

## RESEARCH NEWS

with that of a far distant (> 500 km) occurring Rohtas limestone and shale of the lower Vindhyan Semri Group (Vindhyan Supergroup) in the peninsular India<sup>3</sup>. Since B-Sf is important evidence for the occurrence of small animal body fossils with hard parts, in the early Cambrian, a re-examination of the age of the sequence in which B-Sf are found to occur is warranted. Surprisingly, isotope geochronological aspect has not yet been properly scrutinized for upholding biostratigraphic correlation. Secondly, it is also aimed to assess whether a generalized concept of explosion of diverse skeletonized taxa at the beginning of the Cambrian age has got any role to play with the recently recognized fossil record of B-Sf. The studies presented here may ultimately help in unfolding the mystery of the evolution of Precambrian life worldwide.

### Focus on geology and geochronology

As B-Sf fossils have generated commotion amongst earth scientists with regard to the age revision of the Vindhyan Supergroup, i.e. from the existing Proterozoic-Cambrian age to terminal Proterozoic-Cambrian, it is first of all necessary to look over the geological and geochronological aspects of the Vindhyan Supergroup (Figure 1) as a whole in order to resolve the sharp discrepancy as mentioned. Geologically, the lower Vindhyan of the Vindhyan

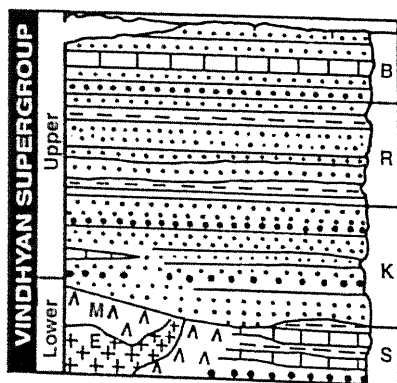


Figure 1. Stratigraphic column<sup>14,19</sup> of more than 4500 m thick Vindhyan Supergroup rocks. S, Semri Group; K, Kaimur Group; R, Rewa Group and B, Bhandar Group. Erinpura granite (E) and Malani volcanics (M) are coeval in origin.

Supergroup is represented by the Semri Group rocks<sup>4</sup> which starts with the basal conglomerate and sequential occurrence of limestone, porcellanite, the Kheinjua formations (shows trace fossils of triploblastic metazoa<sup>2</sup>), olive shale, fawn limestone, glauconitic sandstone and the Rohtas formations (known for containing brachiopods<sup>5</sup>, recently it has shown rich occurrence of B-Sf<sup>3</sup>) alternate layers of shale and limestone of predominantly continental shallow marine environment. The shaly beds of the Rohtas Formation are followed upward by the upper Vindhyan's Kaimur Group (consisting of lower grits, conglomerate, sandstone and breccia and subsequent sandstone, shale, quartzite and intermittent conglomerate), Rewa Group made up of alternating sequences of shale and sandstone, and then the topmost Bhandar Group where the shale-sandstone sequence is punctuated by limestone beds. All these rocks are mostly undeformed and unmetamorphosed, as a result, they are suitable for radiometric dating. A much modified version of Vinogradov and Tugarinov's<sup>6</sup> age data, as given by Kreuzer *et al.*<sup>7</sup>, points to  $1080 \pm 40$  Ma age of the upper Semri Group glauconitic sandstone pertaining to Kheinjua Formation. The age of the overlying Rohtas Formation, on the other hand, is comprehensible by taking into account the intriguing situation arising from an intrusion of  $1067 \pm 31$  Ma old diamondiferous Majhgawan kimberlite pipe (which purports a precise age of emplacement obtained from Rb-Sr analyses of acid leached phlogopite mica from kimberlite rock of Majhgawan area<sup>8</sup>) into the older Semri Group rocks and then partly into some of the younger (~ 890 Ma) (ref. 7) Kaimur Group rocks. As a matter of fact, this geological set-up may provide insight into: (i) the age of the Semri Group rocks as older than about 1067 Ma, and (ii) substantial erosion and denudation of the rocks of the upper Rohtas Formation. Both are dealt below.

The erosion was so severe that the diamondiferous kimberlite, within the Rohtas Formation, remain stand as these withstood erosion. The processes must have operated quite gradually over a considerable span of time, and so we find 'major' unconformity atop the Rohtas Formation. Later, these were one of the sites of subsequent sedimentation

corresponding to the Kaimur Group. Wherever it occurred around parts of the pre-existing kimberlite pipes, a false impression of igneous intrusion into the younger Kaimur beds is likely to be imposed upon. These conditions were possible, since the Semri Group rocks, lying over the old (Paleoproterozoic) Bijawar Group and under the young Kaimur Group, had been present in the nearby areas. Furthermore, the complete absence of deep-seated fundamental fractures (which are necessarily required for the emplacement of kimberlite) and any changes in the structural pattern of the rocks, mainly, from the force exertion due to magmatic intrusion<sup>9</sup> rightly provides impetus to the view offered on sedimentation over and around Majhgawan diatreme. Hence, these assessments maintain significance of the radiometric dating. And it also helps to adduce the minimum possible age of the Rohtas Formation as 1067 Ma, or if not exact, then younger than 1080 Ma, because the underlying Kheinjua Formation rock is of 1080 Ma age. Obviously then, other lower Semri group rocks ought to be older than 1080 Ma age.

The suggested Mesoproterozoic age for the Rohtas Formation is further explicable from K-Ar dating of the lower Kaimur group glauconites ( $940 \pm 30$  to  $910 \pm 30$  Ma with a mean of  $940 \pm 90$  Ma) (ref. 6) which occur above Rohtas Formation of  $\geq 1067$  Ma age. Because both the stratigraphy and geochronology of the upper Semri and the lower Kaimur Groups are in tune with each other, the genuinity of radiometric dating is upheld. As regards to precision, a modified age data of  $890 \pm 40$  Ma, given by Kreuzer *et al.*<sup>7</sup> on the basis of recalculation of Vinogradov and Tugarinov's radiometric data<sup>6</sup>, can be taken into consideration. This radiometric age also seems to justify the relatively younger isotopic age of the middle Kaimur Group rock (~ 725 Ma) (ref. 10) than the age presented here for the lower Kaimur Group. Particularly the age of 725 Ma points to Neoproterozoic age for the middle Kaimur Group. It has been obtained from the lead isotope dating of galenas found at the transition zone of Ghaghar sandstone and Bijaigarh shale, and it indicates the age of both sedimentation and galena mineralization<sup>10</sup>. Because galena lead isotope compositions hardly