SHARMA, K. K. and GUPTA, K. R., (1978) Some observations on the geology of the Indus and Shyok valleys between Leh and Panamik, District Ladakh, Jammu and Kashmir, India. *Recent Researches in Geology*, v. 7, pp. 133-143.

SHARMA, K. K. and KUMAR, S., (1978) Contribution to the Geology of Ladakh, North-Western Himalaya. *Him. Geol.*, v. 8, pt. 1, pp. 252-287.

SRIKANTIA, S. V. and BHARGAVA, O. N., (1976) An outline of the structure of the area between the Rohtang Pass in Lahaul and the Indus valley in Ladakh (Preprint). *Int. Himalayan Geol. Surv. New Delhi 1976, Section II.*

——— (1978) The Indus Tectonic Belt of Ladakh Himalaya; its geology, significance and evolution in *Tectonic Geology of the Himalaya*, Ed. *P. S. Saklani*. Today and Tomorrow's Printers & Pub., New Delhi, pp. 43-62.

THAKUR, V. C. and VIRDI, N. S., (1978) Lithostratigraphy, structure and tectono-metamorphic history of the southeastern region of Ladakh, Kashmir Himalaya. (Abst.) *Proc. IX Him. Geology Sem., Dehra Dun*, pp. 96-98.

THAKUR, V. C., VIRDI, N. S., RAI, H. and GUPTA, K. R., (1981) A note on the geology of Nubra-Shyok area of Ladakh, Kashmir Himalaya. *Jour. Geol. Soc. India*, v. 22, no. 1, pp. 46-50.

VIRDI, N. S., (1981) Presence of parallel metamorphic Belts in northwest Himalaya-Discussion. *Tectonophysics*, v. 72, pp. 141-146.

VIRDI, N. S., THAKUR, V. C. and KUMAR, S., (1977) Blue schist facies metamorphism from the Indus Suture zone of Ladakh and its significance. *Him. Geol.*, v. 7, pp. 479-482.

(Received: Sep. 24, 1979; Revised form accepted: April 30, 1981)

REVIEW

SEDIMENTOLOGY OF SHALE—STUDY GUIDE AND REFERENCE SOURCE by P. E. Potter, J. B. Maynard and W. A. Pryor. Springer-Verlag, New York, Heidelberg, Berlin, pp. 306, US 32.80 dollars.

Although shales are very common sedimentary rocks, their integrated study has so far been neglected. *Sedimentology of Shale* is the first book dealing exclusively with the study of shales. The authors P. E. Potter, J. B. Maynard, and W. A. Pryor have admirably proposed an integrated approach to the study of shales.

The book is divided into three major chapters — Overview Question set, and Annotated and illustrated bibliography.

The chapter Overview is rather short and leaves the reader thirsty about several problems on shales. The part dealing with sedimentary structures is informative, but it lacks detailed information on the lamination characteristics within the shale layers. The pebbly mudstones are assigned to turbidite facies, though they are equally, if not more, common in alluvial fan and other facies. In deformational structures useful references to Anketell, Cegla, and Dzulynski, and Lowe are missing.

The facies analysis of shales is very concise and one misses information on many questions, e. g. thick monotonous shale successions without much silt and sand intercalations, variability in black shale facies, black shale-carbonate rhythmic sequences, fuller's earth, bentonites. Differences in shales of different environments are not clearly brought out, e. g. differences amongst the fine-grained turbidite deposits, shale of shelf zone and shale of lagoon are not clear. However, a good point about the chapter is that it ably emphasizes that most shales are not as

monotonous as earlier believed, but often show internal laminations and contain thin silt and sand layers exhibiting various sedimentary structures.

Chapter 2 is useful and demonstrates how shales can be studied to get meaningful results.

Chapter 3 is a good compilation of literature, mostly with useful comments.

The main accomplishment of the book is that it gives the present status of knowledge on shales and clearly outlines the potentials for future study. I feel that the book achieves its purpose of drawing attention of geoscientists to the importance of shales and ably demonstrates that there are many interesting facets of shales. The book is well-written, well-produced for which both the authors and the publishers are to be congratulated.

INDRA BIR SINGH

GEONEWS

Abstracts of Talks delivered at Scientific meetings of the Society

POLYMETAMORPHISM OF THE ALMORA CRYSTALLINES

K. V. KARANTH
Department of Geology, M. S. University of Baroda, Baroda 390 002

(Talk delivered on 5th August 1981)

High grade crystalline schists resting on less metamorphosed sedimentary sequence in the Kumaun Himalaya were recognised in the Almora region as early as 1939 by Heim and Gansser. The existence of reverse metamorphism led to the deciphering of the Almora nappe. A detailed structural and metamorphic study has revealed four tectonic episodes in the Almora crystallines. The first two episodes have brought major metamorphic changes. The earliest event (D_1) belonging to a pre-Himalayan orogeny produced the early cleavage (S_1) parallel to the axial planes of the isoclinal folds (F_1) which now trend NNE-SSW. Almandine and sporadic staurolite generated during this event indicate their growth under static condition. D_1 culminated with the intrusion of granite lenses which granitised the adjacent metapelites.

The second event (D_2) pertaining to the Himalayan orogeny refolded this sequence into another set of isoclinal folds (F_2) co-axial with the first one. The metamorphism that accompanied F_2, obliterated the early schistosity at most places and produced the present widespread axial-plane schistosity (S_2) and snowball garnet. The continued action of D_2 detached the crystallines from the basement and pushed them over less metamorphosed younger unit of the Lesser Himalaya. The chlorite trails of the retrograded garnet in the mylonitised zone indicate a southeasterly movement of the thrust sheet. The early stage of thrusting of the nappe synchronised with the progressive metamorphism in the interior portion. D_2 event isoclinally folded the granitic bands, but failed to impress a new cleavage at most places. It microclinised K-feldspar unevenly and induced glide twinning and fractures in plagioclase in some parts. The third (D_3) and fourth (D_4) events merely folded and crinkled these rocks.