BOOK REVIEWS

GEOLOGY OF WESTERN HIMALAYA 1993, V.C. Thakur, Pergamon Press, Oxford, 366p. $550.00

The Western Himalaya comprising the areas of Garhwal - Kamaun, Himachal Pradesh, Jammu and Kashmir of India, northern part of Pakistan and southwestern part of Tibet, represents geologically the most interesting part of the Himalaya. It displays wide ranging Proterozoic-Phanerozoic formations and complex tectonic features. The author has chosen this sector for presenting a compilation of geological information generated by Indian and Western Earth Scientists during the preceding three decades.

The book is divided into seven Chapters followed by a detailed list of references and subject index. The geological descriptions follow the scheme of tectonic zonation of Outer - Lesser - Higher - Tethys and Trans-Himalaya. The first Chapter is an introduction to the subject with brief description of physiography, drainage and tectonic setting.

Chapter 2 covers the Outer Himalaya zone which encompasses the vast belt of Cenozoic sediments. A geological description of the area of foot-hills, Potwar plateau, Ganga Basin and Intermontane basins is given. The addition of magneto-stratigraphy of the Siwalik Group is a welcome feature. In the section on Karewa there is no mention about the work of Farooqi and Desai (1974).

The Chapter on Lesser Himalaya Zone (3) covers the area between Main Boundary Thrust and the outer tectonic line of the crystalline thrust sheets. There is also a narrow zone of Shali subsidiary belt of Bandla range (Bilaspur) in the Himachal Himalaya and Jammu Limestone of Riasi and other areas (also called as Great Limestone) in Jammu and Kashmir which are part of the Lesser Himalaya Zone but has not been indicated in Fig.3.1. The description of geology of Lesser Himalaya is rather fragmentary. It would have been helpful if the individual belts had been described along with their characteristic formations accompaneid by a correlation table.

The Salt Range is strictly outside the realm of the Himalaya though affected by the Himalayan orogenic movements. It needed an exclusive treatment. However, the Attock - Cherat Range, Kala-Chitta Range, Nowshera and Hazara areas are in continuation of the Himalaya on the western side of the Main syntaxial bend.

For the area falling in northern Pakistan there are four maps which provide diverse interpretations. This area needs a better regional synthesis and also exposition of its relationship with the Salt Range. The Pakistan part of the Lesser Himalaya appears to have a parallel sequential order of Shali-Simla Group - Blaini and possibly Krol with restricted marine transgressions during Permain-Triassic and Cretaceous-Paleocene. It needs careful correlation. In the generalised stratigraphic column of the Lesser Himalaya (Fig.3.1) there is no mention of Simla Group, though later in the tectonic synthesis section the Simla-Jaunsar correlation (p.277) has been accepted. If the Krol sequence had been treated separately it would have presented a clearer picture.

The extension of Shali Structural belt to Jammu sector is undoubted. There are however, two subsequent Permo-Trias and Paleocene-Eocene limited transgressive cycles which are characteristic of the northern part of the Indian Peninsula. The Dogadda fossiliferous rocks in Garhwal not only needed some coverage but also reinterpretation.

In the fourth Chapter the author appears to have used the term Higher Himalaya zone to cover the metamorphic and granitoid rock complexes outside the realm of Lesser Himalaya. Strictly this zone does not everywhere occupy the highest topographic line as stated. It can only have geotectonic connotation than topographic. The crystalline cores and

the outer nappes comprise the metamorphic - granitic complex covering vast areas. Various sectors are described with regard to rock type and metamorphism. However, certain terms like Chail whose validity has been questioned continue to appear in the book without much justification.

The crystalline rocks of Zanskar area which link up with the Lahaul-Spiti sector have received a disconnected treatment. A beltwise description would have been more helpful. The author has presented tectonostratigraphic sections for metamorphics of Garhwal-Kumaun, but has omitted the section of the well known Jutogh metamorphic belt which is mapped lithostratigraphically in the type area of Himachal Pradesh.

In Chapter 5, author deals with the Geology of Tethys Himalaya. This zone presents a remarkable marine sequence covering almost the entire Proterozoic-Phanerozoic period and is broadly developed in the Kashmir basin, Chamba-subbasin, Spiti-Zanskar basin, Tandi subbasin, Kinnaur subbasin and Garhwal-Kumaun basin in the Western Himalaya. The author however, has followed individual geographic sections as described by various authors. This has resulted in repitition of geological descriptions and also it misses the basin aspect of the Tethyan rocks.

The Kali valley section of Kumaun, which is more towards the eastern closure of the basin, has the stratigraphic development upto Norian stage. Westwards in Garhwal the sequence stretches upto Aptian. The Carboniferous gap is characteristic of the Kumaun basin.

Westward, the Spiti and Zanskar areas are separately described, the fact that Spiti and Zanskar are part of one single basin should have prompted integration of various lithostratigraphic classifications in this book on regional geology. The names adopted in Spiti should have a precedence because many of them were adopted by Hayden in 1904 and the additional names introduced later represent refinement of his chassification. Almost all the lithostratigraphic units of Spiti continue through Lahaul-Sarchu Charap and Pang into Zanskar. In Zanskar, however, the Volcanics (also called Ralakung Volcanics and Panjal Volcanics) and Paleocene-Eocene (Kanji Group) are the additional geologic units developed. Thus, there was an excellent opportunity to integrate these segments of the same basin in this book on Western Himalaya. The Eastern Kinnaur is the transgressive limit of the Spiti basin. Geological information of Tandi belt of Lahaul has escaped the attention of the author.

The Nimaling Crystalline rocks which include Tso-Morari Complex have borne a transgressive Permian phase which now appears as infolded outliers with an imprint of regional metamorphism which are often mistaken as part of the crystallines.

The geology of Tethyan belt of Kashmir is still based on the work of Wadia and Middlemiss who carried out the pioneering mapping work. Recent contribution in Lidder valley based on lithostratigraphic mapping (Srikantia and Bhargava, 1983) finds no mention.

Tanawals of Kashmir remain an enigmatic formation. It is essentially a Lesser Himalayan Formation of Pre-Phanerozoic period and cannot be part of the Tethyan sequence. In this book Kashmir has received restricted references.

Chamba-Bharderwah segment bears the record of upper Palaeozoic transgressive phase over the Proterozoic basement.

The Trans Himalayan sector is presented in Chapter 6. It constitutes the area between the Tethys Himalaya and Korakoram and includes Indus and Shyok Tectonic Zones and the bordering Karakorum belt.

The geological information gathered during a continuous strike mapping from Dras to Hanle by the Geological Survey of India workers has received very little coverage in the book. The reviewer cannot help commenting that representation of geology of this magnificent tectonic sector is clouded with incorrect observations. For example, the so-

called Lamayuru Formation is neither a flysch nor is it part of the Indus Tectonic Zone. It is a schuppen belt of Kuling-Lilang rocks occurring along the sole of the Spiti - Zanskar Tethyan Thrust Sheet which overrides the Sengeluma belt of the Indus Tectonic Zone and this particular view finds no mention in the book. The sequence of the so-called Indus Formation and the biostratigraphy have been erroneously constructed across major thrusts.

The Nubra-Shyok Tectonic Zone also deserved a more detailed presentation adopting uniform nomenclature for both the western and eastern segments.

The Karakorum area was also mapped by Bhandari *et al.* (1980) of G.S.I. and therefore, it is not correct to state that no geological work was carried out in this region after Norin (1946) till Gergan and Pant (1983) visited the area. An exclusive treatment of Karakorum belt as a whole would have been welcome.

In Chapter 8 the author has attempted a tectonic synthesis. There is no longer any doubt about the northern extension of Peninsular India into the Lesser Himalaya. It seems plausible that Berinag-Rampur Groups could be older than the first carbonate cycle of Deoban-Shali-Larji. Author suggests a Pan-African event in the Himalaya based on 500 Ma age intrusive granites. The field evidences however, do not support this view. There are other dates which do not fit into this interpretation. Neverthless, its significance needs proper evaluation.

It is difficult to accept that the rocks of crystalline nappes (Jutogh etc.) formed the basement for the Lesser Himalayan formations as these nappes can be traced northward to their roots where they form the basement for the totally contrasting Tethyan sequence of rocks. The continued use of the term Chail is damaging as the widely published ground truth has clearly brought out the fallacy of the term.

The contact between the crystalline rocks and the overlying Tethyan cover is that of basement and cover relationship and whatever tectonic dislocation observed in various sectors are local and have very little regional significance.

The author has summarised views on subduction related magmatism, collisional tectonics and briefly touches on Himalayan metamorphism, leucogranites, crustal shortening and finally tectonic evolution. However, topics like metamorphism, magmatism, tectonics and sedimentation needed more space. Metallogeny and paleogeography are hardly referred. The geological information on Southwest Tibet part of the Western Himalaya is scanty. Lack of any photograph in this book is conspicuous and not understandable. There is an omission of Pal (1980) under Fig.4.2. in the reference.

Any compilation of information on subject like geology of Western Himalaya has many inherent difficulties in presentation because of divergent perception of geological problems and lack of uniform standard of information. In this background, the book by Thakur is a good attempt and serves as a useful geological reference on Western Himalaya and should have a place in all geoscience libraries. As the price of the book is exorbitant, it is doubtful if many Indian Universities can afford to buy the book. The publishers have regretted for not making the coloured geological map available with the volume and have expressed the same would follow as soon as it is ready.

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GROUND WATER ASSESSMENT, DEVELOPMENT AND MANAGEMENT, 4TH REPRINT (1994) by K.R. Karanth, Tata McGraw-Hill Publ. Co. Ltd., New Delhi, 720p.

Mr. Karanth's book is a monumental effort covering the entire spectrum of ground water hydrology, geology and engineering. The book is quite unique in the breadth and depth