9th I.C. Pande Memorial Lecture – Naveen Chaudhri, Department of Geology, Panjab University, Chandigarh *(E: naveen.geol@gmail.com)*

Prof. Irish Chandra Pande (1914-2006), a former Head (1966-1976) of the Department of Geology, Panjab University, Chandigarh, was born in Nainital. After his schooling from Nainital, he did his masters in Geology (1941) from the Banaras Hindu University (BHU), Varanasi. He was married to Shanta in 1940, and was appointed as Lecturer in 1942 at the Geology Department of BHU. In 1954, he was awarded PhD degree by the Imperial College of Science, London. His thesis was related to the origin of Donegal Granite, which he completed under the guidance of Prof. H.H. Read and Prof. W.S. Pitcher within a record period of eighteen months. In the same year he became Reader at the BHU. Subsequently he moved to the Panjab University as Professor in 1964. He was elected as Fellow of Indian Academy of Sciences, New Delhi in 1975. His area of research was mainly in the NW Himalaya, and he has published more than 115 papers and two books. He visited London, Prague, Montreal, Moscow and other countries in various academic capacities. After his retirement, Prof. Pande stayed mostly in Dehradun and on August 17, 2006, he passed away in Delhi at an age of 92.

A memorial lecture series was started in 2011 by the Panjab University to commemorate Prof. Pande's contributions in the fields of structural geology and petrology. Importantly, the targeted audience of these lectures is largely students. Since its inception, a number of eminent structural-petrologists have endeavored to perpetuate the profound memory of Prof. Pande by delivering erudite lectures; these in order of their appearance are: Dr. S.K. Biswas, Prof. D.C. Srivastava, Dr. A.K. Dubey, Prof. N. Mandal, Prof. T. Bhattacharyya, Prof. Somnath Dasgupta, Prof. Talat Ahmad, Prof. Dilip Saha, Prof. N.V. Chalapathi Rao and Prof. N.R. Karmalkar. As a befitting tribute to Prof. Pande, the 9th memorial lecture was delivered by his alumnus of the BHU, Prof. Anand Mohan, presently Registrar, Dayalbagh Education Institute, Agra, on "Metamorphism at Extreme P-T Conditions: Windows to Earth's Interior" at Panjab University on February 19, 2019 (Fig. 1). Prof. Rajeev Patnaik, Chairman, Department of Geology felicitated Prof. Mohan and Dr. Parampreet Kaur, Associate Professor, introduced the speaker and the topic of lecture to the audience.

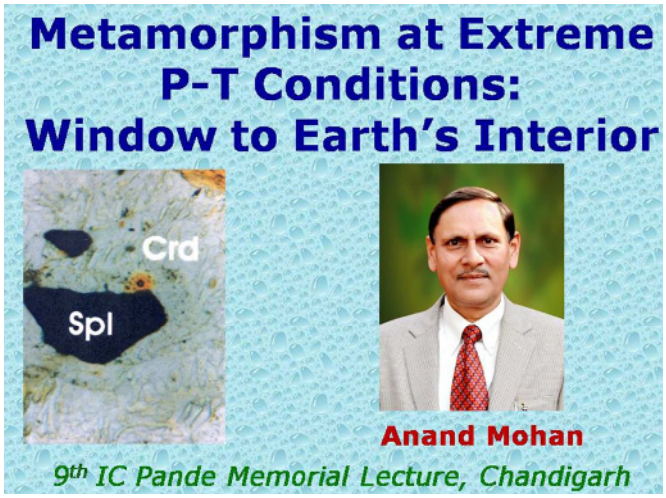

Fig. 1. The title of the talk delivered at 9th I.C. Pande Memorial Lecture by Prof. Anand Mohan at Panjab University, Chandigarh.

The lecture focused on ultrahigh-temperature, or UHT, metamorphism, which occurs where rocks of the continental crust are subjected to temperatures in exceeding 900°C at pressures of 0.6-1.2 GPa, with peak-T dT/dz gradients of 30-50°C/km. UHT metamorphism can be established on the bases of a variety of thermometers (e.g. Al in orthopyroxene, Ti in quartz and zircon, Zr in rutile) and diagnostic mineral assemblages (e.g. Al-orthopyroxene + sillimanite + K-Feldspar + quartz, sapphirine + quartz and ternary feldspars in pelites).

Increasing number of terranes documenting UHT regional metamorphism are now recognized from the Eastern Ghats Granulite Belt and Southern Granulite Belt of Madurai Block, India. Textures in these Mg-Al rocks, spectacular as they are, hint at the extraordinary potential information they conceal within the tiny domain. Prof Mohan illustrated that quartz-deficient assemblages at Ganguvarpatti contain Mg-rich garnet (x_{Mg} ~ 0.52) +orthopyroxene (10.7 wt. % Al_2O_3) but the field of sapphirine + quartz was not reached. He deduced a sequence of reactions from the spectacular textural imprints that formed in response to decompression during uplift history. In these rocks resorption of Mg-rich garnet (X_{Mg} : 0.52) produced finger-like symplectitic intergrowth of sapphirine + orthopyroxene + cordierite. With decreasing pressure, garnet and sapphirine reacted to produce orthopyroxene + spinel + cordierite. During further uplift, orthopyroxene and sapphirine reacted to form a corona of spinel + cordierite whereas Fe-rich garnet (X_{Mg}:0.42) resulted in cordierite + spinel + orthopyroxene symplectites.

Prof. Mohan stressed that radiometric dating of the underplated magmatic rocks is required to confirm that these are syn-metamorphic in origin. This would provide data for the source of heat responsible for UHT metamorphism in the UHT terranes. Also, the occurrence of UHT granulites as enclaves within the granulite facies rocks, presumably formed at relatively lower temperature is problematic. Did the host granulites formed at UHT conditions during the thermal peak and later re-equilibrated? or was the UHT metamorphism local and related to heat supplied by basic/mafic intrusive, while the host granulites were formed in the common preferred P-T range of the granulite facies metamorphism?

Prof. Mohan also described ultra-high-pressure (UHP) metamorphism which refers to metamorphic processes at pressures high enough to stabilise coesite, the high-pressure polymorph of SiO_2. The formation of many UHP terrains has been attributed to the subduction of micro-continents or continental margins and the exhumation of all UHP terrains has been ascribed principally to buoyancy caused by the low density of continental crust-even at UHP-relative to Earth's mantle. The presence of coesite, diamond, or majoritic garnet are diagnostic indicators of UHP metamorphism.

The lecture was well received by students and they found the topic highly appropriate. The event ended with a vote of thanks.

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