# BOOK REVIEW

## MICROPALEONTOLOGY: APPLICATION IN STRATIGRAPHY AND PALEOCEANOGRAPHY by Devesh Sinha (Editor) (ISBN-13-978-81-7319-768-0, ISBN-10-81-7319-768-7), Narosa Publishing House, New Delhi, 2007, 381p.

The volume Micropalaeontology Application in stratigraphy and Paleoceanography consists of 26 papers on diverse aspects of micropaleontology covering the entire spectrum of the geological column

The Vindhyan Supergroup has attracted global attention for its recent fossil discoveries Microfossils assemblage from the Vindhyans forms the subject matter of the first two papers Importance of the microfossils in deciphering the biostratigraphy can best be gauged by these two papers of the volume Though the assemblage indicates varied and diametrically opposite age connotations to the Vindhyan sediments yet the interest of deciphering the true age of the Vindhyans does not fade out The first two papers reflect the same vigor Prasad et al have described microfossils recovered from surface as well as a drill core (Damoh-A) samples representing all the formations of the Vindhyan Supergroup It is concluded that the sediments of the Vindhyans deposited from Early Mesoproterozoic to Terminal Proterozoic and did not transgress into Lower Paleozoic (Cambrian) However, some recent papers on stromatolites, microfossils and geochronology missed the attention of the author that broadly support their view and suggest even older age for Lower Vindhyan On the contrary Azmi et al have discussed at length the weakness of geochronology and strengths of biochronology in deciphering the age of the Vindhyans Supergroup with five figures, five plates, one table and taxonomical details of newly described fossils The authors have challenged the long held view about the age of the Vindhyan Supergroup On the basis of the robust fossil data Azmi et al have considered the recent geochronological data '*erroneous*' and '*emphasized*' the age of Vindhyan Supergroup from 'Terminal Proterozoic to minimum pre-trilobite Early Cambrian' In arriving to this conclusion they have taken into account the various fossils viz , triploblastic animal traces described by Seilacher et al and Ediacaran fossil *Spriggina* (?) by Kathal et al which have already been discarded I am sure like Azmi's 1998 paper, this will also evince keen interest among the Precambrian paleobiologists

Although title of the paper by Sinha et al suggests only the Yong Limestone as the subject matter of the paper yet they have discussed acritarchs assemblage from the Yong Limestone and Siala Formations of the Garhwal Himalaya On the basis of the acritarchs assemblage and marker taxa they have suggested the Middle to Late Silurian age to the Yong Limestone Formation and consider that the Ordovician/Silurian boundary lies within the Siala Formation They have touched several Pan-Acritarch issues in the paper which distracts the reader's attention Ram-Awatar has discussed palynostratigraphy and depositional environment of Lower Gondwana sediments in Raigarh basin, Chhattisgarh On the basis of palynological assemhblage he has proposed the occurrence of deglaciation palynofloral event in the sediments of Jhugna-Bhawana Nala Section, an event supporting the hypothesis proposed by Wopfner and Jin in 1993 Ghosh and Banerji have discussed the biostratigraphic significance of megaspore from the Triassic sequence of peninsular India on the basis of five megaspore assemblages recorded from different Gondwana basins These assemblages have been correlated with Lower Triassic megaspores of Europe and Upper Triassic megaspores of Australia and Europe It has been concluded that the megaspore taxa are endemic to Nidpur beds (Early Middle Triassic) and more cosmopolitan genera appear in Tiki Formation (Upper Triassic) Ayyasami et al have discussed the merits of Upper Cretaceous exposures of Ariyalur, Thanjavar and Virddachalam in south India, for considering the Santonian-Campanian boundary stratotype in comparison to the type area of the Santonian Stage in the Aquintaine region of France It has been suggested that Indian sections are complete and have eight marker events than three suggested by the International Commission on Cretaceous stratigraphy in Brussels Meeting In their opinion the Sillakkhudi Formation of the Ariyalur Group ranging in age from Upper Santonian to Campanian, best exposed in a nala near Mel Mattur village to Sadaiya kkanpatti, offers scope for the Santonian-Campanian boundary in Ariyalur outcrop area

Kar and Singh have reviewed microfloral remains described from Deccan Intertrappeans beds It has been pointed out that the continuous microfloral record is lacking in these sediment and most of the reported assemblages are

confined up to Maastrichtian In this context, the record of Paleocene palynofossils by these authors from intertrappeans of Lalitpur is significant as it is the only record of Tertiary fossils from these sediments

Rana et al have described a significant assemblage of vertebrate fossil fauna from Fatehgarh Formation exposed in Bariyara village, Barmer district, Rajasthan The importance of the discovery lies in recording Paleocene continental vertebrate fossils dominated by fish remains that provide information on the age, paleoecological and paleoenvironmental settings of the Fatehgarh Formation Authors have concluded that these remains suggest Earliest Paleocene age for Fatehgarh Formation Subathu Formation has been matter of considerable study for long The age of the Formation has been most discussed aspect There is another paper in the book on this area reported by Singh et al They have worked the different sections of Subathu Formation of Dharmpur area, Solan district, Himachal Pradesh Authors have presented five fold zonation of the Subathu Formation suggesting an age range from Ypresian - Post Lutetian and also presented environmental interpretation based on the palynoflora Whiso et al in a short note have provided taxonomical details and significance of foraminifera *Planorotalites palmerae* recovered from Dillai Parbat area of Assam in North East India

Kundal and Humane have discussed the stratigraphic, paleobiogeographic and paleoenvironmental significance of *Mesophyllum* a nongeniculate coralline alga from Western Kachchh They have also provided the taxonomical details of the various species of the described alga The age of the Fulra Limestone and Maniyara Fort Formation have been suggested to be Middle Eocene and Oligocene respectively and depth of deposition have been attributed to 10-15 m sometimes ranging up to 40 m

A paper by Rajshekhar et al documents the Holocene sea-level change and neotectonism inferred from Beach rocks of South Andaman, Bay of Bengal The results are based on elevation history, $a^{14}_{C}$ dates, fauna, algae and geomicrobiology These have also been compared with contemporaneous deposits of mainland This study is significant in the light of Tsunami of 26$^{th}$ December 2004

Sharma has provided a very informative account of Cenozoic radiolarian research in India An in depth review of progress in the field of Radiolarian research and also future research directions are given in the paper In another paper, Sharma and Daneshian have recorded the pattern of radiolarian species diversity in the Early Neogene of Andaman-Nicobar Islands This compliments the relatively few publications on radiolarian diversity and also provides the possible causes responsible for variations in diversity including the temperature correlations

Baroon in his paper has provided an important and most sought after data on biostratigraphically useful Diatom events of the Oligocene and earliest Miocene in the low latitudes on equatorial Pacific Ocean with magnetostratigraphy at ODP site 1220 Keller and Paido have reviewed the *Guembelitria* blooms and low oxygen tolerant small biserial heterohelicid species and species richness from sections in the Indian ocean and correlated these to sequences in the eastern Tethys to show the distribution of blooms during the Late Maastrichtian and Early Danian and its relationship to mantle plume volcanisms in the Indian ocean

Srinivasan and Sinha have recorded the hitherto unrecognized two microtektite horizons in the Early Miocene from DSDP site 216 on the crest of the Ninetyeast Ridge near the equator The discovery will provide excellent tool for improved correlation on a regional scale and information regarding hitherto unknown impact event and their consequences Flower et al presented a thorough data on the astronomic and oceanographic influences on global carbon cycling and tested the processes against the limited or non upwelling Atlantic hydrography across the Oligocene/ Miocene Boundary and assessed the relative importance of trade wind strength and nutrient supply in controlling global organic carbon burial

Rai et al have discussed the response of Miocene deep sea benthic foraminifera to paleoceanographic changes at DSDP site 237 in Northwest Indian Ocean They have quantitatively analyzed benthic foraminifera at this site and their relationship with the environmental parameters and interpreted the same by employing multivariate method In a comprehensive paper, Ibaraki presented Neogene planktic foraminiferal biostratigraphy on the Pacific coast of South America and its paleoceanographic implications The paper is based on the study of the samples collected over a decade from many Neogene sequences on the Pacific coast of South America The study provides a precise correlation chart and various geological events that occurred during the Neogene The presence of biosiliceous sediments in Peru suggests the coastal upwelling became strong on the Peruvian coast from Middle Miocene time up to the Present The abrupt decrease in surface temperature in an Upper part of zone N19 at about 3 5 Ma in north western Ecuador suggests that an increased coastal upwelling with losing of the central American Seaway Various depositional patterns in the region of study also indicate that the coastal upwelling expanded from north to southward Sinha and Singh have demonstrated episodes of weakening of Leeuwin Current (Southeast Indian Ocean)

during Quaternary based on isotopic and planktic foraminiferal evidences. The region of this current is undergoing no upwelling as of today. However, the present study has identified five intervals during Quaternary at 2.2 Ma, 1.83 Ma, 0.68 Ma, 0.45 Ma and 0.40 Ma when the sea off western Pacific underwent intense upwelling contrary to modern oceanographic conditions due to weakening or cessation of the flow of Leeuwin Current. These periods may possibly be the periods of reduced sea surface temperature in the Indian Ocean and reduced summer monsoonal intensity. Singh and Mohan have discussed planktic foraminiferal evidence for Neogene deep sea hiatuses in the Northern Indian Ocean based on robust data obtained from five DSDP sites under equatorial water mass. The study is based on dissolution intervals reflecting the chemistry of water column, wherein fluctuations in percentage abundance of solution susceptible vs. solution resistant planktic foraminiferal taxa and the rate of accumulation, intervals of dissolution can be detected. Their study has identified four major deep sea hiatuses and two strong dissolution intervals in the northern Indian Ocean. These hiatuses occur at 16.0-14.0Ma, 13.0-11.0Ma, 10.5-10.0Ma and 5.5-4.5Ma. The intense carbonate dissolution occurred during 20.0-17.0Ma and 14.0-13.0Ma. These studies coupled with oxygen stable isotope record indicate global climatic cooling and consequent lowering of sea level.

In a general article, Ramesh and Tiwari have provided the overview of stable isotopes methodology and concept as applicable to paleoceanography and proposed that *Orbulina universa* can be a potential monsoon proxy. P.K. Saraswati has presented a comprehensive review on the symbiosis, calcification and stable isotopes in foraminifera. It has been suggested that the knowledge of the oxygen and carbon isotopic composition of the modern symbiont-bearing foraminiferal species show particular trends different from the symbiont-free species. This information will have significant implications in paleobiology and paleoceanography.

O.P. Singh, in his research paper, has described a rich assemblage of calcareous nannofossils comprising of nineteen species from Lacam Point section of Havelock Island that range from Late Early Miocene to Early Middle Miocene. In the last paper of the volume Bhattacharjee et al. have provided detailed account of a distribution pattern of benthic foraminifera off Krishna-Godavari delta and their environmental significance and discussed the distinct five benthic foraminiferal biofacies in the study area.

It is well-planned, designed (as mentioned, printed from the camera ready copy provided by the editor) and executed volume. It is aptly dedicated to the doyen of Micropaleontology in India, Prof. M. S. Srinivasan, who shaped the course of students to pursue Micropaleontology. It is a comprehensive account of micropaleontology, and in every sense indeed! Renowned and active researchers from India and other countries have contributed papers for the volume. Individual papers are well readable in isolation. The most positive approach of the editor which-I find-readers will equally well appreciate, is his sincere support and encouragement to express the existing diversity of opinions in different papers (the first two papers are glaring testimony of this aspect). I am sure this volume will motivate students, researchers and professionals of micropaleontology alike.

However, a few short comings have been noticed. Some of the maps, figs. and plates are not produced well (for example maps on page (31, 94, 135, 136, 212, 221, 307 etc.). Reductions of some of the figures have turned out to be illegible. Referencing pattern and usage of both British and American spelling at many places have escaped the editor's attention in some of the papers. References of the some of the papers indicate that they were overdue in the authors' cupboard. It is my feeling and I am sure-reader will also agree that the presentation of taxonomy of any assemblage should be kept outside the scope of such volumes. Papers dealing with taxonomy deserve complete treatment in any subject specific regular journals. Such descriptions get diluted in proceedings volume.

I sincerely hope such short comings will not undermine in anyway the potential of the volume and will be duly taken care of in a possible next edition. Needless to mention this volume deserves a place in the libraries of academic institutes, universities and personal collections of professionals. We must be grateful to the editor for nicely bringing out the colloquium proceedings and much more because he used his acquaintances in requesting papers beyond those presented in the Micropaleontological colloquium held at Varanasi in 2003.

Narosa Publishing House is known for bringing out classical scientific contributions since its establishment. While some of their books provide an in-depth over views and comprehensive matters for students and researchers alike, others describe recent developments in chosen area of science. The present volume is elegantly brought out by the publisher and provides a glimpse of the potentials of micropaleontology.

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