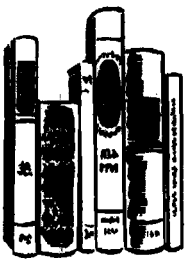
during the afternoons. Subjects to be covered include pulsed stroboscopic lighting, optical high-speed cameras, Kerr cells, Faraday shutters, and image converters. Specialists in high-speed photography have been invited to lecture on their particular subjects. The seminar will include laboratory demonstrations of many types of equipment related to high-speed photography. The program will be under the direction of Prof. Harold E. Edgerton of the Department of Electrical Engineering, M.I.T. Tuition is $175. Academic credit is not offered.

**A trend away** from the "learning more and more about less" type of specialization and toward the "Renaissance man" type of diversified learning was hinted at by Hans H. Zinsser, M.D., Chairman of the Medical Electronics Session at the International Convention of the Institute of Radio Engineers held in New York, in March. In discussing medical engineering foreseen as a new profession, Dr. Zinsser spoke of "a new breed competent to talk in both fields, not only through acquisition of a vocabulary, but trained in ways of thought that summarize much more than medicine, or engineering, or basic biology comprises at the present time. It is by the development of such multiple-faceted minds that we can most readily progress to the full realization of the potentialities before us."

Dr. Zinsser outlined a suggested curriculum leading to a degree in medical or bio-medical engineering.





# books reviewed

## Principles of Optics

By Max Born and Emil Wolf. Published (1959) by Pergamon Press Inc., 122 East 55 St., New York 22. v-xxvi + 803 pp. including illus., charts, graphs, etc. 6½ by 9½-in. Price $17.50.

It is interesting to note that much of the brilliant work done in optics in the second half of the nineteenth century is still perfectly valid and in continuing use. But the broadening scene of physics has elucidated many points that remained mysterious at the close of that period. The optical accomplishments of the twentieth century are constantly revising the point of view in this field.

The present book is a re-working of an earlier *Optik* by the senior author, Max Born. There have been many changes, and the volume is practically a new work. In several respects it is more, perhaps, to be compared with the famous *Lehrbuch der Optik* of Paul Drude. This came out at about the turn of the century (in English translation only by 1922). The comparison consequently reflects a half-century of development in optics.

The broad objectives of the *Lehrbuch* and the present work are really much alike — to present a systematic and unified theory of the major optical phenomena.

The subject matter of the two books is surprisingly similar. Simply, it covers the production of images by lenses and mirrors, interference and diffraction phenomena, the many phenomena of polarized light and its transmission through crystals, and the optics of conducting media such as metals. Some of this is treated by the use of geometrical optics, but most of it needs the more fundamental wave theory.

The first difference that one notes is in the order of presentation. Drude started with the straight geometrical optics. When he introduced waves, he managed as long as possible with an equivocal mechanistic medium. Electromagnetic waves appeared only very far along in the book.

Born and Wolf start right out in the very first chapter with Maxwell's equations. It is only after a hundred pages that they show how the equations lead to the rectilinear light rays of geometrical optics, and they then proceed to go into image formation.

The authors gather together all the material dealing with partially coherent light into a single chapter. Drude treated bits of this here and there as he dealt with Young's fringes, breadth of spectral lines,

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and other subjects. The modern information theory approach unifies and clarifies this field considerably.

One notices a difference in the general plan of attack on explanations and derivations. Where the older book was heuristic and tentative, Born and Wolf are sophisticatedly analytic, as befits the accumulation of knowledge which has occurred in the interim. One must admit that the reader can pay a certain price for sophistication, in that comprehension does not always come so easily.

In dealing with the design of imaging systems, a major element is the theory of aberrations. If one is to evaluate the preference of one design over another it is necessary to have such a quantitative criterion of performance as indicated by the aberration. The fundamentals of geometrical aberrations run back as far as Seidel in the 1850's, and of wave or diffraction aberrations to Lord Rayleigh around 1880. Born and Wolf present the material in two chapters, in a particularly comprehensive discussion. Its modernity is indicated by the references, running to 1957.

A number of chapters in the book have been written by other than the titular authors. Among these is a detailed discussion by Professor A. B. Bhatia on the diffraction of light by ultrasonic waves. Similarly a chapter on rigorous diffraction theory (as distinguished from the earlier use of Huyghens' principle) and a mathematical appendix were contributed by Dr. P. C. Clemmow. Other material was prepared by Drs. Wayman, Wilcock, Stokes, and Professors Taylor and Gabor.

There are some very detailed appendices to cover certain mathematical tools used in the text, such as the calculus of variations (adapted from Hilbert's 1903 Goettingen lectures), the Dirac delta function, the circle polynomials of Zernike, etc.

The book is fairly strictly limited to the theoretical reader. There is a chapter on image-forming instruments, but this material is fairly sketchy and illustrative, and not really meant to guide the practical individual.

The book will presumably become a standard reference work in the field of theoretical optics. It is suitable as a text for advanced students.—*Pierre Mertz*, 66 Leamington St., Lido, Long Beach, N.Y.

## Professional Association in the Mass Media:
### Handbook of Press, Film, Radio, Television Organizations

Published (1959) by the United Nations Educational, Scientific and Cultural Organization, Place de Fontenoy, Paris 7, France (U.S. Agent: UNESCO Publications Center, 801 Third Ave., New York 22). 206 pp. 8 by 10½-in. Price $5.00.

This useful and informative handbook lists alphabetically, country by country throughout the world, organizations for the press, film, radio and television. Each organization is listed with its address, scope and purpose, membership, qualifications for membership, publications, history, and names of officers. Part I of the handbook lists international organizations. Of the total of 64 international organizations, one is concerned mainly with the entire field of mass communication. There are 31 international press organizations, 22 film, nine broadcasting, and one television. Part II lists 1049 national organizations. Of this number, 561 are press organizations, 341 film, 134 radio, and 13 television.

## From Tin Foil to Stereo

By Oliver Read and Walter L. Welch. Published (1960) by Howard W. Sams & Co., 1720 E. 38 St., Indianapolis 6. 524 + xvi pp. Illus. Appendix. Index. 6 by 9-in. Price $9.95.

Beginning with the statue of Memnon at Thebes and ending with a discussion of stereo discs, *From Tin Foil to Stereo* spans more than 3000 years of human endeavor to imitate or reproduce natural sounds by mechanical means. The book is, as the title suggests, mainly concerned with the evolution of the phonograph since its invention in 1877 by Thomas A. Edison. The book is also about America, American business practices in the late 19th and early 20th centuries, and some of the legal mazes and bypaths stemming from the invention and development of the phonograph.

The book is not only documented with amazing thoroughness, making it a valuable source of reference material, it is also a delight to read. Not the least of its delights is the hundreds of photographs some of which, the authors state, are reproduced for the first time. For lovers of

Americana and of "the good old days" there is a wealth of historic and (to some) nostalgic material. One of the most amusing illustrations is in the Appendix (p. 479) showing the title page of "The Song of Mister Phonograph" (copyrighted 1878). A robot-like creature whose head is a cylinder capers in music-hall style.

The book is full of references and quotations, and names of inventors, attorneys, businesses, singers, musicians — some long-dead, others very much alive, and others alive in history and memory — march through the pages. Old law suits, decided long ago, are recounted in detail, throwing new light on some of the judgments of history. For example, after a detailed account of the suit of Marconi Co. vs. DeForest Co. (pp. 229–231) the authors ask, "But the question remains, with respect to historical accuracy, to whom belongs the major credit for the initial and basic contribution of the first vacuum tube, Fleming or Edison? Edison had built the first tube, Fleming had discovered a new use for it . . .?"

The book is not one that can be read at one sitting, in spite of its highly readable style, but is rather a book that can be returned to again and again for entertainment as well as information. The authors have made a genuine contribution to the history of the United States by their careful and illuminating examination of the development of one invention.

### Fundamentals of Photographic Theory

2d ed., completely revised, by T. H. James and George C. Higgins. Published (1960) by Morgan & Morgan Inc., 101 Park Ave., New York 17. 345 pp. incl. index, illus. and graphs. 5½ by 8¼-in. Price $7.50.

*Fundamentals of Photographic Theory* was first published in 1948. The second edition has been extensively revised and reset to include recent discoveries and developments. The book, which gives a general account of the theory of the photographic process, based on fundamental chemical and physical concepts, is used as a textbook in photographic courses in many colleges. In the second edition, extensive revisions have been made, particularly in the chapters on the photographic emulsion, formation of the latent image, mechanism of development, kinetics of development, and structure of the developed image. New information on the theory of color photography and color sensitometry is included and there is a description of the chemistry of the formation of dye images. A comprehensive list of references is given at the end of each chapter. A reader who requires more advanced or more detailed treatment of any phase of the photographic process will find an ample listing of source material from which he may select what suits his needs.

**"The American Standard** Requirements for Electrical Indicating Instruments: Panel, Switchboard and Portable Instruments" is published by American Standards Association, 10 E. 40 St., New York 16. This is Standard C39.1-1959, a revision of C39.1–1955. The development of this American Standard has resulted from the work of the Sectional Committee on Electrical Measuring Instruments C39. This specification is intended to assure that instruments conforming to it will be satisfactory for general industrial use.

**British Broadcasting Engineering Monograph,** *Programme Switching, Control, and Monitoring in Sound Broadcasting*, published February 1960, is No. 28 in a series which was begun in June 1955. About six monographs, each dealing with some phase of television and sound broadcasting, are published each year. Individual copies are priced at 5s; and an annual subscription is 1 £. Orders can be placed with BBC Publications, 35 Marylebone High Street, London, W.1.

**Sound and Vision Broadcasting,** if it maintains the high standard set by the first (Spring 1960) issue, will be a valuable addition to publications dealing with particular or overall aspects of the broadcasting field. It is published by the Broadcasting Division of Marconi's Wireless Telegraph Company, Ltd., Chelmsford, Essex, England. The aim, according to the Editor, R. L. Varney, "is to cover not only the engineering side of broadcasting but also that of programing, and to interest all those whose work may lie in either direction, whether sound or vision." The magazine will be issued three times a year. Translations in German and Spanish of the main articles are included. The first issue contains seven main articles and six brief news stories on installations throughout the world. The publication is enhanced by numerous illustrations.