

Springer Series on
Wave Phenomena

Koichi Furutsu

Random Media and Boundaries

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



Springer-Verlag

Random Media And Boundaries Unified Theory Twoscale Method And Applications

Alexander G. Voronovich



Random Media And Boundaries Unified Theory Twoscale Method And Applications:

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, 2018-06-19 Optical Thin Films and Coatings From Materials to Applications Second Edition provides an overview of thin film materials and their properties design and manufacture across a wide variety of application areas Sections explore their design and manufacture and their unconventional features including the scattering properties of random structures in thin films optical properties at short wavelengths thermal properties and color effects Other chapters focus on novel materials including organic optical coatings surface multiplasmonics optical thin films containing quantum dots and optical coatings including laser components solar cells displays and lighting and architectural and automotive glass The book presents a technical resource for researchers and engineers working with optical thin films and coatings It is also ideal for professionals in the security automotive space and other industries who need an understanding of the topic Provides thorough review of applications of optical coatings including laser components solar cells glazing displays and lighting One stop reference that addresses deposition techniques properties and applications of optical thin films and coatings Novel methods suggestions for analysis and applications makes this a valuable resource for experts in the field as well **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 [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 [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

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

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

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

Electromagnetic Wave Propagation in Turbulence Richard J. Sasiela, 2012-12-06 *Electromagnetic Wave Propagation in Turbulence* is devoted to a method for obtaining analytical solutions to problems of electromagnetic wave propagation in turbulence In a systematic way the monograph presents the Mellin transforms to evaluate analytically integrals that are not in integral tables Ample examples of application

are outlined and solutions for many problems in turbulence theory are given The method itself relates to asymptotic results that are applicable to a broad class of problems for which many asymptotic methods had to be employed previously

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

Radar Target Imaging Wolfgang-Martin Boerner, Herbert Überall, 2012-12-06 Radar imaging as understood here involves target recognition i e the determination of the detailed properties of an object size shape structure and composition and also location and speed from radar echoes returned by it Advanced approaches are required for this and several of recent interest are discussed in this book They include mathematical inverse scattering techniques based on the solution of integral equations use of the singularity expansion method SEM related to the resonance scattering theory RST in which the pattern of resonance frequency location in the complex frequency plane can be employed to characterize a given radar target and the use of polarization information Finally the measurement of radar cross sections is described

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 Brekhovskikh, Valery Goncharov, 2012-12-06 *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 Physics, Uspekhi, 2004 **Acoustics of Layered Media I** Leonid M. Brekhovskikh, Oleg Godin, 1998 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 *Journal of the Optical Society of America*, 2000 **Caustics, Catastrophes and Wave Fields** ĬŮĬrri Aleksandrovich KravtšĬlov, ĬŮŮrri Il'ich Orlov, 1999 The second edition of *Histological Typing of Salivary Gland Tumours* is more extensive and detailed than the previous edition New technical methods have increased our understanding of many tumours The various types of carcinomas are categorized separately and the inclusion of the TNM Classification of salivary gland tumours and the more detailed description of the lesions will contribute to a better understanding **International Books in Print, 1995** Barbara Hopkinson, [Anonymus AC01401231], 1995 *Electromagnetic Pulse Propagation in Causal Dielectrics* Kurt Edmund Oughstun, George C. Sherman, 1994 *Physics Briefs*, 1993

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