

# An abnormal megaspore from Lower Permian Coal Measures near lake Tanganyika, Zaire

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Maheshwari, Hari K. & Bajpai, Usha (1987). An abnormal megaspore from Lower Permian Coal Measures near lake Tanganyika, Zaire. *Palaeobotanist* 35 (2) : 175-177.

An abnormal megaspore with a tetradiate mark of cytokinesis is reported from the Lukuga Group of Zaire, Central Africa. The sporoderm of the megaspore shows effects of bio-degradation probably resulting due to bacteria.

**Key-words**—Palynology, Megaspore, Bacteria, Biodegradation, Permian (Zaire).

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## सारांश

तंगानयिका झील (ज़ायर) के समीपस्थ अधरि परमी कोयला-मेज़र्स से एक असाधारण गुरुबीजाणु

हरिकृष्ण माहेश्वरी एवं ऊषा बाजपेयी

केन्द्रीय अफ्रीका में ज़ायर के लुकुगा समूह से कोशिका द्रव्य-विभाजन के चतुरंगक चिन्ह से युक्त एक असाधारण गुरुबीजाणु की बीजाणुचर्म जैवनिम्नीकरण का प्रभाव व्यक्त करनी है जो कि सम्भवतया जीवाणुओं के फलम्बरूप हो सकता है।

THE Permian Period in Zaire is represented by sediments of Lukuga Group which are mostly confined to the eastern part and outcrop from Irumu in the north-east up to almost the southern boundary of Katanga. Much work has been done on the palynostratigraphy of the group; almost all the formations are rich in microspores and pollen. However, megaspores have been recovered from only a few beds of Assise á couches de houille represented by Coal Measures near lake Tanganyika, south of Albertville (Bose & Maheshwari, 1968).

These megaspores are yet to be described and illustrated. One of the specimens from this assemblage shows an abnormal feature, that is, tetradiate lines of cytokinesis. Though unusual attachment of spores and pollen in dyads and tetrads is known in a few species, e.g. *Glyptostrobus* sp. (Wodehouse, 1935), *Selaginella deflexa* Brack (Selling, 1945), *S. rupestris* Spring (Graustein, 1930), *S. selaginoides* (L.) Link (Erdtman, 1943), etc., the only report of an abnormal laesura known to us is by Devi and Khare (1985) who reported a circular laesura in *Pteris vittata* L. The tetradiate megaspore is thus an unique find and is described and illustrated here.

## DESCRIPTION

The megaspore is almost circular in proximo-distal view. The most unusual feature of the megaspore is the presence of tetradiate lines of cytokinesis. Instead of the usual three 'letes' the megaspore has four 'letes'. All the 'letes' are equal in length and do not extend beyond the 'contact area'. Even though the arcuate ridges are not seen, the 'contact area' is well demarcated and slightly raised above the surface of the megaspore. The exospore is psilate at the light microscope level. Under the scanning electron microscope the sporoderm shows setting in of the biodegradational process.

Sandwiched between the tip of one of the 'letes' and the sporoderm is an ovoid body with rough surface. There are two other bodies lying on the sporoderm. One of the bodies is built up of irregular and broken ridges with mini and micro projections. The other body comprises a large number of ovoid to spherical structures, all with micro projections. These probably represent bacterial attack resulting in biodegradation of the sporoderm.

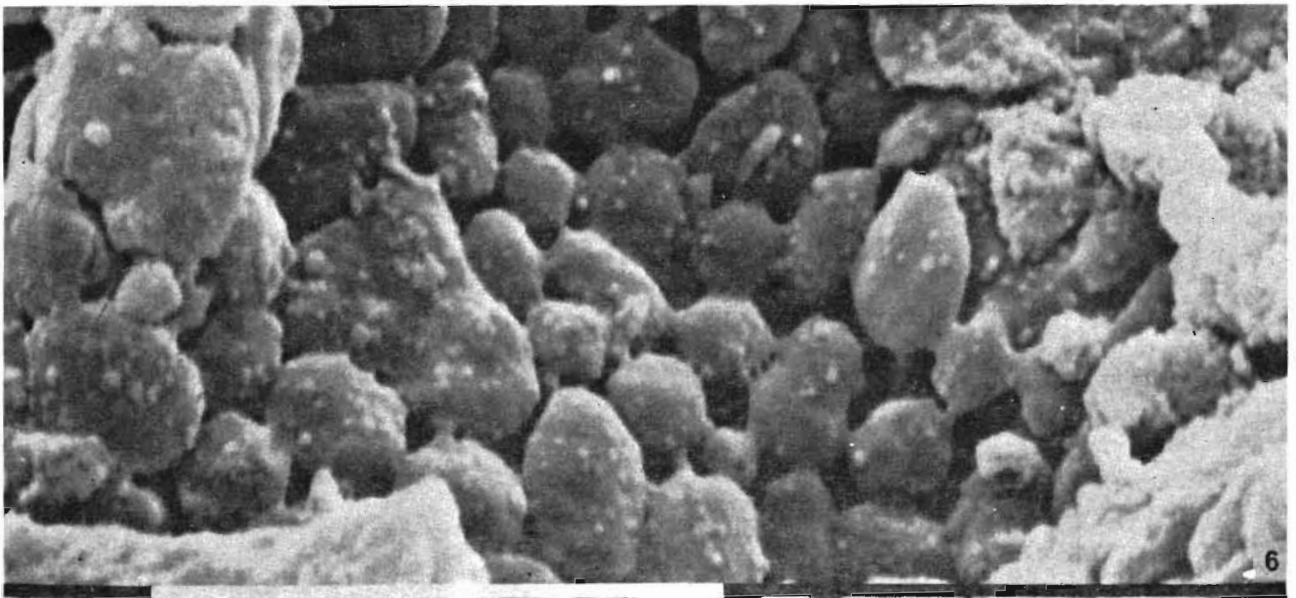
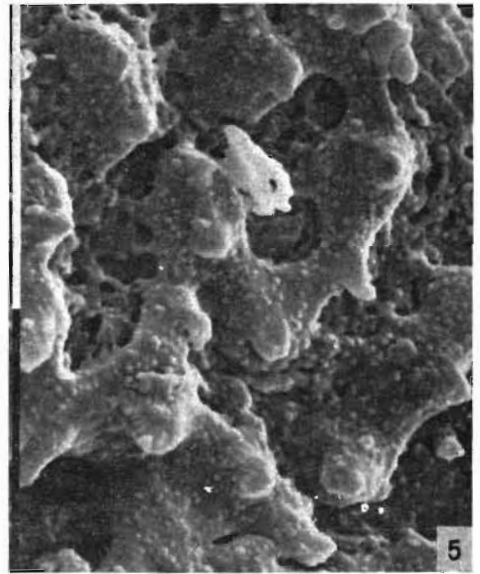
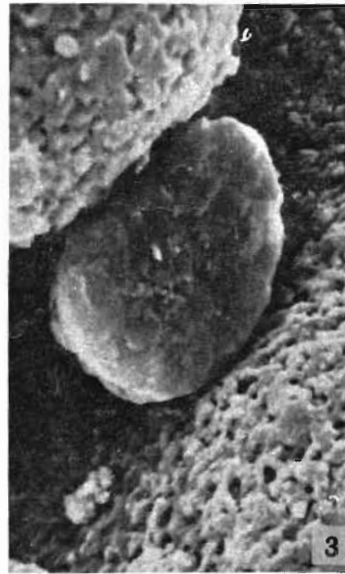
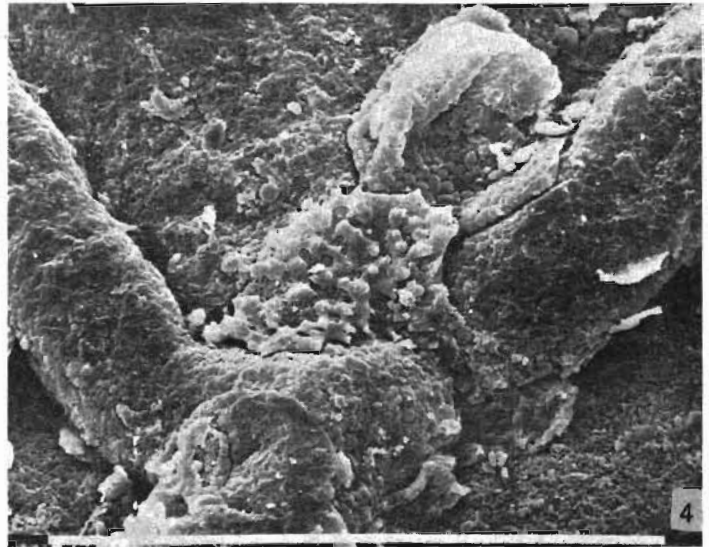
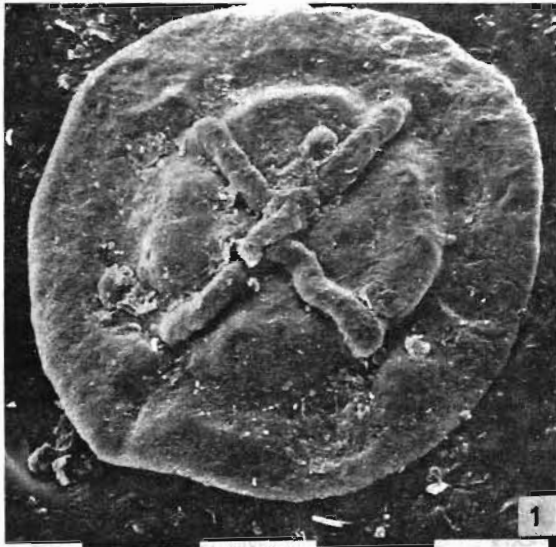
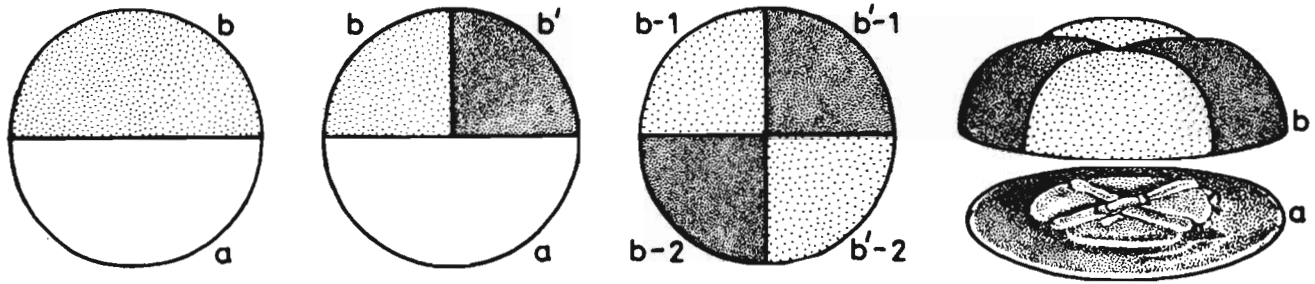


PLATE 1



**Text-fig. 1**—Presumed sequence of divisions in megaspore mother cell resulting in formation of abnormal megaspore (a).

The megaspore was recovered from the SEM stub and subjected to the differential maceration technique as outlined by Maheshwari and Bajpai (1984) to know the nature of mesosporium. However, only fragments of mesosporium could be recovered and because of this drawback the specimen could not be identified with the known megaspore taxa.

### DISCUSSION

Pteridophytes regularly produce spores as direct products of meiosis. The meiocytes of heterosporous pteridophytes produce spores of two sizes. Some of the sporangia contain large number of small sporocytes, each of which gives rise to four microspores after meiosis. In other sporangia a regular and extensive degeneration of sporocytes takes place leaving only one or a few sporocytes to enlarge and undergo meiosis producing four large spores, the megaspores.

The micro- and megaspores of pteridophytes generally show 2 or 3 contact facets depending upon the type of tetrad, e.g. tetragonal or tetrahedral. The contact facets mark the lines of cytokinesis or cell plate formation within the spore mother cell. A megaspore with 4 contact facets, as in the present case, is an abnormality and its origin requires explanation. A possible sequence could be as follows:

In the megasporangium, the sporogeneous tissue segregates into individual cells which function as meiocytes. Usually all except one of the spore mother

cells degenerate and the survivor undergoes cytokinesis through meiosis producing four spores arranged in a tetrad. In the present case it seems that after meiosis I, the cell plate was laid down forming a dyad. One of the member of the dyad did not divide further while the other one underwent two mitotic divisions to produce 4 cells arranged in a tetragonal tetrad. These 4 cells probably developed into abortive megaspores whereas the other member of the dyad acquired 4 'letes' marking the lines of contact between the functional megaspore and the 4 abortive megaspores. An attempt to reconstruct this sequence has been made in Text-figure 1.

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### PLATE 1

1. Scanning Electron Micrograph of the megaspore showing four "letes" and raised contact areas.  $\times 155$ .
2. A part of the megaspore magnified to show the rounded apex of one of the "letes". The reticle marks the presence of an oval foreign body.  $\times 300$ .
3. The portion outlined by the reticle in figure 2 magnified further.  $\times 2400$ .
4. Two foreign bodies lying in the angle between two "letes"  $\times 810$ .
- 5, 6. The foreign bodies magnified further to show their nature and their biodegradational effect. 5.  $\times 4100$ ; 6.  $\times 7600$ .