# *Waves And Rays In Elastic Continua*

After every major earthquake, the Earth rings like a bell for several days. These free oscillations of the Earth and the related propagating body and surface waves are routinely detected at broad-band seismographic stations around the world. In this book, F. A. Dahlen and Jeroen Tromp present an advanced theoretical treatment of global seismology, describing the normal-mode, body-wave, and surface-wave methods employed in the determination of the Earth's three-dimensional internal structure and the source mechanisms of earthquakes. The authors provide a survey of both the history of global seismological research and the major theoretical and observational advances made in the past decade. The book is divided into three parts. In the first, "Foundations," Dahlen and Tromp give an extensive introduction to continuum mechanics and discuss the representation of seismic sources and the free oscillations of a completely general Earth model. The resulting theory should provide the basis for future scientific discussions of the elastic-gravitational deformation of the Earth. The second part, "The Spherical Earth," is devoted to the free oscillations of a spherically symmetric Earth. In the third part, "The Aspherical Earth," the authors discuss methods of dealing with the Earth's three-dimensional heterogeneity. The book is concerned primarily with the forward problem of global seismology--detailing how synthetic seismograms and spectra may be calculated and interpreted. As a long-needed unification of theories in global seismology, the book will be important to graduate students and to professional seismologists, geodynamicists, and geomagnetists, as well as to astronomers who study the free oscillations of the Sun and other stars.
Fundamentals of Seismic Wave Propagation, published in 2004, presents a comprehensive introduction to the propagation of high-frequency body-waves in elastodynamics. The theory of seismic wave propagation in acoustic, elastic and anisotropic media is developed to allow seismic waves to be modelled in complex, realistic three-dimensional Earth models. This book provides a consistent and thorough development of modelling methods widely used in elastic wave propagation ranging from the whole Earth, through regional and crustal seismology, exploration seismics to borehole seismics, sonics and ultrasonics. Particular emphasis is placed on developing a consistent notation and approach throughout, which highlights similarities and allows more complicated methods and extensions to be developed without difficulty. This book is intended as a text for graduate courses in theoretical seismology, and as a reference for all academic and industrial seismologists using numerical modelling methods. Exercises and suggestions for further reading are included in each chapter.
Intended as an introduction to the field, Modern Global Seismology is a complete, self-contained primer on seismology. It features extensive coverage of all related aspects, from observational data through prediction, emphasizing the fundamental theories and physics governing seismic waves--both natural and anthropogenic. Based on thoroughly class-tested material, the text provides a unique perspective on the earths large-scale internal structure and dynamic processes, particularly earthquake sources, and on the application of theory to the dynamic processes of the earths upper skin. Authored by two experts in the field of geophysics. this insightful text is designed for the first-year graduate course in seismology. Exploration seismologists will also find it an invaluable resource on topics such as elastic-wave propagation, seismicinstrumentation, and seismogram analysis useful in interpreting their high-resolution images of structure for oil and mineral resource exploration. More than 400 illustrations, many from recent research articles, help readers visualize mathematical relationships 49 Boxed Features explain advanced topics Provides readers with the most in-depth presentation of earthquake physics available Contains incisive treatments of seismic waves, waveform evaluation and modeling, and seismotectonics Provides quantitative treatment of earthquake source mechanics Contains numerous examples of modern broadband seismic recordings Fully covers current seismic instruments and networks Demonstrates modern waveform inversion methods Includes extensive references for further reading
The second edition of Principles of Seismology has been extensively revised and updated to present a modern approach to observation seismology and the theory behind digital seismograms. It includes: a new chapter on Earthquakes, Earth's structure and dynamics; a considerably revised chapter on instrumentation, with new material on processing of modern digital seismograms and a list of website hosting data and seismological software; and 100 end-of-chapter problems. The fundamental physical concepts on which seismic theory is based are explained in full detail with step-by-step development of the mathematical derivations, demonstrating the relationship between motions recorded in digital seismograms and the mechanics of deformable bodies. With chapter introductions and summaries, numerous examples, newly drafted illustrations and new color figures, and an updated bibliography and reference list, this intermediate-level textbook is designed to help students develop the skills to tackle real research problems.
Authored by the internationally renowned José M. Carcione, Wave Fields in Real Media: Wave Propagation in Anisotropic, Anelastic, Porous and Electromagnetic Media examines the differences between an ideal and a real description of wave propagation, starting with the introduction of relevant stress-strain relations. The combination of this relation and the equations of momentum conservation lead to the equation of motion. The differential formulation is written in terms of memory variables, and Biot's theory is used to describe wave propagation in porous media. For each rheology, a plane-wave analysis is performed in order to understand the physics of wave propagation. This book contains a review of the main direct numerical methods for solving the equation of motion in the time and space domains. The emphasis is on geophysical applications for seismic exploration, but researchers in the fields of earthquake seismology, rock acoustics, and material science - including many branches of acoustics of fluids and solids - may also find this text useful. New to this edition: This new edition presents the fundamentals of wave propagation in Anisotropic, Anelastic, Porous Media while also incorporating the latest research from the past 7 years, including that of the author. The author presents all the equations and concepts necessary to understand the physics of wave propagation. These equations form the basis for modeling and inversion of seismic and electromagnetic data. Additionally, demonstrations are given, so the book can be used to teach post-graduate

courses. Addition of new and revised content is approximately 30%. Examines the fundamentals of wave propagation in anisotropic, anelastic and porous media Presents all equations and concepts necessary to understand the physics of wave propagation, with examples Emphasizes geophysics, particularly, seismic exploration for hydrocarbon reservoirs, which is essential for exploration and production of oil

The present book — which is the third, significantly revised edition of the textbook originally published by Elsevier Science — 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 Elastic Continua, 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 Waves and Rays, 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 invoke the concept of a ray. In Variational Formulation of Rays, 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 the Appendices, 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. Request Inspection Copy

A graduate-level textbook which takes a pedagogical and mathematical approach to seismology.

With Applications to Scattering by Cracks
Encyclopedia of Solid Earth Geophysics
Elastic Waves
Viscoelastic Waves in Layered Media
Parabolic Equation Methods for Electromagnetic Wave Propagation
Elastic Waves in Solids II

Imaging of Complex Media with Acoustic and Seismic Waves
Waves And Rays In Seismology: Answers To Unasked Questions (Second Edition)
Nonlinear Wave Processes in Acoustics

This text considers models of different "acoustic" media as well as equations and behavior of finite-amplitude waves. It also considers the effects of nonlinearity, dissipation, dispersion, and for two- and three-dimensional problems, reflection and diffraction on the evolution and interaction of acoustic beams.

Papers in this book provide a state-of-the-art examination of waves in pre-stressed materials. You'll gain new perspectives via a multi-disciplinary approach that interweaves key topics. These topics include the mathematical modeling of incremental material response (elastic and inelastic), an analysis of the governing differential equations, and boundary-value problems. Detailed illustrations help you visualize key concepts and processes.

In this interdisciplinary book, leading experts in underwater acoustics, seismology, acoustic medical imaging and non-destructive testing present basic concepts as well as the recent advances in imaging. The different subjects tackled show significant similarities.

1st ed. published under title: Seismic waves and rays in elastic media.

This one-of-a-kind book presents many of the mathematical concepts, structures, and techniques used in the study of rays, waves, and scattering. Panoramic in scope, it includes discussions of how ocean waves are refracted around islands and underwater ridges, how seismic waves are refracted in the earth's interior, how atmospheric waves are scattered by mountains and ridges, how the scattering of light waves produces the blue sky, and meteorological phenomena such as rainbows and coronas. Rays, Waves, and Scattering is a valuable resource for practitioners, graduate students, and advanced undergraduates in applied mathematics, theoretical physics, and engineering. Bridging the gap between advanced treatments of the subject written for specialists and less mathematical books aimed at beginners, this unique mathematical compendium features problems and exercises throughout that are geared to various levels of sophistication, covering everything from Ptolemy's theorem to Airy integrals (as well as more technical material), and several informative appendixes. Provides a panoramic look at wave motion in many different contexts Features problems and exercises throughout Includes numerous appendixes, some on topics not often covered An ideal reference book for practitioners Can also serve as a supplemental text in classical applied mathematics, particularly wave theory and mathematical methods in physics and engineering Accessible to anyone with a strong background in ordinary differential equations, partial differential equations, and functions of a complex variable

This book seeks to explore seismic phenomena in elastic media and emphasizes the interdependence of mathematical formulation and physical meaning. The purpose of this title - which is intended for senior undergraduate and graduate students as well as scientists interested in quantitative seismology - is to use aspects of continuum mechanics, wave theory and ray theory to describe phenomena resulting from the propagation of waves. The book is divided into three parts: Elastic continua, Waves and rays, and Variational formulation of rays. In Part I, continuum mechanics are used to describe the material through which seismic waves propagate, and to formulate a system of equations to study the behaviour of such material. In Part II, these equations are used 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, the high-

frequency approximation is used and establishes the concept of a ray. In Part III, it is shown 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 travel time.
Seismic Waves and Rays in Elastic MediaElsevier


*Presents innovative mathematical theory and corresponding numerical results for wave propagation in layered media with arbitrary amounts of intrinsic absorption.*

*Ultrasound has found an increasing number of applications in recent years due to greatly increased computing power. Ultrasound devices are often preferred over other devices because of their lower cost, portability, and non-invasive nature. Patients using ultrasound can avoid the dangers of radiological imaging devices such as x-rays, CT scans, and radioactive media injections. Ultrasound is also a preferred and practical method of detecting material fatique and defects in metals, composites, semiconductors, wood, etc. Detailed appendices contain useful formulas and their derivations, technical details of relevant theories The FAQ format is used where a concept in one answer leads to a new Q*

*Seismic Wave Propagation in Stratified Media presents a systematic treatment of the interaction of seismic waves with Earth structure. The theoretical development is physically based and is closely tied to the nature of the seismograms observed across a wide range of distance scales - from a few kilometres as in shallow reflection work for geophysical prospecting, to many thousands of kilometres for major earthquakes. A unified framework is presented for all classes of seismic phenomena, for both body waves and surface waves. Since its first publication in 1983 this book has been an important resource for understanding the way in which seismic waves can be understood in terms of reflection and transmission properties of Earth models, and how complete theoretical seismograms can be calculated. The methods allow the development of specific approximations that allow concentration on different seismic arrivals and hence provide a direct tie to seismic observations.*

*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 quantitive seismology; it can serve as a textbook for courses in mathematical physics or applied mathematics.*

*The author dedicates this book to readers who are concerned with finding out the status of concepts, statements and hypotheses, and with clarifying and rearranging them in a logical order. It is thus not intended to teach tools and techniques of the trade, but to discuss the foundations on which seismology -- and in a larger sense, the theory of wave propagation in solids -- is built. A key question is: why and to what degree can a theory developed for an elastic continuum be used to investigate the propagation of waves in the Earth, which is neither a continuum nor fully elastic. But the scrutiny of the foundations goes much deeper: material symmetry, effective tensors, equivalent media; the influence (or, rather, the lack thereof) of gravitational and thermal effects and the rotation of the Earth, are discussed ab initio. The variational principles of Fermat and Hamilton and their consequences for the propagation of elastic waves, causality, Noether's theorem and its consequences on conservation of energy and conservation of linear momentum are but a few topics that are investigated in the process to establish seismology as a science and to investigate its relation to subjects like realism and empiricism in natural sciences, to the nature of explanations and predictions, and to experimental verification and refutation. In the second edition, new sections, figures, examples, exercises and remarks are added. Most importantly, however, four new appendices of about one-hundred pages are included, which can serve as a self-contained continuum-mechanics course on finite elasticity. Also, they broaden the scope of elasticity theory commonly considered in seismology. Contents: Science of Seismology Seismology and Continuum Mechanics Hookean Solid: Material Symmetry Hookean Solid: Effective Symmetry and Equivalent Medium Body Waves Surface, Guided and Interface Waves Variational Principles in Seismology Gravitational and Thermal Effects in Seismology Seismology as Science Appendices: On Strains On Stresses On Thermoelasticity On Hyperelasticity On Covariant and Contravariant Transformations On Covariant Derivatives List of Symbols Readership: Students, professionals, researchers, and laypersons interested in seismology. Keywords: Elasticity Theory;Inverse Problems;Seismology;Continuum Mechanics;Mathematical PhysicsReview: "This one-of-a-kind book is refreshing in its presentation of an amazing blend of fundamental scientific and philosophical questions with their practical implications to concrete examples in Seismology. It is refined in its style, in the sophistication of its quotes, in the breadth of its sources and in the many details that reveal a labour of love. As an additional bonus, the book is also extremely useful. It presents the underlying theory of the relevant aspects of Continuum Mechanics in a clear and sufficiently rigorous way, while challenging the reader's intellect at every step of the way ... This inspiring book is highly recommended." Professor Marcelo Epstein University of Calgary, Canada "This book provides an extensive and self-contained treatment of the mathematical theory of wave propagation in elastic continua, with special attention to topics, some of them well advanced, which are most important for their applications in geophysics ... The author's wide culture, clear style and rigorous approach make this book a first foundation stone of a field which should be called Rational Seismology." Professor Maurizio Vianello Politecnico di Milano, Italy 0*

*Elastic waves possess some remarkable properties and have become ever more important to applications in fields such as telecommunications (signal processing), medicine (echography), and metallurgy (non-destructive testing). These volumes serve as a bridge between basic books on wave phenomena and more technically oriented books on specific applications of wave phenomena. The first volume studies the different mechanisms of propagation in isotropic and anisotropic media. The second volume describes the generation and applications of free and guided waves.*

*Earthquakes are detected and studied by measuring the waves they create. Waves are transmitted through the Earth to detect oil and gas deposits and to study the Earth?s geological structure. Properties of materials are determined by measuring the behaviour of waves transmitted through them. In recent years, elastic waves transmitted through the human body have been used for medical diagnosis and therapy. Many students and professionals in various branches of engineering encounter problems requiring an understanding of elastic waves. In this book, they will find the basic concepts and methods of the theory of wave propagation in elastic materials. One-dimensional waves,* *transient waves and harmonic waves including reflections of plane waves at interfaces. Rayleigh waves, waves in elastic layers and in layered materials are discussed. Analytical methods in nonlinear wave propagation are presented. This book includes exercises with solutions and many explanatory figures.*

*Elastic Wave Propagation and Generation in Seismology*
*Generation, Acousto-optic Interaction, Applications*
*Second Edition*
*Ray Methods for Waves in Elastic Solids*
*X-ray Scattering by Elastic Waves in Perfect Crystals*
*Viscoelastic Waves and Rays in Layered Media*
*High Frequency Theory*
*Seismic Ray Theory*
*Wave Fields in Real Media*
*Modern Global Seismology*

Elastic Waves: High Frequency Theory is concerned with mathematical aspects of the theory of high-frequency elastic waves, which is based on the ray method. The foundations of elastodynamics are presented along with the basic theory of plane and spherical waves. The ray method is then described in considerable detail for bulk waves in isotropic and anisotropic media, and also for the Rayleigh waves on the surface of inhomogeneous anisotropic elastic solids. Much attention is paid to analysis of higher-order terms and to generation of waves in inhomogeneous media. The aim of the book is to present a clear, systematic description of the ray method, and at the same time to emphasize its mathematical beauty. Luckily, this beauty is usually not accompanied by complexity and mathematical ornateness.

Self-contained coverage of topics ranging from elementary theory of waves and vibrations in strings to three-dimensional theory of waves in thick plates. Over 100 problems.

This second edition extends the rigorous, self-contained exposition of the theory for viscoelastic wave propagation in layered media to include head waves and general ray theory. The theory, not published elsewhere, provides solutions for fundamental wave-propagation and ray-theory problems valid for any media with a linear response, elastic or anelastic. It explains measurable variations in wave speed, particle motion, and attenuation of body waves, surface waves, and head waves induced at anelastic material boundaries that do not occur for elastic waves. This book may be used as a textbook for advanced university courses and as a research reference in seismology, exploration geophysics, engineering, solid mechanics, and acoustics. It provides computation steps for ray-tracing computer algorithms to develop a variety of tomography inferred anelastic models, such as those for the Earth's deep interior and petroleum reserves. Numerical results and problem sets emphasize important aspects of the theory for each chapter.

Elastodynamics, Volume II: Linear Theory is a continuation of Volume I and discusses the dynamical theory of linear isotropic elasticity. The volume deals with the fundamental theorems regarding elastodynamics and the different mathematical methods of solution and their employment in one, two, and three dimensions. The text outlines the fundamentals of linear elastodynamics and explains basic equations, displacement formulation, stress formulation, and the uniqueness theorem of elastodynamics. The book also investigates elastodynamic problems involving one-space dimension in governing boundari ...

Developments in Solid Earth Geophysics 10: Transient Waves in Visco-Elastic Media deals with the propagation of transient elastic disturbances in visco-elastic media. More specifically, it explores the visco-elastic behavior of a medium, whether gaseous, liquid, or solid, for very-small-amplitude disturbances. This volume provides a historical overview of the theory of the propagation of elastic waves in solid bodies, along with seismic prospecting and the nature of seismograms. It also discusses the seismic experiments, the behavior of waves propagated in accordance with the Stokes wave equation, and wavelet functions and their polynomials. The book explains the laws of propagation of seismic wavelets and seismic ray paths, as well as the equations of wavelet propagation, the velocity-type seismic wavelet, and the spectrum of the wavelet. It discusses the motion of a mechanical seismograph disturbed by extraneous forces or motions. It also provides information on the differential equation describing the motion of a galvanometer, laboratory studies of wavelet contraction, and characteristics of a wavelet-contractor amplifier. Furthermore, the book explains the experimental studies of the primary seismic disturbance and internal friction. This monograph is a valuable source of information for physicists, students who want to pursue a career in geophysics or selenophysics, and those who actively working in these fields.

This textbook — incorporated with many illuminating examples and exercises — is aimed at graduate students of physical sciences and engineering. The purpose is to provide a background of physics and underlying mathematics for the concept of rays, filling the gap between mathematics and physics textbooks for a coherent treatment of all topics. The authors' emphasis and extremely good presentation of the theory of characteristics, which defines the rays, accentuate the beauty and versatility of this theory. To this end, the rigour of the formulation — by a pure mathematician's standards — is downplayed to highlight the physical meaning and to make the subject accessible to a wider audience. The authors describe in detail the theory of characteristics for different types of differential equations, the applications to wave propagation in different types of media, and phenomena such as caustics.

Parabolic equation methods, used to analyze radiowave propagation in radar and radio communication systems, have become the dominant tool for assessing clear-air and terrain effects on propagation. This volume introduces the mathematical background to parabolic equation modelling and describes simple parabolic equation algorithms before progressing to more advanced topics, including domain truncation, impedance boundaries and the implementation of fast hybrid methods combining ray-tracing and parabolic equation techniques. The text's self-contained approach is suited to graduate students and researchers with little experience of radiowave propagation.



*A comprehensive treatment of the seismic ray method; an invaluable advanced textbook and reference volume.*

*This book is a continuation of 'Acoustic and Elastic Wave Fields in Geophysics, Part I' published in 2000. The second volume is dedicated to propagation of linear plane, spherical and cylindrical acoustic waves in different media. Chapter 1 is devoted to principles of geometric acoustic in plane wave approximation. The eikonal and transport equations are derived. Ray tracing and wavefront construction techniques are explained. Chapter 2 deals with dynamic properties of wave fields. The behavior of pressure and displacements amplitudes in zero approximation is analysed in two ways: using Poynting vector and solving the transport equation. This chapter contains several examples related to shadow zones and caustics. In Chapter 3 using the results of analysis of high-frequency wave kinematics and dynamics some fundamental aspects of Kirchhoff migration are described. Chapters 4 and 5 are devoted to propagation of plane waves in media with flat boundaries in the case of normal and oblique incidence. Special attention is paid to the case when an incident angle exceeds the critical angles. Formation of normal modes in the waveguide is discussed. Chapter 6 deals with a spherical wave reflection and refraction. The steepest descent method is introduced to describe the behavior of reflected, transmitted, head and evanescent waves. In Chapter 7 propagation of stationary and transient waves in a waveguide formed by a flat layer with low velocity are investigated. Normal modes and waves related to the branch points of integrands under consideration are studied. Dispersive properties of normal modes are discussed. Chapter 8 describes wave propagation inside cylinder in acoustic media. Several appendices are added to help the reader understand different aspects of mathematics used in the book.*

*Although the mathematical theory of nonlinear waves and solitons has made great progress, its applications to concrete physical problems are rather poor, especially when compared with the classical theory of linear dispersive waves and nonlinear fluid motion. The Whitham method, which describes the combining action of the dispersive and nonlinear effects as modulations of periodic waves, is not widely used by applied mathematicians and physicists, though it provides a direct and natural way to treat various problems in nonlinear wave theory. Therefore it is topical to describe recent developments of the Whitham theory in a clear and simple form suitable for applications in various branches of physics. This book develops the techniques of the theory of nonlinear periodic waves at elementary level and in great pedagogical detail. It provides an introduction to a Whitham's theory of modulation in a form suitable for applications. The exposition is based on a thorough analysis of representative examples taken from fluid mechanics, nonlinear optics and plasma physics rather than on the formulation and study of a mathematical theory. Much attention is paid to physical motivations of the mathematical methods developed in the book. The main applications considered include the theory of collisionless shock waves in dispersive systems and the nonlinear theory of soliton formation in modulationally unstable systems. Exercises are provided to amplify the discussion of important topics such as singular perturbation theory, Riemann invariants, the finite gap integration method, and Whitham equations and their solutions. Contents:Introduction and Basic ConceptsNonlinear Wave Equations in PhysicsWhitham Theory of ModulationsComplete Integrability of Nonlinear Wave EquationsPeriodic SolutionsDissipationless Shock WaveNonlinear Theory of Modulational InstabilityAppendices:Some Formulas from the Theory of Elliptic FunctionsAlgebraic Resolvents of Fourth Degree PolynomialsSolutions to Exercises Readership: Advanced graduate students and young researchers in nonlinear wave theory. Keywords:Nonlinear Waves;Solitons;Integrable Equations;Inverse Scattering Transform;Periodic Solutions;Whitham Theory;Modulation;Hodograph Transform;Dissipationless Shock Waves;Modulational Instability*

*Consisting of more than 150 articles written by leading experts, this authoritative reference encompasses the entire field of solid-earth geophysics. It describes in detail the state of current knowledge, including advanced instrumentation and techniques, and focuses on important areas of exploration geophysics. It also offers clear and complete coverage of seismology, geodesy, gravimetry, magnetotellurics and related areas in the adjacent disciplines of physics, geology, oceanography and space science.*

*Seismic waves are one of the standard diagnostic tools used to determine the mechanical parameters (volume density of mass, compressibility, elastic stiffness) in the interior of the earth and the geometry of subsurface structures. There is increasing evidence that in the interpretation of seismic data - especially shear-wave data - the influence of anisotropy must be taken into account. This volume presents a method to compute the seismic waves that are generated by an impulsive source in a stratified anisotropic medium. Although written with the seismic applications in mind, the method that is developed is not limited to solid-earth geophysics. In fact, the methods discussed in this monograph are applicable wherever waves propagate in stratified, anisotropic media. The standard approach to this problem is to employ Fourier transformations with respect to time and with respect to the horizontal spatial coordinates. To obtain numerical results, the relevant inverse transformations then have to be evaluated numerically. In this monograph the problem is, in contrast to the standard approach, solved by applying the Cagniard-de Hoop method and by representing the wave field as a sum of generalized rays. With this method, the computational results can be obtained relatively easily with any degree of accuracy, and with considerably less computation time. For completeness, analysis of acoustic waves in stratified isotropic media is included. Furthermore, for large horizontal or vertical source-receiver separations very efficient approximations are derived. Several examples and applications are given.*

*Elastic Waves in the Earth provides information on the relationship between seismology and geophysics and their general aspects. The book offers elastodynamic equations and derivative equations that can be used in the propagation of elastic waves. It also covers major topics in detail, such as the fundamentals of elastodynamics; the Lamb's problem, which includes the Cagniard-de Hoop theory; rays and modes in a radially inhomogeneous earth and in multilayered media, which includes the Thomson-Haskell theory; the elastic wave dissipation; the seismic source and* *noise; and the seismographs. The book consists of 33 chapters. The first 16 chapters include basic material related to the propagation of elastic waves. Topics covered by these chapters include scalars, vectors, and tensors in cartesian coordinates, stress and strain analysis, equations of elasticity and motion, plane waves, Rayleigh waves, plane-wave theory, and fluid-fluid and solid-solid interfaces. The second half of the book covers various ray and mode theories, elastic wave dissipation, and the observations and theories of seismic source and seismic noise. It concludes by discussing earthquake seismology and different seismographs, like the pendulum seismometer and the strain seismometer.*

[Ray methods for waves in elastic solids]
[Theoretical Global Seismology]
[Seismic Waves and Rays in Elastic Media]
[Elastodynamics]
[Acoustic and Elastic Wave Fields in Geophysics, Part II]
[Wave Motion in Elastic Solids]
[Third Edition]