

“Deformation style in Main Boundary Thrust and Ramgarh Thrust, Kumaun Lesser Himalaya” –
Manish A. Mamtani (IIT, Kharagpur; Email: mamtani@gg.iitkgp.ernet.in)

A two day field workshop sponsored by the Department of Science & Technology (DST, New Delhi) and led by Professor Deepak C. Srivastava (IIT, Roorkee), was held in the Kumaun Lesser Himalaya from 16-17 February 2010. The objectives of the workshop were: (1) to acquaint the young

participants with some of the structures in the large-scale thrust zones and (2) to discuss and understand the mechanism of formation of structures in the thrust zones. To fulfill these main objectives, the convener led the traverses in the areas where Main Boundary Thrust (MBT) and Ramgarh Thrust are

exposed in the Kumaun Lesser Himalaya. Professor S.K. Tandon (Delhi University), Dr. V.C. Thakur (Wadia Institute of Himalayan Geology, Dehradun), Professor Deepak C. Srivastava (IIT Roorkee), Professor K.K. Agarwal (Lucknow University), Dr. P.D. Pant (Kumaun



Participants of the two-day field workshop in Kumaun Lesser Himalayas.

University, Nainital) and Dr. Manish A. Mamtani (IIT Kharagpur), and 10 young researchers, Batuk Joshi and Deepak Joshi (Delhi University), Ritu Chauhan (Kumaun University), Bhupendra Singh (HNB Garhwal University), Mayank Joshi, Dinesh Chauhan and Kavita Tripathi (WIHG, Dehradun), Vibha Katiyar (Banaras Hindu University), Chandra Prakash (Lucknow University) and Deepa Arya (IIT Roorkee) participated in the workshop enthusiastically (Fig. 1).

A brief introduction to the Geological framework of the Siwalik Group rocks and the large scale structures in the Kumaun Lesser Himalaya was given by Prof. S.K. Tandon and Prof. Deepak C. Srivastava in the early morning of February 16, 2010. The fieldwork started with observations in the Lower and Middle Siwalik Group rocks and Prof. Tandon gave an excellent explanation of the outcrops showing sedimentary and synsedimentary deformation structures in these rocks. He explained the origin of carbonate nodules, intraformational lag, paleosol, scour and multistoried sand

bodies. Subsequent to the observations in the Siwalik rocks on the footwall of the MBT, the participants proceeded to observe rocks and structures on the hanging wall of the MBT. Prof. Srivastava showed the outcrops of the leucocratic Amritpur granite and its juxtaposition with the metabasalts along a large scale fault. In the afternoon session, he showed the participants a spectacular section of the MBT deformation zone containing structures such as imbricate faults, tectonic wedges and folds. Discussions were also held on the sheath-like geometries of folds noted within in this zone. In the evening there was interaction between the experts and the students on the structures observed during the day and their mechanism of formation.

On second day, the fieldwork started with observations in the volcano-sedimentary rocks overlying the Amritpur granite. Large scale normal fault cutting through top-to-south ductile shear zones and small scale flat and ramp structures were observed in the sandstone beds south of Bhimtal. The style of deformation in the

hanging wall and footwall of the Ramgarh Thrust was closely studied in a traverse from Khairna to Bhujan. In particular, the ductile shear structures such as S-C fabrics, asymmetrical crenulations, and the brittle structures including ramp-flat, en-echelon fractures, Andersonian fractures (filled with quartz, thus forming quartz veins), quartzite pods surrounded by ductile shear zones. Phyllonite and mylonite fabrics were observed and their relationship with Ramgarh Thrust was discussed. Discussions on the importance of observing stretching lineations were held and the student participants were trained in working out kinematics using various shear sense indicators observed in XZ section of the strain ellipsoid. The latter information was used to decipher the direction of thrusting in the geographical reference frame. The fieldwork ended with observations on the Chamarla Thrust, where the Ramgarh Granite comes into contact with the metasediments of Nathuakhan Formation. Subsequently, discussions were held about the various thrust-tectonic models that can explain the repetition of various horizons and their geometrical variations on a regional scale. On returning to the base camp (Kathgodam), there was an open discussion about the merits of organizing such field workshops. Student participants gave their feedback and the experts motivated them to continue their research activities with vigor. It was felt that such workshops not only enable young researchers to discuss problems with experts directly in the field, but also provide them with an opportunity to learn from discussions held on outcrops between experts. It was decided that similar field workshops involving a few faculty members/experts and a small group of student participants should be held regularly in different areas within India. The workshop ended with a vote of thanks to Professor Deepak C. Srivastava, who organized the stay and planned the field traverses very well.