SCIENTIFIC BOOKS

A TREATISE ON DIFFRACTION

The Diffraction of Light, X-rays and Material Particles. By CHARLES F. MEYER. University of Chicago Press, pp. 473 + xiv with 283 figs., $5.00, 1934.

THE theory of light diffraction is often encumbered with more mathematics than is essential to an understanding of most of the observed phenomena. The simple theory of Fresnel explains most observations. The dynamical theory of Kirchhoff is much more difficult in application, and yet it can not yield rigorously correct results. In practise it gives results which are very like those of the Fresnel theory. The rigorous theory of Sommerfeld has been applied to only the simplest cases. Even then it has been found necessary to assume perfect conductivity of the diffracting screen, and thus its predictions regarding the intensity of light diffracted at large angles do not agree very well with observation.

The Fresnel theory is made the basis of the chapters on the diffraction of light in this treatise by Professor Meyer. The treatment is thus made relatively simple. There is, however, no lack of thoroughness. The logical limitations of the treatment are clearly pointed out, and in a later chapter are considered the conditions under which it may be expected to be inapplicable. The dynamical theories of Kirchhoff and Sommerfeld are briefly described in this latter place.

The author states that portions of this book are suitable as a test for students of optics and that more mature physicists are offered here a novel and improved exposition of the subject. It is the opinion of the reviewer that the presentation is well suited to both classes of readers. The treatment is simple, unusually well arranged and clearly written, and is sufficiently comprehensive to be somewhat of an encyclopedia of the subject of light diffraction. The diffraction of x-rays and material particles are treated rather less exhaustively in the last third of the book.

The first chapter consists of a historical summary of the diffraction of light, beginning in the seventeenth century with Grimaldi and ending with Planck in the twentieth century. To a considerable extent the historical method of this introductory chapter is followed throughout the book, and references to original papers are always given. These are usually accompanied by other references to later systematic treatments. The references seem to the reviewer to be very happily chosen. They are never burdensome in number, and there is usually a brief discussion of their relative values.

The theory of light diffraction occupies eighty-four pages. Following this comes a long and comprehensive chapter on "The Diffraction Grating." This chapter contains a great deal of material which has not been gathered together elsewhere. It is sufficiently detailed to be valuable to a spectroscopist. This is perhaps the only portion of the book which contains more material than one ought reasonably to expect to find as part of the mental equipment of an average physicist—at least of an "ideal average physicist."

To the reviewer the most interesting part of the book is a long chapter entitled "Sundry Ramifications of Diffraction Theory." In this chapter are considered various interesting subjects which are presumed to be a part of the stock in trade of every physicist, but which are nevertheless not all readily available elsewhere. These subjects include the resolving power of optical instruments, Abbe's theory of microscopic vision, meteorological phenomena and the measurement of star diameters. It seems to the reviewer that the average physicist should be well acquainted with the miscellaneous subjects of this chapter, and that the treatments given here are about right in extent for one who is not a specialist in some branch of optics. In fact this remark applies rather well to the entire book.

The chapter on x-ray diffraction begins with an excellent historical review of this subject. Only so much of the elements of crystal structure is given as seems essential to understanding the different methods of crystal structure analysis. This saving of space allows a presentation of the elements of x-ray diffraction and x-ray spectroscopy in eighty-three unhurried pages. This presentation covers more of the details than one might expect, and is withal a neat feat of exposition.

The last chapter, "The Diffraction of Material Particles," follows the historical development of its subject even more closely than do the other chapters of the book, and in some cases in more minute detail than seems justified. The chapter is, however, only fifty-three pages in length and the subjects which are treated have been well chosen.

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BOOKS ON POPULAR ASTRONOMY

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THESE important leaflets owe their origin to the suggestion of an amateur astronomer, Mr. Bernard Benfield, of San Francisco, by whom also they were edited in collaboration with the secretary of the society, Mr. C. H. Adams. In four small but closely printed pages each of them is a chapter on some interesting topic and gives the well-considered views of a worker in that particular field. The publication