of the chapters discuss different aspects of this problem. D. Moos presents an interesting case study of VSP in fractured crystalline rock. The importance of both scattering and anelasticity is emphasized. M. Simaan and P. L. Love discuss the synthesis of VSP including the effects of absorption, dispersion and frequency-dependent reflection coefficients. E. Strick in a significant chapter occupying almost a third of the book provides a thorough review of anelasticity and *P*-wave distortion. In comparing well log sonic data and VSPs it is essential that dispersion and distortion are accounted for properly. In this excellent article, Strick considers the various mathematical models for attenuation and dispersion and compares the predicted waveforms with observations. It might be argued that too much emphasis is placed on analytic models. Mathematical methods and final results are often sensitive to analytic details not necessarily required by the data nor predicted by physics. Perhaps a more general, numerical approach would be preferable and more flexible as available data expand. Nevertheless, this article is to be highly recommended.

Three chapters in the book consider synthetic VSP data. The article by Simaan and Love in which the normal recursive transfer model is used connecting up- and downgoing wave in successive layers, has already been mentioned. J. M. Mendel extends this method using the so-called 'state variable' models. The Bremmer series decomposition is used to separate primaries and multiple seismograms. These two chapters are restricted to plane wave seismograms. In the other chapter on modelling, D. Khosla and G. H. F. Gardner use both scale laboratory models and finite difference solutions to model realistic structures. Unfortunately, the book contains no mention of modelling techniques intermediate between plane wave and finite difference methods. The final chapter of the book by E. R. Kanasewich, D. Bingham and C. Gold is outside the main scope of the book as its title suggests: 'Continuous monitoring of microtremors using a digital seismic array'.

This book naturally suffers from the rapid growth of its subject. The main emphasis is on near-offset VSP data while many recent developments have been with far-offset and hole-to-hole tomography. Most seismologists will be happy to use library copies of this book rather than buy their own. Nevertheless, much is useful as introductory reading for VSP techniques and the chapter by E. Strick is highly recommended.

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Imaging the Earth's Interior

J. F. Claerbout, *Blackwell Scientific Publications, Oxford, 1985*

414 pp., £42.00

Fundamentals of Geophysical Data Processing, 2nd edn

J. F. Claerbout, *Blackwell Scientific Publications, Oxford, 1985*

274 pp., £42.00

The interpretative techniques that are being used in the seismic exploration industry have changed considerably in the past, and continue to do so at present. A major breakthrough occurred around 1970 when Claerbout introduced wave equation migration with finite difference methods, soon to be followed by Kirchhoff summation and a variety of methods, where almost every conceivable permutation of the domain parameters x, k, z, t, ω passes in revue. University teachers trained in earthquake seismology (such as I am) often found themselves bewildered by the avalanche of methods and questionable approximations, all disguised in a technical flash language that was a problem to decipher by itself. But even some of those who won their spurs in the industry but switched to academia found themselves cut loose from major developments. The reason is that most of the research in this field is being done in industrial laboratories, and universities usually lack the means for major research efforts in such a costly field. The task to train students with up-to-date exploration methods which they will encounter in their future professional life is a difficult and sometimes impossible one.

Claerbout's own group at Stanford, however, is widely recognized as a very successful research group, and one should expect that *Imaging the Earth's Interior,* Claerbout's most recent book, can bridge the gap between university teaching and practical applications. This it certainly does. And even more than that, I think.

The book starts with an introduction to the basic methods of wide-angle migration, such as Kirchhoff methods and Stolt's method. The first chapter also peeks at several fundamental concepts: the acoustic wave equation and the paraxial approximation to it and the role of the Fourier transform in migration. Directly from the start one is struck by Claerbout's style which is not very conventional, but highly effective; even when he makes a detour into technical aspects he avoids becoming dull.

In the second chapter he introduces finite difference methods, with a very clear description of the 15° and 45° approximations. Details of the principles of numerical analysis behind the method are given, although complicated error analyses are avoided – nevertheless one obtains a good feeling for numerical pitfalls. Retarded coordinates and their usefulness are treated (the start of this section reads: 'To examine running horses it may be best to jump on a horse'). This chapter ends with treating practical migration, both in frequency and time domain, and gives computer programs that are ready to use.

More detail is offered in the second half of the book. Chapter 3 takes a look at the practical complications of realistic field data: dip, offset, lateral velocity variations. We learn about stacking and velocity analysis in relation to migration, and many other practical questions are answered. Chapter 4 deals with further technicalities and offers little in terms of new concepts, which to me made it a little harder to enjoy. But the last chapter is again very stimulating. It gives a few alternatives that have so far not found any practical application in the industry: slant stacking, interval velocities and multiple reflections are, among other things, presented as topics for future research.

This open end to the book characterizes the whole style: although written as a textbook for study, a stimulating atmosphere of research pervades every chapter. Part of this is due to Claerbout's challenging method of exposition. Each of the chapters starts by outlining concepts, using little or no mathematics. He is like a magician, who first shows a few tricks and then explains to the curious public how he did it. He tosses the wave equation in the air, it topples, and when it lands back in his hands he shows you a different aspect of it, not once, but three, four times. All this with a language that is almost a verbatim lecture, reminiscent of the famous Feynman lectures on physics. Dogmatic mathematicians may raise their eyebrows more than once, such as when Claerbout simply replaces k_x by $\partial/\partial x$ when he wants to accommodate lateral varying velocity. But here, again, the author makes it a policy to arouse the curiosity of the student and keep it alive rather than drown a budding enthusiasm in dull mathematical rigour. As a consequence, I think many students will be stimulated to prove statements by themselves, before turning over to the following pages. Is there a better compliment that one can pay a textbook?

The book is very much up-to-date, with many references even from late 1984. This is no doubt due to the fact that the author did his own typesetting while developing his lectures using a sophisticated text formatter. Also, the book is interspersed with computer programs that provide the reader with hands-on experience if s/he has a system with sufficiently large (graphical) capabilities at her/his disposal. This makes the book priceless, but even without it it is a very good buy.

Blackwells had the good idea to reprint Claerbout's earlier book (*Fundamentals of Geophysical Data Processing*). Apart from a few added references, nothing has changed in this edition. It looks at seismic data more from a statistical point of view, using time series analysis, and forms a good companion to *Imaging the Earth's Interior.*

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Seismic Wave Propagation in Stratified Media

B. L. N. Kennett, *Cambridge University Press, 1985*

£12.50, $24.95

The book presents a unified account of seismic wave generation and propagation in stratified media. This is a particularly valuable approach to disseminate one of the most important techniques which has been developed in recent years: the construction of theoretical seismograms as an aid to structural and source studies. The unified treatment is achieved through elaboration of the mathematics describing waves in laterally homogeneous media; at the same time proper credit to the original authors is given. All this makes the book a model mathematical treatise, accessible to all seismologists – including graduate students in seismology – absolutely necessary in the bookshelves of theoretical seismologists for some time to come.

The techniques developed in the book are very general thus they are applicable to a wide range of problems with distance scales which vary from a few kilometres in geophysical prospecting, to many thousands of kilometres for seismic phases returned from the Earth's core. The illustration of the theoretical results by using examples taken from reflection and refraction seismic surveys, as well as earthquake observations gives an excellent link between theory and observations. Many topics not normally covered in books on theoretical seismology, such as source representation theory, generalized ray theory and calculation of complete synthetic seismograms, including the very important wave effects arising from the presence of the Earth's surface, are treated systematically and with clearness.

The book is divided into 11 chapters. In the introduction the basic problems of seismology are described pointing out clearly the different approximations and consequent limitations of the theory of linear isotropic elasticity with special reference to anisotropy, attenuation and heterogeneity of the Earth. In chapter 2 the seismic displacement within a stratified medium is represented as a superposition of cylindrical wave elements modulated by angular terms dependent on source excitation. For each of these elements the development of the associated displacements and tractions with depth, z, is followed by means of sets of coupled first-order differential equations in z. Such coupled equations are well suited to the solution of initial value problems, and in this context the propagator matrix is introduced. In chapter 3 the construction of stress-displacement fields is discussed. Chapter 4