DISCUSSION

This section is intended to provide a forum for the discussion of papers published in our Journal by those working in similar fields of investigation and research. Such a discussion is expected to be of value not only to the actual workers in the concerned field, but also to a wider circle of readers interested in the progress of geological studies.—Editor.

Paper on 'RADIOACTIVE LIMONITE OF LOTA PAHAR, SINGHBHUM DIST., BIHAR' by V. Subramanyan, published in the Journal of the Geological Society of India, (Vol. 13, No. 4, pp. 329-338, 1972).

Comments by A. K. Banerji and D. Mukherjee, (Geology Department, Presidency College, Calcutta).

We had occasion to map the geology of the area around Lota Pahar recently in some detail and our observations differ significantly from those of the author of the above mentioned paper.

So far as the local geology is concerned, the shale-phyllite of the Iron ore stage occurs to the south of the Lota Pahar fault while the Chakradharpur granite gneiss occurs to its north. The fault itself is really one of several shear planes developed during the evolution of the Singhbhum shear zone which is rather wide in the Lota Pahar region, and within which the Chakradharpur granite gneiss is emplaced as a syn-tectonic intrusive body (Banerji, 1969). Several patches of shale-phyllite, chlorite schists, quartzite etc occur to the north of the fault as lenticular roof pendants above the granite gneiss. The so called breccia along the fault zone is actually a sheared polymictic conglomerate which has been impregnated with granitic material. In view of the above, the idealised section shown in Fig. 2 of the paper needs revision. It is doubtful whether isoclinal folds with steeply dipping axial planes could be constructed north of the Lota Pahar fault where shale-phyllite occur only as isolated lenses.

Regarding uranium mineralisation, we would like the author to verify whether the observed cavities are always cubic. We have seen cavities of various shapes and sizes in the area. The suggestion that the cavities are after original pyrite should be carefully investigated. We would like to point out that there are abundant occurrences of apatite-magnetite detritals on the northern and south-eastern slopes of Lota Pahar indicating occurrence of apatite-magnetite veins in the area. In fact we were told that some A.M.D. drills in the area had actually intersected apatite-magnetite veins. It is common knowledge that uranium mineralisation is closely associated with apatite-magnetite and copper sulphide mineralisation in the eastern and central parts of the shear zone (Banerji, *et al*, 1972). We would like the author to consider whether the uranium mineralisation described by him is not of the same type, and whether the limonite reported by him is not really after magnetite. Uraniferous magnetite has been reported previously from the shear zone (Karkhanavala, 1958). Perhaps the transported limonite mentioned by the author represents detrital pieces from the weathered and oxidised outcrops of apatite-magnetite veins.

Finally we would like to point out that uranium mineralisation in the western part of the shear zone is possibly genetically related to the Chakradharpur granite gneiss as it is to the soda-granite in the eastern part.

REFERENCES

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Author's reply

1 It is gratifying to note that some recent work has been done in the Lota Pahar area. I worked there during the field season of 1960 and for various reasons could not publish my findings so far. Incidentally, the paper by Banerji *et al* appeared in print well after I submitted the manuscript of my paper and hence could not be cited and discussed.

2 The Chakradharpur granite-gneiss occurs unmistakably to the north of the range as shown in my map (Fig. 1). The small body of intrusive granite shown in my idealized section (Fig. 2) is not the main Chakradharpur granite-gneiss. It is in fact a small band of granite which I remember to have observed on the southern slopes of the range at its eastern end; this was not of mappable dimensions on the 1" scale and so was hypothetically shown, only in the section, with a question-mark. Possibly, my wording in the paper was not sufficiently clear.

3 Fig. 2, as mentioned in the paper, is only an 'idealized' section and as such represents just one of the possibilities—the one which appealed to me as the more likely. It is also applicable only to the col. in the range and does not include areas far to the north of it. Anticlinal crestal regions are admittedly tensional zones and isoclinally overturned anticlines represent a step further. Considering the degree of shattering the ferruginous quartzites have undergone at the top of the ridge to the east, the steep dips suggest to me only an isoclinal fold at this place.

4 As for the cavities in the limonite, they were unmistakably cubic invariably, but of different sizes from 0.1 inch cube to 1 inch cube. A similar observation was made by Shri K. Venkataraman and my other colleagues in the Atomic Minerals Division (Personal communication). One of my specimens of limonite is kept at the Museum of the A.M.D., D.A.E., Eastern Circle, New Alipore, Calcutta. The ferruginous shales of the locality are peppered with crystals of pyrite, big and small, and so the origin of the limonite is a straight-forward affair.

5 While, as pointed out by Banerji and Mukherjee, it is true that magnetite veins do occur in the Lota Pahar area, as elsewhere in the shear zone, the magnetite specks would not have been sufficient to give rise to the huge quantity of limonite that was seen and sampled there in 1960. The traces of limonite, if any, left over in the area today are not likely to reveal the true story.

6 However, I agree with the first part of the authors' theory that the uranium mineralization is closely associated with apatite-magnetite and copper sulphide

mineralization. I have, in fact, drawn attention to this in my paper while referring to the paragenetic sequence established by Dar (1964) which reads: 'apatite (with some tourmaline) and magnetite—prolonged biotitisation and chloritisation of rocks—uraninite—period of quiescence—pyrite, pyrrhotite and nickel sulphides—chalcopyrite and carbonates'. Uranium has obviously formed after apatite-magnetite, but, being mobile (as it is known to be) has migrated subsequently and got fixed in the limonite.

REFERENCE

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