Waveguide propagation and diffraction of optical radiation

V. S. Letokhov

Usp. Fiz. Nauk **154**, 171–172 (January 1988)

S. Solimeno, B. Crosignani, and P. DiPorto, *Guiding, Diffraction and Confinement of Optical Radiation*, Academic Press, Orlando, 1986, pp. 620.

During the last quarter century that has elapsed from the moment of invention of the laser and the universal application of laser light our concepts concerning the propagation of light, particularly in spatially inhomogeneous media have been significantly broadened. It suffices to mention such major divisions of modern optics as holography, laser optics, fiber or gradient optics, and integral optics in order to form an idea as to how far optical science and technology have moved forward in their possibilities for controlling the propagation of a light beam.

Naturally the present state of the problem of propagation and diffraction of light ought to be reflected in monograph literature. The monograph under review happens to serve this purpose very successfully. The monographs that have been published until now have usually discussed some one of the aforementioned sections of modern optics. In contrast to them, the monograph being reviewed undertakes discussion of all the contemporary divisions of optics from a uniform point of view. Chapter 1 examines the general properties of propagation of electromagnetic radiation and its interaction with matter. Chapter 2 discusses the asymptotic methods of solving the wave equation. Chapter 3 is devoted to an analysis of the propagation of light in stratified periodic structures (multi-layered films, metallic and dielectric reflectors and interference filters). Chapter 4 examines the diffraction phenomena accompanying the propagation of light, while Chapter 5 continues the detailed analysis of diffraction integrals. Chapter 6 analyses in a modern manner (with the aid of the scattering S-matrix) the scattering of light by objects, including the description of metallic and dielectric lattices. Optical resonators and Fabry-Perot interferometers are examined in Chapter 7. Finally, Chapter 8 describes the propagation of light in optical fibers. Thus, the range of material covered is quite broad.

Among other merits of the book the following should be singled out. First of all, the book is suitable not only for scientific research workers as a readily available reference book, which contains many useful formulas, but also for undergraduate and graduate students as a deep and well-thought-out textbook. For this purpose the book contains at the end of each chapter several dozen problems grouped in accordance with each section (the book contains a total of 205 problems), frequently with an indication of references to the original paper where the solution of the problem is given. Secondly, the authors of the book are well acquainted with the achievements not only of the western, but alo of Soviet scientists and give an objective evaluation of their contribution to the development of modern optics.

In conclusion I must say that I derived pleasure in becoming acquainted with this interesting book and found much material of interest to me. I strongly recommend it also to other readers associated with applications of laser light in science and technology.

Extended and near edge structure of x-ray absorption spectra

R. V. Vedrinskiĭ and V. L. Kraĭzman

Usp. Fiz. Nauk **154**, 172–173 (January 1988)

EXAFS *and Near Edge Structure* III. Eds. K. D. Hodgson, B. Hedman, and J. E. Penner-Hahn. Springer-Verlag, Berlin; Heidelberg; New York; Tokyo, 1984. pp. 533 (Springer Proceedings in Physics. V.2).

The book under review contains the materials of the III International conference devoted to a discussion of fundamental and applied problems associated with the fine structure of x-ray absorption spectra. The conference took place at Stanford University in the USA and attracted more than 200 participants. The transformation during the last decade of x-ray absorption spectroscopy into an independent field of scientific research was stimulated by the development in the middle 1970s of new methods of structural analysis based on the use of the so-acalled EXAFS spectra—the extended x-ray absorption fine structure. These methods that have acquired the common name of EXAFS-spectroscopy make it

 0038-5670/88/010097-03$01.80