

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.

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## GEONEWS

*Abstracts of Talks delivered at Scientific meetings of the Society*

### POLYMETAMORPHISM OF THE ALMORA CRYSTALLINES

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*( 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.