

A MIOFLORA OF BARREN MEASURES AGE FROM THE AURANGA COALFIELD, BIHAR

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ABSTRACT

The present paper describes for the first time a mioflora of Barren Measures age from the Auranga Coalfield. The assemblage (13 genera and 26 species) is dominated by striate-disaccates along with a good amount of *Densipollenites*. The quantitatively significant genera are *Faunipollenites*, *Densipollenites*, *Striatites*, *Verticypollenites*, *Scheuringipollenites* and *Lahirites*. Two species, *Densipollenites brevis* and *Striatopodocarpites crassistriatus* are new.

INTRODUCTION

THE palaeobotanical investigations of the various Lower Gondwana stages, viz., Talchir, Karharbari, Barakar and Raniganj of the Auranga Coalfield have earlier been carried out by Feistmantel (1881a, 1881b, 1882, 1886), Bhattacharyya (1959) Bhattacharyya (1963), Maithy (1971), Srivastava and Anand-Prakash (1973), Srivastava (1977a, b) and Lele and Srivastava (1977).

During the present palaeobotanical studies a good assemblage of spores and pollen comparable to the Barren Measures mioflora, have been recovered. So far the Barren Measure Stage has not been recognized in the Auranga Coalfield. Rizvi (1972) in his recent geological work stated about this stage as "rocks of Barren Measures in the type area of Jharia Coalfield have not been noted in this area. Careful search along the Barakar-Raniganj could not bring to light their presence. If at all any deposition of these rocks took place, either they were eroded by the time Raniganj rocks were deposited or they are still covered and do not show any exposure".

The present sample site (see in Map, Srivastava, 1977b) has been mapped as Barakar by Rizvi (loc. cit.) but the miofloristic evidence now indicates a Barren Measures age.

MATERIAL AND METHODS

Samples have been collected from a section exposed in north-east bank of Sukri

River about 1.5 km north-east of Rajbar Village (see in Map, Srivastava, 1977b). The rock section is exposed as follows in ascending order:

Sandstone	7.00 m
Coaly shale	1.00 m
Brown to grey- colour shale	1.00 m
Coaly shale (mioflora described here)	2.00 m
Sandstone	2.00 m
rest concealed below	

The samples were macerated with the usual Schulz's method. All the type slides are preserved at the Museum of Birbal Sahni Institute of Palaeobotany, Lucknow.

DESCRIPTION

- Anteturma — *Sporites* Potonié, 1893
Turma — *Triletes* (Reinsch) Potonié & Kremp, 1954
Subturma — *Azonotriletes* Luber, 1935
Infraturma — *Laevigati* (Bennie & Kidston) Potonié, 1956

Genus — *Punctatisporites* (Ibrahim) Potonié & Kremp, 1954

Punctatisporites indicus Tiwari, 1968

Pl. 1, fig. 1

Description — Size range 46-50 × 40-45 μ, rays indistinct, 1/2-2/3 radius long, exine thick, finely intramicropunctate.

Remarks — Bharadwaj and Verma (1974) have restricted *Punctatisporites* for punctate sculptured forms, but this can not be ascertained in the few specimens available in the present material.

- Turma — *Monoletes* Ibrahim, 1933
Subturma — *Azonomonoletes* Luber, 1935
Infraturma — *Laevigatomonoletii* Dybova & Jachowicz, 1957

Genus — *Latosporites* Potonié & Kremp, 1954

Latosporites colliensis (Balme & Hennelly) Bharadwaj, 1962

Pl. 1, fig. 2

Description — Size range 60-65 × 50-55 μ, circular to subcircular, monolete open, running 3/4 of the length, exine 1-1.5 μ thick, laevigate, rarely folded.

Turma — *Aletes* Ibrahim, 1933

Subturma — *Azonoletes* (Luber) Potonié & Kremp, 1954

Infraturma — *Psilonapiti* Erdtman, 1947

Genus — *Kagulubeites* Bose & Maheshwari, 1968

Kagulubeites verrucosus Bose & Maheshwari, 1968

Pl. 1, fig. 3

Description — Size range 55-60 × 50-55 μ, splitting zone visible, exine 1-2 μ thick, microverrucose, verrucae fine, closely placed.

Infraturma — *Tuberini* Pant, 1954

Genus — *Mammialetes* Kar, 1969

Mammialetes mammus Kar, 1969

Pl. 1, fig. 4

Description — Size range 60-70 × 75-80 μ, subcircular, mark absent, exine sculptured with 12-15 μ long, mamillate process with swollen tips.

Anteturma — *Pollenites* Potonié, 1931

Turma — *Saccites* Erdtman, 1947

Subturma — *Monosaccites* (Chitaley) Potonié & Kremp, 1954

Infraturma — *Monopolsacciti* Hart, 1965 emend. Dibner, 1971

Subinfraturma — *Proximalsaccini* Dibner, 1971

Genus — *Densipollenites* Bharadwaj, 1962

Densipollenites indicus Bharadwaj, 1962

Pl. 1, fig. 5

Description — Size range 110-120 × 95-110 μ, circular to subcircular, body distinct,

50-55 × 40-58 μ, saccus folded intrareticulation fine to medium.

Densipollenites invisus Bharadwaj & Salujha, 1964

Pl. 1, fig. 6

Description — Size range 110-115 × 60-75 μ, body circular, thick, 30-35 × 40-50 μ, saccus folded, intrareticulation medium to coarse.

Remarks — The overall size and the body size is smaller than the holotype (137.5 × 102.5 & 54 × 46 μ).

Densipollenites densus Bharadwaj & Srivastava, 1969

Pl. 1, fig. 7

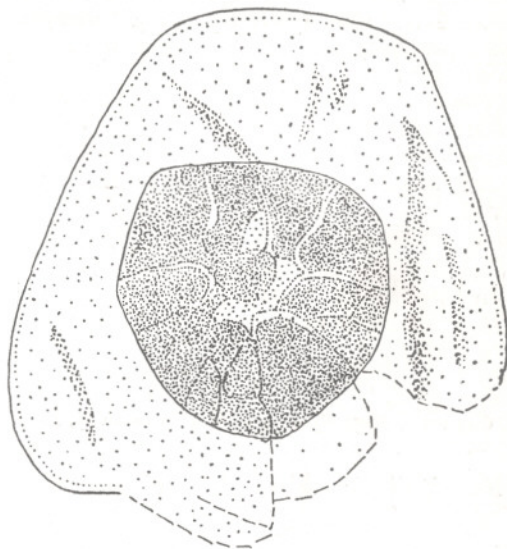
Description — Size range 90-110 × 60-80 μ, body 30-40 × 40-45 μ, saccus folded, intrareticulation medium to coarse.

Densipollenites brevis sp. nov.

Pl. 1, figs. 8, 9; Text-fig. 1

Holotype — Pl. 1, fig. 8; Slide no. 5029.

Type Locality — Sukri River Section, near Rajbar Village, Auranga Coalfield, Bihar.



TEXT-FIG. 1 — *Densipollenites brevis* sp. nov., drawing of the holotype showing small size and pleated central body × Ca 830.

Horizon & Age — Barren Measures Stage, Lower Gondwana; Lower Permian.

Diagnosis — Size range 70-80×72-81 μ , circular to subcircular, body 34-40×30-42 μ , circular, dense.

Description — Central body dark brown, thick but not as in *D. densus* Bharadwaj & Srivastava, (1969) tends to be segmented or grooved, saccus fine to medium intrareticulate.

Comparison — The present specimens compare with *D. indicus* Bharadwaj, 1962 and *D. densus* Bharadwaj & Salujha, 1965 in the presence of well-defined central body but differ considerably in its small size and in the absence of profuse folding of the saccus. The saccus tends to form a radial pleating around the distal attachment zone.

Subinfraturma — *Distalsaccini* Dibner, 1971

Genus — *Potonieisporites* (Bharadwaj) Bharadwaj, 1964

Potonieisporites sp.

Pl. 1, fig. 10

Description — Size range 100-110×95-105 μ , circular, body oval, 64×58 μ , monolete mark probably represented by a bend fold, saccus fold rim visible.

Remarks — The specimens compare with *Potonieisporites novicus* Bharadwaj but the latter species is larger in size. Due to lack of specimens no specific name has been given.

Subturma — *Disaccites* Cookson, 1947

Infraturma — *Striatiti* (Pant) Bharadwaj, 1962

Genus — *Faunipollenites* Bharadwaj, 1962

Faunipollenites varius Bharadwaj, 1962

Pl. 1, fig. 11

Description — Size range 105-140×60-80 μ , horizontal striations 4-7, branched, sulcus 4-10 μ wide.

Faunipollenites parvus Tiwari, 1965

Pl. 2, fig. 13

Description — Size range 70-80×40-50 μ , horizontal striations 4-6, branched, sulcus 4-10 μ broad.

Faunipollenites perexiguus Bharadwaj & Salujha, 1965

Pl. 2, fig. 14

Description — Size range 50-70×60-70 μ , horizontal striations 6-8, unbranched, sulcus 2-4 μ .

Remarks — This species is distinguishable from *F. parvus* by its rhomboid to more subcircular shape, narrow distal channel, and greater overlap of sacci on the distal side.

Faunipollenites singrauliensis Sinha, 1972

Pl. 1, fig. 12

Description — Size range 85-92×67-72 μ , horizontal striations 5-7, sulcus slit like, 1-3 μ wide.

Genus — *Crescentipollenites* (Bharadwaj) Bharadwaj, Tiwari & Kar, 1974

Crescentipollenites fuscus (Bharadwaj) Bharadwaj, Tiwari & Kar, 1974

Pl. 2, fig. 15

Description — Size range 110-120×60-70 μ , body elliptical, 40-50×60-70 μ , horizontal striations 5-7, two vertical semilunar folds present along distal attachment, sulcus biconvex, 10-12 μ wide.

Genus — *Striatopodocarpites* (Soritsch. & Sedowa) Bharadwaj, 1962

Striatopodocarpites diffusus Bharadwaj & Salujha, 1964

Pl. 2, fig. 16

Description — Size range 110-120×60-72 μ , body 55-60×60-72 μ , diffused, horizontal striations 9-14, sulcus 12-17 μ wide.

Striatopodocarpites crassistriatus sp. nov.

Pl. 2, fig. 17; Text-fig. 2

Holotype — Pl. 2, fig. 17; Slide no. 5030.*Type Locality* — Sukri River Section, near Rajbar Village, Auranga Coalfield, Bihar.*Horizon & Age* — Barren Measures Stage, Lower Gondwana; Lower Permian.*Diagnosis* — Size range $80-100 \times 50-64 \mu$, central body oval to rhomboidal, $48-56 \times 44-63 \mu$, horizontal striations 6-10, sulcus $16-18 \mu$ wide, straight to \pm convex, sacchi haploxyloid.*Description* — Bilateral, haplo to diploxyloid, striations thick, grooved (recalling-taenae) run over the full length of the body, exine intramicoreticulate, sometimes connected vertically near the margin of the body, sacchi hemispherical, distally widely apart, attachment full, straight to \pm convex, sometimes associated with thin folds, intrareticulation fine to medium.*Comparison* — In its size and shape the present specimen compare with *Striatopodocarpites decorus* described by Bharadwaj and Salujha (1964, pl. 10, fig. 140) but later has truncate ends body, whereas in the former body ends are rounded; in the thick grooved nature of striations it differs from all the known species.**Genus — *Lahirites* Bharadwaj, 1962***Lahirites parvus* Bharadwaj & Salujha, 1964

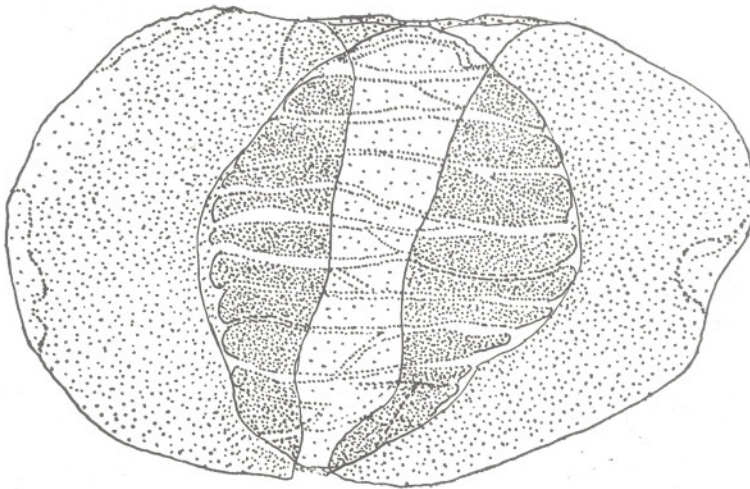
Pl. 2, fig. 18

Description — Size range $115-130 \times 55-67 \mu$, body $35-40 \times 50-52 \mu$, horizontal striations 5-8.*Remarks* — Some specimens show the overlapping tendency of saccus distally in the middle.*Lahirites incertus* Bharadwaj & Salujha, 1964

Pl. 2, fig. 19

Description — Size range $80-95 \times 30-36 \mu$, body $30-35 \times 28-36 \mu$, horizontal striations 6-8, sulcus $10-12 \mu$ wide.**Genus — *Striatites* (Pant) Bharadwaj, 1962***Striatites barakarensis* Sinha, 1972

Pl. 2, fig. 20

Description — Size range $100-115 \times 60-75 \mu$, body \pm rhomboid, $30-35 \times 40-45 \mu$, horizontal striations 7-9, sulcus \pm straight, $5-7 \mu$ wide.TEXT-FIG. 2 — *Striatopodocarpites crassistriatus* sp. nov., drawing of the holotype showing thick striations \times Ca 950.

Striatites subtilis Bharadwaj & Salujha, 1964

Pl. 2, fig. 21

Description — Size range 75-90 × 34-50 μ, body 32-40 × 30-40 μ, horizontal striations 5-7, sulcus 3-5 μ wide.

Striatites notus Bharadwaj & Salujha, 1964

Pl. 2, fig. 22

Description — Size range 74-85 × 48-54 μ, body 34-40 × 32-42 μ, horizontal striations 6-9, sulcus 3-5 μ wide.

Remarks — The species is distinguishable from *S. subtilis* Bharadwaj & Salujha by its thicker body and prominent marginal rim on the body.

Striatites communis Bharadwaj & Salujha, 1964

Pl. 2, fig. 23

Description — Size range 60-67 × 34-40 μ, body 24-30 × 30-35 μ, marginal ridge absent, horizontal striations 7-10, sulcus 2-4 μ wide.

Genus — *Verticypollenites* Bharadwaj, 1962

Verticypollenites gibbosus Bharadwaj, 1962

Pl. 2, fig. 24

Description — Size range 100-107 × 40-45 μ, body 34-42 × 34-38 μ, horizontal striations 5-7, sulcus 1-3 μ wide.

Verticypollenites subcircularis Bharadwaj & Salujha, 1964

Pl. 2, fig. 25

Description — Size range 70-90 × 40-45 μ, body 35-38 × 38-42 μ, horizontal striations 6-9, sulcus 2-4 μ wide.

Verticypollenites finitimus Bharadwaj & Salujha, 1964

Pl. 2, fig. 26

Description — Size range 64-90 × 25-40 μ, body 28-38 × 26-34 μ, sulcus 3-8 μ wide.

Infraturma — *Disacciatrileti* (Leschik) Potonié, 1958

Genus — *Scheuringipollenites* Tiwari, 1973

Scheuringipollenites ovatus (Hart) comb. nov.

Pl. 2, fig. 27

Remarks — *Florites ovatus* Balme & Hennelly (1955) has been recombined as *Sulcatisporites ovatus* by Bharadwaj (1962) and as *Vesicaspora ovata* by Hart (1960). Illustrations given by Balme and Hennelly (1955, pl. 5, figs. 49-52) agree with the diagnosis and description of *Scheuringipollenites* Tiwari (1973).

Description — Size range 70-80 × 45-58 μ, bilateral, body thin, sacchi hemispherical, 4-6 μ wide distal free area, intrareticulation fine.

COMPARISON AND DISCUSSION

The present mioflora is dominated by striate-disaccates and monosaccates. Quantitatively important genera are *Faunipollenites*, *Densipollenites*, *Striatites*, *Verticypollenites*, *Scheuringipollenites* and *Lahirites*.

Other quantitatively significant genera are *Latosporites*, *Mammialetes* and *Crescentipollenites*.

The following genera are rarely represented *Potonietsporites*, *Striatopodocarpites*, *Punctatisporites* and *Kagulubeites*.

Bharadwaj, Sah and Tiwari (1965) studied the Barren Measures miofloral assemblages from the type area of Jharia Coalfield, Bihar. They have shown that the assemblage is dominated by the striate-disaccate along with a significant percentage of *Densipollenites*; triletes are very few. Kar (1973) studied the Barren Measures miofloral assemblages of the North Karanpura basin and found that the striate-disaccates, viz., *Striatopiceites*, *Strotersporites* and *Striatites* along with a good percentage of *Densipollenites* are dominant in the Middle Barren measures Stage. The significance of *Densipollenites* for the Barren Measures is also revealed in the miofloral study of the Brahmani Valley Coalfield (Srivastava & Maheshwari, 1974). On the basis of all these evidences, Bharadwaj (1971, 1974) recognized three zones of *Densipollenites* in the Barren Measures succession.

The present assemblage which is dominated by *Faunipollenites*, *Striatites*, *Verticypollenites* and *Lahirites* along with, *Densipollenites* can be closely compared with that of the known Barren Measures miofloras (esp. Middle Biozone) according

to the present palynostratigraphic standard. This evidence thus indicates the possible existence of the Barren Measures Formation in the Auranga Coalfield which has hitherto remained geologically unrecognized.

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EXPLANATION OF PLATES

(All magnifications $\times 500$)

PLATE 1

1. *Punctatisporites indicus* Tiwari; Slide no. 5030.
2. *Latosporites colliensis* (Balme & Hennelly) Bharadwaj; Slide no. 5030.
3. *Kagulubeites verrucosus* Bose & Maheshwari; Slide no. 5030.
4. *Mammialetes mammus* Kar; Slide no. 5030.
5. *Densipollenites indicus* Bharadwaj; Slide no. 5029.
6. *D. invisus* Bharadwaj & Salujha; Slide no. 5030.
7. *D. densus* Bharadwaj & Srivastava; Slide no. 5029.
8. *D. brevis* sp. nov. (Holotype); Slide no. 5029.
9. *D. brevis* sp. nov.; Slide no. 5029.
10. *Potonieisporites* sp.; Slide no. 5030.
11. *Faunipollenites varius* Bharadwaj; Slide no. 5030.
12. *F. singrauliensis* Sinha; Slide no. 5029.

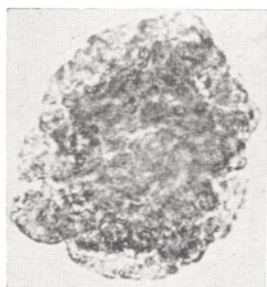
PLATE 2

13. *Faunipollenites parvus* Tiwari; Slide no. 5030.

14. *F. perexiguus* Bharadwaj & Salujha; Slide no. 5030.
15. *Crescentipollenites fuscus* (Bharadwaj) Bharadwaj, Tiwari & Kar; Slide no. 5030.
16. *Striatopodocarpites diffusus* Bharadwaj & Salujha; Slide no. 5029.
17. *S. crassistriatus* sp. nov. (Holotype); Slide no. 5030.
18. *Lahirites parvus* Bharadwaj & Salujha; Slide no. 5030.
19. *L. incertus* Bharadwaj & Salujha; Slide no. 5030.
20. *Striatites barakarensis* Sinha; Slide no. 5030.
21. *S. subtilis* Bharadwaj & Salujha; Slide no. 5029.
22. *S. notus* Bharadwaj & Salujha; Slide no. 5029.
23. *S. communis* Bharadwaj & Salujha; Slide no. 5030.
24. *Verticypollenites gibbosus* Bharadwaj; Slide no. 5030.
25. *V. subcircularis* Bharadwaj & Salujha; Slide no. 5030.
26. *V. finitimus* Bharadwaj & Salujha; Slide no. 5029.
27. *Scheuringipollenites ovatus* (Hart) comb. nov.; Slide no. 5029.



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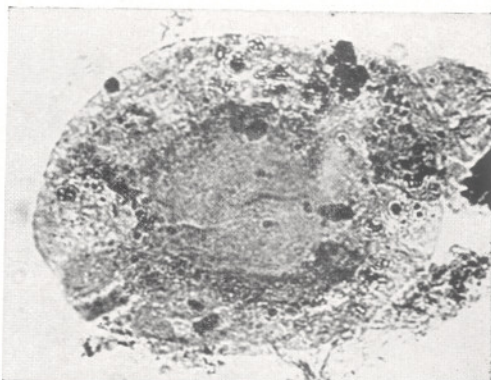
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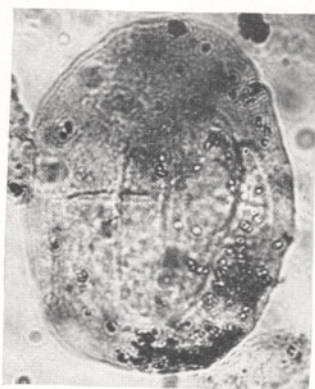
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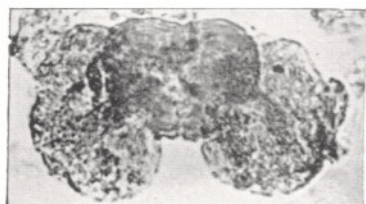
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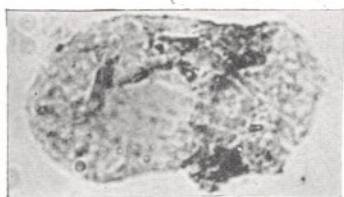
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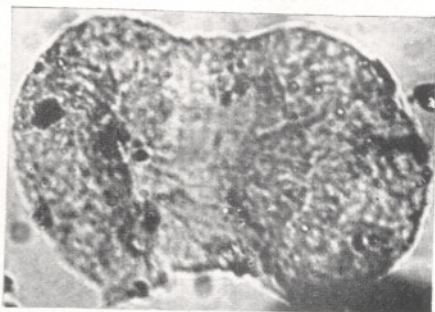
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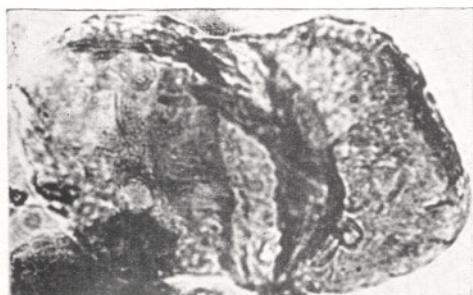
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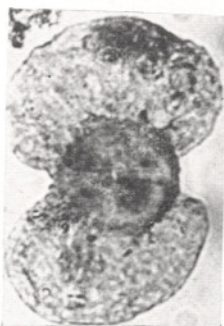
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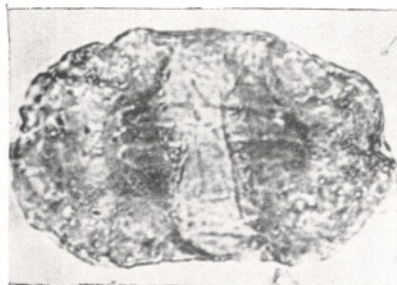
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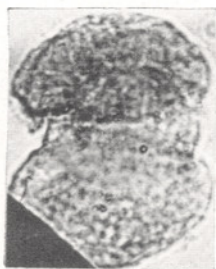
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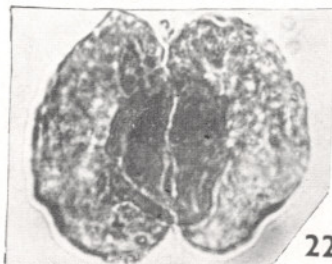
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