pisoliths seen in Guyana, South America. I was surprised to see from your Fig.4 that they are hollow, or layered. However, there is a web link to similar structures at http: wwwrses.anu.edu.au/environment/2002_Ann_Rep/ ARp08.html. Bernal says that they are typically 1 cm diameter, but I am sure the Guyanese ones are smaller. The Guyanese laterites are developed on peneplanation benches of various ages.

B.S.Paliwal, Department of Geology, J.N. Vyas University, Jodhpur – 342 005 replies:

We sincerely thank Dr. Robin Westerman for his keen interest in our findings of magnetic spherules in recent alluvium of Rajasthan. There are very little chances of these spherules being lateritic pisoliths. However, this possibility will be explored in our future publication when complete geochemistry of spherules collected from different localities and different stratigraphical levels is complete. Our present geochemical analyses (both for major and trace elements see Tables 1 and 2) do not support that these magnetic spherules are manganiferous pisoliths as seen by Dr. Westerman in Guyana, South America. Ferromanganese nodules on an average contain about 16.174 (wt%) manganese (Cronan, 1977; Calvert, 1978). In general red clays of ocean floor are also contaminated with an average 12% of manganese grains (Roonwal, 1986). We will be very happy to receive cooperation from Dr. Robin Westerman or others interested in pursuing the matter further.

References

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Cronan, D.S. (1977) Deep Sea Nodules: Distribution and Geochemistry. *In:* G.P. Glasby (Ed.), Marine Manganese Deposits. Elsevier, Scientific American, pp.11-44.

Roonwal, G.S. (1986) The Indian Ocean: Exploitable Mineral and Petroleum Resources. Springer-Verlag, New York, 161p.

RECORD OF PILLBUG (*Armadillidium*) AND MILLIPEDE (*Polyxenus*) REMAINS FROM THE RESIN LUMPS OF WARKALLI FORMATION (UPPER TERTIARY), KERALA COAST by G.P. Srivastava, Manoj Shukla, Prabhat Kumar, Madhav Kumar and Anand Prakash. Jour. Geol. Soc. India, v.67, no.6, pp.715-719.

A.R. Nambiar, Geological Survey of India, Marine Wing, Mangalore – 575 001; **Email:** nambiar_ar@yahoo.co.in, comments:

The team of scientists from Birbal Sahni Institute of Palaeobotany (BSIP) and Lucknow University are to be congratulated for their reporting for the first time the occurrence of arthropod remains in the resin lumps associated with the Tertiary sediments (Warkalli Formation) of Kerala. Previously, the group has reported the occurrence of insects and related ichnofossils embedded in the resin within the sediments from the same area (*cf.* Shukla et al. 2000, *JGSI*, v.56, pp.315-319).

The purpose of the correspondence is not to comment on the discovery, but to bring to the notice of the authors about some simple, but grave mistakes they repeatedly make on the location of the samples from which fossil remains are recorded. The authors report the occurrence of insect and arthropod remains embedded in fossil resins collected from China clay mine, Payangadi, Kerala. In both the papers, it is mentioned that the mine is located 40 km west of Cannonore (Kannur). Kannur is a coastal town (*see* Fig.1) and 40 km west means far beyond territorial waters in Arabian Sea. In Fig.1, location of Payangadi clay mine is shown east of Nileshwar, which is also wrong. Payangadi (Pazhayangadi in Malayalam) clay mine is located near to Payangadi railway station, about 22 km NNW of Kannur. There are also clay mines near Nileshwar. Hence, whether the samples studies are from Payangadi or Nileshwar clay mines is in doubt.

The geological map (Fig.1) shows continuous outcrop of Quilon Formation in the coastal tract between Tellicherry and Nileshwar. Quilon Formation is nowhere exposed, but occurs only as subcrops, that too particularly in south Kerala. Further, the lithological section of the clay mine shows more than 2 m thick alluvium, which is also not true.

G.P. Srivastava, 18/144, Indira Nagar, Lucknow – 226 016 replies:

The samples studied were collected from Payangadi Clay Mines located near Payangadi Railway Station about 22 km NNW of Kannur. Further, it is clarified that the samples were collected from Payangadi Clay Mines and not from Nileshwar Mines. The geological map (Fig.1) has been taken from Paulose, K.V. and Narayanswami, S. (1968) as it is shown in the paper by Shukla et al. (2000a).

The geological map (Fig.1) shows continuous outcrop of Quilon Formation in the coastal tract which has been reproduced from Paulose, K.V. and Narayanswami, S. (1968) and duly acknowledged by Shukla et al. (2000a). As regards to the thickness of alluvium shown in the lithology, I feel it is variable.

NOTES

SPECIAL PUBLICATION ON THE SHIVA STRUCTURE

Attention of the readers is drawn to a recently brought out 39-page special publication of the Museum of Texas Tech University (No.50, October 2006) on the "Shiva Structure: A Possible KT Boundary Impact Crater on the Western Shelf of India" by Sankar Chatterjee, Necip Guven, Aaron Yoshinobu and Richards Donofrio. The submerged Shiva Crater in the Mumbai offshore Basin is presumed to be the largest (a 500 km diameter) of the known impact craters showing a structural relief of about seven kilometers.

The authors "..... speculate that the Shiva bolide (~40 km diameter) crashed obliquely on the western continental shelf of India around 65 Ma, excavating the crater and shattering the lithosphere. The peak ring of the Bombay High area has a core of Neoproterozoic granite with a veneer of Deccan Trap that rebounded upward for more than 50 km during the transient cavity stage as revealed by the mantle upwarping. Pseudotachylite veins of silica melt are observed within the drill cores of granitic target rock that may be linked to the impact-melting event. The combined Neoproterozoic granite and Deccan Trap target lithologies generated two kinds of impact melt ejecta that were emplaced radially in the down range direction within the Deccan lava pile: rhyolite dykes and iridium-rich alkaline igneous complexes. The age of the crater is inferred from its brecciated Deccan lava floor and the overlying Palaeocene Panna Formation within the basin, isotopic dating of the presumed proximal ejecta melts, and the magnetic anomaly of the Carlsberg Ridge that was created by the impact. Concentric geophysical anomalies, thermal anomalies, seismic reflection, and structural drill core data endorse the impact origin of the Shiva structure. The KT boundary sections in India, often preserved within the Deccan lava flows, have yielded several cosmic signatures of impacts such as an iridium anomaly, iridium-rich alkaline melt rocks, shocked quartz, nickel-rich spinels, magnetic and super-paramagnetic iron particles, nickel-rich vesicular glass, sanidine spherules, high-pressure fullerenes, glass altered smectites, and possibly impact-generated tsunami deposits. The impact was so intense that it led to several geodynamic anomalies; it fragmented, sheared, and deformed the lithospheric mantle across the western Indian margin and contributed to major plate reorganization in the Indian Ocean. This resulted in a 500 km displacement of the Carlsberg Ridge and initiated rifting between India and the Seychelles. At the same time, the spreading center of the Laxmi Ridge jumped 500 km westerly close to the Carlsberg Ridge. The oblique impact may have generated spreading asymmetry, which caused the sudden northward acceleration of the Indian plate in Early Tertiary. The central uplift of a complex crater and the shattered basement rocks form ideal structural traps for oil and gas. Many of the complex impact structures and events at the KT transition such as the Shiva crater, Chicxulub crater and the Boltysh crater create the most productive hydrocarbon sites on the planet. The kill mechanisms assocated with the Shiva crater appears to be sufficiently powerful to cause worldwide collapse of the climate and econsystems leading to the KT mass extinction when the dinosaurs and two-thirds of all marine animal species were wiped out."

The publication carries excellent diagrammatic sketches, sections and photomicrographs to buttress the contentions of the authors. This special publication is a recommended reading for the general reader as well as the specialist interested in the role of extra-terrestrial impact processes in the crustal evolution of our planet, mass extinctions, triggered/induced volcanic processes, location of productive hydrocarbon sites and a host of related processes.

Bangalore M.S. Rao