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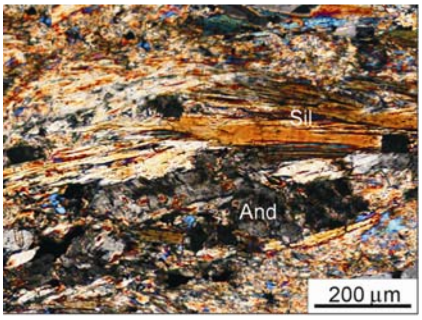
Contact metamorphism in the Himalaya

The Himalayan mountain chain, a distinctive example of continental–continental collision between Indian and Eurasian plates, well preserves inverted metamorphism related to the Himalayan orogeny whereas pre-Himalayan contact metamorphism is rarely recognized in the Himalaya. The occurrence of pre-Himalayan contact metamorphism in the Himalaya is reported by the discovery of hornfels from Arunachal Lesser Himalaya of Eastern Himalaya. Detailed field observations, petrography, mineral chemistry and geochemical studies confirmed the occurrence of hornfelses in association with Lesser



Himalayan granitoids (LHG) of Palaeoproterozoic. The causes of contact metamorphism with their petrogenetic processes are discussed and established in the article by Bikramaditya Singh (**page 405**). On the basis of mineral assemblage, the hornfelses have been divided into three types: Type-I (andalusite-bearing hornfels), Type-II (andalusite-garnet-bearing hornfels) and Type-III (garnet-sillimanite ± andalusite-bearing hornfels). They have different bulk rock compositions that support the presence of different mineral assemblage. The compositional constraint seems to be the main cause for the absence of common contact metamorphism mineral cordierite in the area. It may be due to insufficient magnesium for forming cordierite in these rocks or high aluminous in the original sediments which support high Al_2O_3 content of the bulk rock composition and abundance of andalusite and sillimanite. The relict mineral assemblages (quartz, andalusite, garnet, plagioclase, *k*-feldspar, biotite and sillimanite) of the contact metamorphism present in the hornfels suggest that the contact metamorphism has undergone from hornblende-hornfels facies to pyroxene-hornfels facies. The LHG can be traced all along the 2000 km length of the Himalayan mountain belt. However, it has been debated on these granitoids are to be intrusive granites or tectonic sliver of basement of the Lesser Himalayan crystallines. The discovery of hornfelses occurring in association with LHG is a strong evidence of the pre-Himalayan contact metamorphism occurred due to granite intrusion in the Lesser Himalaya.

Sand-based stormwater filtering system

Groundwater is declining at alarming rates in about one seventh of India's geographical area. Injection well type recharge structures have proven effective in augmenting groundwater and improving its quality. Sand-based recharge filters, consisting of vertical layers of coarse sand, gravel and boulders form an integral part of recharge wells to prevent the entry of physical impurities of the runoff water into the groundwater. In the absence of well-defined design criteria, clogging of the recharge filter is a serious constraint in the performance of recharge system.

Kumar *et al*. (**page 395**) conducted a series of laboratory column experiments under different sediment loads to evaluate the efficiency of coarse sand of different particle sizes as a top layer of recharge filter to derive its optimal size and thickness vis-à-vis standard sizes of gravel and boulder layers. The results indicate that more than 60% of suspended particles in water are retained in upper 10 cm of coarse sand layer and the removal efficiency increased with an increase in thickness of coarse sand bed. The authors suggest that for field adaptation it involves use of coarse sand bed of 0.7–1.0 mm size and minimum 75 cm thickness in field recharge filter. Further, provision of a supplementary sediment tank or biological filter around the recharge structure is proposed to reduce sediment load of inflow water to further improve the performance of filtering system.