of the equations. Grivet's book contains much more mathematical material, despite the author's remarks on the prevalence of deductive methods in France and recommendation for a "harmonious and fecund association" of the semi-empirical methods with mathematical rigorousness.

Grivet's book starts with a very nice and concise history of the transmission line. He points out that, since its beginnings, this "banal industrial object" attracted the attention of some of the best physicists of the last hundred years. The turning point in their understanding occured in 1893, when Heaviside created a "bridge between the theory of circuits and the theory of waves."

An attractive feature of the book is the reduction to four primary parameters of the numerous properties of conductors, including superconductors. He also shows how the concept of frequency spectrum allows in many cases to further reduce the analysis to two secondary parameters: the propagation constant and the characteristic impedance. The analysis extends to traveling waves, as well as to pulse propagation. Presumably the second volume will present the analysis of stationary waves.

Fuller's book is considerably shorter and much more oriented to the engineering student. This approach has its advantages too; eight chapters out of twelve have problems appended to them. Solutions to the problems are sometimes indicated by giving a few numerical answers; complete explanations of a few selected problems are given at the end of the book. There is considerably more emphasis on practical devices and measurements than in Grivet's book.

The two books thus appear to be complementary. Those interested in the physics of high-frequency phenomena (with sufficient knowledge of French) would have to turn to the book by Grivet. If microwaves are merely a tool for physics research, Fuller's book offers interesting material.

Ladislaus Marton
Editor-In-Chief
Advances in Electronics and Electron Physics

Solid State Surface Science, Vol. 1

Mino Green, ed.
Marcel Dekker, New York, 1969. $18.50

The physics and chemistry of solid surfaces have made considerable progress within the last few years despite the scarcity of well established theoretical foundations and the abundance of data obtained on poorly defined and impure surfaces.

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By Arthur L. Loeb, *Ledgemont Laboratory, Kennecott Copper Corporation, Lexington, Massachusetts* and *Department of Visual and Environmental Studies, Harvard University*

A volume in the Wiley Monographs in Crystallography, edited by M. J. Buerger

Color and Symmetry presents the author's findings on the mathematical study of repeat patterns which resulted from a reexamination of the seventeen plane symmetry groups. The discussion, confined to the euclidean plane, treats three dimensions: two geometrical coordinates and color. An algorismatic approach is used to enumerate all planar colored configurations. Included in the text are sixteen colored illustrations which tabulate the configurations.

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By A. F. Harvey, *Royal Radar Establishment*

Coherent Light is a comprehensive, modern reference work to the whole field of coherent light, a relatively new subject which began with the development of the laser. The book is concerned with theoretical aspects, like optical physics and quantum electronics; the various types of lasers and associated devices, such as modulators and detectors; and practical aspects including atmospheric propagation, communication, and radar. Numerous illustrations, tables, and world-wide bibliographies supplement the text.

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In *Shock Waves in Collisionless Plasmas*, the authors have gathered and organized the large body of knowledge on collision-free plasmas. This information had previously been scattered among the various journals of plasma physics, fluid dynamics, and space physics.

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By Bela A. Lengyel, *San Fernando Valley State College, Northridge, California*

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- Hill's equation, which includes material not readily available in other literature
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- numerous applications of the mathematical concepts to physical problems

1971 368 pages $17.50

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their proponents use hand-waving arguments. Even so the understanding of surfaces and of surface phenomena is slowly emerging from the simple quasi-chemical pair-interactions point of view (or a "box of Fermi gas" for metals) and, in many instances, is acquiring a reasonably rigorous quantum-mechanical basis. What are now badly needed are conscientiously written and carefully reviewed articles, analogous to the well known Seitz—Turnbull—Ehrenreich series in solid-state physics, that would counteract the not sufficiently critical papers in journals or in proceedings of quickly assembled conferences. The new series *Solid State Surface Science*, edited by Mino Green, may be the harbinger of such a series.

The first chapter on chemisorbed hydrogen by J. Horiuti and T. Toya is an example of a clear and lucid treatment of one of the most fundamental phenomena in surface physics. The second chapter, by R. F. Greene, deals with solution of the Boltzmann transport equation near crystal surfaces and in thin films, and it clarifies many aspects of a very important and often misunderstood area of research. In chapter three Mino Green and M. J. Lee discuss simple complexes on semiconductor surfaces that have bearing upon problems encountered in electronic devices and in catalysis.

In chapter four, by J. C. Rivière, the techniques of measuring work functions and the results are described and many valuable numerical data given. The final (fifth) chapter by J. N. Zemel covers the extremely difficult field of epitaxy and of epitaxic film of lead chalcogenides and related compounds in particular. In general the book is on a high level and is suitable for graduate students as well as for research scientists. This first volume bids well for the future of the new series.

Roman Smoluchowski
Princeton University

Principles of Crystal Structure Determination

By G. B. Carpenter
231 pp. Benjamin, New York, 1969. $14.50

As x-ray crystallography has evolved into a mature science the number of introductory textbooks has multiplied relative to the number of fundamental reference works. The textbooks tend to be statements of the individual authors' preferences on the degree of importance to be attached to various topics in the field. Only rarely is any additional insight or clarity added to the foundation topics that have been treated many times in works dating back as much as 35 years. However, to the extent that a general knowledge of crystallography is introduced into the overall science curriculum, there is a need for brief texts suitable for the scientist who will use the results of crystal-structure analysis without becoming a specialist in the field. Within such a framework G. B. Carpenter has written a useful text, directed at beginning graduate students or advanced undergraduates.

The book is divided into four main sections: crystals, lattices and structures (2 chapters), diffraction of x-rays by crystals (5 chapters), crystal symmetry (3 chapters) and determining and refining crystal structures (2 chapters).

The author writes concisely, has a taste for mathematical neatness without undue complexity and uses simple, uncluttered figures. Unfortunately, there is one respect in which the figures do not come off as intended. There are numerous references to gray lines that invariably have been printed black. There are relatively few typographical errors. About 70 problems have been added at the ends of the chapters; some of them would be very difficult without more exposition in the chapters that precede them.

There is a representative (but by no means complete) bibliography.

Robinson B. Burbank
Bell Telephone Labs, Murray Hill, N.J.

Theory of Weak Interactions in Particle Physics

By Robert E. Marshak, Riazuddin, Ciaran P. Ryan
761 pp. Interscience, New York, 1969. $29.95

The study of weak interactions has had a profound influence on the development of modern physics. Furthermore, our understanding of these interactions has increased immeasurably over the past decade. It is therefore quite appropriate for a major book to appear that is devoted solely to this subject.

The *Theory of Weak Interactions in Particle Physics* explains the development that has occurred, recounts the experimental findings and describes the latest theoretical tools used to attack problems in this field. The only earlier book on "weak interactions of elementary particles" known to me is the short, now somewhat outdated, monograph by L. B. Okun' by that title. The present text differs from other major ones on weak interactions (for examples, that by C. S. Wu and S. A. Moszkowski entitled *Beta Decay*) in that the focus is always kept on the properties of particles rather than nuclei.

The first two chapters are devoted to "Physical" and "Mathematical Preliminaries." Both chapters are brief, concise and include a substantial amount of detail in a brief 170 pages. They are, I believe, difficult to follow for the physicist who is not already familiar with the subject matter. Thus, although the idea of having all required mathematical tools and a summary of experimental findings appearing at the beginning may be pedagogically sound, I believe that it tends to make the book less readable. However, it has the advantage that the person who is familiar with the mathematical details can concentrate on the physics of the subject matter. The third chapter is devoted to a description of the leptonic interactions; this is followed by a long chapter on the semileptonic and finally one on the hadronic or nonleptonic weak processes. The last chapter consists of a discussion of the intermediate vector-boson hypothesis.

The development is carried out consistently at a high and advanced level. Although the book contains the basic theory of the field, it also details many recent innovations and theoretical formalisms. Some of these theories will surely be found wanting in the future, and this is a drawback that may limit the useful life of the text. However, for the same reason, it belongs on the shelf of every physicist who is working in weak interactions. These workers should, furthermore, find the detailed list of references a useful asset.

The book has more of the characteristics of an encyclopedic reference than those of a text; it contains a great wealth of material, including both recent and historical developments. Indeed, in order to delineate this history, the authors sometime present the theory in such generality that the reader may find it difficult to keep his perspective. On the other hand, there are times when the properties of some theory (for example Heitler radiation damping, helicity amplitudes) are used without adequate preparation. One further feature that I found distracting is that speculative and nonspeculative material sometimes appear side by side. But these shortcomings are minor in the light of the abundance of physics that is clearly laid out.

Ernest M. Henley
University of Washington

Electronics for the Physicist

By Cyril Delaney
256 pp. Penguin, New York, 1969. $3.50

It is a real pleasure when an up-to-date and useful technical book appears paperbound. This book treats most modern aspects of electronics with good style, consistent notation and a wealth of useful information. The reader will get a surprise when he encounters field-effect transistors as the first active device discussed, but as the author