

Dynamic Stratigraphy

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concerning carbonate complexes of the Rhenish Schiefergebirge of the Variscan geosyncline. This is the first time that much of this information has appeared in English. In addition, considerable new data are presented on classification of these carbonate complexes, lithofacies, biofacies, diagenesis and paleogeography. The lithofacies and biofacies are well illustrated. Considerable data on age, thickness, size and shape are succinctly summarized in tables. These carbonate complexes occur on the southeast margin of the Old Red continent, on isolated submarine volcanic (ophiolite) rises in the internal part of the Rhenish Trough, and overlie crystalline rocks on the inner (southeastern) shelf. This paper is a very good starting point for any review concerning the Devonian buildups of Central Europe.

The paper by A. Bosellini and D. Rossi on "Triassic Carbonate Buildups of the Dolomites, Northern Italy" also makes available classical data not previously available in English. This paper provides a succinct summary of the Middle Triassic carbonates of the Dolomites. These authors show that a submarine topographic relief of between 700 and 1,500 metres, between the buildups and the surrounding basin, was attained gradually by accumulation of carbonate sediment on the buildups. These buildups were controlled by tectonic uplifts which localized carbonate sedimentation on these topographic highs. Carbonate sedimentation on these highs kept pace with rapid subsidence. The buildups appear to border a trough comparable in size to that of the Tongue of the Ocean. Bosellini and Rossi classify the buildups as stratigraphic reefs in the sense of Dunham (1970). This paper is complete with a series of superb photographs that would entice anyone to visit the Dolomites.

The final paper by R. K. Matthews concerns "A process approach to diagenesis of reefs and reef associated limestones". Matthews quite rightly stresses that "the diagenetic modification is a composite of numerous processes separated in time" and that nature is a very messy laboratory. He reviews the basic chemistry of carbonate diagenesis and

diagenetic environments and processes that occur near the earth's surface, written for geologists not sedimentary geochemists. The research carried out by Brown University up to 1971 on the Pleistocene carbonates of Barbados is summarized in this paper. Considerably more research has been done since then by both the Brown and McGill University groups and the interested reader should consult the relevant journals for these papers.

On the whole this is an excellent series of summary papers that in addition contain significant new ideas and new data. It nicely complements two other recent books: Milliman (1974) *Marine Carbonates* published by Springer-Verlag, and the *Comparative Sedimentology of Carbonates* symposium (Am. Assoc. Petroleum Geol. Bull., v. 58, no. 5).

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Dynamic Stratigraphy

by Robley K. Matthews
*Prentice-Hall, Inc., Englewood Cliffs,
 N.J., 360 p., 1974.*
 \$12.95.

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Taking *Dynamic Stratigraphy* from the shelf, and reading the sub-title in the jacket, and the Introduction, one would expect to enjoy an analysis of the stratigraphic record in the light of the new theories on global tectonics. This is not the case. Matthews has reached beyond hypothetical mechanisms, and he has succeeded in offering a vivid impression of an unsteady and non-uniform motion of the surface of Earth. His message is that changes occur, sometimes catastrophically, and they are recorded in vertical and lateral facies changes.

One goal of sedimentology and stratigraphy is to make people able to *read rocks* - that is, with understanding. This textbook is a guide through different stages of learning, first the sedimentary alphabet, then the spelling, and at the end a few interesting pages of geological history are offered for reading.

The book is subdivided into four major sections. The first part introduces the basic principles of stratigraphy, the philosophy of study, the reasons, sometimes practical ones, for this study, and briefly but effectively, a tombstone is placed on the old layer-cake concept - that was a useful field working tool in the past - and the new concept of facies and sequences of facies is put forward. It is unfortunate that the name of Walther, and his "Principle of facies correlation and variation" are never formally referred to.

In the second part (9 chapters, 120 pages) of the textbook, a classical approach has been taken in analysing the properties of sediments and sedimentary rocks, their generalized environments of formation, the principles of dating and correlating sedimentary deposits. The fourth chapter on the dynamics of the

stratigraphic record is of particular interest. It deals with the study of the vertical and lateral movements of the surface of Earth, and the effects these movements have on the characters of the sediments and their rate of deposition.

It is unfortunate that the concept of geological time is not treated in a more exhaustive manner. Stratigraphy is the placing of *events* in their *sequence* in *time*. Matthews is biased toward the analysis of events, and assumes that students are familiar with, or can rapidly assimilate, the concept of time, and the methods to measure it. His lower sensitivity to these problems is also revealed in several minor details, such as (a) calling parts of the Devonian (e.g., Lower Devonian) sometimes an "era", sometimes a "period", or just "time"; (b) presenting geological time tables that may be confusing because of poor labelling of columns; and in one case (Table 9.2) the first column is not separated from the others, so that it appears that Triassic, Jurassic and Cretaceous belong to the Paleozoic. A more acute sensitivity to pedagogic principles could also be hoped for, e.g., by avoiding the use of terms and concepts before - sometimes several chapters before - a definition or brief explanation of them is given.

In the third part (5 chapters, 84 pages) of the book, which has a good review of recent and outstanding papers, an analysis is made of active processes and sediments formed in major environments of sedimentation, from braided streams to oceanic floors, and from restricted basins to open carbonate shelves. From the knowledge acquired from recent environments, sedimentary models are constructed that can be used in the interpretation of ancient stratigraphic units. Here, Matthews offers a superb selection of recent papers. This third part of the textbook justifies the subtitle given to this book, that is, "Dynamic Stratigraphy — Introduction to Sedimentation and Stratigraphy". This subtitle should be displayed in larger characters, and it should be written also in the jacket to make its titling less misleading.

The fourth section of the book is entitled "Cyclicity in the Stratigraphic Record". At the level of this book, this is stratigraphy at its best, and it may be

of interest also to the non-specialist, experienced geologist. Here, Matthews pulls together the knowledge gathered through the book, and guides the student through the analysis of Pleistocene marine sections, Paleozoic sequences of epeiric seas and the Kansas cyclothems. He shows how the various sedimentological and stratigraphic concepts and models are put to work.

The book reads well. The illustrations are well chosen, and enhance the understanding of the subject matter. With some reservation, the book can be considered a suitable textbook for institutions that offer only a one semester course covering both stratigraphy and sedimentology. Parts of the book can be used as a reading reference for students taking more specialized courses.

Matthews has shown effectively the close association that exists between sedimentology and stratigraphy, so much so that in future editions it would be helpful if formal definitions for both sciences could be given in the early pages. For the future, it is also hoped that larger emphasis will be given to the relation of stratigraphy to the "new global tectonics", to mineral accumulations, and to features of the sedimentary columns useful to man.

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The Nature of the Stratigraphic Record

by Derek V. Ager
John Wiley and Sons, Ltd., Toronto
 114 p., 1973.
 \$9.95.

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"This is not a textbook or a research treatise . . . It is a commentary on the general pattern of earth history . . . it is stratigraphy looked at by a non-stratigrapher." Thus the author in his preface; and he adds: "the one great hope I have for this book is that it will stimulate thought and argument, even rage."

Derek Ager is perhaps best known for his work on Mesozoic rhynchonellid brachiopods, and for his book on paleoecology (published in 1963). His research has carried him to many parts of Europe, and he has been an observant geological tourist in Canada and the United States. This book contains his personal reflections on the broader issues raised by his work, observations and reading. Its general thrust is summed up in one line summaries at the end of each chapter. Some examples: "at certain times . . . particular type of sedimentary environment were prevalent over vast areas of the earth's surface"; "the sedimentary pile at any one place . . . is . . . a tiny and fragmentary record of vast periods of earth history"; "the periodic catastrophic event may have more effect than vast periods of gradual evolution"; "most sedimentation in the continental areas is lateral rather than vertical . . .". The chapter heads are designed to drive the message home: "More Gaps than Record", "Catastrophic Stratigraphy", "Catastrophic Uniformitarianism".

I doubt that many geologists familiar with the results of modern sedimentology will find much that engages them in this book. There are, of course, matters with which we may disagree but the basic message seems valid, and it is well to be reminded of it. The sedimentary record is more incomplete than the pioneer