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Microfacies of Carbonate Rocks—Analysis, Interpretation and Application, by Erik Flügel, 2004. Springer-Verlag, Tiergartenstrasse 17, 69121 Heidelberg, Germany; xx + 976 pages, 362 figures, 7 tables, hardcover; € 106.95. ISBN 3-540-22016-X.

The objectives of the book are to provide (1) a synthesis of methods in microfacies (mf) studies; (2) applications of mf and of new developments in carbonate sedimentology; and (3) a focus on compositional and textural constituents from which depositional and diagenetic history are derived. The author states categorically that the current book is entirely new; it is not a revision of his 1982 book. This is supported by references to new concepts and practical suggestions for users on (a) analysis/description of a wide range of environments; (b) diagenetic features and processes leading to porosity and permeability; (c) biological content; (d) a sequence stratigraphic framework; (e) comments on paleoclimates; and (f) the relation between platform and basinal carbonates and reservoir rocks. The book is written for upper level undergraduates and graduates and can also be used in research, exploration and production of hydrocarbons and ores. The structure of the book and the brief contents per chapter are summarised underneath.

Chapters 1-2 are *introductory*. They present new perspectives and an introduction on source information on mf, and offer a broad approach on depositional environments with new insights in cool and arctic water carbonates as well as in deepwater seep and vent carbonates.

Chapters 3-10 review mf *analyses*. After presentation of an overview of basic textural and structural properties of mf (with some excitingly new insights in the role of algae and bacteria on carbonate lithification), grains and matrix are reviewed in great detail with occasionally interesting new insights. The origin of some obscure terms is traced, but it is not always made clear which terms are recommended/rejected. A chapter dedicated to overviews of depositional/diagenetic mf fabrics also focuses on discontinuities that may be of importance in sequence stratigraphy and postdepositional effects (ambiguously contrasted with diagenetic effects). Then a basic review is presented of quantitative mf analysis. A very detailed overview follows of diagenetic products in relation to processes and environments in which they formed. Emphasis is on porosity types and dolomitisation. Then the common carbonate classifications are presented whereby the original classifications are nicely contrasted with later modifications. Strong emphasis is put on the biological origin of carbonates and on microbial influences, boring and encrustation. A comprehensive summary of results of recent thinking is presented here. Chapter 10 (175 pages) contains a very detailed summary of fossil remains characteristics in thin sections. In view of the topic and the size of this chapter it is almost “a book within a book.”

Chapters 11–16 (the 2nd part of the book) review mf *interpretation*. Criteria are presented to define and typify mf, partly through copious references to earlier plates.

Paleoenvironmental and climatological conditions are reviewed and seismic events as reflected in carbonate sequences are briefly touched upon. Then integrated facies analyses follow by including results of insoluble residue analysis, trace elements and organic matter. Depositional models and their facies zones are introduced, and it is shown how they reflect in standard microfacies (smf). Here many of the preceding chapters are integrated. The 26 smf are briefly characterised and illustrated. Then the scope is broadened through basin analysis and recognition of depositional settings. Tools are reviewed for translating smf into depositional settings. Depositional constraints are reflected in cyclicity, growth of reef carbonates, vanishing carbonate platforms, formation of cold / very hot (at seeps) water carbonates and formation of mixed carbonate/siliciclastics. A discussion is added of imprints of sequence stratigraphic architecture elements in carbonates.

Chapters 17–19 (3rd part of the book) present mf *applications*. It focuses on practical use of microfacies such as characterisation of reservoir/host rocks, building materials and application in archeometry, but also on recognition of hydrocarbon reservoirs and ore host rocks and on industrial and agricultural use of carbonates. Therefore, it reviews controlling facies, weathering phenomena and—finally and interestingly—the use of microfacies analysis in archaeology on a wide range of products such as building stones, mosaics and works of art.

An appendix presents answers to exercises distributed throughout the text. It also gives notes on important details found on the CD that is attached to the book, and it acknowledges permissions to reproduce plates and illustrations. A 56-page topic index completes the book. Extensive references are partly scattered through the various (sub)chapters, partly compiled on the added CD.

It is clear that this work is the result of lifelong research of which earlier stages have been reported in Flügel's precursor books in German (1978) and in English (1982), both of which I had the pleasure to review. Over time new aspects have been added, and up-to-date references and personal communications are used. The acknowledgements suggest that the majority of contributors are German, coming from both Germany (mainly Göttingen and Erlangen) and abroad. However, various international contributors are also mentioned. References go back to the beginning of the 19th century but are mainly from the last 25 years, with some as recent as 2003.

A remarkable feature of the book is the abundance of excellent quality illustrations and the lengthy and detailed plate captions. The various “glossaries” in “boxes” throughout the text are useful and practical. The subdivision of the book in a descriptive and an interpretative part unavoidably results in extensive cross-referring to plates, illustrations and tables. Because of the key role of the excellent plates and the size of the book (the first one I come across that also has its weight referred to in the data provided by the publisher: 2620 g) one wonders whether an accompanying separate plate volume would not have been a solution to prevent interrupting reading the text to find the referred plate. The same is true for chapter 12, which really is ‘a book within a book’ and would be more easy to use if bound separately as an accompanying volume. These minor critical comments do not reduce the wholehearted recommendation of the book for the target groups and for anybody interested in an up-to-date reference work on carbonate microfacies. The voluminous book is acceptably priced for what it offers.

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