FOSSIL REPORT FROM SEMRI GROUP, LOWER VINDHYAN

Introduction

The 'discovery of Early Cambrian small shelly fossils and brachiopods from Lower Vindhyan of Son valley, central India by Azmi (1998), challenging the conventional views on the Meso-Neoproterozoic Vindhyan lithocolumn has generated a lot of concern and interest among geologists and palaeontologists the world over and many comments have appeared in literature (Science, 3rd October, 1998; 23rd October, 1998; 6th November, 1998; 13th November, 1998 and Azmi, 1999).

Many Indian workers (Ravi Shanker, S. Kumar and D.K. Bhatt), who had an opportunity to examine Azmi's collection and slides, both prior and subsequent to the publication, expressed their difference of opinion in respect to the biogenecity of the so-called fossils and cautioned to check for mineral growth/artefacts as well as to check for the mineral composition of the 'fossils'.

Examination of the reposited material

D.K. Bhatt examined the reported fossils reposited in the Wadia Institute of Himalayan Geology (WIHG), Dehradun. The examination of the material was carried out from 18th to 20th November, 1998, in collaboration with the Director, WIHG and R.J. Azmi.

The so-called inarticulate brachiopod fossils reported from the rocks of Semri Group were found to be devoid of morphological characters of brachiopoda. On the basis of preliminary observations it was quite clear that the tiny, broadly spheroidal objects with protruding apex, seen "sticking" to the bedding surface of a flaggy limestone block, represented forms of algal growth (the material illustrated by scanning electron microscope is latex cast of the original. The original material is free of electrochemical coating necessary for SEM study). One of such objects when partially ground, showed concentrically laminated appearance, confirming its wrong assignment to brachiopoda. Several of these spheroidal looking growths were also observed to be laterally linked with each other, which may have grown simultaneously. Azmi (1999, p.122) subsequently retracted about this find.

The structures illustrated by Azmi (1998, Plate 1, Figs. 1-8 and 12) have also been misconstrued as cone-in-cone structure in some quarters. Closer examination suggested algal growths in the shape of small, rounded bodies possessing high conical to low rounded 'apex', well spread on the bedding surface of a thin limestone block. The 'apex' in each case was directed vertically upwards from the bedding plane. The individual tiny object can be compared with *Chimaera* Vlasov, a type of conophyton (stromatolite) (pers. comm. S. Kumar).

Apart from the so-called inarticulate brachiopods, the other features shown in Plate 1, Figs. 9-11 and 13-28 (Azmi, 1998) are all electrochemically coated for SEM photomicrography and therefore, preclude observations of surfacial features. This circumstance, in turn, led to uncertainty in their identification as small shelly fossils, unless they could be declared to be so merely on general shape and dimensional characters. For observations of surfacial characters, fresh collection from host strata was necessary.

Field observations

We undertook the field visit to Maihar and Rohtasgarh areas between 17th January and 24th January, 1999. The elaborate locational details subsequently provided by Azmi (1999) helped to precisely identify the referred sections and the 'fossiliferous' horizons in the field.

Maihar Section, M.P.: The work in Maihar section, included measurement of sections and

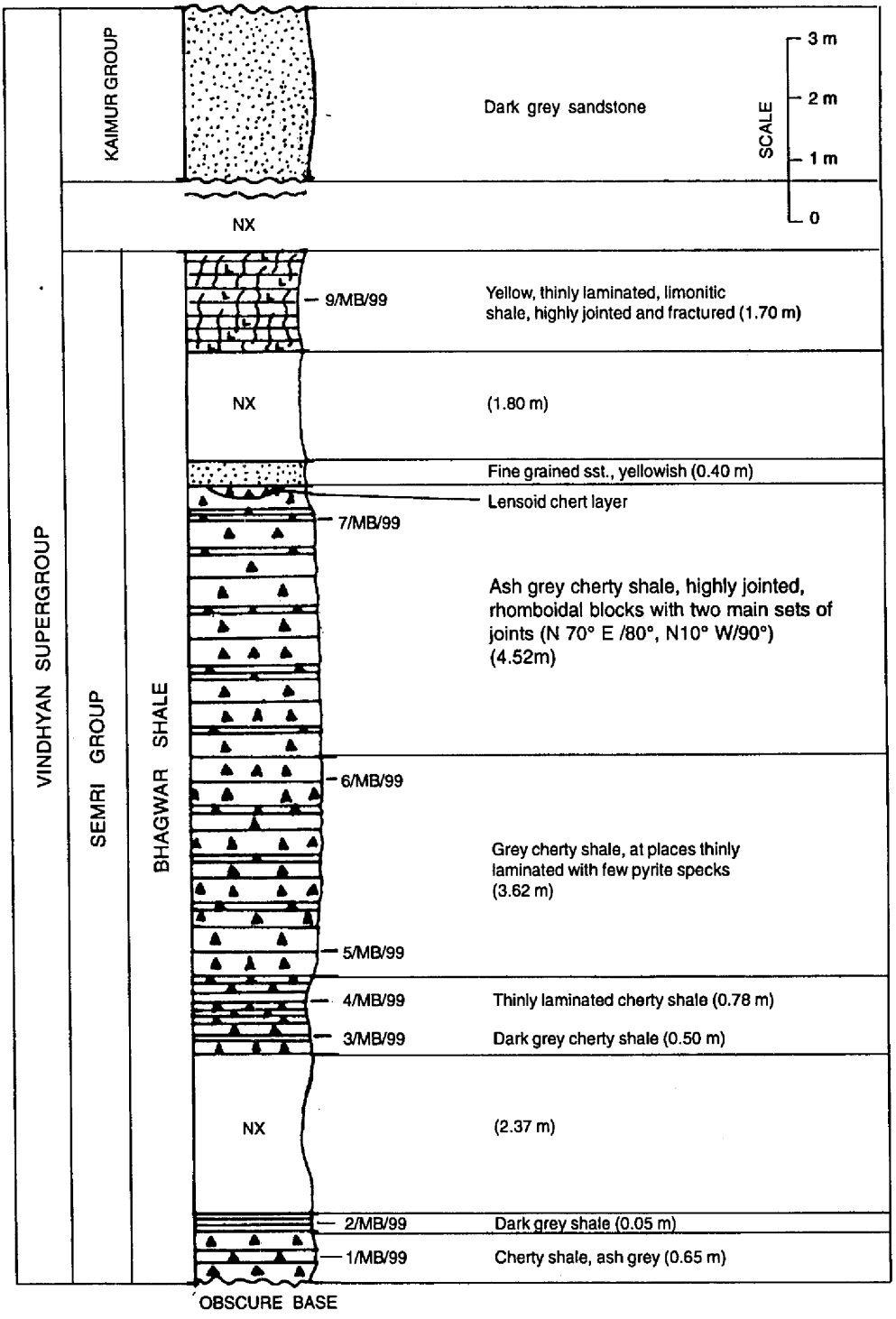

Fig.1. Lithocolumn of the section exposed near Badanpur (Maihar), M.P., referred by Azmi (1999, Fig.3), showing the sample horizons.

collection of samples for laboratory studies (Fig.1). While collecting samples, care was exercised to collect from the 'fossiliferous' horizons mentioned by Azmi (1999). On the basis of detailed field observations, the following conclusions are drawn:

1. The major lithology exposed in the section is grey cherty shale (similar lithology has generally been referred as porcellanite in the literature of Vindhyan stratigraphy). This cherty shale sequence forms part of Bhagwar Shale Formation (Sastry and Moitra, 1984) that overlies the Rohtasgarh Limestone Formation in the regional stratigraphy of Semri Group. No lithology akin to cherty limestone mentioned in Azmi, 1999, Fig.3, is present in the section.
2. No major disruption of the Vindhyan terrain is observed in the area and the possibility of existence of an outlier or faulted block of younger lithounits of Vindhyan is ruled out. The sections are present in normal order of superposition.
3. No evidence of biogenic activity (algal or trace) is observed.

Rohtasgarh Section, Bihar: Ramdihra Limestone Quarry in the Rohtasgarh area (in Bihar) which is the second reported fossiliferous section was also examined. On the basis of traverses in the area and the field observations, the following conclusions can be drawn:

1. Rohtasgarh Limestone sequence (60 m thick) exposed in Ramdihra Limestone Quarry forms two escarpments of roughly 30 m thickness, overlain by prominent shaly horizon (30 m thick) which is capped by Kaimur Sandstone forming the top of the hill (Fig.2).

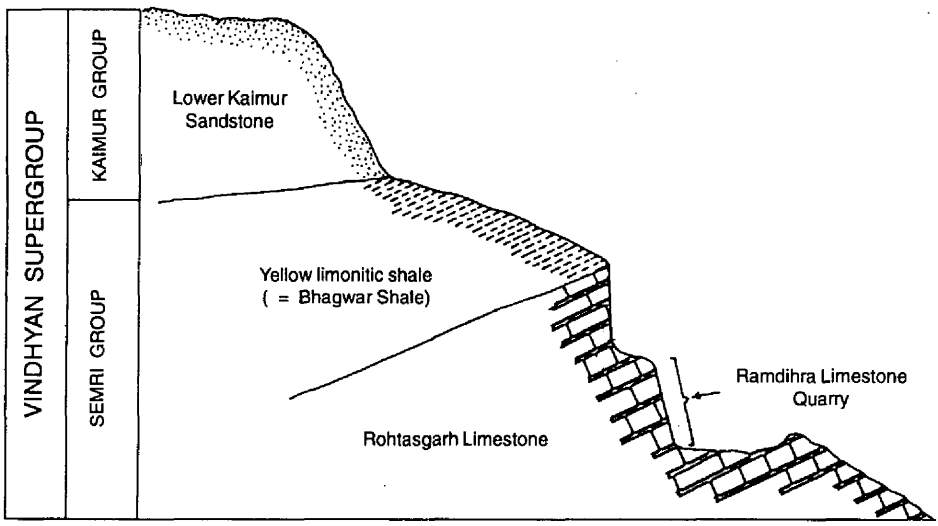

Fig. 2. Regional stratigraphical set-up in Ramdihra Limestone Quarry area.

2. The illustration of Ramdihra Limestone Quarry section given by Azmi (1999, Fig.5) cannot be taken as true, for the quarry is not overlain by Kaimur Sandstone, as shown by him. Apparently, the upper escarpment, which is formed again by Rohtasgarh Limestone but not quarried has been mistakenly taken to be formed by Kaimur Sandstone.
3. Biogenic structures in the form of algal mats, rounded-conical algal bodies and suspected

trace-fossils are observed in profusion on bedding surfaces of shale/flaggy limestone slabs in the quarry.

4. Some of the specimens show mega-scale algal structures and mineral growth structures, which may give the impression of brachiopod fossils on a casual look. Such structures in widely varying dimensions are seen at several levels of the quarry-face.

Comparing the stratigraphic set-up of Maihar area with that of Rohtasgarh, two significant inferences can be drawn:

1. Stratigraphic set-up of Semri Group in Maihar area and Rohtasgarh area appear similar, except that Bhagwar Shale Formation has not been stratigraphically differentiated in Rohtasgarh area. The pale yellow claystone/shale horizon (approx. 30 m thick), overlying the Rohtasgarh Limestone in Ramdihra section (Fig.2), appears stratigraphically equivalent to Bhagwar Shale Formation of Maihar area.

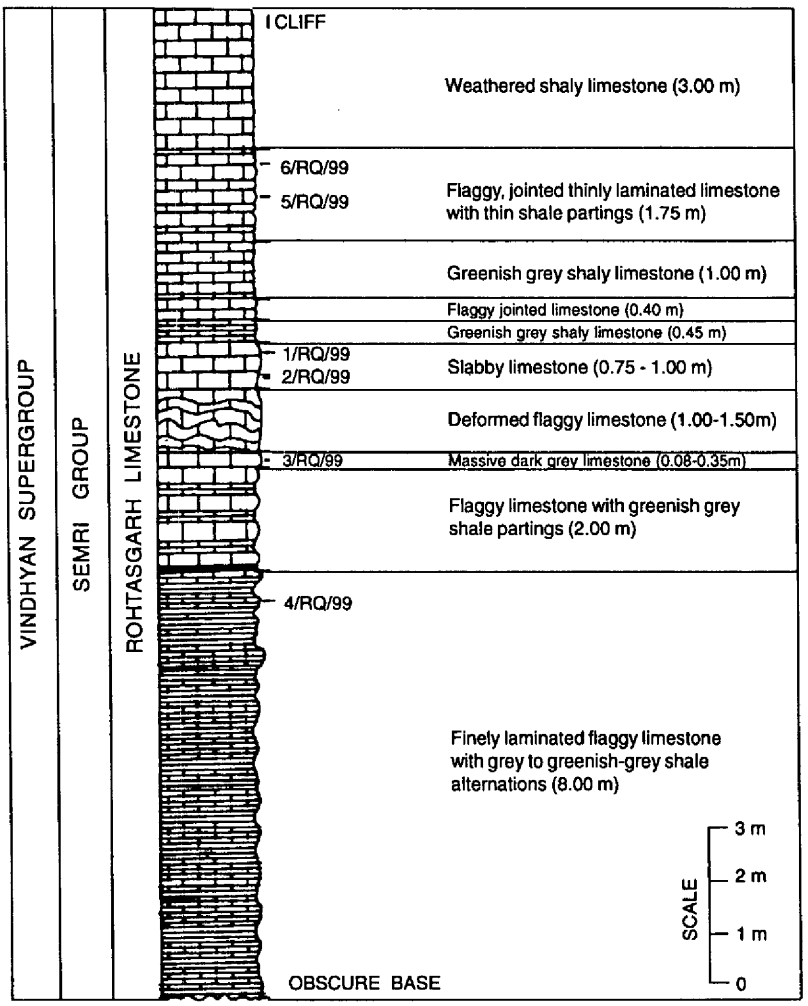

Fig.3. Lithocolumn of the section exposed in the quarry-face at Ramdihra Quarry, Rohtasgarh, Bihar, referred by Azmi (1999, Fig.5), showing the sampled horizons.

2. The 'fossil' horizon coming from Bhagwar Shale in Maihar section lies stratigraphically at least 60 m above the 'fossil' horizon in Ramdihra section, which occurs in Rohtasgarh Limestone. But Azmi (1998) concluded that the fossiliferous horizon at Maihar is older than the one at Ramdihra.

Laboratory investigation of samples

Several samples from the two referred sections were collected (Figs. 1 and 3). These were dissolved in 10% glacial acetic acid and prepared for microscopic examination, following standard procedure.

Two samples from Ramdihra section (Nos. 1/RQ/99 and 2/RQ/99 in Fig.3) exposing Rohtasgarh Limestone and two samples from Maihar section (Nos. 3/MB/99 and 4/MB/99 in Fig.1) exposing Bhagwar Shale, which specifically relate to the fossiliferous levels reported by Azmi (1999, Figs.3 and 5), were paid special attention.

The microscopic examination carried out did not reveal organic remains of any kind in the above samples.

Sample No. 2/RQ/99 (Fig.3) was, however, found to be very rich in a variety of mineral growth structures. The surface features of the specimens under microscope revealed growth structures of fine crystalline matter in massive form (Plates 1 and 2). These abiogenic structures are non-reactive to strong acid. XRD analysis indicates that these mineral growth structures are composed of α-or low-quartz (90%) and impurites (10%). Their dimensional range is widely variable and does not show any proportional consistency as can be expected in case of metazoans. Plates 1 and 2 illustrate the different stages of the most commonly present abiogenic structures. Some of the growth

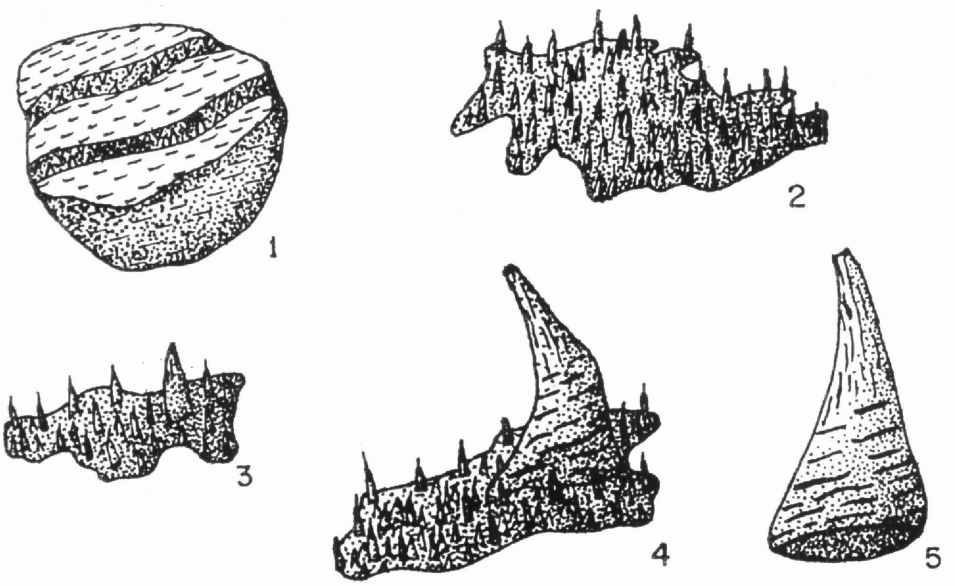

Plate 1. Sketches showing the variety of mineral growth structures recovered from sample No. 2/RQ/99 (fig.3), Rohtasgarh Limestone, Semri Group, Vidhyan Supergroup, in the Ramdihra Limestone Quarry. **Fig.1.** Crystalline quartz in the cracks developed on the surface of a clay-sized dolomite (calcargillite). **Fig2.** Crystalline quartz mass in the form of a thin irregular sheath, showing protuberances largely made up of quartz. **Fig.3.** One of the acicular protuberances growing to bigger size. **Fig.4.** Next stage of the growth, showing concentration of dark-coloured impurities in the lower part of the protuberance. **Fig.5.** A fully grown protuberance in isolation, apparently detached from the quartz crystalline sheath; this may give false impression of organic symmetry.

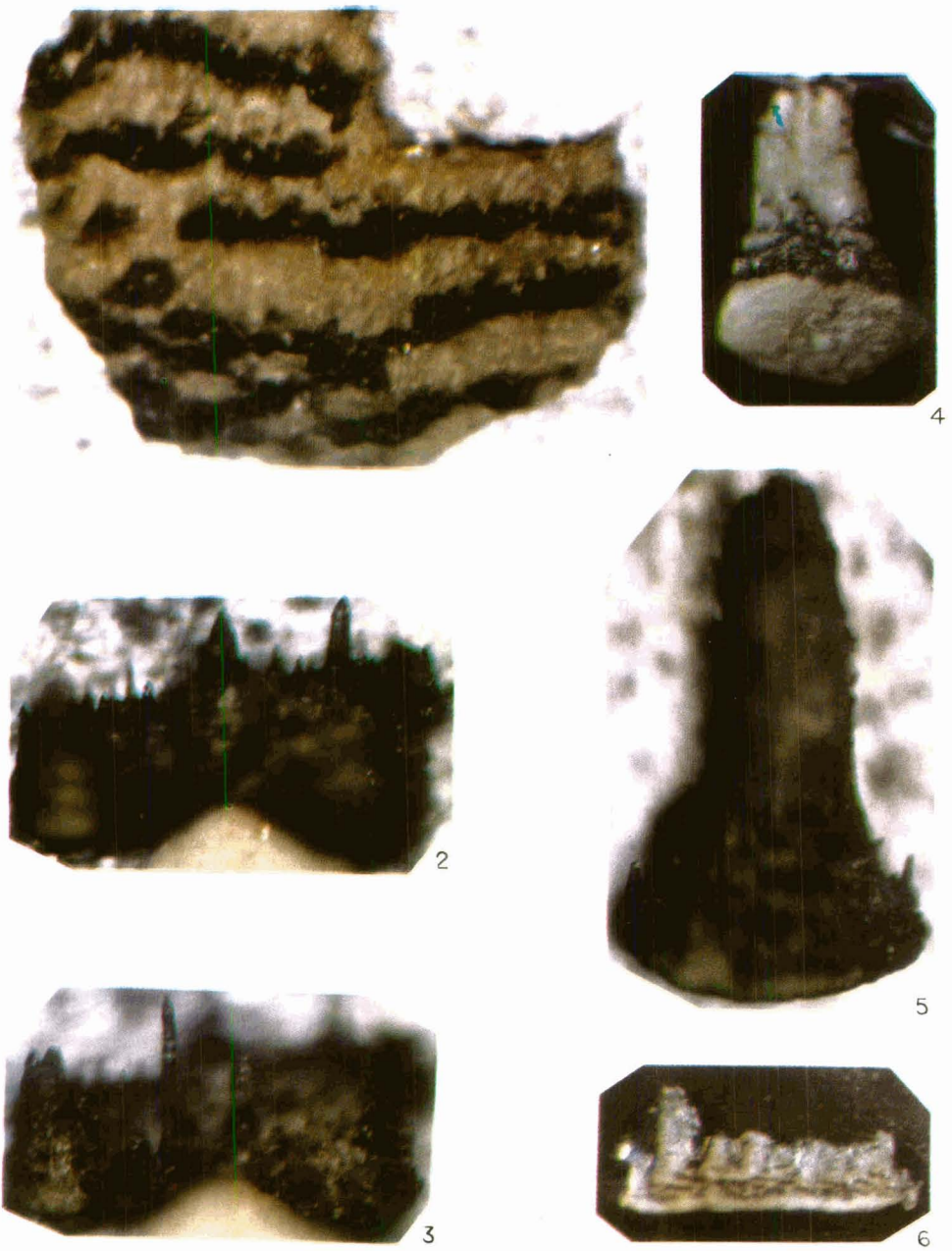

Plate 2. Fig.1. Crystalline quartz growth (with impurity) developed in cracks in fine grained dolomite (calcargillite), x 300. **Fig.2.** Acicular growth of quartz upon a thin, irregular crystalline quartz sheath, x 300. **Fig.3**. Same as 2; one of the acicular protuberance growing relatively large and massive (left foreground), x 300. **Figs.4 and 5.** Isolated protuberance grown to big sizes, detached from composite mass of crystalline quartz sheath with small, secondary acicular growths in the lower part; dark-coloured impurities are concentrated in the basal part. These growth structures may give false impression of organic symmetry; Fig.4 shows the circular basal view of the mineral growth, where light coloured material from the host rock is observed; Fig.4, x18, Fig.5, x 300. **Fig.6.** Another variety of crystalline growth of quartz; this growth element if viewed under SEM (with electrochemically coated surface) may impart a false impression of the Early Triassic conodont *Neospathodus* Mosher, x 18.

structures (Plate 1, Fig. 5; Plate 2, Figs. 4 and 5) resemble in general shape and dimensions to some elements illustrated by Azmi (1998, Plate 1, Figs. 9-11, 25 and 26) as small shelly fossils. But like small shelly fossils neither these structures show a shell wall, lamellar in nature, nor are they composed of either calcium carbonate or calcium phosphate - the most commonly known chemical constituents of small shelly fossils, especially in case of halkieriids and tommotiids.

Conclusions

In light of the field work and subsequent laboratory studies, following conclusions are drawn:

1. The general stratigraphic set-up and lithologs given by Azmi (1998, 1999) are not factually correct and do not match with observations taken by us in field and also do not stand the description given in the literature.
2. The samples collected from the reported horizons and macerated by normal conventional methods from both the localities were found to be devoid of small shelly fossils. Many mineral growth structures from a sample from Rohtasgarh area superficially resemble some elements of small shelly fossils as illustrated by Azmi (1998) and are quite misleading in this regard if viewed simply for their shape and dimensions.
3. The so-called brachiopod fossils from Rohtasgarh Limestone do not show characters of brachiopods.

Acknowledgements: The present study was carried out on the initiative and under the guidance of Dr. S.K. Acharyya, Director General, Geological Survey of India. Shri Ravi Shanker, Senior Deputy Director General, Geological Survey of India, closely monitored the field work and provided logistics and benefit of his counselling in the subsequent laboratory work and presentation of data. Dr. G.L. Dwivedi, Director, Mineral Physics Division, GSI, W.R. analysed the XRD data. Shri R.S. Rajawat, Geologist, GSI, W.R. carried out the photomicrography. Prof. S. Kumar, Lucknow University, was kind in giving his considered opinion on the algal structures collected from Ramdihra material.

References

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