date in data and ideas. While describing the metamorphic perspective of the UHT rocks from EGGB, the authors know where to leave the questions unanswered. They provide a meaningful insight on the evolution of deep crustal rocks experiencing UHT metamorphism and their global impact in resolving supercontinent puzzle. S. Sinha-Roy describes in easy-to-follow fashion the Precambrian terrain evolution in Rajasthan. Aided by the power of the deep seismic reflection profiles, the author has interpreted the frozen Proterozoic deep crustal structures of Rajasthan terrain that fall in line with the proposed plate tectonic model. A note on the geology of the Delhi Supergroup in space and time has been provided by P. Gupta and U. Bose. Fareedudin presents isotopic constraints on the Precambrian poly-metamorphic terrains of Rajasthan and their tectono-metamorphic evolution emerging within the framework of Grenvillian orogeny and Pan-African event. On the other hand, Bhushan has touched upon the Neoproterozoic magmatism of the Malani igneous suite from Western Rajasthan. It is not amazing that the Aravalli-Delhi orogenic belt, forming a part of the northwestern Indian Shield has the largest repositories of Pb-Zn, phosphorite and evaporite minerals in the country. There is a great deal of emphasis by M.K. Deb on the different metal deposits from this shield and their metallogenesis in the background of a viable crustal evolution model. In the concluding section, D.J. Dasgupta places greater confidence on the strength of the satellite imagery, ground observations, computer software coupled with GIS to critically analyze and explore the Pb-Zn mineralization in BGC of Western Indian Craton. The only paper in Section VI by A. Roy et al. enumerates the present state of knowledge of supracrustal belts and the associated gneiss-granitoid terrains in relation to crustal evolution during Precambrian times in the Central Indian Shield.

Illustrative diagrams are used throughout the text and there is also scattering of black and white photographs; all are clear and the absence of colour does not seem to limit their effectiveness. Its wider coverage makes the volume a valuable stepping stone to a more in-depth study. Many contributions are packed with a wealth of historical and contemporary information that make this volume delightful to read. The ample merit of this volume should ensure its place on the bookshelves of the university libraries and on the desks of researchers and teachers. The volume is available in the library of the Geological Society of India for reference purposes.

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ROLE OF EARTH SCIENCES IN INTEGRATED DEVELOPMENT AND RELATED SOCIETAL ISSUES. Geological Survey of India, Special Publication No.65, Volumes I, II and III, Kolkata, 2001; 773p; Price Rs.305/-; US$ 17, £11.60.

Encompassing special lectures delivered and papers presented at the National Symposium organized by the Geological Survey of India (GSI) at Lucknow (November 2 to 4, 2001), to commemorate the 150th anniversary of the Geological Survey of India, the three volume publication brings out very useful material that environmentalists, engineers, local planners and administrators are seeking keenly. The three volumes appear to be the sequel to, and patterned after, another GSI publication – *Contributions in Environmental Geology*, Special Publication No.43, 1996. The 1996 and 2001 publications complement each other.

There are seven invited papers on some aspects of environmental geology, covering themes on which already much has been written (by the authors themselves in a couple of cases). The erudite paper on the palaeoenvironmental assessment of central Narmada valley brings out some facts of crucial interest, including the appearance of man in the Indian subcontinent.

The 133 papers that make up the volumes, cover the following subjects: (i) environmental impact, (ii) geoenvironment in urban and rural development, (iii) hazards of mining and radioactive waste disposal, (iv) geohazards (cyclone, flood, mass-wasting, earthquake, desertification, land degradation), (v) assessment risks of pollutions of water and air, (vi) snow, ice and glaciers – impacts, climate and hazards, (vii) sedimentation, landuse and palaeoenvironment in the Quaternary period,

(viii) neotectonics and palaeoseismicity, and (ix) coastal geomorphology.

Most of these presentations are of the nature of reports on district-level environmental conditions for the use of planners – they have uniform style of contents, embodying geological setting, geomorphological layout, landuse pattern, the problem, the remedial measures and conclusions. All the reports are well-illustrated and fortified by tabulated data related to study areas and places, primarily in the Indo-Gangetic Plains and adjoining terrane of the Peninsular India. The references suffer from some inadequacies, for almost all authors cite mostly the works done by their own colleagues.

Although the reader does not get the excitement of reading analytical, interpretive, or erudite reviews and research papers, he does obtain critical information on the environment of the places and the areas where things are going wrong, and learns about the strategies to mitigate the hazards that lurk in the developmental process.

The commendable effort to put together a mass of valuable data in three volumes represents an effort of the Geological Survey to demonstrate beneficially the crucial role geologists are playing in the developmental programmes, and also the drive and determination of its Director General Shri Ravi Shanker to tell the world about what the officers of the GSI have been doing in these vital areas.

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CORRESPONDENCE

"ASH BEDS" IN THE NW HIMALAYA

The occurrence of the so called "ash beds" – Volcanic Ash (VA), Volcanic Tuff (VT), Tuffaceous Mudstone (TM), Bentonitised Beds (BB), Bentonitised Tuff Beds (BTB) within the Upper Siwalik Formation (Nagrota, Jammu; Karewas, Kashmir; Pinjor) have been highlighted and used by various workers as a marker horizon (Burbank and Johnson, 1982; Tandon and Kumar, 1984; Tripathi, 1986; Yokoyama et al. 1987; Ranga Rao et al. 1988; Kundal et al. 1999; Bhatia et al. 2001 and others).

These "ash beds" have been identified on the basis of one or more of the following criteria (*cf* Burbank, 1985): (a) colour, (b) bentonitic character of the beds, (c) abundance of biotite and zircon in the basal portion of these beds, (d) similarity of zircon ages in the "ash beds" with those of the Subrecent volcanic eruptions in Dacht-I-Nawar volcanic complex (in Afghanistan), (e) presence of pumice fragments (only in the Peshwar and Potwar regions of Pakistan), (f) physical similarity and stratigraphic position of such beds occurring in Kashmir, Jammu and Pinjor with those of Peshawar and Potwar regions.

It is noteworthy that none of the characters mentioned above in the regions of Jammu and Pinjor is characteristic of volcanic ash.

Fission track (FT) ages on the zircon phenocrysts from VT (Nagrota) were determined to be 2.31±0.54 m.y. and 2.8±0.56 (Uttarbeni) by Ranga Rao et al. (1988). However, Yokoyama et al., (1987) and Mehta et al. (1987) have obtained 1.6±0.2 m.y. (Nagrota) and 1.63±0.48 m.y. respectively. The 1.64 m.y. age has been suggested to coincide with the top of Olduvai Subchorn or the Neogene-Quaternary boundary (Bhatia et al., 2001). Mehta et al. (1993) obtained an age of 2.14±0.51 m.y. for "ash beds" of Pinjor. Thus it is evident that there is no consensus about the FT ages on zircon separates from these beds.

Yokoyama et al. (1987); Ranga Rao et al., (1988) and Agarwal et al. (1993) have emphasised that the "ash beds" in the Jammu area act as a good marker in the field and coupled with faunal changes just above it, it can be used as a useful tool in fixing the Pliocene-Pleistocene boundary. The faunal break between Tatrot and Pinjor occurs 15 m below the lower BTB (Nagrota Formation) and this also marks the climatic changes from warm and humid to warm and arid. *Elephas planifrons* which was earlier considered to be characteristic of Pinjor fauna, was recorded by Agarwal et al. (1993) from 3.6 m.y. Thus the "ash bed" has a great significance in the faunal dispersion and climatic changes and magnetic polarity stratigraphy.

Gupta (1995, 1996a,b, 2000, 2001 and Gupta et al.