

Springer Series on

Wave Phenomena

Yu. A. Kravtsov Yu. I. Orlov

Geometrical Optics of Inhomo- geneous Media



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Geometrical Optics Of Inhomogeneous Media Springer Series On Wave Phenomena

**Leonid M. Brekhovskikh, Yury P.
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Geometrical Optics of Inhomogeneous Media I[ri Aleksandrovich Kravt[s]ov, 1990-09-10 This monograph is concerned with the fundamentals of up to date geometrical optics treated as an approximate method of wave theory Geometrical optics has changed dramatically over the last two decades Primarily it has acquired a number of novel disciplines space time geometrical optics the quasi isotropic approximation the modern theory of caustics related to catastrophe theory and perturbation techniques for rays to name only a few Another acquisition is the reliable boundaries of applicability for geometrical optics based upon the concept of the Fresnel volume for a ray These recent additions to the field are the focus of discussion in the book We did not attempt to separate study oriented and illustrative material from that intended for professionals but rather we spread it throughout the text to facilitate for the reader the mastering of this attractive intuitively appealing and efficient ray method In preparing the manuscript we used a set of lecture notes devised for All Union Schools on Diffraction and Wave Propagation published in Russian Sections 2 1 4 6 and 10 result from joint efforts of both authors The other material of the book we wrote separately I contributed Sects 2 5 9 and 3 17 and Chap 4 Yu I Orlov prepared the rest Unfortunately he could not take part in the preparation of the English edition as he died in 1982 at the age of 41 on the verge of what would have been great achievements considering his strong and original talent

Waves And Stability In Continuous Media - Proceedings Of The 14th Conference On Wascom 2007 Roberto Monaco, Salvatore Rionero, Tommaso Ruggeri, Natale Mangabari, 2008-04-17 This volume is the fifth in a series of proceedings which started in 1999 The contributions include the latest results on the theory of wave propagation extended thermodynamics and the stability of the solutions to partial differential equations

Proceedings "WASCOM 2007", 14th Conference on Waves and Stability in Continuous Media Roberto Monaco, 2008 This volume is the fifth in a series of proceedings which started in 1999 The contributions include the latest results on the theory of wave propagation extended thermodynamics and the stability of the solutions to partial differential equations

Remote Sensing of Turbulence Victor Raizer, 2021-10-03 This book offers a unique multidisciplinary integration of the physics of turbulence and remote sensing technology Remote Sensing of Turbulence provides a new vision on the research of turbulence and summarizes the current and future challenges of monitoring turbulence remotely The book emphasizes sophisticated geophysical applications detection and recognition of complex turbulent flows in oceans and the atmosphere Through several techniques based on microwave and optical IR observations the text explores the technological capabilities and tools for the detection of turbulence their signatures and variability

FEATURES Covers the fundamental aspects of turbulence problems with a broad geophysical scope for a wide audience of readers Provides a complete description of remote sensing capabilities for observing turbulence in the earth's environment Establishes the state of the art remote sensing techniques and methods of data analysis for turbulence detection Investigates and evaluates turbulence detection signatures their properties and variability Provides

cutting edge remote sensing applications for space based monitoring and forecasts of turbulence in oceans and the atmosphere This book is a great resource for applied physicists the professional remote sensing community ecologists geophysicists and earth scientists History Of Russian Underwater Acoustics Oleg A Godin,David R Palmer,2008-02-01 This book describes using first person accounts the history of the development in the Soviet Union and later in Russia of an extremely important technical field and how that history was influenced by WWI WWII and the Cold War by government bureaucracy in both positive and negative ways by the economic collapse of the Soviet Union and most importantly by the dedicated efforts of vast numbers of individuals including some of the greatest scientific minds of the 20th century It will make fascinating reading for engineers and scientists who were engaged in similar work in the West for historians of the Cold War and of the Soviet Union and for present day researchers who need to learn about Russian scientific contributions Because of its importance to national security much of the research and development effort in underwater acoustics was classified during the Cold War both in the Soviet Union and the United States This book presents the first declassified accounts of the development of numerous hydroacoustic systems by individuals having first hand knowledge of the development efforts Surface Acoustic Waves in Inhomogeneous Media Sergey V. Biryukov,Yuri V. Gulyaev,Victor V. Krylov,Victor P. Plessky,2012-12-06 Surface Acoustic Waves in Inhomogeneous Media covers almost all important problems of the interaction of different types of surface acoustic waves with surface inhomogeneities The problems of surface acoustic wave interaction with periodic topographic gratings widely used in filters and resonators are under careful consideration The most important results of surface wave scattering by local defects such as grooves random roughness elastic wedges are given Different theoretical approaches and practical rules for solving the surface wave problems are presented **Surveys in Applied Mathematics** Mark I. Freidlin,Sergey Gredeskul,John K. Hunter,Andrew Marchenko,Leonid Pastur,2012-12-06 Volume 2 offers three in depth articles covering significant areas in applied mathematics research Chapters feature numerous illustrations extensive background material and technical details and abundant examples The authors analyze nonlinear front propagation for a large class of semilinear partial differential equations using probabilistic methods examine wave localization phenomena in one dimensional random media and offer an extensive introduction to certain model equations for nonlinear wave phenomena *Mathematical Aspects of Classical and Celestial Mechanics* Vladimir I. Arnold,Valery V. Kozlov,Anatoly I. Neishtadt,2007-07-05 The main purpose of the book is to acquaint mathematicians physicists and engineers with classical mechanics as a whole in both its traditional and its contemporary aspects As such it describes the fundamental principles problems and methods of classical mechanics with the emphasis firmly laid on the working apparatus rather than the physical foundations or applications Chapters cover the n body problem symmetry groups of mechanical systems and the corresponding conservation laws the problem of the integrability of the equations of motion the theory of oscillations and perturbation theory *Caustics, Catastrophes and Wave Fields* Yu.A. Kravtsov,Yu.I.

Orlov, 2012-12-06 *Caustics Catastrophes and Wave Fields* in a sense continues the treatment of the earlier volume 6 *Geometrical Optics of Inhomogeneous Media* in the present book series by analysing caustics and their fields on the basis of modern catastrophe theory. This volume covers the key generalisations of geometrical optics related to caustic asymptotic expansions. The Lewis Kravtsov method of standard functions, Maslov's method of canonical operators, Orlov's method of interference integrals as well as their modifications for penumbra space-time random and other types of caustics. All the methods are amply illustrated by worked problems concerning relevant wave field applications. *Acoustics of Layered Media II* Leonid M. Brekhovskikh, Oleg Godin, 1999-03-25 *Acoustics of Layered Media II* presents the theory of sound propagation and reflection of spherical waves and bounded beams in layered media. It is mathematically rigorous but at the same time care is taken that the physical usefulness in applications and the logic of the theory are not hidden. Both moving and stationary media discretely and continuously layered including a range dependent environment are treated for various types of acoustic wave sources. Detailed appendices provide further background on the mathematical methods. This second edition reflects the notable recent progress in the field of acoustic wave propagation in inhomogeneous media. *Laser Cleaning II* D. M. Kane, 2007 *Laser Cleaning II* is the second of a series of books reporting research on the use of lasers for cleaning material surfaces and related micro scale and nano scale laser processing. It follows *Laser Cleaning* edited by Boris LukOCoyanchuk published in 2002. The primary focus is on contaminant particle removal nano scale sized particles in particular which represents a major cleaning challenge in industrial contexts and poses a broad range of research questions. The contributions provide stimulating answers to these questions spanning the essential areas: the fundamental theoretical and experimental physics of light particle interface interactions; invention and development of laser cleaning techniques and diagnostics; simulations for important material and process systems and laser cleaning and processing applications. *Laser cleaning for art and cultural heritage conservation* is a related mature field of research which is also treated. *Nonlinear Optics in Solids* Ole Keller, 2012-12-06 In recent years one has witnessed in physics a substantial increase in interest in carrying out fundamental studies in the nonlinear optics of condensed matter. At the Danish universities this increase has been especially pronounced at the Institute of Physics at the University of Aalborg where the main activities are centered around fundamental research within the domains of nonlinear quantum optics, nonlinear optics of metals and superconductors and nonlinear surface optics. In recognition of this it was decided to arrange the first international summer school on nonlinear optics in Denmark at the Institute of Physics at the University of Aalborg. This book is based on the lectures and contributed papers presented at this international summer school which was held in the period 31 July - 4 August 1989. About 60 experienced and younger scientists from 12 different countries participated. Twenty eight lectures were given by 14 distinguished scientists from the United States, Italy, France, Germany, Scotland, England and Denmark. In addition to the lectures given by the invited speakers 11 contributed papers were presented. The programme of the summer school em

phasized a treatment of basic physical properties of the nonlinear interaction of light and condensed matter and both theoretical and experimental aspects were covered Furthermore general principles as well as topics of current interest in the research literature were discussed **Proceedings**, 2004 *Acoustics of Layered Media I* Leonid M. Brekhovskikh, Oleg A. Godin, 2012-12-06 This monograph is devoted to the systematic presentation of the theory of sound wave propagation in layered structures These structures can be man made such as ultrasonic filters lenses surface wave delay lines or natural media such as the ocean and the atmosphere with their marked horizontal stratification A related problem is the propagation of elastic seismic waves in the earth's crust These topics have been treated rather completely in the book by L M Brekhovskikh *Waves in Layered Media* the English version of the second edition of which was published by Academic Press in 1980 Due to progress in experimental and computer technology it has become possible to analyze the influence of factors such as medium motion and density stratification upon the propagation of sound waves Much attention has been paid to propagation theory in near stratified media Le media with small deviations from strict stratification Interesting results have also been obtained in the fields of acoustics which had been previously considered to be completely developed For these reasons and also because of the inflow of researchers from the related fields of physics and mathematics the circle of persons and research groups engaged in the study of sound propagation has rather expanded Therefore the appearance of a new summary review of the field of acoustics of layered media has become highly desirable Since *Waves in Layered Media* became quite popular we have tried to retain its positive features and general structure **Color Imaging** Erik Reinhard, Erum Arif Khan, Ahmet Oguz Akyuz, Garrett Johnson, 2008-07-22 This book provides the reader with an understanding of what color is where color comes from and how color can be used correctly in many different applications The authors first treat the physics of light and its interaction with matter at the atomic level so that the origins of color can be appreciated The intimate relationship between energy levels orbital states and electromagnetic waves helps to explain why diamonds shimmer rubies are red and the feathers of the Blue Jay are blue Then color theory is explained from its origin to the current state of the art including image capture and display as well as the practical use of color in disciplines such as computer graphics computer vision photography and film **Waves and Rays in Elastic Continua** Michael A. Slawinski, 2010 This is the second edition of the textbook that was first published by Elsevier Science Professor Slawinski has the copyright to the textbook and the second edition is significantly extended The present book emphasizes the interdependence of mathematical formulation and physical meaning in the description of seismic phenomena Herein we use aspects of continuum mechanics wave theory and ray theory to explain phenomena resulting from the propagation of seismic waves The book is divided into three main sections elastic continua waves and rays and variational formulation of rays There is also a fourth part which consists of appendices In Part 1 we use continuum mechanics to describe the material through which seismic waves propagate and to formulate a system of equations to study the behaviour of such a material In Part 2 we

use these equations to identify the types of body waves propagating in elastic continua as well as to express their velocities and displacements in terms of the properties of these continua To solve the equations of motion in anisotropic inhomogeneous continua we use the high frequency approximation and hence establish the concept of a ray In Part 3 we show that in elastic continua a ray is tantamount to a trajectory along which a seismic signal propagates in accordance with the variational principle of stationary traveltime Consequently many seismic problems in elastic continua can be conveniently formulated and solved using the calculus of variations In Part 4 we describe two mathematical concepts that are used in the book namely homogeneity of a function and Legendre's transformation This section also contains a list of symbols

Scalar Wave Theory John DeSanto, 2012-12-06 This book comprises some of the lecture notes I developed for various one or two semester courses I taught at the Colorado School of Mines The main objective of all the courses was to introduce students to the mathematical aspects of wave theory with a focus on the solution of some specific fundamental problems These fundamental solutions would then serve as a basis for more complex wave propagation and scattering problems Although the courses were taught in the mathematics department the audience was mainly not mathematicians It consisted of graduate science and engineering majors with a varied background in both mathematics and wave theory in general I believed it was necessary to start from fundamental principles of both advanced applied mathematics as well as wave theory and to develop them both in some detail The notes reflect this type of development and I have kept this detail in the text I believe it essential in technical careers to see this detailed development at least once This volume consists of five chapters The first two on Scalar Wave Theory Chapter 1 and Green's Functions Chapter 2 are mainly mathematical although in Chapter 1 the wave equation is derived from fundamental physical principles More complicated problems involving spatially and even temporally varying media are briefly introduced

Waves And Rays In Elastic Continua (Fourth Edition) Michael A Slawinski, 2020-09-24 Seismology as a branch of mathematical physics is an active subject of both research and development Its reliance on computational and technological advances continuously motivates the developments of its underlying theory The fourth edition of *Waves and Rays in Elastic Continua* responds to these needs The book is both a research reference and a textbook Its careful and explanatory style which includes numerous exercises with detailed solutions makes it an excellent textbook for the senior undergraduate and graduate courses as well as for an independent study Used in its entirety the book could serve as a sole textbook for a year long course in quantitative seismology Its parts however are designed to be used independently for shorter courses with different emphases The book is not limited to quantitative seismology it can serve as a textbook for courses in mathematical physics or applied mathematics

[Fundamentals of Ocean Acoustics](#) Leonid M. Brekhovskikh, Yury P. Lysanov, 2013-06-29 As man turns his attention from the overcrowded continents of this planet and explores the spaciousness of the ocean the applications of ocean acoustics become increasingly numerous and important This book provides an up to date introduction to the theory of sound propagation in the ocean with much new material having

been added throughout the second edition. It includes both ray and wave treatments and considerable attention is paid to stochastic problems such as the scattering of sound at rough surfaces and random inhomogeneities. An introductory chapter that discusses the basic experimental data complements the following theoretical chapters. Wave Scattering from Rough Surfaces Alexander G. Voronovich, 2013-03-07. Since the first edition of this book was published in the 1994, the theory of wave scattering from rough surfaces has continued to develop intensively. The community of researchers working in this area keeps growing which provides justification for issuing this second edition. In preparing the second edition I was challenged by the problem of selecting new material from the many important results obtained recently. Eventually a new section was added to the central Chap 6 of this book. This section describes the operator expansion technique put forward by M. Milder which conforms well with the general approach adopted in the book and which to my mind is one of the most promising. Remote sensing of the terrain and ocean surface represents one of the most important and interesting challenges to the theory of wave scattering from rough surfaces. Rapid progress in electronics results in sensors with new capabilities. New powerful computers and data communication systems allow more sophisticated data processing techniques. What information about soil or air-sea interaction processes can be obtained from gigaflops of data streaming from air or space-borne radars? To use this information efficiently one cannot rely entirely on heuristic approaches and needs adequate theory. I hope that this book will contribute to progress in this important area.

Geometrical Optics Of Inhomogeneous Media Springer Series On Wave Phenomena Book Review: Unveiling the Power of Words

In a world driven by information and connectivity, the energy of words has been evident than ever. They have the capacity to inspire, provoke, and ignite change. Such could be the essence of the book **Geometrical Optics Of Inhomogeneous Media Springer Series On Wave Phenomena**, a literary masterpiece that delves deep to the significance of words and their impact on our lives. Published by a renowned author, this captivating work takes readers on a transformative journey, unraveling the secrets and potential behind every word. In this review, we will explore the book's key themes, examine its writing style, and analyze its overall impact on readers.

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