# DISCUSSION

## Comment

## 1

(A comment on the paper, "**Ediacaran Medusoids from the Krol Formation, Naini Tal Syncline, Lesser Himalaya**" by V. K. Mathur and Ravi Shanker published in the Journal of the Geological Society of India, Vol. 36, No. 1, 1990, pp. 74-78).

1) The basis for assigning Ediacaran age to the 'medusoid' assemblage from the Krol strata of Naini Tal is not clear. The soft-bodied metazoan fossils, which are long ranging in age, i.e., from deep within Proterozoic to well past Cambrian (Rozanov, 1989), are all not necessarily Ediacaran in age, contrary to what apparently is implied by the authors. The three chief criteria for establishing an Ediacaran age for a given assemblage of soft-bodied animal fossils are: i) its sub-Cambrian level, ii) its position stratigraphically above the younger Proterozoic glacial tillites or iii) geochronologically determined dates in the range of 575-640 m.y. (Glaessner, 1979). None of these criteria are established or even considered by the authors for the level yielding 'medusoids' in the Naini Tal section. They appear to be deriving their age deduction solely from an 'assemblage of soft-bodied metazoan fossils' recorded by them from the same horizon earlier (Mathur and Ravi Shanker, 1989)—this earlier record again lacking an independent basis for an Ediacaran age. Obviously, therefore, the Ediacaran time-tag to the 'medusoids' from Naini Tal is suspect.

2) The discoidal, concentrically ringed impressions, recorded from Proterozoic strata in several parts of the globe are presently rather loosely grouped within 'medusoids' or cnidarian jelly fish remains, although none of these impressions shown diagnostic cnidarian characters (Seilacher, *in* Runnegar, 1989). 'Medusoids' of similar characters as in the Proterozoic are also known from the Early Cambrian of China and perhaps the Late Cambrian of Siberian Platform (Runnegar, 1989). According to Luo Huilin (1989) the Chenjiang Fauna of Meishucunian age (Early Cambrian) is primarily composed of 'medusae'. In case of Krol-Tal succession, which is palaeontologically very close to the Chinese section (Brasier, 1989; Bhatt, 1989), a strong case for Meishucunian age of the 'medusoid'-yielding horizon at Naini Tal can be argued in the absence of evidences of its Ediacaran age, contrary to the presumption of the authors.

3) Bhatt and Mathur (1990) recently recorded small shelly fossils from the same section at Naini Tal. The oldest level up to which these workers recorded the microfossil elements falls at least a hundred meters stratigraphically below the 'Ediacaran medusoids' level of Mathur and Ravi Shanker (1990a). This is palaeontologically anomalous, for nowhere in global context small shelly fossils begin appearing in the geologic column below the level of Ediacaran soft-bodied metazoan fossils (Rozanov, 1989).

Bhatt and Mathur (1990) assigned the shelly fauna from Naini Tal a post-Ediacaran or a tentative Meishucunian age. In this context an earlier statement of

the authors (Mathur and Ravi Shanker, 1990b) that *Ediacaran* soft-bodied animal fossils and *Meishucunian* small shelly fossils can co-exist is chronostratigraphically queer, for it amounts to stating that fenestellid bryozoa of *Permian age* can co-exist with ophiceratid ammonoid of *Triassic age*. On the other hand, however, if the 'medusoid' level at Naini Tal be assigned to Meishucunian, the occurrence of 'medusoid' horizon concurrently within the small shelly fossil yielding Meishucunian interval (Bhatt and Mathur, 1990) is explained chronostratigraphically on Chinese evidence (Runnegar, 1989; Luo Huilin, 1989).

4) The comparison of Nainital 'medusoids' has been mostly attempted with those from Wernecke Mountains, Yukon Territory, Canada (Narbonne and Hofmann, 1987) by the authors without indicating in the text of the paper if these 'medusoids' were also tried to be identified with those nearer home, available from the Chinese section, with which their identity, if present, would be on more rational grounds on palaeogeographical considerations (Brasier, 1989). In this background it is not surprising, therefore, that the specimens from Naini Tal exhibit contrasting variations in dimensions and ornamentation when compared with those from the Canadian material (see Mathur and Ravi Shanker, 1990a). However, for some unknown reason the authors still preferred to group the Naini Tal 'medusoids' under the same zoological nomenclature as their supposed counterparts in the Canadian material.

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**References**

BHATT, D. K. (1989) Small shelly fossils, Tommotian and Meishucunian Stages and the Precambrian-Cambrian boundary – implications of the recent studies in the Himalayan sequences. Journal Palaeontological Society of India, v. 34, pp. 55-68.

BHATT, D. K. and MATHUR, A. K. (1990) Small shelly fossils of Precambrian-Cambrian boundary beds from the Krol-Tal succession in the Nainital Syncline, Lesser Himalaya. Current Science, v. 59, no. 4, pp. 218-222.

BRASIER, M. D. (1989) China and the Palaeotethyan Belt (India, Iran, Pakistan, Kazakhstan and Mongolia). *In:* J. W. Cowie and M. D. Brasier (eds.). The Precambrian-Cambrian boundary. Clarendon Press, Oxford, pp. 40-74.

GLAESSNER, M. F. (1979) Precambrian. *In:* R. A. Robinson and C. Teichert (eds.). Treatise in Invertebrate Paleontology. Geol. Soc. Amer. and Univ. Kansas Press, Lawrence, Kansas, Pt. A, pp. 79-118.

LUO HUILIN (1989) Biological events from Late Precambrian to Early Cambrian and discussion of Precambrian-Cambrian boundary in China. Abstract, 28th IGC, Washington, D. C., U.S.A., pp. 2-336—2-337.

MATHUR, V. K. and RAVI SHANKER (1989) First record of Ediacaran fossil elements from the Krol Formation, Naini Tal Syncline. Jour. Geol. Soc. India, v. 34, no. 3, pp. 245-254.

—— (1990a) Ediacaran medusoids from the Korl Formation, Naini Tal Syncline, Lesser Himalaya. Jour. Geol. Soc. India, v. 36, no. 1, pp. 74-78.

—— (1990b) Reply to the comment on the paper 'First record of Ediacaran fossil elements from the Krol Formation, Naini Tal Syncline. Jour. Geol. Soc. India, v. 34, no. 3, pp. 245-254; 1989' by Bhatt, D. K. and Mathur, A. K., Jour. Geol. Soc. India, v. 35, no. 1, pp. 119-121.

NARBONNE, G. M. and Hofmann, H. J. (1987) Ediacaran biota of the Wernecke Mountains, Yukon, Canada. Palaeontology, v. 30, pt. 4, pp. 647-676.

ROZANOV, A. YU. (1989) Figure 1. Abstract, 28th IGC, Washington, D. C., U.S.A. pp. 2-728.

RUNNEGAR, B. (1989) Proterozoic evolution of metazoa. Abstract, 28th IGC, Washington, D.C., U.S.A., pp. 2-733—2-734.

## Reply

Bhatt has missed the central theme of our findings, which is the record of certain soft bodied metazoans found in the uppermost part of the Naini Tal sequence. Our systematic and sustained lithostratigraphic work in the Krol belt sequence between Solan and Naini Tal has convinced us that the beds from which the fossils have been found in Naini Tal underlie the Chert Member of the Lower Tal Formation from which the diagnostic fossil of Meishucunian Zone I has been found and, therefore, the Naini Tal fauna belongs to the same period in which the Ediacaran fauna has been found elsewhere. We have already commented on the stratigraphic position of the beds yielding small shelly fauna described by Bhatt from the Naini Tal area (Bhatt and Mathur, 1990), Bhatt's Naini Tal fauna is not equivalent to the fauna recovered from the Maldeota area in Mussoorie syncline as claimed by him and also the equivalent fauna in the Garhwal syncline (Kumar *et al.* 1987) for it does not contain diagnostic assemblage. Bhatt in his comments has suggested that we should have tried correlation with the fauna from China rather than far off Canada and Australia. Bhatt has relied only on the abstracts of Luo Huilin, Runnegar and Rozanov distributed during 28th International Geological Congress held at Washington D.C. We have gone through these abstracts and feel that unless the full papers are available along with photographs of the fauna discussed in these abstracts, it would be premature to make any comparison or comments based only on abstracts.

Following are our replies to the specific points made out by Bhatt.

1. Authors do agree that all soft bodied metazoans are not necessarily Ediacaran (Upper Proterozoic) in age. They recorded Upper Proterozoic Ediacaran fossils (1989, 1990 and Mss.) from the upper part of the Krol Formation in the Naini Tal Syncline of the Krol Belt, which is overlain by the Tal Formation yielding Lower Cambrian fossils in the western part of the Krol Belt. Tal Formation is not exposed in the Naini Tal Syncline on the basis of detailed lithostratigraphic analysis (Ravi Shanker *et al.* 1972, 1975 Mss. and Ravi Shanker, 1989). Krol Formation is underlain by the Infra-Krol and Blaini Formations yielding Precambrian microbiota. (Acharyya *et al.* 1989, Dhaundiyal and Moitra, 1987 and Joshi *et al.* 1988). Of course, Blaini– Infra Krol – Krol – Tal succession is not geochronologically dated so far.

2. Medusoids viz. *Tirasiana* sp., *Medusinites* sp. and *Beltanella* sp. and *Sekwia* sp. (Mathur and Shanker, 1990; Shanker and Mathur Mss.) are members of Ediacaran fossil assemblage of Upper Proterozoic age. Their identification is based on morphological characters observed in wide variety of specimens.

3. Since the small shelly fossils from the horizon physically underlying the Ediacaran fossil horizon in the Naini Tal Syncline (Bhatt and Mathur, 1990) does not contain diagnostic assemblage, comprising *Anabarites, Protohertzine* and *Circotheca* of Meishucunian Zone I, this horizon cannot be considered as belonging to Meishucunian Zone I (Xing *et al.* 1984, Bhatt *et al.* 1985 and Kumar *et al.* 1987). However, the form recorded as *Coleoloides* typicalis does not show any diagnostic characters. It simply appears to be tubular form which appears in upper Vendian or Sinian sequences (Cloud and Glaessner, 1982; Luo Huilin, 1989). Moreover, small shelly fossils *(Anabarites and Cribricyathids)* do appear in Upper Proterozoic times and co-exist/reported with Ediacaran soft bodied metazoans (Cloud and Glaessner, 1982; Sokolov and Fedonkin, 1984; Germs, 1972).

4. Medusoids recorded from the Krol Formation of Naini Tal Syncline (Mathur and Ravi Shanker, 1990) are not recorded from the Chinese section so far. However, Cyclomedusa recorded by Xing and Liu, 1979 from Wuhangshan Group of late Precambrian, Liadong

Peninsula, China, might be soft sand deformation structures or probably trace fossil like Monocraterion (Chen Meng'e, 1984 in Sun, 1986). Ediacaran biota reported from the Naini Tal Syncline (Mathur and Ravi Shanker, 1989; 1990 Shanker and Mathur Mss.) is similar to Ediacaran biota of NW Canada, Australia and Russian Platform.

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**References**

ACHARYYA, S. K., RAHA, P. K., DAS, D. P., MOITRA, A. K., SHUKLA, M. and BANSAL, R. (1989) Late Proterozoic microbiota from the Infra Krol rocks from Naini Tal Synform, Kumaon Himalaya. Indian Jour. Geol., v. 61, no.3, pp. 137-147.

BHATT, D. K., MAMGAIN, V. D. and MISRA, R. S. (1985) Small shelly fossils of Early Cambrian (Tommotian) age from Chert Phosphorite Member, Tal Formation, Mussoorie Syncline (Lesser Himalaya), India and their chronostratigraphic evaluation. Jour. Paleont. Soc. India, v. 30, pp. 92-102.

BHATT, D. K. and MATHUR, A. K. (1990) Small shelly fossils of Precambrian-Cambrian boundary beds from the Krol-Tal succession in the Naini Tal Syncline, Lesser Himalaya. Curr. Sci., v. 59, no. 4, pp. 219-223.

CLOUD, P. and GLAESSNER, M. F. (1982) The Ediacaran Period and system; Metazoa inherit the earth. Science, v. 217, pp. 783-792.

DHAUNDIYAL, J. N. and MOITRA, A. K. (1987) Precambrian Acritarch from Blaini Formation, Garhwal Syncline, Uttar Pradesh. Indian Minerals, v. 41, no. 1, pp. 69-74.

GERMS, G. J. B. (1972) Trace fossils from the Noma Group, Southwest Africa. Jour. Palaeont., v. 46, pp. 864-870.

JOSHI, A., MATHUR, V. K. and KUMAR, G. (1988) First record of Precambrian Microbiota from the Blaini Formation, Mussoorie area, Lesser Himalaya, U.P., India. Geophytology, v. 18, no. 1, pp. 116-120.

KUMAR, G., BHATT, D. K. and RAINA, B. K. (1987) Skeletal microfauna of Meishucunian and Qiongzhusian (Precambrian-Cambrian boundary) age from the Ganga Valley, Lesser Himalaya, India. Geol. Mag., v. 124, no. 2, pp. 167-171.

LUO HUILIN, (1989) Biological events from Late Precambrian to Early Cambrian and division of Precambrian-Cambrian boundary in China (Abstract), 28th I.G.C., Washington, D.C., U.S.A.

MATHUR, V. K. and RAVI SHANKER (1989) First record of Ediacaran fossils from the Krol Formation of Naini Tal Syncline. Jour. Geol. Soc. India, v. 34 Sept. 1989, pp. 245-254.

—— (1990) Ediacaran medusoids from the Krol Formation, Naini Tal Syncline, Lesser Himalaya. Jour. Geol. Soc. India, v. 36, no. 1, pp. 74-78.

NABBONNE GUY, M. and HOFMANN, H. J. (1987) Ediacaran Biota of the Wernecke Mountains, Yukon, Canada. Palaeontology, v. 30, pt. 4, pp. 647-676.

RAVI SHANKER (1989) The Mussoorie Phosphate Basin, India. *In:* Northolt and Sheldon (ed.). World's Phosphate Resources, C. U, Press, pp. 443-448.

RAVI SHANKER, GANESA, T. M. and DHAUNDIYAL, J. N. (1972) Stratigraphic analysis of Krol. Tal basin in Tehri, Puri and Naini Tal districts, U.P. Geol. Surv. India Progress Report, Field Season 1970-71 (unpublished).

RAVI SHANKER and MATHUR, V. K. (MSS) (1990) The Precambrian-Cambrian sequence in Krol Belt and Ediacaran fossils (Extended abstract) Workshop on 'The Precambrian-Cambrian boundary with special reference to Ediacaran fauna'.

RAVI SHANKER, PRAKASH, G. and DHAUNDIYAL, J. N. (1975) Report on the stratigraphic analysis of Krol-Tal Basin in Pauri. Tehri, Dehradun districts, U.P. and Sirmur, Mahasu and Simla districts, H.P. (1971-72), Geol. Surv. India (unpublished).

ROZANOV, A. Y. (1989) Evolution of biosphere and skeletonization (Abstract), 28th I.G.C., Washington, D.C., U.S.A.

RUNNEGAR, E. (1989) Proterozoic evolution of metazoa (Abstract), 28th I.G.C., Washington, D.C., U.S.A.

SOKOLOV, B. S. and FEDONKIN, M. A. (1984) The Vendian as the Terminal System of the Precambrian. Episodes, v. 7, no. 1, pp. 12-19.

SUN, W. (1986) Precambrian medusoids: The *Cyclomedusa Plexus* and *Cyclomedusa*-like pseudofossils. Precambrian Research, v. 31, pp. 325-360.

XING, YUSHENG and LIU, GUIZHI (1979) Coelenterate fossils from the Sinian System of southern Liaoning and its stratigraphical significance. Acta. Geol. Sin., v. 53, pp. 167-172.

XING, YUSHENG, DING QIXIU, LUO HUILIN, H. C., HE TINGGUI and WANG YANGENG (1984) The Sinian-Cambrian boundary of China and its related problems. Geological Magazine, v. 121, pp. 155-170.

## Comment

## 2

(A comment on the paper, **Geomorphotectonics of the Basement in a part of Upper Son Valley of the Vindhyan Basin,** by L. K. Das, D. C. Mishra, D. Ghosh and B. Banerjee. Published in the Journal of the Geological Society of India, Vol. 35, No. 5, 1990, pp. 445-458).

A recent paper by Das *et al.* (1990) discusses primarily the magnetic field of the eastern part of the Vindhyan Basin in terms of subsurface geological structures. They have, indeed, provided new data set for a geologically important region. Their main conclusion is that linear anomaly pattern results from the subsurface relief of the Vindhyan basement which is mainly composed of the Mahakoshal Group.

Our main concern stems from the fact that the authors have failed to acknowledge our work in the region. The gravity data referred to in their paper were largely collected by us and reported in Qureshy and Warsi (1975, 1978). We identified a 1100 km long but narrow zone of gravity highs extending from Ratlam to Patna traversing mostly low density rocks exposed at the surface. Furthermore we focussed on the region of eastern Vindhyan Basin and suggested that the linear gravity highs were possibly caused by the Bijawars (Qureshy and Warsi, 1975; p. 50). Our inference of subsurface thickening of the Bijawars was based on the gravity as well as limited magnetic data available at the time. We wish to bring this to the attention of the authors and readers of the Journal.

Additionally, we would also like to point out that Das *et al.* (1990) have very liberally used magnetic gradients to interpret presence of faults throughout their study area. Could it be possible that some represent non-fault contacts? They have also inferred the 'middle layer' with resistivity values of 100-200 Ohm.m to represent volcanogenic sediments. No corroborating geological and geophysical evidence has been presented by them.

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