

Book Reviews

Exploration Seismology Volume 1: History, Theory and Data Acquisition

By R.E. Sheriff and L.P. Geldart
Cambridge University Press
253 p., 1983, \$29.95

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In the current crop of textbooks on Exploration Geophysics, or more specifically, Exploration Seismology, it is refreshing to find a publication that does more than simply pamper the neophyte with things with which he is already familiar. The textbook under review here has something for everyone involved in the practical business of exploring for oil and gas.

The text has its origins in Chapter 4 of an earlier published work, *Applied Geophysics*, by Telford, Geldart, Sheriff and Keys (CUP, 1976). In writing that chapter, the present authors were restricted by lack of space from including much material they would have liked to include. The present expanded version discusses several important aspects of exploration seismology which are not systematically described in the literature. These include the early history of seismic exploration, the vector wave equation, transversely isotropic media, the Kirchoff formula, diffraction solutions, various types of surface waves, reflector curvature effects, resolution, three-dimensional methods, vertical seismic profiling and shear wave studies.

Since the subject matter to be handled is so extensive the work has been divided into two volumes. Volume 2, which is not reviewed here, deals with Data Processing and Interpretation.

In general, the text is well written and easy to follow. There is liberal use of illustrations which are mostly original, but a few well-worn figures reappear, such as the GeoQuest Fresnel – zone model (Fig.

4.25). The inclusion of a Sheriff specialty, the nomogram, is a welcome addition and raises the question, is there a market for a text on geophysical nomograms?

There are several commendable chapters which are worthy of mention. One of these is the first chapter on the History of Seismic Exploration. This may simply be a personal preference, but the chapter does tell us where we've been! The discussion on seismic costs gives an economic perspective. The chapter on the Theory of Seismic Waves is not original, but it is comprehensive, appropriate and well written. The discussion on diffraction theory is eloquent, but for the neophyte it fails to indicate clearly why the phase inversion occurs. The inclusion of specific problems is useful but no answers are given. The chapter entitled "Characteristics of Seismic Events" is one of the better sections of the book, and gives it almost a unique flavour. Finally, the Reference List is comprehensive and selective.

My feeling is that the authors have achieved their objective in providing a book intended both as a text for students in advanced courses and as a reference book for those people engaged in seismic exploration. In the authors' words, "The theoretician and student need to appreciate what is practical, and practitioners need to understand theory and the possibilities it may suggest." Sheriff and Geldart have struck the balance between the two. This book will provide a valuable addition to the libraries of those interested in contemporary applied seismology.

The Geology of Offshore Ireland and West Britain

By D. Naylor and P.M. Shannon
Graham & Trotman
174 p., 1982; \$53.00 US; cloth

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This book has been written by two Dubliners with considerable experience in petroleum geology, and an interest in presenting its regional geological findings in volumes of a distinctly academic aspect. The present publication is in a sense a successor of the earlier and less comprehensive *Geology of the North-West European Continental Shelf, Volume 1*, by P. Naylor and S.N. Mounteney, and covers principally the North Atlantic region, between Britain and Canada, but excluding Norwegian or North seas. Topics are divided into an Introduction, twelve chapters on regional geology, one on paleogeography, one on oil and gas exploration and two appendices.

The book is elegantly printed and very well illustrated with maps and cross sections, although there are curious inconsistencies. For instance, in Fig. 1.3 the original North Atlantic fit requires a considerable rearrangement of Iberia which is shown by an arrow, leaving the actual rotation to the reader. Then, the chapters on the adjacent Irish Sea and Celtic Sea Basins are separated by a lengthy treatment of North Atlantic geology, including parts of Canada. It appears that the book is intended for professional geologists, but yet the authors saw fit to include a short and facile appendix on exploration techniques more appropriate to a very elementary text on physical geology. Appendix 2 (the Glossary) also appears somewhat out of place, since it includes a hodgepodge of somewhat specialized terms such as *acidization*, *condensate* and *secondary recovery* alongside with *dip*, *fault*, *bed* and, yes, even *oil*. Presumably it is ex-

pected that the book will be read by laymen as well as specialists, but in such a case no glossary can explain the subtleties of geological stratigraphy and structure described in virtually every chapter. Considering the, by now, catastrophic costs of British publications, one wonders how much Appendices 1 and 2 have added to the price of the book.

Most chapters are devoted to major basins or complex areas involving several basins and the treatment is generally systematic, usually including sections on geo-physical data as well as stratigraphy, structure and potential for finding hydrocarbons. In this respect the authors commonly enter short historical reviews on exploration and also include a short specific chapter. There is no index.

The writing is racy and in parts entertaining. A slight bending of English words surfaces from time to time resulting in such terms as *trapdoor structure* (p. 69) or *grabenal* (p. 36) so that when a straightforward misprint (p. 38, *Hettagian*) crops up, it looks almost natural. There are also cases of repetitive descriptions which arise because, apart from the section on Paleogeography, no generalized conclusions are presented, and the same tectonic or stratigraphic events have been applied to each basin anew. Yet, I think the book, with its numerous references, is useful and allows one to consider the Trans-Atlantic (Canada-Europe) geological relationships in the light of numerous data and new ideas. For whom, precisely, this book is intended is a moot question, but anyone interested in the tectonics of the North Atlantic, be they an academic or a member of the oil industry, must have it on their shelves.

Notions de géologie avec exemples du Québec

By Bruno Landry and Michel Mercier
Modulo Éditeur,
Outremont, Québec H2V 3X1
1983, 426 p., \$22.00; paper

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Those who teach introductory geology courses in Canadian universities are familiar with the problem of choosing a suitable textbook. All the leading contenders, well illustrated, up-to-date, and more or less well written, are intended for the American market. The standard introductory course there consists of a semester of physical

geology, heavy on geomorphology and geo-physical topics (the oceans, the earth's interior, space science) but with relatively little attention to those which make up the bulk of professional geological activities: mineralogy, petrology, geochemistry, sedimentology, stratigraphy, structural geology. These topics seem to be relegated mainly to the laboratory and to such field excursions as the university location permits. And, of course, examples are chosen almost exclusively from the United States of America.

The text under review departs considerably from this American norm, and appears to have been inspired by the "nationalist" movement in Quebec. Written by two instructors from the Quebec two-year college system (CEGEP), it is no doubt designed to be used in these colleges, and its publication has been subsidized by the Quebec Ministry of Education. At \$22 for 426 two-column, well-illustrated pages, it is clearly a bargain for those in or outside the province.

The title is exact: the book does not attempt to give a comprehensive overall treatment of the earth sciences, but selects certain topics which are particularly relevant to the inhabitants of Quebec, and treats them in some depth with examples and illustrations chosen almost exclusively from Quebec. The first half of the book, on internal processes, discusses minerals, rocks and structural geology. The second half, on external processes, treats glaciers, landslides, rivers (and floating ice), ground-water and periglacial phenomena. The book closes with a brief chapter (16 p.) on the geology of Quebec.

The level of treatment in some chapters goes well beyond that found in most American introductory books. For example, the chapter on minerals includes a description of centres, planes and axes of symmetry, and, besides the seven crystal systems, discusses also Bravais lattices. The chapter on structures has an extensive discussion of strain, classifies folds using Ramsay's concept of dip isogons and includes a thorough discussion of faults (illustrated by examples from the area around Quebec City). It closes with a detailed description of the seismicity of Quebec, based on an open-file report on the Gros Cacouna deep-sea port site, prepared by the Earth Physics Branch of EMR.

One advantage of this type of treatment is that it gives the student a good idea of what geologists actually do, and catches his or her interest by describing in some detail the results of investigations of areas close to home. A disadvantage is that it is difficult to combine the topical, or case history, method with the systematic development of knowledge of major ideas. Some inconsistencies can easily be corrected in

future revisions, for example, triangular diagrams are introduced in a box devoted to feldspar mineralogy on p. 63, but the method of plotting points on a triangular diagram is not explained until the next chapter, in a section on sedimentary rocks on p. 154. Others may not be so easy to rectify: the theory of plate tectonics is introduced briefly, along with the fundamentals of seismology and earth structure, in the first chapter. It is then used freely throughout the rest of the book—but there is no thorough discussion of heat flow, earth magnetism or paleomagnetism, no good description of the historical development of plate tectonics and no description of the way in which the main features of the modern earth can be explained in terms of the theory. (By way of compensation, Appendix C presents the attractive reconstructions of continental drift since the Permian, prepared by the Earth Physics Branch of EMR.)

Selection of certain topics for more complete treatment implies that other topics are glossed over or omitted entirely. It is impossible for the authors to please everybody; but, granted their (unwritten) premise that the book should deal only with topics relevant to the geology of Quebec, it is hard to understand the slight and non-quantitative treatment given to methods of radioactive dating (in Chapter 1, p. 11-13, with the emphasis on Carbon-14) as compared, for example, with the full treatment given to the quantum theory of atomic structure (p. 8-9, and again at length in Appendix A), all of which is promptly ignored in favour of the old-fashioned Bohr model in Chapter 2. Glaciers, rivers and landslides all deserve full treatment in a book for Quebec students; one can understand the absence of any treatment of tropical or arid environments, but was it really necessary or wise to omit any treatment of waves, tides and other marine phenomena?

For the Anglophone geologist, this book has brought together a great deal of information on Quebec geology, which is otherwise scattered in journal articles or government reports. Comparison of the text with an English equivalent will introduce the reader quickly to what I presume to be the correct French vocabulary of geology (I confess that is why I bought the book in the first place, and doctoral candidates facing French language exams might well be advised to do the same). Perhaps most important of all, this book might bring about discussion of a topic too long ignored: just what is the appropriate content for an introductory course in geology to be taught to Canadian students?