toward the former. Incidentally, the book is dated 1949, but the author's preface is dated December 1945. This doubtless explains why microwave molecular spectroscopy goes unmentioned, since this is almost entirely a postwar development. One can only regret this, since a fairly large fraction of students now interested in molecular spectroscopy are concerned with this new branch of the field.

ARTHUR ROBERTS

State University of Iowa

Practical Spectroscopy. C. Candler. London N.W.1: Hilger & Watts, 1949. U. S. distributor: Jarrell Ash Co., Boston, Mass. 190 pp. $6.10 postpaid.

This book is one of the well-known Hilger publications dealing with selected topics of applied optics and allied fields. Although it has been written primarily for university and technical college students, it is a source of valuable information for everyone interested in the field of practical spectroscopy. The book contains elementary treatments of spectroscopic instruments and auxiliary apparatus, including photometers and interferometers. The various methods of wavelength measurements, qualitative and quantitative spectrochemical analysis, and absorption spectroscopy are discussed in some detail. About one-fifth of the book deals with infrared spectroscopy.

The book's most remarkable feature is the abundance of experiments and practical exercises described at the end of appropriate chapter sections. Every instructor of a laboratory course in practical spectroscopy will greatly profit by this collection, even though he does not have all the instruments. The text refers mainly to instruments made by Hilger, but this does not impair its general value, since most of the experiments can be performed with other apparatus also.

K. W. MEISSNER

Purdue University

Introduction to Theoretical Physics, 5 vols. Max Planck. Reissue; translated by Henry L. Brose. ***General Mechanics,*** Vol. I, 272 pp. ***The Mechanics of Deformable Bodies,*** Vol. II, 234 pp. ***Theory of Electricity and Magnetism,*** Vol. III, 247 pp. ***Theory of Light,*** Vol. IV, 216 pp. ***Theory of Heat,*** Vol. V, 301 pp. New York: Macmillan, 1949. $3.00 a volume.

This work consists of five volumes of modest size, written between 1916 and 1932. The first volume deals with the general mechanics of mass points and rigid bodies, and the second with the mechanics of deformable bodies—elasticity, sound, and hydrodynamics. Volume III, on the theory of electricity and magnetism, covers static and dynamic processes in vacuum and in continuous media, and in conclusion points out the conceptual need for Einstein's restricted principle of relativity. Volume IV, on the theory of light, treats geometrical and physical optics, crystal optics, and dispersion, and finally draws an analogy between the optics of inhomogeneous bodies and the Schrödinger equation of quantum mechanics. Volume V deals with the theory of heat—thermodynamics, heat conduction, thermal radiation, and statistical mechanics. It was the unifying role of the last-named subject, in basing the concepts of heat on mechanics and electrodynamics, that led the author to place this volume at the end of the series.

The approach throughout stresses clarity of physical concepts rather than mathematical elegance or comprehensive coverage. The result is a work that goes much farther beneath the surface than the usual elementary physics text, and is not as detailed as the advanced specialized books on the separate fields of physics. Knowledge of analytic geometry and differential calculus is assumed in the first volume, and of integral calculus and some differential equations in the others. These volumes appear to be most suitable for use by exceptionally capable elementary physics sections, for separate courses at the intermediate level, and for reference or review by advanced students of physics.

L. I. SCHIFF

Stanford University

University Physics. Francis Weston Sears and Mark W. Zemansky. Cambridge, Mass.: Addison-Wesley, 1949. 848 pp. $6.00.

This textbook, based on the senior author's Principles of Physics series, is intended to cover a one-year elementary course for physics and engineering students taking concurrent courses in calculus.

The chapters on mechanics and hydraulics, which occupy almost one third of the book, are excellent. The treatment is, above all, rigorous. Vector analysis is used throughout. Calculus is introduced gradually. Typical of this section of the text is the treatment of Newton's second law, which is first introduced in its simpler form, but later reformulated in the more rigorous form used in mathematical physics. Three systems of units—English gravitational, mks, and cgs—are introduced, but mechanics are discussed largely in the first system.

Electricity and magnetism are covered in another third of the book and given much the same rigorous treatment as mechanics. The rationalized mks units, which simplify the writing of Maxwell's equations, are used, but the authors neither develop nor state Maxwell's equations.

The remaining third of the book deals with the subjects of optics, heat, sound, and atomic physics. The mathematical treatment of optics is comprehensive. The other chapters are generally more qualitative or descriptive in form and contain some equations whose derivations are not given, but whose meaning the student can grasp. Introductory equations and definitions, however, are treated rigorously: thus the short section on heat contains a thorough discussion of temperature scales. Thermodynamics is treated without either the concept or the term of entropy. In the final chapters the student is whisked from the Bohr atom to nuclear reactors and brought as close as possible to the present frontier of physics.

Students of engineering should find this text clear and practical and derive much aid from the many problems and examples. Physics majors should receive a sound introduction from the rigorous treatment of the more comprehensively covered fields, but may wish additional information on thermodynamics and sound.

T. ENNS

Johns Hopkins University

Some Recent Researches in Solar Physics. F. Hoyle. London-New York: Cambridge Univ. Press, 1949. 134 pp. $3.00.

This book in the new series of Cambridge Monographs on Physics deals mainly with Hoyle's own recent work on the corona and chromosphere, carried out in collaboration with Bondi and Lyttleton. It is therefore mainly of interest to workers in this branch of astrophysics.

The monograph starts out with two chapters dealing with sunspots and with the observational data regarding the chromosphere and the corona. The final chapters deal with electromagnetism in solar physics, terrestrial phenomena directly influenced by the sun, and emission of radiowaves by the sun.

The book's main merit probably lies in the fact that it will draw attention to the importance of accretion processes in astrophysics. It seems to me that Hoyle's conclusions are far from final. His considerations fail, for instance, to account for the fact that only a certain select group of spectra are emitted by the corona, whereas other spectra corresponding to ionization potentials and excitation energies of the same order of magnitude as those of the observed spectra are not present.

The theoretical part appears to give a quantitative discussion, although it is noted by Hoyle that the results indicate only orders of magnitude. A more qualitative discussion might therefore have been more to the point. Also Alfvén's influence on ideas about electromagnetic effects in astrophysics might have been stressed more.

D. TER HAAR

Purdue University

Introduction to Theoretical and Experimental Optics. Joseph Valasek. New York: John Wiley; London: Chapman & Hall, 1949. 454 pp. $6.50.

This book is an introduction to the various fields of advanced optics, both theoretical and practical. To read it with real understanding requires more than a passing acquaintance with optics and theoretical physics. The theoretical material is well presented. Each discussion is necessarily very condensed, however, because the author touches upon so many topics. The good student will be stimulated by these brief presentations of material new to him and will complement them by reference texts, many of which are named in the good bibliography included here.

It is pleasing to see many engineering optical applications included and brought into close connection with theoretical optics. This is accomplished in part by the 24 optical experiments described at the end of the book, each requiring reference to a portion of the text. There are also included throughout the text optical applications in engineering and in other fields of service. For example, there is a good treatment of the one subject in optics of most importance to all of us—the eye and spectacle lenses. One searches in vain, however, for those recent applications of physical optics, reflection reducing films, and interference filters.

It is suspected that the author, in common with the reviewer, accepts with hesitation the recently recommended photometric terms *illuminance* and *luminance.* Though *illuminance* is used everywhere in place of the older term *illumination*, the section that discusses *luminance* is entitled, "Brightness of Images." It remains to be seen whether the younger generation will find the new words less confusing than the old.

This book is also useful as a handy reference text for the specialized optical worker who wishes to refresh himself quickly on some matter in another field.

RICHARD TOUSEY

Naval Research Laboratory

Partial Differential Equations in Physics. Arnold Sommerfeld; translated by Ernest G. Straus. New York: Academic Press, 1949. 335 pp. $5.80.

The present book is a translation of the sixth volume of Sommerfeld's *Lectures on Theoretical Physics.* The theory of partial differential equations is, of course, not a branch of theoretical physics. Its inclusion in Sommerfeld's series of lectures is, however, well justified, not only because of the author's many valuable contributions to this field, but because this branch of mathematics, above all others, is an indispensable tool in the theoretical physicist's work.

The motivation for the selection of topics and for the procedures employed is physical throughout this volume, and in this respect the book differs considerably from most modern writings on its subject. It is closer in spirit to the classical literature in this field, whose authors still believed in the "preestablished harmony" between what is physically important and mathematically significant. The book starts with an introduction to Fourier series, Fourier integrals, and other Fourier-like expansions, and then proceeds with a discussion of the various types of partial differential equations and boundary conditions arising from physical problems, and of some basic tools used in solving them. The next chapter deals more specifically with boundary value problems in heat conduction. This is followed by a rather detailed but concise treatment of cylinder and sphere problems in potential theory. Next, the eigenvalue problems of classical and quantum mechanics are discussed. The last chapter deals with the propagation of radio waves and serves as an illustration of many of the general methods developed in earlier chapters.

The chief merit of the book lies in its skillful handling of complex problems, by the use of a minimum of mathematical formalism and a maximum of physical intuition. Mathematicians will miss the rigor in statements and proofs that they are accustomed to (there is hardly any discussion of convergence, although infinite expansions appear in all parts of the book) and will not accept the author's "uniqueness axiom for physical boundary value problems" (p. 248) as a substitute for difficult uniqueness proofs. On the other hand, the physicist will feel completely at home in this book and he will be grateful