

## Pelagic Sediments: On Land and Under the Sea

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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,  
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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

Central Atlantic. In each paper the authors point out that the final product of maturation, quartz, contains little evidence of its biogenic origin.

In contrast to the maturation hypothesis, the possibility of host-sediment control on the mineralogy of silica phases is proposed in an abstract by Lancelot, a view that is reminiscent of earlier work by Millot (1960).

Bedded cherts as ocean ridge-derived sediments are discussed by Nisbet and Price using examples of Mesozoic radiolarities from the Orthis Mountains of Greece and Garrison completes the section on cherts with a more general survey of "Radiolarian cherts, pelagic limestones and igneous rocks in eugeosynclinal assemblages".

Of the final three papers in Pelagic Sediments, two concern sedimentary processes related to active ridge systems. Boström in a short abstract outlines the origin of ferromanganous active-ridge sediments pointing out that once formed these are likely to be subducted and metamorphosed and Robertson and Hudson give a very explicit account of "Pelagic sediments in the Cretaceous and Tertiary history of the Troodos massif, Cyprus". Jack Wendte ends it all with an interesting demonstration that sessile arenaceous Foraminifera in Recent manganese nodules and crusts may be used to estimate rates of accretionary growth.

In summary Special Publication Number 1 of the IAS is an attractive, well edited and high quality piece of work which clearly illustrates the important contribution that modern oceanographic investigations have made to our understanding of pelagic sedimentation.

MS received August 13, 1975.

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## Depositional Environments as Interpreted from Primary Sedimentary Structures and Stratification Sequences

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(SEPM Short Course No. 2, Dallas, 1975)

By J. C. Harms, J. B. Southard,  
D. R. Spearing and R. G. Walker  
*Society of Economic Paleontologists  
and Mineralogists, 161 p., 1975.*  
Soft Cover \$5.00.

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Where can "upper level geology students or geologists interested in interpreting depositional environments" go to obtain good, basic, up to date and cheap information covering the principles of hydrodynamics, primary sedimentary structures, and stratification sequences? One good place to start would be this book. At five dollars, the reader is brought up to date with many of the more critical references, and while it contains little new information, what is presented is an excellent starting place for those new to this specialized branch of the ever enlarging field of geology.

The title of this book may be somewhat misleading. It indicates, at least to me, a very broad field of study. However, the opening statements make the following clarifications: the primary objective is to guide the reader toward "the use of primary sedimentary structures and stratification sequences as tools for interpretation of depositional environments of clastic sediments emphasizing advances in understanding of the past ten years".

There are seven chapters in this work which may be roughly divided into two parts, principles, and application of principles. Chapter 1, Purpose and Scope, clearly sets forth the objectives which include the following areas. Chapter 2, Bed Configurations; Chapter 3, Stratification Produced by Migrating Bed Forms; Chapter 4, From Sedimentary Structures to Facies Models, Examples from Fluvial Environments; Chapter 5, Stratification and Sequence in Prograding Shoreline Deposits; Chapter 6, Shallow Marine

Sands; Chapter 7, Conglomerate: Sedimentary Structures and Facies Models. Despite the limitations of the subject matter, the strength of this book lies in the fact that basic updated information pertinent to the principles of hydrodynamics is applied to resultant bed configurations. These bed configurations are, in turn, related to characteristics of stratification produced by migrating bed forms and (hopefully) preserved in the geologic record.

The book tends to emphasize the identification and interpretation of the smallest units of the stratigraphic sequence (sedimentary structures) as recognized in cores and outcrops. Building from local recognition, stratigraphic sequences and combinations of sequences are then shown to be useful in analyzing depositional processes and depositional environments. The reader is guided through the arrangements of these sequences spatially and concludes with generalized models for fluvial sediments, prograding shorelines, shallow marine sands, and conglomerates deposited in marine and non marine environments. With a bit of imagination and good information gleaned from individual cores or outcrops, and utilizing the basic principles outlined in the first few chapters of this book, the reader should then be able to proceed toward analysis of depositional environments not covered such as lacustrine, eolian, turbidite sedimentation, etc.

For the most part, the graphs, figures and illustrations are clear and well presented, but unfortunately, a few are either much too small, too cluttered or have reproduced very poorly.

When one considers the fact that this book is the result of only a few hours of discussion sponsored by the Society of Economic Paleontologists and Mineralogists in Dallas (April 5, 1975) then it is a surprise that it contains so much good information. For the intended reader, it is an excellent starting place, a fine supplement to existing text books and an extension of many past seminars and short courses. At five dollars, it is a bargain.

MS received July 2, 1975.