Is River Ghaggar, Saraswati?

Jayant Tripathi and others[1] purport to show on the basis of isotopic analysis of samples collected from Ghaggar that the study indicated that the river was an ephemeral stream with no connection to Saraswati, which the authors continue to call mythical, and its sediments did not show features characteristic of material derived from the high Himalaya.

The evolution of Himalayan drainage is a very complicated study. So many diversions, reversals and river captures have taken place. Even the mighty Sindhu and Brahmaputra originating in high Tibetan plateau once flowed – Sindhu to the west and the Brahmaputra to the east. It was only their drainage which was captured by younger north-south flowing streams eroding headward and diverted their flow southward to join the Arabian sea and the Bengal Basin.

River Saraswati is also a major river flowing south from the high Himalaya. The entire north Gujarat and Western Rajasthan beneath the Thar desert is made up of delta of this mighty river. The present day rivers like Ghaggar, Mahi and Luni could not have built up this vast delta. Major contribution of sediments to the delta was from river Saraswati. Pleistocene glaciation ended 10,000 years ago. The end of aridity resulting in the break-up of glaciers and release of waters to *Sapta Sindhu* – the mighty Himalayan rivers started flowing westward and southward. Saraswati emerged as a major river of NW India since the date. The delta built up by the river is no less significant than the Sindhu (Indus fan) or the Ganga–Brahmaputra (Bengal fan) delta.

The land over which the Indus and its group of rivers flow is at higher elevation as compared to the plains of easterly flowing Ganga and its tributaries. In such a situation the tendency for rivers flowing at a lower elevation like the Yamuna is to erode headward and capture the flow of the rivers belonging to the Indus basin flowing westward. River Jamuna is a classic example of such capture: Eroding headwards it has captured and diverted the headwaters of the Saraswati around 3000 BC. Bereft of the perennial supply of water from Himalayan glaciers, flow started dwindling and Saraswati dried up by 2000 BC. The supply of water and with it sediments from the high Himalaya ceased long ago. Ghaggar is a poor representation of the mighty Saraswati of the past draining just the outermost Siwalik hills. Samples collected from Ghaggar of the present day obviously could not have shown glaciogenic character. Without fully appreciating the drainage history of Himalyan rivers it would be incorrect to come to a conclusion, casting doubts on the volume of geological and geomorphological evidence pointing to the high Himalaya as the source of the Saraswati, and explained convincingly by Oldham and others from 1893 down to the present day.

If the authors have to prove that Saraswati was not a Himalayan river, they must collect sediments from deeper levels making sure that they are older than 3000 years BC and then take them up for their isotopic studies. Systematic sedimentological studies of samples obtained from deep cores would contribute more valuable information than surface samples. On the basis of present isotopic work on samples collected from surface and close to Siwalik which has obviously supplied the bulk of the sediment it would not be correct to conclude that the mighty Saraswati did not have a Himalayan source.

1. Tripathi, J. K. *et al.*, *Curr. Sci.*, 2004, **87**, 1141–1145.

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Reply:

We thank B. P. Radhakrishna for having read our paper[1] and for having expressed his concern on our suggestion that the present day Ghaggar river could not be the Vedic Saraswati as described in the literature. Our suggestion and Radhakrishna's comments on this, should both provide the necessary impetus to the study of Indian rivers for their geological and historical evolution. We delightfully record here that our present research endeavours on Indian rivers are actually the wish of Radhakrishna as expressed at the meeting in 2002, at Banaras Hindu University. In more ways than one we are indebted to him for his timely advice as well as for his constructive criticisms. In the present context of our paper[1], and Radhakrishna's comments on it, we would like to include the following available geological information in support of our suggestion.

Our sediment samples, which are both *in situ* and reworked, include river alluvium and aeolian sediments, collected up to a depth of 9 m and also dust from the Thar Desert, all with the depositional age ranging from 20,000 years to the Present[1]. These sediments were largely derived from Sub-Himalayan lithologies as indicated by our data[1]. It is possible that the sediments underlying those studied here could have been derived from any other source including the glaciated High Himalayas. These deep-seated sediments could be likely older than 20,000 years, i.e. much older than the Harappan Civilization (4,000 to 5,500 years BP). Further if these deeper sediments underlying Thar Desert represent deltaic facies of the extinct rivers, then the sediments could be even older than 125,000 years as this was the time of the maximum strandline in the western part of India[2,3]. Again this inferred age of deposition of sediments is not relevant to the Harappan Civilization or probably to any river valley civilization. However, in order to further constrain the sources to the sediments of the Thar region we need to undertake a very detailed geochemcial study of these sediments.

1. Tripathi, J. K., Bock, B., Rajamani, V. and Eisenhauer, A., *Curr. Sci.*, 2004, **87**, 1141–1145.
2. Chamyal, L. S., Maurya, D. M. and Rachna, R., *Quat. Int.*, 2003, **104**, 69–86.
3. Jain, M., Tandon, S. K. and Bhatt, S. C., *Proc. Indian Acad. Sci.*, 2004, **113**, 453–471.

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