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.

A. G. Shenstone
Palmer Physical Laboratory, Princeton University

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.

Sydney H. Gould
Department of Mathematics, Purdue University

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

second edition, has met these difficulties quite admirably. First, the subjects for presentation have been wisely selected. Second, the authors of the various chapters cover their subjects fully, but many details are left unsaid, which helps the reader to grasp an over-all picture of the underlying theory. Third, the extensive reference citations at the end of each chapter enable one to pursue any of the subjects in greater detail.

The second edition, although completely revised and largely rewritten, follows the general pattern of the first edition quite closely. One chapter in the first edition, "The photographic aspects of sound recording," has been omitted, but three new chapters have been added: "The action of charged particles on the photographic emulsion," "The latent image produced by x-rays," and "The sensitometry of color films and papers."

Another departure from the first edition is the appointment of special editors for each of the five main parts of the book—(i) "The photographic material," (ii) "The action of radiation," (iii) "Optical sensitizing," (iv) "Development and the after-processes," and (v) "The physics of the photographic process." Some 20 authors have collaborated in preparing the 25 chapters under these main headings.

Most of the discussion throughout the book has a theoretical slant, but many practical facts are included. Some of the chapters actually have more practical than theoretical value, which ties the text into the art of picture production and gives it wider applicability.

By way of criticism, it is my opinion that the research conducted by Kodak scientists has been overly stressed and in some instances original authors are not mentioned. There are very few typographic errors, and in nearly every instance such errors are obvious. For example on page 348 in the legend for Fig. 140 "radiant density" is used when it obviously should be "radiant energy." On the other hand, typographic errors such as the one on page 221 where the expression "the fromation of silver iodide" is used, near the bottom of the page, is likely to cause one to reach for the dictionary to see whether such a word as "fromation" really exists.

LLOYD E. VARDEN

200 East 66 Street, New York

Principles of Geomorphology. William D. Thornbury. Wiley, New York; Chapman & Hall, London, 1954. ix + 618 pp. Illus. $8.

Except for the omission of such subjects as dynamic geology, this textbook could easily be entitled "Intermediate physical geology." It is essentially an amplification of the material, usually covered in an elementary physical geology course, on weathering, mass-wasting, stream erosion and peneplanation, the arid cycle, eolian landforms, karstic forms, glaciation, oceanography, and volcanic and pseudovolcanic landforms. The two final chapters discuss sources of geomorphic information such as maps (topographic, geologic, soil, and climatic) and aerial photos, and practical applications of geomorphic reasoning and interpretation (as in engineering and military geology and in the location of ground water, ore bodies, and petroleum). Abundant references are included at the end of each chapter. Author and subject indexes are provided. Illustrations are numerous and excellent, and the format is very pleasing.

There are various features that distinguish this from some previous geomorphology textbooks. The devoting of an entire chapter each to submarine topography and "applied geomorphology" seems valuable. The introduction, almost at the beginning, of nine "fundamental concepts" (uniformitarianism; structure, process, and stage; complex origin of most landscapes; and so forth), which can be fully appreciated only after much further discussion but can well be kept in mind, is probably also worthwhile. Another valuable feature of the book is the reference in many places to the appearance on air photos of the features described.

With its many good qualities, the book unfortunately is poorly written and contains many inaccuracies. Teachers might be well advised to read several chapters before deciding to adopt it as a textbook.

CHARLES R. WARREN

U.S. Geological Survey

The Alkaloids: Chemistry and Physiology. vol. IV. R. H. F. Manske and H. L. Holmes, Eds. Academic Press, New York, 1954. x + 357 pp. $8.50.

This volume is devoted to the chemistry of the alkaloids of the isoquinoline type, in 11 authoritative chapters, and further includes two sections on alkaloids of obscure or unknown structure, namely, the Erythrophleum alkaloids and those of the Aconitum and Delphinium groups. It represents the last volume on the chemistry of the alkaloids, except for a section on miscellaneous alkaloids, which will be included in volume V on pharmacology. It is intimated that a supplement may appear. This would be most welcome in view of dramatic synthetic developments in some of the most important alkaloid groups.

In this volume, the contributors have been chosen astutely for their competence in the several fields. In an introductory section, the biosynthesis of isoquinolines is discussed by Manske, with the conclusion that we do not know, but can speculate, awaiting confirmation with labeled atoms. The well-worn but physiologically interesting alkaloids of the mescal cactus are discussed by L. Reti (Buneos Aires), with a subordinate section on other cactus alkaloids. Here, as elsewhere, one is impressed by the unusually complete botanical documentation.

The simple benzylisoquinoline alkaloids, principally papaverine and its congeners in opium, are well reviewed by Alfred Burger (University of Virginia), an early worker in this field. Manske and W. R. Ashford (Merck, Montreal) present an exhaustive chapter on