MEETING REPORT

Field Workshop on the Marwar Supergroup*

Marwar Supergroup (MSG) is one of the important peninsular Neoproterozoic–Cambrian successions of India named after the Marwad region in Rajasthan. Sedimentary successions of MSG are exposed on the Malani Igneous Suite, one of the Neoproterozoic (705–750 Ma) Large Igneous Provinces (LIPs) of the world. Discovery of the Cambrian fossils from the Nagaur Group of MSG has been instrumental in attracting experts from several fields. MSG was an important constituent of Rodinia continent. Presently, it is being extensively explored by several petroleum giants for its hydrocarbons potential. On global scale, it is attracting many researchers from the geological fraternity to understand the evolution of LIP and MSG. Understanding the need for congregation of experts to discuss and debate various aspects of MSG, an international field workshop on the Marwar Supergroup, western Rajasthan was organized. Various groups have demonstrated the potential of palaeobiological, geochronological, chemostratigraphical and sedimentological studies on MSG. The scope for such varied studies attracted 34 participants from 7 countries drawn from various universities, institutions and industries to this workshop.

Mukund Sharma (Organizing Secretary, Birbal Sahni Institute of Palaeobotany (BSIP)), presented as curtain-raiser, the aim and relevance of the workshop. It was followed by six invited lectures on various aspects of MSG by S. K. Bhushan (Hospet), Shuhai Xiao (Virginia, USA), Joseph G. Meert (Florida, USA), Mukund Sharma, Ulf Linnemann (Dresden, Germany) and S. C. Mathur (Jodhpur). These lectures gave a brief introduction to the participants on what they could expect to see in the field.

During field trips conducted on 7 days, the participants were shown 25 outcrops exposed in Jodhpur, Nagaur, Bikaner and Jaisalmer districts of Rajasthan. Every day field work was followed by discussion in the evening.

On the first day, participants saw the outcrops representing the basement rocks and the Sonia Sandstone at the Antenna Hill and in other sections in and around Jodhpur. Giant plant-like features profusely developed on bedding planes of the Sonia Sandstone engaged the attention of the participants. Their organic/inorganic nature, affinity and taphonomy along with depositional environment were discussed at length. In addition, many Ediacaran fossils were also noticed on the bedding planes.

On the second day the participants moved to Artiyan Kalan Section where lowermost silty unit of the Sonia Sandstone is exposed in pits around Artiyan Kalan village. This is the classical section from where Raghav *et al.*[1] reported the first Ediacaran fossil from MSG. Participants devoted considerable time to search and collect fossils and the section suitably rewarded them. Microbial mat, wrinkle structure, Kinneyia, *Beltinelliformis*, *Marsonia* and other well-preserved structures were noted from this unit. In the vicinity, another outcrop of the Sonia Sandstone showed a 1 m thick unit of carbonate. This might represent an important unit, indicating transgressive event in geological past. Many participants collected samples for carbon isotope analysis. Thereafter, they moved to the first section of the Bilara Group represented by the Pondlo Limestone, a prominent pink coloured band exposed near Garasani Village on Jodhpur–Asop road. Pink colour band of dolomite has its own importance in the Neoproterozoic successions and are considered an event bed. The present unit of carbonate rock is recrystallized. Another section of the Bilara Group was observed in Asawari Temple section, where gradational contact between the Bilara and Nagaur groups is seen. Fault and folds indicating tectonic disturbances are present in the area.

Next day contact between the Girbhakar Sandstone and Dhanapa Dolomite was seen in Jasawant Sagar Dam section and various other mine sections around Pundlu. Here, one can see carbonate rocks of Bilara Group. Pundlu is best place to study depositional history and palaeoenvironment of carbonate rocks. Gotan Limestone which emits fetid smell is best exposed in this area. Many participants felt that the Bilara carbonates may turn out to be an event bed such as 'Shuram' of Oman. Dhanapa Dolomite was observed near Dhanapa village, where the outcrops exhibit stromatolites. Participants collected chert nodules from here for further palaeobiological investigation. Another important section was the Tukliyan Sandstone of the Nagaur Group well exposed near Tukliyan village. These sandstones lack any of the Cambrian elements.

Following day, the base camp was shifted to Nagaur about 150 km north of Jodhpur. From here the participants moved to examine Sonia Sandstone at Chhoti Khatu area about 70 km north of Nagaur. Paliwal[2] has reported felsic igneous rock from the Chhoti Kahtu area, which is sandwiched between underlying Sonia Sandstone and overlying Girbhakar Sandstone and is considered as an important event for constraining the age of the basin. It has been a matter of debate whether felsic unit is extrusive or intrusive. Different interpretations were offered. Participants interested in determining the age of MSG and in palaeomagnetism made extensive collections. It is likely that this unit may be useful for constraining the age and position of MSG.

Next day the focus was on the Cambrian site which is exposed in Dulmera section about 65 km north of Bikaner. From this locality Kumar and Pandey[3,4] had first discovered Cambrian trace fossils from the Nagaur Sandstone. They suggested that this is the first Cambrian section recognized in the peninsular part of India. The ichno-fossil assemblage observed here consists of *Cruziana*, *Rusophycus*, *Palaeophycus*, *Diplichnites*, *Dimorphychnus*, *Monomorphichnus*, *Aulichnites*, etc. The participants collected extensively from this section.

*A report on the International Field Workshop on the Marwar Supergroup, western Rajasthan held during 20–28 January 2014. It was organized by the Society of Earth Scientists, Lucknow. The workshop was sponsored by the Birbal Sahni Institute of Palaeobotany, IUGS-International Sub-commission on Ediacara, International Sub-commission on Cambrian, International Geological Correlation Programme-587 and J. N. Vyas University, Jodhpur. Funding was committed by DST, CSIR, BRNS, Mumbai and Baldota Group, Hospet.

Following day, the participants moved to Sam, Jaisalmer. On the way they saw Pokaran Boulder Bed (PBB), considered to be the base of MSG. Chauhan *et al.*[5] and Bhatt *et al.*[6] have discussed its origin and lithostratigraphic position. The origin of PBB, i.e. whether it is glacial deposit or not, is being debated. Participants were unanimous that there is no evidence to consider PBB as a glacial boulder bed.

During the return journey to Jodhpur participants saw the Malani Igneous Suite in Baukan Section. The valedictory session was held at Jodhpur. The oil industry was interested in the sequence stratigraphic framework of the MSG basin which will be helpful to understand the environment of deposition, lithofacies, structural set-up and microbial life in the basin. Palaeontological data need support from sedimentological inputs. New macrofossil morpho-forms, some of which are enigmatic, can give important clues regarding early multicellular organisms and their evolution. Felsic volcanic unit of Chhoti Khatu could be significant and provide precise age constraint for the basin.

All participants appreciated the informative, elegantly prepared field guide book and the meticulous planning of the field trip by the scientists from BSIP.

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6. Bhatt, D. K., Prasad, S., Jain, R. L. and Mathur, A. K., *J. Geol. Soc. India*, 2005, **65**, 301–308.

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Indian Physics Association Awards

The Indian Physics Association Awards 2012 were recently presented by M. K. Sanyal (President, Indian Physics Association) at a function organized on 11 April 2014 at the Multipurpose Hall, BARC Training School Hostel, Anushaktinagar, Mumbai.

R. D. Birla Memorial Award 2012 was awarded jointly to T. V. Ramakrishnan (Indian Institute of Science (IISc), Bangalore) and Ajay Sood (IISc). Ramakrishnan has made pioneering contributions in the theory of freezing of liquids and in the localization of electrons due to disorder. Sood has researched in the areas of Raman spectroscopy and soft matter physics. The award is given once in two years for excellence in pure physics and carries a citation, gold medal and cash prize of Rs 50,000.

M. M. Chugani Memorial Award for excellence in applied physics for 2012 was awarded to O. N. Srivastava (Banaras Hindu University, Varanasi) for his significant contributions in the areas of hydrogen storage in nanomaterials and in the fields of non-crystallized solids. The award carries a citation, gold medal and cash prize of Rs 1 lakh.

The Buti Foundation Award for 2012 was given jointly to Aditi Sen De (Harish-Chandra Research Institute, Allahabad) for contributions to quantum information, quantum optics and foundations of quantum mechanics and V. K. Chandrasekar (Bharathidasan University, Tiruchirappalli) for the understanding of the fundamental aspects of nonlinear dynamics and complex systems. The award is given for outstanding contributions in the area of theoretical applied physics, astrophysics and biophysics. It carries a citation, a gold medal and a cash prize of Rs 25,000.

The first P. K. Iyengar Memorial Award for excellence in experimental physics was awarded to S. M. Yusuf (Bhabha Atomic Research Centre, Mumbai), for his significant contributions in the field of magnetism particularly involving neutron scattering. The award is given for outstanding contributions in terms of innovative experimental techniques or innovative instrumentation. The award consists of a citation and a cash prize of Rs 100,000.

Earlier awardees include, the Nobel Laureates Prof. Abdus Salam and Prof. S. Chandrasekhar among others are Prof. A. Salam, Prof. B. V. Sreekantan, Prof. Subrahmanyan Chandrasekhar, Prof. R. Ramanna, Prof. Govind Swarup, Prof. Sivaramakrishna Chandrasekhar, Dr. P. K. Iyengar, Prof. R. Chidambaram, Prof. G. S. Agarwal, Prof. J. V. Narlikar, Prof. Ashoke Sen, Prof. Bikash Sinha and Prof. P. K. Kaw.

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