Book Proposal



CONTENTS

1. TITLE INFORMATION 2
2. AUTHOR(S)/EDITOR(S) INFORMATION 2
3. BOOK INFORMATION 2
- 3.1 Type of work 2
- 3.2 Originality of the work 2
- 3.3 Language(s) of the work 2
- 3.4 Main discipline(s) / sub-discipline(s) 2
- 3.5 Content Level 2
- 3.6 Estimated manuscript delivery date 2
- 3.7 Estimated number of pages in manuscript 2
- 3.8 Estimated number of 3
- 3.9 Table of Contents will include 3
- 3.10 Supplementary Material 3
- 3.11 Potential Use as a Textbook 3
- 3.12 Description of the Work 3
- 3.13 Unique Selling Points (USPs) 4
- 3.14 Keywords 5

4. COMPETITIVE LITERATURE 6
5. APPENDICES 9

1. TITLE INFORMATION

Book title: *Subsurface Image and Parameter Estimation in Seismic Exploration. Second Edition*

2. AUTHOR(S)/EDITOR(S) INFORMATION

Author/Editor: *Author*
Last Name: *Gritsenko*
First Name: *Sergey*
Professional/Academic affiliation: *Head of the Laboratory for Seismic Data Processing and Interpretation, A.P. Karpinsky Russian Geological Research Institute (2006–2021); Scientific Consultant, A.P. Karpinsky Russian Geological Research Institute (consulting activities on a voluntary basis).*
Postal address: *Sergey Gritsenko*
2 Dostoevskogo Street, Apt. 9
Molodyozhny Settlement, Kamensky District
Rostov Region, 347852
Russian Federation.
E-mail: *gritsenko1@yandex.ru*

3. BOOK INFORMATION

3.1 Type of work: *Monograph*

3.2 Originality of the work:

The proposed English-language manuscript has not been previously published. It is a substantially revised and expanded version of the first Russian-language edition published by the A.P. Karpinsky Russian Geological Research Institute. The structure and content of the book have been extensively revised; new chapters, appendices, and results of the author's subsequent research have been added. The manuscript is not a direct translation of the first edition.

3.3 Language(s) of the work: *English*

3.4 Main discipline(s) / sub-discipline(s):

1. *Applied Geophysics*
2. *Exploration Geophysics / Seismic Exploration*
3. *Seismic Data Processing and Interpretation*
4. *Seismic Imaging: Common Depth Point (CDP) Method, Migration, and Demigration*
5. *Multi-Focusing Methods and Tomography*
6. *Forward and Inverse Dynamic Problems in Viscoelastic Media*

3.5 Content Level:

Graduate
Professional/practitioner
Research

3.6 Estimated manuscript delivery date:

The manuscript is complete and available for immediate submission.

3.7 Estimated number of pages in manuscript:

251 A4 pages in the current author-formatted manuscript, including figures, equations, and tables.
The manuscript contains 59,528 words.

3.8 Estimated number of:

Tables *4*
Illustrations
(differentiate between B/W and color): *104 (34 B/W, 70 Color)*

3.9 Table of Contents will include:

Preface: *Preface to the First Edition; Preface to the Second Edition.*
Introduction: *Yes*
Bibliography *Yes — References (158 references)*
Other: *Five appendices: Calculation of the Apparent Frequency and Attenuation of the Wavefield in a Viscoelastic Medium; Documentation of the CubeTechnology System; Special Courses in Seismic Exploration; Review Questions for the Study Guide; Reviews and Comments.*

3.10 Supplementary Material: *No separate supplementary material is currently planned. Supporting material is incorporated into the book in Appendices B–E: Documentation of the CubeTechnology System; Special Courses in Seismic Exploration; Review Questions for the Study Guide; and Reviews and Comments*

3.11 Potential Use as a Textbook:

Course title	***Type***	***Level***
Physical Principles of the Common Depth Point (CDP) Method	*Theory*	*Master's level*
Color Seismic Images and Their Use for Direct Hydrocarbon Detection	*Theory*	*Master's level*
Seismic-Stratigraphic Modeling and Seismic-Stratigraphic Stacking	*Theory*	*Master's level*
Migration and Demigration	*Theory*	*Master's level*

These are proposed special courses. Enrollment figures and teaching contacts are therefore not yet available. Main text: the proposed book. Supplementary reading: selected references cited in the corresponding chapters

3.12 Description of the Work:

In this book, we will delve into the mathematical world of seismic exploration, considering methods for constructing subsurface images from the standpoint of the geometrical theory of imaging, as well as methods for estimating geological-medium parameters by solving inverse kinematic and dynamic problems.
Using Fermat's principle, formulas for traveltime fields are derived. These formulas will help us gain a deeper understanding of the essence of the Common Depth Point (CDP) method and of ways to determine velocity from seismic data.
Let us consider how interference can be suppressed by focusing over large apertures. This will allow us to better understand how interference-suppression methods work.

We will discuss how velocity can be determined from seismic data. The main factor affecting the relationship between stacking velocity and velocity in the medium is the horizontal variation of velocity in the medium. We will derive the Lynn equation, which will help us determine velocities while taking this factor into account.
Let us talk about diffraction. Large-aperture focusing methods that take the curvature of the reflecting boundary into account make it possible, when its curvature tends to infinity, to effectively isolate diffraction phenomena. Examples of their detection are presented on synthetic and real time sections from surveys in the Laptev Sea (Khatanga Bay) and the Gulf of Mexico. We will discuss the main tasks of seismic-data interpretation: tracking reflecting horizons, matching times at profile intersections, data smoothing, depth calculation and mapping, and assessment of the accuracy of structural mapping.
The book proposes a method for color visualization of seismic images based on the wave nature of seismic waves. The resulting color images may become a valuable tool in hydrocarbon exploration.
Methods of seismic-stratigraphic modeling and stacking are considered in detail. These methods are intended for interference suppression and can provide kinematic information at any times of seismic observations for inverse problems, including reflected-wave tomography.
The physical foundations of migration, demigration, integral modeling, and ray modeling are considered, together with algorithms for the software implementation of these methods.
The inverse dynamic problem of determining the parameters of a viscoelastic medium from the wavefield is considered. Unlike full-waveform inversion (FWI), which is based on iterative model fitting and repeated solution of the forward problem, the proposed approach is based on solving an inverse coefficient problem for the wave equation. Two methods for determining the elastic parameter and the stress relaxation time from the VSP wavefield are considered. The wave equations are written in a unified form for the Maxwell model and the standard linear solid.
Based on analysis of the frequency characteristics of seismic data, a method is proposed for improving the vertical resolution of seismic records. This method has found application in the problem of determining the effective thickness of thin beds.
An innovative algorithm for the automated determination of oil-and-gas accumulation areas and the structural traps contained within them is offered to petroleum specialists. Results of applying the algorithm using S. G. Neruchev's methodology for estimating hydrocarbon resources are presented for fields in the Lower Neocomian deposits of the Tanama Structural Terrace of the Yenisei-Khatanga Regional Trough.
This book is intended for readers who wish to deepen their knowledge of the mathematical aspects of the seismic method. It will be useful to specialists engaged in seismic-data processing and interpretation in industrial organizations, as well as to researchers. In addition, the book will be of interest to senior undergraduate and graduate students studying applied mathematics, geophysics, and geophysical methods of mineral exploration. It can also be used in preparing specialized courses in these fields.

3.13. Unique Selling Points (USPs):

1. *A unified mathematical approach to seismic imaging and the estimation of medium parameters. The CDP method, migration and demigration, traveltime-field analysis, velocity estimation, and inverse problems are considered from the common standpoint of geometrical imaging theory, Fermat's principle, and wavefield focusing. This allows the reader to see the*

interrelationships among methods that are often presented as separate technologies in other books.

2. *Special emphasis on traveltime-field derivatives. Through traveltime-field derivatives, the book connects wavefront geometry, image parameters, stacking velocity, the NIP theorem, and the solution of inverse problems. This provides a deeper understanding of the kinematic foundations of seismic imaging and medium-parameter estimation.*
3. *An original approach to the inverse dynamic problem in a viscoelastic medium. Unlike iterative full-waveform inversion (FWI), which requires repeated solutions of the forward problem, the book considers an inverse coefficient problem for the wave equation and a two-stage recovery of medium parameters: first the elastic parameter and then the relaxation time.*
4. *New and original methods alongside established technologies. The book considers Kinematic Filtering, the Spherical Mirror method, solution of the Lynn equation, extraction of diffracted waves, seismic-stratigraphic stacking, kinematic seismograms, demigration, the RGB method, and automated delineation of traps. The reader is introduced not only to established methods but also to alternative approaches designed to overcome some of their limitations.*
5. *A direct connection between mathematical theory, algorithms, and implemented software. The main ideas of the book are developed to the algorithmic level and implemented in the CubeTechnology system, documentation for which is included in an appendix to the book. This enables the reader to follow the path from physical meaning and mathematical formulation to algorithms and practical software implementation.*
6. *Practical orientation toward petroleum geophysics applications. The book considers color seismic images, estimation of the effective thickness of thin beds, seismic-stratigraphic modeling and stacking, and automated delineation of oil-and-gas accumulation areas and structural traps. This directly connects the mathematical methods presented in the book with practical seismic-data interpretation.*
7. *70 color figures. Color seismic images, maps, spectral representations, and processing results provide a clear visual link between theoretical concepts and the results of their application. This facilitates the understanding of complex methods and increases the practical value of the book as both a teaching resource and a reference for specialists.*
8. *An analytical review of the book. The book's distinguishing features and strengths are discussed in a separate analytical review published on Zenodo:* https://www.calameo.com/read/0068543809166a3e53876. *(Analytical Review of the Book Subsurface Image and Estimation of Medium Parameters in Seismic Exploration.pdf) The review particularly highlights the book's conceptual unity, the author's original scientific results, the combination of mathematical theory with implemented software, and the way in which the achievements of the Russian school of seismic research, particularly the Novosibirsk school, are presented as an integral part of the development of specific scientific ideas. This introduces English-speaking readers to results and approaches that are comparatively underrepresented in English-language educational literature.*

3.14 Keywords: *Seismic exploration, Seismic imaging, Common Depth Point (CDP), Traveltime field, Velocity estimation, Multifocusing, Diffraction, Migration and demigration, Seismic stratigraphy, Inverse problems, Viscoelastic media, Vertical seismic profiling (VSP), Hydrocarbon exploration.*

4. COMPETITIVE LITERATURE

Title: *Interval Velocities from Seismic Reflection Time Measurements*
Author(s)/Editor(s): *Peter Hubral and Theodor Krey; edited by Kenneth L. Larner*
Publisher: *Society of Exploration Geophysicists (SEG), Tulsa, Oklahoma, USA.*
ISBN: *Print: 978-0-931830-13-6 (ISBN-10: 0-931830-13-3).*
Electronic edition: 978-1-56080-250-1.
Year of publication: *1980*
Price in USD: *US$36 list price; US$20 for SEG members*
Price in EUR:
Number of pages: *203 pages*
How is your book different:
Hubral and Krey's book is focused primarily on the determination of interval velocities from reflected-wave traveltimes, ray theory, and the relationships among stacking velocity, migration velocity, and velocities in the medium. The proposed book has a substantially broader scope and treats seismic imaging and the estimation of geological-medium parameters within a unified mathematical and physical framework based on geometrical imaging theory, Fermat's principle, and wavefield focusing.
A major distinction is the rigorous proof of the NIP theorem, based on traveltime-field derivatives and Fermat's principle. The book establishes the relationship between the second derivatives of reflected-wave traveltime and those of the one-way wave propagating from the reflecting boundary to the surface, and shows that stacking velocity is independent of the curvature of the reflecting boundary. In an earlier paper by S. A. Gritsenko published in 1979 in the Western translation journal Soviet Geology and Geophysics, inaccuracies in the approaches of Hubral and Krey to the calculation of wavefront-curvature characteristics were also pointed out.
Unlike the book by Hubral and Krey, the proposed book considers not only velocities but also traveltime-field derivatives, the CDP method, migration and demigration, CRS and Multifocusing, Kinematic Filtering, the Spherical Mirror method, the Lynn equation, diffraction, seismic-stratigraphic modeling and stacking, tomography, and ray and integral modeling. These topics are presented as successive parts of a unified treatment.
In addition, the book presents an original approach to the inverse dynamic problem in a viscoelastic medium, including the determination of an elastic parameter and stress relaxation time from VSP data, as well as color seismic imaging, estimation of the effective thickness of thin beds, and automated delineation of oil-and-gas accumulation areas and structural traps.
Another important distinction is the direct link between mathematical theory, algorithms, and software implementation: the principal methods are developed to the level of computational algorithms and implemented in the CubeTechnology system, documentation for which is included in an appendix to the book.

Title: *Seismic Traveltime Inversion*
Author(s)/Editor(s): *Sergey V. Goldin; translated by A. J. Hermont; edited by Peter Hubral.*
Publisher: *Society of Exploration Geophysicists (SEG), Tulsa, Oklahoma, USA*
ISBN: *978-0-931830-38-9*
Year of publication: *1986*
Price in USD: *N/A — no current official publisher price found; the book is an older SEG title.*
Price in EUR: *N/A — no current official publisher price found.*
Number of pages: *363 pages*
How is your book different:
Goldin's Seismic Traveltime Inversion is a fundamental monograph focused primarily on inverse kinematic problems in seismology and on recovering medium parameters from seismic traveltimes.
The proposed book has a substantially broader scope. Kinematic inversion is treated as one component of a unified framework for seismic imaging and the estimation of geological-medium parameters. In addition to traveltime fields and velocity determination, the book covers the physical foundations of the CDP method, traveltime-field derivatives, a rigorous proof of the NIP theorem, CRS and Multifocusing, Kinematic Filtering, the Spherical Mirror method, diffraction, migration and demigration, seismic-stratigraphic modeling and stacking, depth tomography, and ray and integral modeling.

A major additional distinction is the treatment of the inverse dynamic problem in a viscoelastic medium, in which an elastic parameter and stress relaxation time are recovered from VSP wavefields. The book also includes color seismic imaging, estimation of the effective thickness of thin beds, and automated delineation of oil-and-gas accumulation areas and structural traps.
Another important difference is the direct connection between mathematical theory, computational algorithms, and their implementation in the CubeTechnology system, documentation for which is included in an appendix. Thus, whereas Goldin's monograph is centered mainly on traveltime inversion, the proposed book integrates seismic imaging, kinematic and dynamic inversion, interpretation, modeling, and practical software implementation within a single work.

Title: *Imaging the Earth's Interior*
Author(s)/Editor(s): *Jon F. Claerbout.*
Publisher: *Blackwell Scientific Publications, Oxford / Boston.*
ISBN: *ISBN-10: 0-86542-304-0; ISBN-13: 978-0-86542-304-6*
Year of publication: *1985*
Price in USD: *N/A — At the time of checking, used copies were available on the second-hand book market starting at approximately US$90.*
Price in EUR: *N/A — no current official publisher price found.*
Number of pages: *398 pages*
How is your book different:
J. F. Claerbout's Imaging the Earth's Interior is a classic work focused primarily on seismic imaging using the wave equation, wavefield extrapolation, migration, and velocity analysis. Its central objective is the construction of subsurface images from recorded reflected waves, and the book played an important role in the development of wavefield-based seismic imaging methods.

The proposed book has a substantially broader scope. Seismic imaging is treated from the standpoint of geometrical imaging theory, Fermat's principle, and wavefield focusing. In addition to migration, the book covers the CDP method, demigration, traveltime-field derivatives, CRS and Multifocusing, Kinematic Filtering, the Spherical Mirror method, diffraction, velocity determination using the Lynn equation, seismic-stratigraphic modeling and stacking, depth tomography, ray and integral modeling, and seismic interpretation.
Beyond kinematic and imaging problems, the proposed book also addresses the inverse dynamic problem in a viscoelastic medium, including recovery of an elastic parameter and stress relaxation time from VSP wavefields, color seismic imaging, estimation of the effective thickness of thin beds, and automated delineation of oil-and-gas accumulation areas and structural traps.
Finally, the mathematical theory is directly connected with computational algorithms and their implementation in the CubeTechnology system, documentation for which is included in an appendix to the book. Thus, whereas Claerbout's book is centered primarily on seismic imaging and wavefield extrapolation, the proposed book integrates seismic imaging, kinematic and dynamic inversion, interpretation, modeling, parameter estimation, and practical software implementation within a single work.

Title: *Elasticity and Anelasticity of Metals*
Author(s)/Editor(s): *Clarence Zener.*
Publisher: *University of Chicago Press, Chicago. A 1949 review in Nature also notes distribution through Cambridge University Press, London.*
ISBN: *For the original 1948 edition: N/A, because the ISBN system was introduced much later Modern bibliographic records associate the book with: ISBN-10: 0-226-98054-5 ISBN-13: 978-0-226-98054-6.*
Year of publication: *1948*
Price in USD: *The original price in 1948–1949 was US$4.00. This is stated in the contemporary Nature review. The book is long out of print as a regular new edition. At the time of checking, used copies were available from approximately US$11.72, with other copies listed around US$48 depending on condition and edition*
Price in EUR: *N/A — no current official publisher price found.*
Number of pages: *170 pages*
How is your book different:

C. Zener's Elasticity and Anelasticity of Metals is a foundational work on elasticity and anelasticity and is closely associated with the standard linear solid (SLS, or Zener) model.
In the proposed book, a single parameter is introduced to specify the type of rheological model, allowing the constitutive relations and wave-propagation equations to be written in a unified form for both the Maxwell model and the standard linear solid (SLS). Depending on the value of this parameter, the same system of equations represents the corresponding model.
The main distinction is that these models are used not only to describe viscoelastic behavior but also to formulate and solve forward and inverse problems. The book presents methods for determining the elastic parameter and stress relaxation time from the observed wavefield, with the inverse problem formulated as an inverse coefficient problem for the wave equation.
Thus, compared with Zener's original monograph, the proposed book extends the Maxwell and SLS models toward a unified mathematical formulation and the solution of inverse problems for determining the parameters of a viscoelastic medium, which are not addressed in Zener's book.

Title:	*Mathematics of Multidimensional Seismic Imaging, Migration, and Inversion*
Author(s)/Editor(s):	*N. Bleistein, J. W. Stockwell Jr., J. K. Cohen.*
Publisher:	*Springer New York, NY; Interdisciplinary Applied Mathematics, Vol. 13*
ISBN:	*Hardcover ISBN: 978-0-387-95061-7 Softcover ISBN: 978-1-4612-6514-6 eBook ISBN: 978-1-4613-0001-4.*
Year of publication:	*2001*
Price in USD:	*N/A — no current official Springer list price found. At the time of checking, new softcover copies were available from approximately US$51.65–54.99*
Price in EUR:	*N/A — no current official Springer list price found. At the time of checking, new softcover copies were available from approximately €49–53.*
Number of pages:	*510 pages*

How is your book different:

Bleistein, Stockwell, and Cohen's Mathematics of Multidimensional Seismic Imaging, Migration, and Inversion presents a unified mathematical approach to seismic migration and inverse-scattering imaging, with particular emphasis on multidimensional inversion, wave propagation, and the mathematical foundations of migration.
The proposed book has a different and broader conceptual framework. Seismic imaging and the estimation of geological-medium parameters are considered from the common standpoint of geometrical imaging theory, Fermat's principle, traveltime fields, and wavefield focusing. In addition to migration and inversion, the book covers the physical foundations of the CDP method, traveltime-field derivatives, the NIP theorem, CRS and Multifocusing, Kinematic Filtering, the Spherical Mirror method, velocity determination using the Lynn equation, diffraction, demigration, seismic-stratigraphic modeling and stacking, depth tomography, and ray and integral modeling.
A further distinction is that the proposed book extends the treatment from kinematic imaging and inversion to an inverse dynamic problem in a viscoelastic medium. It presents methods for recovering an elastic parameter and stress relaxation time from the observed VSP wavefield by solving an inverse coefficient problem for the wave equation.
The book also connects imaging and inversion with seismic interpretation, color seismic imaging, estimation of the effective thickness of thin beds, and automated delineation of oil-and-gas accumulation areas and structural traps.
The mathematical methods are developed to the level of computational algorithms and implemented in the CubeTechnology system, documentation for which is included in an appendix to the book.

Title:	*Seismic Inversion Methods: A Practical Approach*
Author(s)/Editor(s):	*S. P. Maurya, N. P. Singh, K. H. Singh.*
Publisher:	*Springer Cham; Springer Geophysics*
ISBN:	*Hardcover ISBN: 978-3-030-45661-0 Softcover ISBN: 978-3-030-45664-1*
Year of publication:	*2020*
Price in USD:	*At the time of checking, new hardcover copies were available for approximately US$159.99.*
.Price in EUR:	*At the time of checking, new hardcover copies were available for approximately €149.79.*
Number of pages:	*216 pages*

How is your book different:

*S. P. Maurya, N. P. Singh, and K. H. Singh's *Seismic Inversion Methods: A Practical Approach* is devoted primarily to practical seismic inversion methods, including post-stack and pre-stack inversion, AVO inversion, impedance inversion, geostatistical inversion, and optimization methods used to estimate subsurface properties from seismic data. The proposed book has a substantially broader subject and methodological scope. Inversion is treated as one component of the general problem of seismic imaging and estimation of geological-medium parameters. In addition to inverse problems, the book covers the physical foundations of the CDP method, traveltime-field derivatives, the NIP theorem, CRS and Multifocusing, Kinematic Filtering, the Spherical Mirror method, velocity determination using the Lynn equation, diffraction, migration and demigration, seismic-stratigraphic modeling and stacking, depth tomography, and ray and integral modeling.*

A particular distinction is the treatment of the inverse dynamic problem in a viscoelastic medium. The book presents methods for determining the elastic parameter and stress relaxation time directly from the observed VSP wavefield by solving an inverse coefficient problem for the wave equation. The wave-propagation equations are written in a unified form for the Maxwell model and the standard linear solid (SLS).

In addition, the book connects imaging and inversion methods with seismic interpretation, color seismic imaging, estimation of the effective thickness of thin beds, and automated delineation of oil-and-gas accumulation areas and structural traps. The mathematical methods are developed to the level of computational algorithms and implemented in the CubeTechnology system, documentation for which is included in an appendix to the book.

Title:	*Wave Fields in Real Media: Wave Propagation in Anisotropic, Anelastic, Porous and Electromagnetic Media*
Author(s)/Editor(s):	*José M. Carcione*
Publisher:	*Elsevier, Amsterdam; 4th Edition*
ISBN:	*Print ISBN: 978-0-323-98343-3*
Year of publication:	*2022*
Price in USD:	*At the time of checking, the eBook was available for approximately US$230.00.*
Price in EUR:	*At the time of checking, the eBook was available for approximately €214.00.*
Number of pages:	*796 pages*

How is your book different?

J. M. Carcione's Wave Fields in Real Media is a comprehensive fundamental work on wave propagation in anisotropic, anelastic, porous, and electromagnetic media. Particular attention is given to constitutive relations, the physics of wave propagation, memory-variable formulations, and direct numerical methods for solving the equations of motion.

The proposed book has a broader scope. In its treatment of viscoelastic media, the Maxwell model and the standard linear solid (SLS) are written in a unified form using a parameter that specifies the type of rheological model. These models are used not only for forward wavefield modeling but also for the formulation and solution of inverse dynamic problems.

A principal distinction is the direct recovery of medium parameters from the observed wavefield. The book presents methods for determining the elastic parameter and stress relaxation time by solving an inverse coefficient problem for the wave equation. One of the methods provides a two-stage solution in which the elastic parameter is first determined independently of the relaxation parameter, after which the stress relaxation time is recovered.

In addition, the treatment of viscoelasticity forms part of a broader framework integrating seismic imaging, kinematic and dynamic inversion, interpretation, modeling, and computational implementation. The corresponding algorithms are implemented in the CubeTechnology system, documentation for which is included in an appendix to the book.

5. APPENDICES

A. CV: https://www.calameo.com/read/006854380ef57ae3c8e95

B. A detailed list of previous publications: https://www.calameo.com/read/006854380126988aea20d

C. Table of Contents: https://www.calameo.com/read/006854380677b757d7a5e

D. Several sample chapters:

1. CHAPTER 2. DERIVATIVES OF THE TRAVELTIME FIELD: https://www.calameo.com/read/006854380b52a6c0b2d18

2. CHAPTER 8. SEISMIC-STRATIGRAPHIC MODELING AND STACKING. DEPTH TOMOGRAPHY: https://www.calameo.com/read/006854380a40fff95b3d9
3. CHAPTER 11. INVERSE DYNAMIC PROBLEM IN A VISCOELASTIC MEDIUM: https://www.calameo.com/read/006854380b0ef00ce5f37

E. Book Announcement: https://www.calameo.com/read/0068543806ad93b119ad5

Date prepared: *October 20, 2026*