

Saraswati: The River that Disappeared.

K. S. Valdiya. Universities Press, 3-5-819, Hyderguda, Hyderabad 500 029. 2002. 116 pp. Price: Rs 175.

The book under review testifies yet again the fact to the unflagging interest of the Indian populace in general, in the 'mystic river' extolled in superlative terms in the *Rigveda*. This is the second important publication on the subject in recent years. The earlier one, *Vedic Saraswati* (Geological Society of India, Bangalore) was a multi-authored volume with contributions from eminent workers in different interdisciplinary fields of classic literatures, history, archaeology and earth sciences. This latest book on the Saraswati is a 'proud' publication of the Indian Space Research Organization (ISRO). The ISRO truly deserves credit for the fact that the discoveries of the segments of buried palaeo-channels in the Thar Desert region was possible only through the conscientious studies of the false coloured satellite imageries taken by the organization. Another very satisfying point for ISRO is that it was also the remote sense data generated by the organization, which boosted the findings of a series of 'trunk-less' palaeo-delta complexes in the Rann of Kachchh region of northern Gujarat. Besides these discoveries of buried palaeo-channels and the palaeo-delta complexes based on the remote sense data, two other geological features helped in corroborating the presence of a well-drained fluvial regime in western Rajasthan. These are (i) the invariable occurrence of river-laid deposits underlying all the saline lakes in Rajasthan, and (ii) the presence of isolated patches of pebble-cobble spreads amidst the sandy desert terrain of western Rajasthan (Roy, A. B. and Jakhar, S. R., *Curr. Sci.*, 2001, **81**, 1188–1195). All these very explicit geological evidences firmly establish the fact about the existence of a mighty Himalayan river in the Thar Desert region of western Rajasthan. The geological description of this prodigious river system matches well in all aspects with the Saraswati River, which finds so vivid a portrayal in the Rig Vedic hymns.

The recent geomorphologic and geological studies in northern Gujarat and western Rajasthan have thus greatly helped in lifting the veil of uncertainties over the existence of the Vedic river, so

much so that the Rigvedic hymns on the Saraswati can no longer be considered as a legendary tale of a mythical river. It is, therefore, natural that any new publication on the Saraswati would call up high expectations amongst readers who may look forward to having new information on the cause of migration and ultimate extinction of the mighty Himalayan river. An inquisitive reader may also like to assess the scientific value of any new writings against the backdrop of the recent discoveries.

The book by K. S. Valdiya is a monograph published under the 'Popular Science' series of the ISRO. There can hardly be any misgiving about the possible popularity of the book because of the obsessive eagerness of some people to hear anything and everything about the Vedic river. The other factors which will help in the popularity of the book, are the simple and lucid language, wonderful illustrations, smart printing qualities and the low price tag. The addition of a glossary at the end of the text will also prove advantageous for the common readers who may not have the necessary background knowledge of the geological terms used by the author. All these apart, a reader, however, might have serious reservations about the scientific value of this book, which hinges more on the cultural aspects and the lifestyles of the Harappan people, rather than on the precise geological/geomorphological changes in the region that caused the migration and the extinction of the mighty Himalayan river. The weakest link of the present book is the uncritical acceptance of the 'popular' view regarding the location of the Vedic Saraswati. It is now well known that R. D. Oldham was one of the earliest to be on the trail of the Vedic river after he read Max Müller's translation of the *Rigveda* (*J. Asiat. Soc. Bengal*, 1886, **55**, 322–343). When he came across a small rain-fed stream called 'Sarsuti' in the northern reaches of the River Ghaggar, he thought that it could be the remnant stream of the Vedic Saraswati. The name presumably suffered distortion with the passage of time. More than the uncritical acceptance of Oldham's assumption on the remnant of the Vedic Saraswati, the findings of a very large number of Harappan cultural sites around the dry channels of the Ghaggar–Hakra–Nara seem to have greatly influenced the author's highly flavoured viewpoint. Apparently, it is

this strong conviction, which seems to have constrained the author to accept the dry and rain-fed river basin as *the channel* of the river referred to in the *Rigveda* without any reservation. The recognition of the Ghaggar–Hakra–Nara channel as that of the Vedic Saraswati by the author, like many others, is clearly based on the firm belief that the Harappan and the Vedic cultures were not only contemporary but also identical. In fact, in the entire book beginning from the page one, the author used the names, Saraswati (the Vedic river) and Ghaggar (the dry channel of a rain-fed river), quite synonymously. This uncritical acceptance of the 'popular view' to say the least, not only is questionable but also has pinched much of the charm out of the book. Even the title of the book may help raising eyebrows of some sceptic readers who may know about a number of rivers by the same name. Surprisingly, all of these rivers seem to have disappeared from the present-day scenario. It may be worth specifically mentioning about the presently non-existent Saraswati River at the Triveni Sangam near Allahabad. There are other 'Trivenis' in our country with one missing river bearing the name Saraswati. Certainly, the author is not talking about these missing rivers!

The debate on the relative antiquity of the Vedic and the Harappan cultures is important as it is the only way, in absence of any other scientific means, to find out the age of events relating to migration and final extinction of the Vedic Saraswati. It may sound curious that all the geological and geomorphologic evidences about the mighty Himalayan river come from western Rajasthan and northern Gujarat. In this context, it will be too naïve to assume that the entire history of the mighty Himalayan river in Rajasthan as implied in the book, is only a part of pre-Vedic proto-history. That the author preferred to remain elusive on the issue is clear from his remark (p. 83): 'In my humble opinion, the proximity in space and time of Dwarka and Prabhas of the *Mahabharata* with the Harappan port cities of Dholavira and Lothal has a great bearing on the relationship between Harappan and Vedic cultures.' There is hardly any doubt that the statement of the author would leave a 'not-so-informed' reader totally nonplussed on the possible link between the destruction of the Harappan cultural sites in the Gujarat region with the extinction of the Himalayan

river that flowed through in the Thar Desert region in the north.

The author makes a brief discussion on the tectonic movements that shook the region west of the Aravalli Mountains possibly during the last 10,000 years. Nonetheless, virtually no attempt was made to relate these movements with the actual process of migration and extinction of the Vedic river. The statement that the shifting of the river course took place over the past 1.5 million years, has no scientific basis. He mentions about the river Lavanavati (Luni), but did not consider the fallacy in the name of the river. No flowing river can have saline water. On the other hand, we might say that it was only because of the withdrawal of the water from the channel, the riverbed turned into pools of saline water. Water flows through the present Luni 'channel' only during heavy rains. The very name of the river, Lavanavati, is indicative of the fact that the transformation must have been witnessed by the civilized man, and therefore it cannot be a part of the proto-history.

Certain statements made by the author in the book may not stand scientific scrutiny. Some of these 'wrong' statements may even send off-beam signals to readers who may be interested in trapping the 'flowing sweet water channel' in solving the acute water crisis in the region. On page 4, the author writes about the 'subterranean flow of freshwater in abundance'. Even the most remote possibility of this may help strengthening the conviction (based only on faith!) of certain people that the Vedic Saraswati had plunged underground and is now having a subterranean flow. Those who may be willing to subscribe to this view with the hope of getting perennial water supply, may take note of the fact that the isotopic study of the groundwater collected from the 'Saraswati palaeo-channels' indicated that the sampled water was only 22,000 to 6,000 years old (referred to in the book being reviewed). These old dates (albeit that these are not very well-constrained dates!) only help to disprove the fact about subterranean flow in replenishing the present day groundwater reserve.

Taken as a whole, the book, in spite of its apparent shortcomings, may make a good reading especially in view of the useful illustrations and the long list of references. It would be considered a highly creditable endeavour if the book helps in

instilling keen inquisitiveness in readers' minds to know more about the river, which has evidently migrated from the realm of myth to the field of physical science.

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Biodiversity and Environment: Remote Sensing and Geographic Information System Perspective. Proceedings of the workshop organized by IIRS, India and ITC, Netherlands. P. S. Roy, Sarnam Singh and A. G. Toxopeus (eds). Indian Institute of Remote Sensing, 4, Kalidas Road, Dehra Dun. 219 pp.

This book under review presents many techniques that are currently being used in different parts of the globe to map and conserve nature. The interdisciplinary approach is essential for implementation of integrated conservation strategies. The approaches/applications presented in this book have great influence on the design, planning and implementation programmes to protect nature. The management of ecosystems requires inventory and monitoring of biodiversity in large areas of natural landscapes at fine scales.

Biodiversity refers to the range of variations among a set of entities and is commonly used to describe variety and variability of living organisms in terms of genetic diversity (heritable variations within populations), species diversity (species richness in a habitat) and ecological diversity (biophysical diversity).

India, because of its unique biogeographic location embraces three major biological realms, viz. Indo-Malayan, Eurasian and Afro-tropical. It is notable in its species-richness and endemism, and is ranked tenth amongst the biodiversity-rich countries. India is one of the world's 12 Vavilovian centres of origin and diversification of cultivated plants (with 167 species of agrihorticultural crops and 320 species of their relatives known to have originated here). Conservative estimates of species-richness show that around 127,000 species (plants, animals and microorganisms) have been

so far reported from India and 400,000 species are yet to be explored. Conservation of biodiversity is important to mankind for various reasons. It facilitates ecosystem functions (carbon exchange, watershed flows, soil fertility, climate, etc.), offers aesthetic, scientific, cultural and other values and forms the basis for foodstuff, fibres, pharmaceuticals, chemicals, etc.

Anthropogenic activities coupled with the burgeoning human population, have led to the grim biodiversity scenario; numerous important plant and animal species are on the verge of extinction, while others are threatened or vulnerable. In order to bring about sustainable resource conservation and management, it is essential to adopt several different approaches for managing the ecosystem and biodiversity. To arrest the process of degradation and species-loss requires specialized solutions and an understanding of ecological processes. Protecting biodiversity does not merely involve setting aside chunks of area as reserves. Instead, all the ecological processes that have maintained the area's biodiversity such as predation, pollination, parasitism, seed dispersal and herbivory, involving complex interactions between several species of plants and animals need to be ensured. As of now, there are still major lacunae in information resources pertaining to forests, biodiversity – flora and fauna, causative factors for their degradation, and major threats. The available data are alarmingly inadequate to provide a lucid picture of the current status and ongoing losses/gains. The accelerated rate of extinction of species has prompted a need for a comprehensive assessment of the status, causes and trends of biodiversity at landscape levels and recommend conservation strategies for proper monitoring and management of forests and grassland, along with their inventory at regional, national and global levels.

Today, there is a shift from broad inventory surveys due to costliness and impracticality of such an approach. Instead, there is much interest in techniques that can predict species occurrence, habitat type and genetic impacts with the help of spatial and temporal tools – Geographic Information System (GIS) and Remote Sensing (RS).

Mapping the distribution of habitat types in the region as landscape elements could be done efficiently with the help of remotely sensed data acquired at different