Book Reviews

Optics. Lectures on theoretical physics, vol. IV. Arnold Sommerfeld. Trans. by Otto Laporte and Peter A. Moldauer. Academic Press, New York, 1954. xii + 383 pp. Illus. + plates. $6.80.

Like the three volumes of Sommerfeld's lectures which have already been translated into English, this volume on optics (vol. 4) is an excellent treatise in many ways. Being a course of lectures, it is not a complete exposition of the subject of optics but rather is a careful treatment by means of the electromagnetic theory of a number of the most interesting topics. Thus it does not constitute a textbook in the ordinary sense, since it presupposes a very considerable background knowledge.

The electromagnetic theory is introduced in the very beginning and the mks system of units is used. This is rather unfortunate for those who were brought up to use, and who still like to use, the older systems, but it is probably more suitable for many of the students now studying theoretical physics. The Fresnel formulas for reflection from a dielectric surface are developed very early and are discussed fairly completely, as is also the subject of metallic reflection. With this background it is then natural for the lecturer to go into the theory of the Fabry-Perot interferometer. This he does in an unusual way, treating the problem as a boundary-value problem rather than as a problem in summation. This is a very elegant way of deducing the usual formulas but, as the text points out, it is restricted to the case of an infinite number of reflections. In Chapter II there is a discussion of the optics of moving media, and the theory of relativity is introduced at this point. The discussion of the Michelson experiment is particularly simple. In Chapter III the lectures on dispersion and magnetic rotation conform fairly completely to the classical expositions of these subjects. The discussion of the relationships of the phase, signal, and group velocities is valuable.

In Chapter V, Sommerfeld discusses the problems of diffraction and naturally does it particularly well, since this is a subject in which he has been a leader since 1896, when he was the first person to find a strict electromagnetic solution of a problem in diffraction. The various methods of approach to the problem are discussed, starting with the Huygens principle and going through Kirchhoff's solution and his own. Of particular interest is the portion of Chapter VI which deals with diffraction by a very narrow slit. This is a problem that Rayleigh solved for a certain range of values, but the approximations have been carried considerably further by Sommerfeld. The discussion of instruments, such as the grating, is not particularly original or complete, nor is the discussion of the Cornu spiral. In the last chapter there is a good general treatment of the resolving power, using a criterion slightly different from that of Rayleigh.

This book is not a textbook in optics but rather a source book for theoretical physicists in the methods applicable to optical problems. Like so many books written by theoretical physicists, its connection with experimental topics appears to be very tenuous but there can be no doubt that for an individual who has already made a study of optics from the point of view of the usual textbooks, such as Bruhat's *Cours d'Optique,* Sommerfeld's expositions are of great theoretical value.

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The Psychology of Invention in the Mathematical Field. Jacques Hadamard. Dover, New York, 1954. (Reprint of ed. 1 first published by Princeton Univ. Press, 1945.) xiii + 145 pp. Paper $1.25, cloth $2.50.

When this book, which is now reprinted in the Dover series on the history of science, first appeared in 1945, it was reviewed in many journals, chiefly nonmathematical ones. The consensus of these reviews (see, for example, *J. Philos.* **42**, 333) is that the book is gracefully and interestingly written, that it contains many important anecdotes, and that it will not help the reader to invent mathematics.

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The Theory of the Photographic Process. C. E. Kenneth Mees. Macmillan, New York, rev. ed. 1954. x + 1133 pp. Illus. $21.50.

Outside of a relatively small group of scientists and photographic technicians the complex theory behind the photographic process is little known. This theory has developed slowly and necessarily has drawn from the theoretical advances in nearly all other major fields of science. The photographic process as we know it today involves such studies as those of nonhuman animal products (gelatin), inorganic and organic chemistry, physics, mathematics, physiology of human vision, psychology, and perception. Perhaps no other comparably large industry as that built around the photographic process requires the coordinated efforts of so many specialized people for its success and growth. Just why the theoretical aspects of photography are not more widely known is difficult to answer, but certainly one important reason has been the scarcity of authentic textbooks on the subject, especially in the English language.

In 1942 when the first edition of Mees' *Theory* was published, this great need was partly fulfilled. However, no single textbook could be expected to treat such a scopic subject as the theory of photography completely. Nor could even a complete textbook be revised often enough to keep all its contents up to date. Yet, the first edition of Mees' book, followed by the present