## REVIEW

MICROFACIES ANALYSIS OF LIMESTONES by Erik Flugel (Translated from German by K. Christenson), Springer-Verlag, Berlin, 1982, 633 p. with 53 plates, 78 figures and 58 tables. Price: $ 65.80.

The book is an excellent treatise on the study of carbonate rocks. The treatment of the subject is very comprehensive and has been dealt in a systematic manner covering almost all aspects of Limestones-composition, processes of sedimentation, facies and environments of deposition including the methods of study of carbonate rocks and analysis of facies and palaeoenvironments. The book lays emphasis obviously on sedimentological processes with the ultimate objective of deciphering sedimentation models. The entire subject is discussed in ten Chapters followed by case histories of typical carbonate sedimentation models in Chapter 11. The book is well illustrated and the subject matter is amply supported by examples.

After a short introduction in the first chapter regarding various definitions and conceptual ideas about microfacies and laboratory methodology, the author has briefly discussed recent carbonate sedimentation in the second Chapter. The third Chapter includes discussion on diagenesis of carbonate rocks. The entire subject of diagenesis is discussed in a lucid manner aided by illustrative diagrams. Author also discusses in detail the type of cements and their significance. Diagenetic effects as a result of compaction of sediments and the role of chemical parameters during diagenesis, in our opinion, deserved a more elaborate treatment. The microfacies characteristics (Chapter-4) form an important section of the book. Several new concepts in sedimentological study of carbonate rocks have been put forward. The new ideas for carbonate study include grain-size characteristics, clasticity index and Passega diagrams, in addition to textural characteristics. The author suggests semi-quantitative analytical methods based on thin sections study. Such methods are particularly useful when the number of samples to be analysed are sufficiently large. Computation methodology/standard software programme for plotting and presentation of such data, would have made the discussion complete. ' Fossils in thin sections ' (Chapter-5) is another important Chapter and is amply illustrated with several clear and meaningful diagrams and tables. Table 25 is particularly a useful compilation. Besides, the general discussion on identification of various fossil elements, detailed palaeontological aspects in relation to sedimentation of carbonate rocks are well enumerated. Treatment on algae is particularly noteworthy. Figure 49 illustrates the ecology of calcareous marine algae vis-a-vis depositional environments and morphology of basement floor, in proper perspective. Author has introduced the concept of ' Cenozones ' meaning biostratigraphically related assemblage zones. The author, further discusses the various microfacies types as well as the standard microfacies types which were originally put forward by Wilson (1975). Various ideas regarding classification of carbonate rocks by different authors have been briefly mentioned in Chapter 6. The discussion on microfacies in Chapters 7 and 8 briefly describes qualitative and quantitative methods of facies categorisation and describes standard microfacies (SMF) types. The check list at the end of Chapter 7 is useful for carrying out detailed petrographic analysis of carbonate rocks. Author introduces a few new methods for the study of carbonate microfacies in Chapter 9 which he titled as ' Complementary Methods '. These include geochemical criteria and their relation-

ship to microfacies. The methods include studies of insoluble residues, trace elements and stable isotopes ($O^{16}$, $O^{18}$, $C^{12}$, $C^{13}$). The geochemistry of carbonate rocks – 'Chemofacies,' is an important new dimension in the study of Limestones added in this book. Another important aspect touched upon is the inter-relationship of microfacies with physical and technological characteristics of carbonate rocks like porosity, rheological properties, frost resistance etc. The methodology of such analysis, however, has not been mentioned. A more detailed discussion on this subject would have been useful for professional geologists. For a petroleum geologist, a detailed analysis of micro-facies-porosity (primary and secondary) -diagenesis system is the most important aspect of study. Chapter 10 deals with facies diagnosis and facies models. This Chapter provides guidelines for interpreting various carbonate facies and environments of deposition, and finally the methodology for reconstruction of depositional history through time and space for building up the sedimentation model of a basin. A few new ideas, for example, terrigenous supply versus coastline distribution of microfacies and salinity ranges in various sub-environments, have been presented in this Chapter. Besides, various facies models mostly suggested by earlier workers like Wilson, Irwin, and Shaw are discussed. Chapter 11 deals with several case histories mostly from Western Europe, Alps and a few from Middle East. Discussion, however, is brief and warrants further elaboration keeping in view the general usefulness of the book. In Chapter 12 certain basic problems related to the subjects discussed in the previous Chapters, have been answered. This Chapter is good for recapitulation for students. The last Chapter groups various indices for reference purposes.

In general, this is a good reference volume on carbonate sedimentology for research students. The compilation of exhaustive annotated bibliography on each topic as well as for each Chapter is the best feature of the book. The author deserves sincere compliments from carbonate sedimentologists working all over the world for producing such a useful reference manual.

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