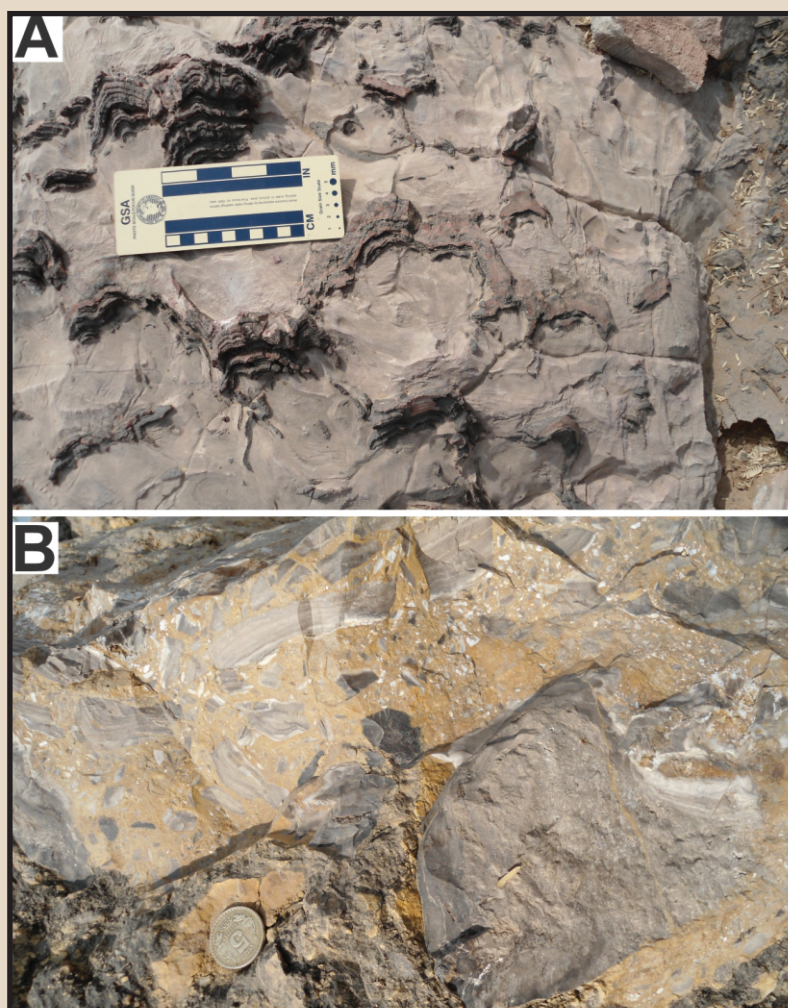


# Proceedings of the Indian National Science Academy

---



---

Full text available at: <http://www.insa.nic.in>

---



## GUEST EDITORIAL

LINTO ALAPPAT

*Department of Geology and Environmental Science, Christ College Autonomous, Irinjalakuda, Thrissur 680 125, Kerala, India*

Scientific studies are open to review in light of new evidences, supported by improved analytical methods and by the detailed understanding of the process itself. It is rightly pointed by H.B.W. (1901) quoting Professor Sollas, about the nature of the subject, that the geoscience has become 'evolutional, and in the transformation has grown more comprehensive'. This issue comprises number of papers presented in the Conference on Geology: Emerging Methods and Applications (GEM 2017). The primary aim of the conference was to give a comprehensive state-of-the-art information on various techniques, discuss on its strengths and potential limitations, introduce the students and applied geo-scientists from Colleges and state universities about the methods at their disposal. New applications of established techniques and other interdisciplinary approach may be productive and useful to geo-scientists in expanding their research. Beyond familiarizing and promoting research, such meetings are useful the fundamental concepts of various approaches in the deliberations for the benefit of basic learners of Earth Science, so that they can embrace such new methods when they become researchers.

Geological studies have evolved as an integrative approach considering Earth's broader context encompassing the lithosphere, biosphere, hydrosphere and atmosphere and their mutual interactions. Geo-scientists, over the period of time, have provided the essential idea, theories and data that help to conceptualize the Earth as a whole, including its dynamics and also a step further to understand the planetary geology using terrestrial analogues. It is also to be noted that the conventional field geological training is still considered as the key aspect of success

for the modern, sophisticated planetary missions like the ones to Moon or Mars (Hodges and Schmit, 2019). Like many other branches of science, geoscience was also known to have breakthroughs in scientific understanding, either based on systematic observations or by improvements in analytical methods. Alfred Wegner's (1880-1930) 'continental drift' theory made ways for modern plate-tectonics theory and the work of Henri Becquerel (1852-1908), Marie Curie (1867-1934) and Pierre Curie (1859-1906) in finding the process of 'radioactivity' to calculate the age of the Earth are some examples for such giant leaps in the history of Geoscience. An interesting compilation of references are given in the Earth in Nature (2019) to highlight some of these geological aspects, consolidation of those facts in to the framework of thinking and how it evolved over the nineteenth century, and resonate even today.

Earth science has become increasingly relevant in the modern world with its ever increasing demand for natural resources, higher frequency of occurrences of natural hazards and enhanced vulnerability. National Research Council (NRC) of United States of America has identified 'Basic Research Opportunities in Earth Science' in the emerging, socially relevant areas such as critical zone studies, geo-biology, earth and planetary materials, continental investigations, studies on Earth's deep interior and planetary sciences. New research aspects of Earth Science includes critical events that took place in the early history of the Earth. This focuses on the origin and differentiation of Earth's materials and layered structure, dynamic and geochemical evolution of early Earth to the habitable condition that prevails now (NRC, 2012). Quantification of chronology of events using various isotope systems

are essential to develop new models and hypotheses in this regard. The conference had also attracted discussions and interactions between climate, tectonics, surface and deep earth processes with developments on thermochronology, luminescence dating, Earth and Planetary surface landform studies using satellite data products etc. The evolving and interlinked nature of life, environment and climate etc. were the theme of discussions of number of speakers.

This part of the special issue contains four review papers and three research articles which focus on various fundamental, evolving areas of research in earth science. The article by Chatterjee A, focuses on combined geochemical and geochronological studies in the sediment deposits of Ghaggar-Hakra-Nara River system to understand its evolution on the basis of published literature and some of their original research work. The study discusses the history of Harappan civilization settlements along the Ghaggar River, sedimentary provenance and facies architecture using Sr-Nd isotopic finger printing and clay mineralogy to distinguish it from glacial-fed to rain-fed river system over the period of its existence. George B G, presents a comprehensive review of the state of the art of studies in the Marwar Supergroup with the available data from lithostratigraphic, paleobiological, chemostratigraphic, and geochronological studies. The paper comments on the sediment provenance of the supergroup and suggests some interesting areas of future research in Neoproterozoic global events in India based on the newly available datasets.

Distribution of recent brackish water Ostracoda from the Pulicat lagoon, near Chennai, Tamil Nadu was reported by Hussain S M *et al.*, to understand the relation between the sediment characteristics and Ostracoda population. The authors have evaluated the favourable substrate and environmental conditions for the population abundance of Ostracoda in the area and from the ratio between the carapaces and open valves of the species; a relatively rapid rate of sedimentation was observed in the Pulicat lagoon.

Sijinkumar A V *et al.*, studied pteropods from the Andaman Sea to understand the effect of dissolution, shell structure and the morphological variations of extant pteropods shells preserved in the late Quaternary sediments. The pteropod shell surface

dissolution features are correlated to the increased strength of summer monsoon and high biological productivity due to associated chemical processes resulting in the lowering of the pH of seawater.

Understanding early silicate Earth differentiation processes has become one of the intriguing problem that geoscientists around the world are working on and in this issue, Gautam I, discusses about using  $^{142}\text{Nd}$  isotope to study this process and the analytical challenges involved. Using available data from various studies and published literature, the implications for the Chondritic nature of Earth *vis-a-vis* early silicate differentiation is provided. The paper has also listed number of potential research problems in this area of geoscience.

Bhattacharya S and Ghosh T, have summarized different kinds of peridotites that belong to various tectonic settings and have discussed their chemistry, major and trace element concentrations to understand the refertilisation process. The authors have presented possible characteristics of refertilised peridotite which will help in identification of peridotites bearing Supra Subduction Zone (SSZ) influence.

Pattanam Archaeological site in the Ernakulam district of Kerala state, India possesses a large number antiquities of foreign origin suggesting the trade relationship with the Mediterranean world (Cherian *et al.*, 2009). It is presumed that this area was part of an ancient spice trade network. Varghese R *et al.*, presents the results of a study focusing on a diverse spectrum of archaeobotanical specimens from the peat samples representing iron age (BC 5-10<sup>th</sup> century), giving evidences of the paleo-environment and plant utilization of the area which point towards the ancient spice trade activity in the region. Though the number of articles are less in number, it is certain that these would form a good reference material for researchers in their respective area of research.

## Acknowledgements

The conference was funded by Ministry of Earth Science (No. MoES/SSWC/58/2016 PC-V), Science and Engineering Research Board (SSY/2016/000056), Government of India and Kerala State Council for Science, Technology and Environment (SSW/295/2016/KSCSTE), which are greatly acknowledged.

## References

- Cherian P J, Raviprasad G V, Koushik Datta, Dinesh K Ray, Selvakumar V and Shajan K P (2009) Chronology of Pattanam: a multi-cultural port site on the Malabar Coast. *Current Science* **97** 236-240
- National Research Council (2012) New Research Opportunities in the Earth Sciences. Washington, DC: The National Academies Press. <https://doi.org/10.17226/13236>
- Hodges K V and Schmitt H H (2019) Imagining a new era of planetary field geology *Science Advances* **5** eaaz2484
- W, H B (1901) Some Recent Advances in General Geology *Nature* **63** 233-235
- The Earth in Nature *Nature Geoscience* **12** 873 (2019). <https://doi.org/10.1038/s41561-019-0488-2>.