

*Analysis of Sedimentary Successions - A Field Manual*

by A. Bhattacharyya & C. Chakraborty, 2000. A.A. Balkema Publishers, P.O. Box 1675, Rotterdam, The Netherlands; 420 pages, hardbound US\$70.00, £47.00; student edition (paperback) US\$38.50, £ 26.00; ISBN 90-5809-209-7

It is a pleasure to announce a new sedimentological field manual written by A. Bhattacharyya & C. Chakraborty. Such books are always most welcome, because they reflect the preferred research interests of the authors and thus concentrate on different problems. Each manual thus provides different approaches and different viewpoints. For the authors, this makes writing a good field manual a great challenge; in this case even more so because the book refers to both continental and marine sediments.

The main part of the book describes the components of sedimentary successions. The authors distinguish between *conglomerate*, *sandstone*, *shale*, *limestone*, *trace fossils*, *paleosols & paleokarst*, *event beds*, and *discontinuity surfaces*.

The '*Conglomerate*' chapter starts with a presentation of the main features that should be studied in the field (clast sizes, shapes, lithology, etc.), and finishes with the characteristics of conglomerate deposits from the various continental and marine environments. This structure - very useful for a field manual - is, unfortunately, not repeated in the following chapters. In addition, it is a pity that the currently important topic of sedimentary structures in coarse-grained deposits is not dealt with here.

The '*Sandstone*' chapter is conspicuous for its interesting photos, with fine examples of various ripple forms. However, the authors focused on the forms from the lower flow regime only, although the distinction between deposits from the upper and lower flow regimes is essential in sedimentological interpretations. This chapter is completed by a description of paleocurrent indicators. The authors emphasize the importance of such data, but do not present an azimuth rose of cross-bed orientation or the methods of mean vector estimation such as parameters of directional data or statistical significance assessment.

'*Shales*' are exceptionally well described, with many details, and the structures of sand and silt/clay are well illustrated. The primary structures in shales and their origin are

arranged schematically in a table. It is unfortunate that this way of description is not applied to all the rock types and their lithological features.

In addition to the rock types described (i.e., conglomerate, sand, shale), we also expected a discussion of diamictites, but these are not included in the text. This is most unfortunate, because diamictites exist in a wide variety of types, and their specific features are fingerprints of their highly different origins. The huge mass-flow deposits that can be found in so many environments should certainly have been dealt with, for example glacial sediments with their common unsorted till and various glaciofluvial and glaciomarine facies. Quaternary geologists are apparently not considered as potential readers of the manual. The same applies to eolian deposits.

At the beginning of the '*Limestone*' chapter, the authors deal with several classifications and with the nomenclature applicable to this rock type. Such an introduction is of great value, especially for beginners in carbonate-rock sedimentology: the coexistence of several limestone classifications, based on both macro- and microscopic features, can pose severe problems to non-specialists. A subchapter, '*Diagenetic Bedding*', is of great importance because it draws attention to the distinction of primary boundaries and diagenetic ones; this difficult aspect is still often disputed in the field. In contrast to the ample attention for limestone, dolomite is hardly dealt with. We think that a second edition should not be published if this omission is not corrected.

The '*Trace Fossils*' chapter is the most extensive chapter of the book and it is well illustrated. Field techniques regarding observation, classification and paleoenvironmental importance of trace fossils are perfectly characterized. Especially the last-mentioned topic deserves praise.

The '*Paleosol & Paleokarst*' chapter is an exhaustive one. This is the more remarkable since sedimentological books touching this subject hardly exist. This chapter is, beyond any doubt, the strongest part of the book. The authors (and the publisher) have, unfortunately, not chosen to use color photographs so that subtle color differences (which are important and sometimes key-features for soil classification and interpretation) are insufficiently well expressed (the '*Limestone*' chapter also would profit greatly from color photographs!). We hope that a possible future edition will pay attention to the need of

color photographs. The important karst and paleokarst aspects are well treated in the present manual. Even karst geomorphology is extensively described.

In the '*Event Beds*' chapter, the authors deal most thoroughly with seismites. The typical successions of tempestites (we can find 20 of them!) are also exhaustively and clearly explained. The rest of the chapter is, however, a bit disappointing. The classical Bouma succession within turbidites is mentioned, but the models of debris flows of various densities are lacking.

Two thoughts came up after reading this part of the book. The first one was that it would be better to separate the description of the field facts much more distinctly from their interpretation. The authors mix them up, however, which may easily result in misunderstanding, especially by younger researchers or students. The second thought was that - although the manual contains a large number of figures and photographs of beds, sedimentary structures and models - too few sedimentary logs are presented. After all, a thoroughly prepared log forms the initial and basic material to further paleoenvironmental interpretation.

The '*Paleogeographic Settings*' chapter contains block diagrams of sedimentary clastic and carbonate environments. They are rather poor, with very schematically indicated zones in the sedimentary subenvironments. Sediment types within the subenvironments are not distinguished, nor are their lateral transitions. This is a missed chance, particularly because this chapter should act as a link to the second part of the book, which deals with sedimentary basin analysis.

'*Sequence Stratigraphy*' is one of two chapters in the second part. All the problems regarding parasequences and the unconformities between them are, as well as system tracts, of good quality. The information is well chosen for a concise and practical guide, although we expected some more information about sequences themselves (there is hardly anything except the definition). At the end of this chapter, the authors present a sequence stratigraphic discussion of alluvial sediments. We would like to see this part as an example of sequence stratigraphy for continental facies, generally based on a somewhat different methodology than the 'traditional' sequence stratigraphy worked out for marine deposits. The alluvial sedimentary successions reveal a great preservation

potential; unfortunately, the non-alluvial continental facies, however essential for basin analysis, are not mentioned at all.

The last chapter, *'Tectonic Signatures in the Basin Fill'*, deals with the tectonic control over the sedimentary basin infill; we consider this section, at least in this form, unnecessary. The authors characterize three basin types as examples of different mechanisms of subsidence. The basic information is presented in a highly concise form, and obviously does not consider all the commonly complex aspects. It would possibly be better to extend the first part (General) of this chapter in the field manual with more examples that include logs, to show how the influence of subsidence on sedimentary successions can be interpreted.

The last quarter of the book is an *Appendix*, with the *North American Stratigraphic Code*. However large, we consider this as a great idea for the field manual, because it brings order in the otherwise seemingly chaotic stratigraphic nomenclature.

It seems, at the end of this review, worth while to consider whether the field manual fulfills its aims as both suggested by the title and listed by the authors in their *Preamble*. The fundamental part of the book (i.e., *Sedimentary Successions: Its Components*) turns out to be a help in facies analysis and thus fully deserves the name *Field Manual*. All readers will most likely find something of interest for them in this part, widening his or her knowledge of sedimentary successions. But can a modern manual for sedimentary geology stop with the traditional facies analysis? The answer must be 'no', and that was apparently also the viewpoint of the authors. Consequently they decided to add some chapters, evolving through sequence stratigraphy to basin analysis. This must have been a painstaking work, because it must have been difficult to select items and to deal with them thoroughly, without making the field manual unpractically thick. We got the impression that the additional chapters became, as a kind of compromise, gradually more superficial and cursory.

Notwithstanding, we think that this book deserves a place among the significant and important volumes on sedimentary geology. The more so because field manuals are relatively scarce. Hence we advise all field geologists to put *Analysis of Sedimentary Successions* on their bookshelf.

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