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Koichi Furutsu

Random Media and Boundaries

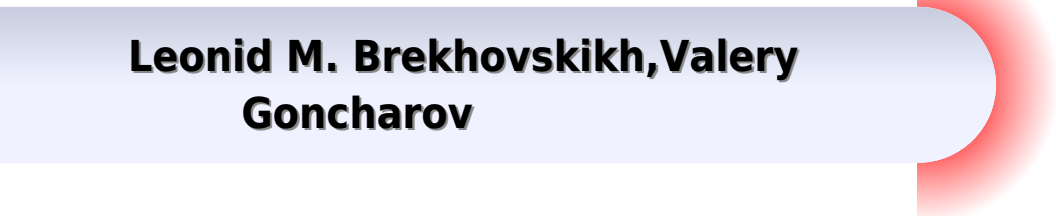
**Unified Theory, Two-Scale Method,
and Applications**



Springer-Verlag

Random Media Boundaries Unified Theory

**Leonid M. Brekhovskikh, Valery
Goncharov**



Random Media Boundaries Unified Theory:

Random Media and Boundaries Koichi Furutsu, 2012-12-06 For a system consisting of a random medium with rough boundaries the governing Bethe Salpeter equation for boundary value transport problems can be written in a form such that the medium and the boundaries are treated on an equal footing This enables several expressions for the solution to be obtained by interchanging the roles of the medium and the boundaries thus allowing the most convenient one to be selected according to the specific situation and the information required This book presents a unified theory based on the Bethe Salpeter equation with particular attention being paid to boundary value problems of transport layer problems a fixed scatterer imbedded in a bounded random medium construction of an optical scattering matrix for a complete system and optical wave propagation in a turbulent medium The last topic is treated in terms of first moment equations combined with the cluster expansion and second the two scale method based on the Lagrange variational principle **Optical Thin Films**

and Coatings Angela Piegari, François Flory, 2013-08-31 Optical coatings including mirrors anti reflection coatings beam splitters and filters are an integral part of most modern optical systems Optical thin films and coatings provides an overview of thin film materials the properties design and manufacture of optical coatings and their use across a variety of application areas Part one explores the design and manufacture of optical coatings Part two highlights unconventional features of optical thin films including scattering properties of random structures in thin films optical properties of thin film materials at short wavelengths thermal properties and colour effects Part three focusses on novel materials for optical thin films and coatings and includes chapters on organic optical coatings surface multiplasmonics and optical thin films containing quantum dots Finally applications of optical coatings including laser components solar cells displays and lighting and architectural and automotive glass are reviewed in part four Optical thin films and coatings is a technical resource for researchers and engineers working with optical thin films and coatings professionals in the security automotive space and other industries requiring an understanding of these topics and academics interested in the field An overview of the materials properties design and manufacture of thin films Special attention is given to the unconventional features and novel materials of optical thin films Reviews applications of optical coatings including laser components solar cells glazing displays and lighting

Acoustics of Layered Media II Leonid M. Brekhovskikh, Oleg A. Godin, 2013-03-14 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 **Progress in Optics**, 1994-11-16 This volume contains six review articles dealing with topics of

current research interest in optics and in related fields The first article deals with the so called embedding method which has found useful applications in the study of wave propagation in random media The second article presents a review of an interesting class of non linear optical phenomena which have their origin in the dependence of the complex dielectric constant of some media on the light intensity These phenomena which include self focusing self trapping and self modulation have found many applications for example in fibre optics devices signal processing and computer technology The next article is concerned with gap solitons which are electromagnetic field structures which can exist in nonlinear media that have periodic variation in their linear optical properties with periodicities of the order of the wavelength of light Both qualitative and quantitative descriptions of gap solitons are presented and some experimental schemes for their detection in the laboratory are discussed The fourth article describes methods for the determination of optical phase from phase modulated images These methods have found applications in plasma diagnostics in connection with flow characterisation and in the design of new optical instruments The final article reviews developments relating to imaging through turbulence in the atmosphere It looks at the state of the art of our understanding of this subject and discusses the most important methods that are presently employed to compensate for image distortion caused by atmospheric turbulence

Surface acoustic waves in inhomogeneous media Sergey V. Biryukov, Yuri V. Gulyaev, Victor V. Krylov, Victor P. Plessky, 1995 This monograph covers important problems caused by the interaction of different types of surface acoustic waves with surface inhomogeneities The problem of surface acoustic wave interaction with periodic topographic gratings widely used in filters and resonators is given careful consideration The most important results of surface wave scattering by local defects such as grooves random roughness and elastic wedges are described Different theoretical approaches and practical rules for solving the surface wave problems are also presented

Stochastic Equations through the Eye of the Physicist Valery I. Klyatskin, 2005-05-20 Fluctuating parameters appear in a variety of physical systems and phenomena They typically come either as random forces sources or advecting velocities or media material parameters like refraction index conductivity diffusivity etc The well known example of Brownian particle suspended in fluid and subjected to random molecular bombardment laid the foundation for modern stochastic calculus and statistical physics Other important examples include turbulent transport and diffusion of particle tracers pollutants or continuous densities oil slicks wave propagation and scattering in randomly inhomogeneous media for instance light or sound propagating in the turbulent atmosphere Such models naturally render to statistical description where the input parameters and solutions are expressed by random processes and fields The fundamental problem of stochastic dynamics is to identify the essential characteristics of system its state and evolution and relate those to the input parameters of the system and initial data This raises a host of challenging mathematical issues One could rarely solve such systems exactly or approximately in a closed analytic form and their solutions depend in a complicated implicit manner on the initial boundary data forcing and system s media parameters In

mathematical terms such solution becomes a complicated nonlinear functional of random fields and processes Part I gives mathematical formulation for the basic physical models of transport diffusion propagation and develops some analytic tools Part II and III sets up and applies the techniques of variational calculus and stochastic analysis like Fokker Plank equation to those models to produce exact or approximate solutions or in worst case numeric procedures The exposition is motivated and demonstrated with numerous examples Part IV takes up issues for the coherent phenomena in stochastic dynamical systems described by ordinary and partial differential equations like wave propagation in randomly layered media localization turbulent advection of passive tracers clustering wave propagation in disordered 2D and 3D media For the sake of reader I provide several appendixes Part V that give many technical mathematical details needed in the book For scientists dealing with stochastic dynamic systems in different areas such as hydrodynamics acoustics radio wave physics theoretical and mathematical physics and applied mathematics The theory of stochastic in terms of the functional analysis Referencing those papers which are used or discussed in this book and also recent review papers with extensive bibliography on the subject

Stochastic Equations: Theory and Applications in Acoustics, Hydrodynamics, Magnetohydrodynamics, and Radiophysics, Volume 2 Valery I. Klyatskin, 2014-07-14 In some cases certain coherent structures can exist in stochastic dynamic systems almost in every particular realization of random parameters describing these systems Dynamic localization in one dimensional dynamic systems vortexgenesis vortex production in hydrodynamic flows and phenomenon of clustering of various fields in random media i e appearance of small regions with enhanced content of the field against the nearly vanishing background of this field in the remaining portion of space are examples of such structure formation The general methodology presented in Volume 1 is used in Volume 2 Coherent Phenomena in Stochastic Dynamic Systems to expound the theory of these phenomena in some specific fields of stochastic science among which are hydrodynamics magnetohydrodynamics acoustics optics and radiophysics The material of this volume includes particle and field clustering in the cases of scalar density field and vector magnetic field passive tracers in a random velocity field dynamic localization of plane waves in layered random media as well as monochromatic wave propagation and caustic structure formation in random media in terms of the scalar parabolic equation *Mechanics of Continua and Wave Dynamics* Leonid M.

Brekhovskikh, Valery Goncharov, 2012-12-06 *Mechanics of Continua and Wave Dynamics* is a textbook for a course on the mechanics of solids and fluids with the emphasis on wave theory The material is presented with simplicity and clarity but also with mathematical rigor Many wave phenomena especially those of geophysical nature different types of waves in the ocean seismic waves in the earth crust wave propagation in the atmosphere etc are considered Each subject is introduced with simple physical concepts using numerical examples and models The treatment then goes into depth and complicated aspects are illustrated by appropriate generalizations Numerous exercises with solutions will help students to comprehend and assimilate the ideas Electromagnetic Pulse Propagation in Casual Dielectrics Kurt E. Oughstun, G.C. Sherman, 2012-12-06

This research monograph presents a systematic treatment of the theory of the propagation of transient electromagnetic fields such as optical pulses through dielectric media which exhibit both dispersion and absorption. The work divides naturally into two parts. Part I presents a summary of the fundamental theory of the radiation and propagation of rather general electromagnetic waves in causal linear media which are homogeneous and isotropic but which otherwise have rather general dispersive and absorbing properties. In Part II we specialize on the propagation of a plane transient electromagnetic field in a homogeneous dielectric. Although we have made some contributions to the fundamental theory given in Part I, most of the results of our own research appear in Part II. The purpose of the theory presented in Part II is to predict and to explain in explicit detail the dynamics of the field after it has propagated far enough through the medium to be in the mature dispersion regime. It is the subject of a classic theory based on the research conducted by A. Sommerfeld and L. **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.

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