tools now available, the industry should be able to do this even better.

Apart from the many logging tools and survey modes now available, the production, testing, and pressure build-up measurements of the initial wells, should be able to help prepare a preliminary overview and an initial management plan. With the progress of the field’s development, this has naturally to be reviewed from time to time and fresh inputs added depending upon what would most improve the economic recovery.

To start with the simulation of the natural forces present will itself substantially improve the recovery. Any new inputs, that have to be added later, should be designed to work in harmony. Where the natural forces present are not adequate, new inputs may have to be added quite early, but all these have to be dovetailed within the overall management plan and aim at maximizing the economic recovery. Sometimes a new input may have to be tried out on an experimental or pilot scheme basis. The project then acquires the character of an exploration in technology and should be treated on par with exploratory wells which are drilled in search of new discoveries. Exploration for new discoveries, enhancement of economic recovery, and conservation in the use of what has been found, are all very important facets of the same overall objective – i.e. of how to keep the petroleum supplies available for a much longer time period than can be foreseen. To the extent it can generate sharing of experiences/ideas and help in the formulation of programmes which lead to substantial improvement in petroleum recovery.

BOOK REVIEW


Stromatolites are organosedimentary structures readily identifiable in the field but are taxonomically complex. Their study is an important tool in Precambrian biostratigraphy. They have been successfully utilized in biostratigraphic correlation but their usage has been limited. Because of their biological origin they assume great importance in the study of life in Precambrian. The Chhattisgarh basin in central India is a geologically well studied Proterozoic sedimentary sequence, but palaeobiological studies have not been pursued vigorously. In this context this volume assumes great significance.

The monograph has ten chapters. Moitra has indicated two objectives of the publication viz., (1) Systematic description and classification of stromatolites and associated microbiota of the Chhattisgarh basin and (2) Analysis and interpretation of data for development of the litho- and bio-stratigraphy of the basin. Some justice has been done to the first objective but the second objective has not been adequately dealt with.

There are many shortcomings in the second chapter. A perusal of the contents under ‘Previous Work’ and the ‘List of References’ at the end of the monograph suggests that the manuscript was finalized much before the actual date of publication. There is only one reference pertaining to the nineties.

The chapter on ‘Previous Work’ would have been useful had the author delved on the interrelationship of these studies and how these were relevant to this study instead of merely enumerating the earlier works. Statements such as, ‘porcellonite-like rock producing sharp angular pieces and displaying conchoidal fractures’ (page 14) only show a casual approach in describing the lithology. One could have easily ascertained the correct rock type in the laboratory. Various sedimentary structures reported could
have been meaningfully used in interpreting the depositional environment rather than merely listing them in the text.

Chapter 3 devoted to ‘General Geology’ gives a brief description of the various litho-units of the Chhattisgarh basin. From the title of the study, one gets an impression that all the litho-units were investigated for stromatolites and microbiota; however, the stromatolites and microbiota are reported only from two formations, viz., Charnaria Limestone and Raipur Limestone. The sedimentological and biological details are presented through sixty-two photographs. It is rather unusual for a government publication not to use the decimal system for measurements (e.g. use of miles in Fig.3). Further, there is no scale provided for some of the photo-illustrations and line diagrams (Figs.12, 13, 15a, 17c, 21a, 22a, 23c, 25c, 26 etc.).

The title of chapter on ‘Stromatolites of the Chhattisgarh basin’ suggests that it incorporates the stromatolite varieties in the basin, but in fact it is a summary of attempts at stromatolite biostratigraphy in India and other parts of the world. Except for the statement about profuse development of stromatolites in the Raipur Limestone Formation, there is no mention of the variety of the stromatolites in this section.

Chapter on ‘Methodology of studies’ is a welcome inclusion. Although in the description of stromatolites the procedures suggested by Grey (1989) have been followed, it would have been appropriate that due acknowledgement was given to her ‘Handbook on Stromatolite Study’ on which they are based. Various parameters of description help in assessing the biostratigraphic potential of the described form.

‘Systematics of stromatolites’ is the most important chapter of this work. The author has invariably provided a field photograph, microscopic observation and three-dimensional reconstruction/field tracing with the description of each morphoform. While dealing with the systematics he has, it seems purposely, avoided naming the classification scheme(s) followed by him. He has recorded and described 24 morphoforms. Of these forms, *Conophyton* cf. *cylindricus* is rather unconvincing from the field photograph (Fig.31a) and micro-lamination (Fig.31b). There are several sentences, such as, ‘Due to widely ranging in size and slender in configuration, this form is comparable to *C. cylindricus* described by of Jammu Limestone’ (p.45) which are incomplete and show that the text was put together in haste and poorly edited. The two other shortcomings are that the synonymies of different forms are not given and comparison is not comprehensively dealt so that the new forms, which are proposed in this monograph, are of limited value. Sometimes even the comparison is not given (Tungussia fn. Indet. p.58).

Chapter on the ‘Microbiota of Chhattisgarh basin’ is also an important part of the study. One had high expectations with the author’s handling of stromatolites and microbiota, but it has failed in making any significant contribution to the database on palaeobiological remains from Chhattisgarh basin. First part of this chapter is incoherent. Both obsolete and current terminology have been freely used, viz., blue-green algae (p.59), Cyanophytes (p.60), Cyanobacteria (p.77), etc. No reasons have been given for adopting the older classification mentioning Cyanophyta rather than classification using the term Cyanobacteria. Many a time biological terminology adopted from other workers has been used without even considering its bearing on the previous sentences of the author’s own text.

The oft-used sentence ‘In all about ... specimens were examined’ gives an impression that the author is not sure of the number of specimens examined by him for that particular morphoform. Filaments and trichomes are two distinct entities in cyanobacteria. An external cylindrical sheath and an internal cellular strand characterize the former, whereas the latter corresponds only to the cellular strand. Moitra has used these terms interchangeably. In none of his illustrations sheath and filaments can be differentiated.

Many of the generic, specific and author names are miss-spelt throughout this section. Throughout the text μm has been used for size (except Table - III) while the photo-illustrations incorporate a μ on the scale. Though it does not make any difference as far the size is concerned, it certainly reflects poor copy editing.

Occurrence of *Renalitis* (p.71, Fig.67) is an important discovery for deciding the age of Raipur Limestone. This alga occurs in the range of the Precambrian-Cambrian, the Nemakid-Daldyn Horizon, the Lower Cambrian sediments. But the description and photograph provided by the author are not good enough to infer the validity of the claim. Similarly the form comprising ‘Radial appendages with central core’ (p.71, Fig.71), which the author himself believes to be of abiogenic origin, should not have been described under the microbiota category. It is a common practice in palaeontology that all the described specimens bear their repository details, which are missing for most of
the described stromatolites and microbiota specimens of the present monograph.

Chapters eighth and ninth are complementary to each other. There is supposed to be a figure 82 (p. 79) giving distribution pattern of stromatolites, which, however, is missing in the reviewer's copy. Text figure 78, supposed to show biozones based on stromatolites, is just a litholog giving only microbiota biozones. Inconsistency of statements is further compounded when Biozones I and II are stated to be at levels 200-265 m R.L. and 270-315 m R.L., respectively on page 79 while the same biozones are recorded at levels 213-266 m and 270-340 m, respectively on page 74; and in the abstract of the paper these two assemblage zones have been placed at 700-850 m R.L. and 900-1200 m R.L., respectively. Author’s statements on the depositional environment of stromatolites are rather confusing and contradictory e.g. (p. 74-78).

The author concludes that “the morphological characters of the stromatolites were biologically controlled” but description of microbiota and photographs do not support this contention. The conclusion that “The microbiota mainly filamentous and coccoid prokaryotic cyanobacteria and some unidentified algal remains show gradual increase in dimensions indicating evolutionary trend” is rather too generalized a statement which is not supported by comparison of statistical data of the microfossils reported from other parts of the world belonging to this period. Statistical data given in figures 79 and 80 are highly mismatched, very confusing and irrelevant (e.g. text of section 7.2.1.2 mentions that the author has examined 15 specimens whereas the graph in Fig. 80 A-1 shows that more than 100 specimens were counted). It is the case with all other graphical representations. Explanations of Figures 79 and 80 are also wrong and interchanged.

Moitra has correlated the two stromatolite biozones of Chhattisgarh basin with the Vindhyan and Cuddapah Supergroups. He has correlated the Chhattisgarh upper biozone with the Bhandar Group of Vindhyan basin and Tadpatri and Vempalle Formations of Cuddapah Supergroup. The lower biozone has been correlated with Semri Group of Vindhyan Supergroup and lower part of the Cuddapah Supergroup. In figure 81, showing biostratigraphic relationship among various Proterozoic basins, a sizeable part of the Bhandar Group, Khairungh Sandstone of the Chhattisgarh Basin and almost entire Kurnool Group have been dated as Palaeozoic-Cambrian. If his representation is infallible, the Precambrian-Cambrian palaeobiologists will be thrilled to have Cambrian sections in peninsular India.

Like the text, ‘References’ too are plagued with inaccuracies; many of the cited references are missing, others are unfortunately misquoted and no uniform pattern of referencing has been adopted. The ‘Acknowledgement’ has four glaring miss-spells. Some of the mistakes present a hilarious reading as, ‘These features show that wave sections were wrong and high energy conditions prevailed...’ (p. 77). The photo-illustrations are of very poor quality and in almost all the figures it is difficult to make out the features described in the text or legends.

Going through the monograph one cannot help noticing that shoddy production and editorial values have marred this otherwise important study. It is clear from the perusal of the volume that the review of the manuscript, editorial scrutiny and proof-reading have been woefully neglected. This is bound to be frustrating to a discerning reader of the monograph.

Moitra’s magnum opus has belied the expectations of Precambrian palaeobiologists. It appears as if a routine field report submitted in the late 1980s was given the shape of a monograph without making any attempt to update the contents. The manuscript does not seem to have been scrutinized.

It, however, is one of the few comprehensive accounts of the stromatolites published in recent years from India and fulfills a long-standing need for integrated study of stromatolite taxonomy, associated microbiota and biostratigraphy of the Chhattisgarh basin. It brings out stromatolite varieties and microfossils in the basin and hence deserves a place on the bookshelves of Precambrian palaeobiologists. It should have been a welcome addition to the database on Precambrian palaeobiology. Unfortunately, however, the manuscript was already dated before publication.

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