

# Sedimentary Rocks, Third Edition

Erich Dimroth

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Dr. Zaslav then has done this nation a great service in writing the Survey's history. The GSC is to be commended in having given the assignment to this particular author. The book is thoroughly researched, a truly scholarly contribution, yet it is most readable and full of human insight. Some chapters, particularly "Washing Dirty Linen", could well be made into TV spectaculars to rival scenes of Pierre Burton's "The National Dream".

Considering the many illustrations, some of them in colour, the price is reasonable. Although it may be unfair to criticize the quality of photographs taken many years ago, it should be said that several are less than satisfactory, showing no contrast but having a washed-out appearance. The coloured maps, including a portion of Logan's magnificent, rare "Geological Map of Canada, 1866" (not published until 1869), on the other hand, are excellent.

One last comment: why did the publisher not give us a more imaginative cover? Once the dust jacket (which is attractive) is worn out and thrown away, all that is left is what looks like the standard Ph.D. thesis. The contents deserve a much better wrapping than that.

MS received August 5, 1975.

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## Sedimentary Rocks, Third Edition

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By F. J. Pettijohn  
*Harper and Row, Publishers,*  
628 p. 1975.  
\$19.95

Reviewed by Erich Dimroth,  
*Sciences de la Terre,*  
*Université du Québec à Chicoutimi,*  
*Chicoutimi, P.Q.*

A new, completely rewritten, edition of the classic textbook on "Sedimentary Geology" by F. J. Pettijohn has long been overdue. This third edition, like the second, stresses the descriptive aspects of sedimentary geology, particularly field relations, textures, and structures of sedimentary rocks. The reader will find thorough discussion of the terminology and classification of sedimentary rocks and of the parameters used to describe them (terms of grain size, rounding, classification of sedimentary structures, etc.), and much historical background material. By contrast, processes of sedimentation have been neglected. The volume contains very little on subjects as important as the hydraulics of sediment transport and deposition, the chemistry of precipitation processes, and processes of mechanical and chemical diagenesis. The aim of the author is "to show the student . . . how to read rock history, how to make an interpretative analysis of what he sees." Subjectively, I would like to restrict this: it appears to me that analysis of the tectonics and history of sedimentary basins, not analysis of the rock-forming processes, are the author's most important objectives.

Basically, the volume consists of three parts. A very brief introduction (Chapters 1 and 2, 24 p.) is followed by extensive discussion (Chapters 3-5, 129 p.) of the parameters used to describe sedimentary rocks: the texture of sediments, their internal organization and structure, and the geometry of sedimentary bodies. Detailed descriptions of the main rock families (Chapters 6-11, 308 p.) form the main body of the book. The sequence of chapters is familiar from the second edition except for the addition of a section on volcanoclastic sediments.

Their contents, however, have been much augmented and they include much of the newer data. As could be expected, changes are particularly profound in the section on limestones and dolomites. A brief digression on diagenetic segregation follows (Chapter 12, 21 p.). Introductions to provenance, paleocurrents and paleogeography, environmental analysis, sedimentation and tectonics, and sedimentation and earth history (Chapters 13-17, 116 p.) conclude the volume.

The book is well produced. There are few misprints and the quality of photographic reproduction is acceptable. As one could expect, there are few outright errors and those that exist are not very consequential. For example Figure 11-23 shows beautiful pore-filling rim-cement greenalite granules not, as stated in the legend, a "chert matrix" (compare Fig. 11-23 and Fig. 3-44). A few errors are more consequential: contrary to the statement on p. 534, large-scale (over 10 cm) cross-bedding does not invariably indicate shallow-water deposition. It occurs quite commonly in conglomeratic flysch of Gaspé and a trough cross-bed 30 meters wide has been observed in sub-aqueous pyroclastic flows at Rouyn-Noranda.

Discussion of genetic models is markedly sceptical and, therefore, commonly is inconclusive. Such scepticism is plainly justified where genetic models are based only on "theoretical or experimental studies", because these only "suggest possible mechanisms". Pettijohn's rendering of presently popular models of the evolution of the earth's atmosphere, or on deposition of iron-formation, are refreshing; these models are virtually unsupported by field or petrographic data. On the other hand, observation of sediment-forming processes taking place today has permitted to formulate process-response models that form the basis of actualistic interpretation of ancient sedimentary rocks. Such processes have been observed to take place, they are far more than "possible mechanisms" based on "theoretical or experimental studies". Thus, I feel that the author's goal has not been plainly achieved. The student will not be able to interpret what he sees at depth without more serious consideration of recent sedimentation processes.

The book should be on the shelf of every geologist interested in sedimentary rocks. I would not use it as a textbook, except in a supporting function. However, as a descriptive text the book is unsurpassed, and the author's descriptive approach and sceptical attitude are excellent antidotes against dogmatism.

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## **Pelagic Sediments: On Land and Under the Sea**

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Edited by Kenneth J. Hsu  
and Hugh C. Jenkyns  
*Special Publication Number 1,  
International Association of  
Sedimentologists  
Blackwell Scientific Publications.  
447 p., 1974.  
Soft Cover \$18.00.*

Reviewed by Alan E. Oldershaw,  
*Department of Geology,  
University of Calgary,  
Calgary, Alberta.*

Pelagic Sediments is the first Special Publication of the IAS and for my money, a real winner. Edited by Kenneth Hsu and Hugh Jenkyns the book contains 17 full papers and two abstracts presented at a symposium held in Zurich 1973. The text is well organized, beautifully illustrated and remarkably free of typographical errors. In particular Blackwell Scientific Publications are to be complimented on their excellent reproduction of the scanning electronmicrographs which garnish many of the papers.

The first paper by Berger and Winterer concerns the relationships between pelagic sedimentation and plate tectonics under the heading of "Plate Stratigraphy and the fluctuating carbonate line". The concept of Plate Stratigraphy is presented in an easily assimilated style without ignoring the complexities of temporal variation in calcite compensation depth and displacement of sea floor relative to zones of varying organic contribution.

The next three papers deal with the sedimentology and early diagenesis of cephalopod-bearing pelagic limestones in the Tethyan (Schlager), the Devonian Griotte and Cephalopodenkalk (Tucker) and the Devonian-Carboniferous of the Carnatic Alps (Bandel). The idea of dissolution facies, related to progressive dissolution of carbonate with increasing water depth, is a recurrent theme in all three papers and is considered in detail by Schlager who proposes an hierarchy of dissolution facies based on the mode of cephalopod preservation.

Chalk is next on the list and three out of the four articles presented are heavy on diagenesis. Schlager and Douglas

introduce the concept of "diagenetic potential" observing that the tendency of a calcareous ooze to form true chalk or limestone varies with the type and distribution of the original sedimentary components. Neugebauer stresses the role of magnesium-rich pore fluids in inhibiting pressure solution and cementation in chalks and a similar idea is projected by Scholle in a discussion of Upper Cretaceous material from England, Northern Ireland and the North Sea. Scholle further proposes a relationship between North Atlantic rifting and an observed, increasing gradient of recrystallization from the North Sea area into Northern Ireland. The chalk theme is brought to a close with a reminder from Håkansson, Bromley and Perch-Nielson, with examples from the Maastrichtian of North West Europe, that not all pelagic sediments are formed in deep-water environments.

The origin of nodular limestones (Knollenkalke, Ammonitico Rosso) is considered in the next two papers. Müller and Fabricus present an actualistic model of nodule formation based on an examination of magnesian-calcite nodules growing in the present-day Mediterranean and suggest an analogous model for similar material in the Tethyan. Jenkyns also relies on a diagenetic mechanism to explain the origin of red nodular limestones in the Mediterranean Jurassic but favours an internal source of cementing agent, derived from dissolution of fine-grained low-magnesian calcite and aragonite, rather than an external source (Mediterranean sea water) as proposed by Müller and Fabricus. Both papers discount the possibility of nodule formation by patchy dissolution of a cemented carbonate sea floor.

The next section is the longest and reflects the impact that the Deep Sea Drilling Project has had on the difficult problem of the origin of bedded chert. Calvert sets the pace with a review of silica deposition and diagenesis in marine sediments. Wise and Weaver follow with an excellent illustration of the transition from opaline silica through disordered cristobalite spherulites to quartz and stress the fact that the mineralogy of a silica-rich sediment is largely controlled by time - the maturation theory. This theory is discussed further by von Rad and Rosch in a paper on deep-sea cherts from the