for this in this list. It is true that *Okapia*, today, is only found living in a small forest zone in the Eastern Congo, but its hind foot structure, as well as that of the feet of its extinct cousins, strongly suggests an open plains habitat. The living *Okapia* species may have moved so recently into the forest that its ankle structure has not yet been modified. Pigs are not all forest animals. What evidence is there that the Nagri ones were? The hystricid and rhizomyid rodents include genera, today, adapted to all kinds of environments. What evidence is there that the Nagri representatives were forest dwellers? The same question may be reasonably asked about the carnivores. On the whole, viverrids live more in open country than in forests and the same is true of the felids. The foot of the Nagri Zone *Hipparion* is broad hoofed and has been interpreted as probably linked with swamp conditions, but there are others who believe a broad wide hoof is indicative of dry grassy plains habitat, as in the case of the zebras today.

As to whether the presence of "tragulids, anthrocotheres, rhinocerotids, and dinotheres suggest forest and swamp", this is again open to question. In any event, are we sure that they come from the same detailed levels, in the overall Nagri Zone, that yielded the limited *Ramapithecus* material? I can assure Tattersall, from my personal observations over the past 60 years, that the living representatives of the hyaenid *Crocuta* and of *Orycteropus* can be found in a very wide range of habitats, including forests with high rainfall as well as sub-desertic areas.

I consider that the attempt to extrapolate the ecology and habitats of *Ramapithecus*, by examining the extinct species of various genera reportedly associated with it, cannot be sustained.

L. S. B. Leakey

Centre for Prehistory and Palaeontology,
PO Box 30239,
Nairobi,
Kenya.

Received April 25, 1969.

1 Tattersall, I., *Nature*, **221**, 451 (1969).

Criteria for recognizing Pre-Cambrian Fossils

Anderson and Misra[1] have described new fossils from the Pre-Cambrian of Newfoundland and ascribe them to impressions of soft-bodied Metazoa, but they do not discuss why they consider the structures to be undoubtedly organic in origin, though the Pre-Cambrian age is beyond dispute. New Pre-Cambrian fossils are reported quite frequently, but only a few of them are accepted as organic. It may therefore be helpful to distinguish the criteria available for distinguishing between organic and inorganic Pre-Cambrian macro-structures (as distinct from microorganisms[2]).

(1) Simple symmetry or abundance are not acceptable criteria. (2) Chemical analysis of the rock is unlikely to help, particularly in more strongly tectonized sediments. (3) Ontogeny may be a useful guide. (4) The structures concerned may suggest a high degree of organic evolution, as with many of the South Australian Pre-Cambrian fossils. (5) Evidence of movement may be indicative of fossils, especially when considered with evidence of (6) mode of preservation and burial.

The use of these criteria is well illustrated by the work of Glaessner and Wade, who have carefully described the relationship of the South Australian Ediacara fossils to the overlying and underlying sediment. Wade[3] has given an account of their preservation, and, by sectioning some of the material, she has been able to show just how individuals came to rest on the substrate, how they were entombed, and what happened to them as they decomposed and were fossilized. Obviously it is necessary to collect the sediment overlying the fossil as well as that underlying it.

Anderson and Misra mention the doubtful *Aspidella terranovica* Billings. This, though common, is definitely inorganic. Sectioning shows that many specimens are water or gas-escape structures[4]. Others are partly attributable to the manner in which the highly lithified clay and silt-grade rock has parted along a changing stratigraphic level, particularly around load and scour structures.

Unfortunately, Anderson and Misra give no evidence for the organic origin of their structures and do not relate them to the underlying and overlying sediment. Although an organic origin cannot be disproved, their illustration does show striking resemblances to impressions of cone-in-cone structure.

R. Goldring

Department of Geology,
University of Reading.

Received December 9, 1968; revised May 12, 1969.

1 Anderson, M. M., and Misra, S. B., *Nature*, **220**, 680 (1968).
2 Barghoorn, E. S., and Tyler, S. A., *Science*, **147**, 563 (1965).
3 Wade, M., *Lethaia*, **1**, 238 (1968).
4 Schindewolf, O. H., in *Geotektonisches Symposium zu Ehren von Hans Stille* (Ferdinand Enke Verlag, Stuttgart, 1956).

Our communication[1] did not describe new fossils from the Pre-Cambrian of Newfoundland but rather gave brief details of the presence of a metazoan fauna of this age, because our aim was to announce what we regard as an important discovery, and we indicated quite clearly that details of the fauna would be published elsewhere. We concentrated on the stratigraphical aspects of the fossil locality because it is essential to establish from the outset that the rocks containing them are in fact Pre-Cambrian and not Lower Palaeozoic or younger. It is true that we did not provide evidence of the organic origin of the structures interpreted as fossils, but we assumed, perhaps wrongly, that readers would await this information in the actual account of the fauna.

In view of the fact that the organic nature of these structures is discussed in a paper now in the press[2], only a brief summary of the reasons for regarding them as organic will be given here: (1) their restriction to certain bedding planes; (2) they lie on these ripple-marked surfaces; (3) their orientation is unrelated to ripple-marks or to cleavage or other fracture patterns and some commonly straight forms are also found in a curved state; (4) they are not related to sedimentary structures; (5) the variety of forms: round lobate, spindle-shaped, leaf-shaped, dentritic; (6) their variation in size (possibly ontogenetic), (7) the complexity of some forms; (8) similarity to known Pre-Cambrian fossils. A general geological account of the fossil-bearing rocks is given in ref. 3.

Any resemblance of the commonest form in the fauna to cone-in-cone structure is illusory, for the cones of these calcareous structures (sometimes replaced by silica)[4] form at right angles to bedding surfaces and not parallel to them, and furthermore, unlike the fossil impressions illustrated, lenses of cone-in-cone structure developed in the same bed have the same orientation; they possess thickness and the cones interfere with one another so that they do not show a regular alternating left–right arrangement.

M. M. Anderson
S. B. Misra

Department of Geology,
Memorial University of Newfoundland,
St John's, Newfoundland, Canada.

Received July 9, 1969.

1 Anderson, M. M., and Misra, S. B., *Nature*, **220**, 680 (1968).
2 Misra, S. B., *Bull. Geol. Soc. Amer.* (in the press).
3 Misra, S. B., thesis, Memorial Univ. Newfoundland (1969).
4 Woodland, B. G., *Fieldiana*, **18**, 187 (1964).