STUDIES IN THE GLOSSOPTERIS FLORA OF INDIA–29
MIOSPORE ASSEMBLAGE FROM THE LOWER GONDWANA EXPOSURES ALONG BANSLOI RIVER IN RAJMAHAL HILLS, BIHAR

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ABSTRACT

The present paper contains a description of miospore assemblage recovered from the Lower Gondwana rocks of the Bansloi valley, Rajmahal hills, Santhal Parganas, Bihar. The miospore assemblage comprises 34 genera and 64 species out of which one genus and 23 species are new. One new *Infraturma* has been established.

INTRODUCTION

IN recent years fossil microspores, megaspores and pollen grains have assumed great importance because of their application in stratigraphy. Palynological researches have been successfully employed in correlating and horizoning various sedimentary deposits, including those in the coalfields and oilfields.

Till recently studies on the miospore assemblages from the Gondwanaland have been rather few. Much of the work on Gondwana miospores has been done in India. Some of the important contributions are those of Virkki (1937, 1939, 1945), Mehta (1944), Sen (1948), Ghosh & Sen (1948), Surange, Singh & Srivastava (1953), Potonié & Lele (1961), Bharadwaj (1962), Bharadwaj & Tiwari (1964), Bharadwaj & Salujha (1964), Tiwari (1965), Maithy (1965) and Kar (1966).

Bharadwaj (1966) studied the distribution of dispersed spores and pollen in various stages of the Lower Gondwanas of India. He also discussed the characteristic miospore groups for each stage specifying index generic associations for each stage.

A number of schemes, based on morphographical characters, have been put forward for classifying dispersed spores (NAUMOVA, 1937; SCHOPF, WILSON & BENTALL, 1944; ERDTMAN, 1947; PANT, 1954; POTONIÉ & KREMP, 1954). In the following pages the classification on morphographical characters used by Potonié (1956, 1958, 1960) and latter by Bharadwaj (1962) has been mainly followed.

The miospore assemblage described in the present paper was obtained from the Lower Gondwana Exposures of Bansloi valley. Details about the geology of the area and the localities of collection have been given in an earlier paper (MAHESHWARI & PRAKASH, 1965). The miospore assemblage comprises trilete, monolete, monocolpate, saccate and alete spores. A classified list of various spore genera is given below.

CLASSIFIED LIST OF MIOSPORE GENERA

Anteturma — ***Sporites*** **H. Pot.**
Turma — ***Triletes*** **(Reinsch) Pot. & Kr.**
Subturma — ***Azonotriletes*** **Luber**
Infraturma — ***Laevigati*** **(B. & K.) Pot.**

Genus — *Punctatisporites* (Ibrah.) Pot. & Kr.

Infraturma — ***Apiculati*** **(B. & K.) Pot.**

Genus — *Cyclogranisporites* Pot. & Kr.
Genus — *Lophotriletes* (Naum.) Pot. & Kr.
Genus — *Granulatisporites* (Ibrah.) Pot. & Kr.
Genus — *Verrucosisporites* (Ibrah.) Pot. & Kr.
Genus — *Horriditriletes* Bharad. & Sal.

Turma — ***Zonales*** **(B. & K.) Pot.**
Subturma — ***Zonotriletes*** **Waltz**

Genus — Indeterminate.

Turma — ***Monoletes*** **Ibrah.**
Subturma — ***Azonomonoletes*** **Luber**
Infraturma — ***Psilamonoleti*** **Hamm.**

Genus — *Latosporites* Pot. & Kr.

Infraturma — ***Ornati*** **Pot.**

Genus — *Thymospora* Wils. & Venkatach.

Anteturma — ***Pollenites*** **Pot.**
Turma — ***Saccites*** **Erdtm.**

Subturma — *Monosaccites* (Chital.) Pot. & Kr.
Infraturma — *Parasacciti* nov.

Genus — Parastriopollenites gen. nov.
Genus — Parasaccites Bharad. & Tiw.

Infraturma — *Apertacorpiti* Lele

Genus — Plicatipollenites Lele
Genus — Virkkipollenites Lele

Infraturma — *Vesiculomonoraditi* (Pant) Bharad.

Genus — Potonieisporites Bharad. emend. Bharad.

Infraturma — *Amphisacciti* Lele

Genus — Crucisaccites Lele & Maithy

Infraturma — *Aletesacciti* Leschik

Genus — Densipollenites Bharad.

Infraturma — *Striasacciti* Bharad.

Genus— Striomonosaccites Bharad.

Subturma — *Disaccites* Cooks.
Infraturma — *Podocarpoiditi* Pot., Thoms. & Thierg.

Genus — Platysaccus (Naum.) Pot. & Kl.
Genus — Cuneatisporites Leschik

Infraturma — *Striatiti* Pant emend. Bharad.

Genus — Striatites Pant emend. Bharad.
Genus — Lahirites Bharad.
Genus — Hindipollenites Bharad.
Genus — Lunatisporites Leschik emend. Bharad.
Genus — Stroterisporites Wilson (*sensu* Venkatachala & Kar)
Genus — Kosankeisporites Bharad.
Genus — Faunipollenites Bharad.

Infraturma — *Rectistriati* Bharad.

Genus — Distriatites Bharad.

Infraturma — *Disacciatrileti* (Leschik) Pot.

Genus — Limitisporites Leschik
Genus — Fimbriaesporites Leschik
Genus — Sulcatisporites Leschik emend. Bharad.

Subturma — *Polysaccites* Cooks.
Infraturma — *Trisacciti* Leschik

Genus — Trochosporites Wilson

Turma — *Polyplicates* Erdtm.

Genus — Gnetaceaepollenites Thierg.
Genus — Vittatina Luber

Turma — *Monocolpates* Ivers. & T.-Smith
Infraturma — *Intortes* (Naum.) Pot. & Kr.

Genus — Ginkgocycadophytus Samoilowitz.

TAXONOMIC DESCRIPTION

Anteturma — *Sporites* H. Pot. 1893
Turma — *Triletes* (Reinsch) Pot. & Kr. 1954
Subturma — *Azonotriletes* Luber 1935
Infraturma — *Laevigati* (B. & K.) Pot. 1956

***Punctatisporites* (Ibrah.) Pot. & Kr. 1954**

Genotype—Punctatisporites punctatus Ibrah. 1933

? *Punctatisporites* sp.

Pl. 1, Fig. 1

The spore is ± circular, small and 44 μ in diameter. The exine is thick and the rays have prominent labra. The rays extend for more than 3/4 radius of the spore.

The spore suggests a general resemblance with *Punctatisporites*, but differs from that genus in having characteristically raised labra and thick exine.

Infraturma — *Apiculati* (B. & K.) Pot. 1956
***Cyclogranisporites* Pot. & Kr. 1954**

Genotype — Cyclogranisporites leopoldii (Kr.) Pot. & Kr. 1954

Cyclogranisporites sp.

Pl. 1, Fig. 2

There are only two spores belonging to this form. The spores are circular, 23-39 μ in diameter with granulate exine. Trilete extends to ± 1/2 radius of the spore. About 30 grana are observed along the equator.

In size the spores resemble *Cyclogranisporites pressoides* Pot. & Kr. but due to lack of sufficient number of specimens a detailed comparison could not be made.

***Lophotriletes* (Naum.) Pot. & Kr. 1954**

Genotype — Lophotriletes gibbosus (Ibrah.) Pot. & Kr. 1954

Lophotriletes cf. *L. rectus* Bharad. & Sal.

Pl. 1, Fig. 3

Holotype — Bharadwaj & Salujha, 1964, pl. 2, fig. 26.

The spores are small, triangular with straight sides and rounded corners. They

measure 23-31 μ in diameter. Trilete when distinct extends to ± 2/3 radius of the spore. Exine ornamented with sparsely distributed blunt coni, numbering ± 15 at the margin.

Granulatisporites (Ibrah.) Pot. & Kr. 1954

Genotype — *Granulatisporites granulatus* (Ibrah.)Pot. & Kr. 1954

Granulatisporites sp.

Pl. 1, Fig. 4

The spores are triangular to subtriangular, 20-35 μ in diameter with a distinct trilete; trilete rays 3/4 radius of the spore or longer. Exine granulate, grana irregularly distributed and not always regular in shape.

The spores show a general resemblance with *Granulatisporites minutus* Pot. & Kr. (POTONIÉ & KREMP, 1955; PL. 12, FIG. 147) but a detailed comparison is not possible because of insufficient number of spores.

Verrucosisporites (Ibrah.) Pot. & Kr. 1954

Genotype — *Verrucosisporites verrucosus* (Ibrah.) Pot. & Kr. 1954

Bharadwaj (1955) defining the genus *Verrucosisporites* mentions that the base of the ornament is broader than its bluntly conical or flat apex in this genus. Forms having ornament with basal diameter equal to the apical diameter or truncate apex were separated by him and put in a new genus *Cyclobaculisporites*. Potonié (1960) and Butterworth *et al.* (1961) think that this distinction is difficult to make in practice and hence the latter have suggested the combination of the two genera. In specimens described below the exine ornamentation varies very much and combines features of both the above genera.

Verrucosisporites varius sp. nov.

Pl. 1, Figs. 5, 6

Holotype — Pl. 1, Fig. 5.

Locus typicus — About 3/4 mile south-east of Alubera, Bansloi valley, Santhal Pargana, Bihar.

Diagnosis — Spores circular to subcircular, occasionally folded, 45-70 μ in diameter. Trilete ± 1/2 or more of spore radius long, one ray usually longer than the other two. Exine verrucose, verrucae uniformly and closely distributed, of varying height and shape, 2-3 μ at the base and 1-2 μ high. Number of projections at the spore equator 50-70.

Comparison — The genotype while resembling in the extent of the trilete differs in being comparatively larger in size and in having rather broad, semicircular protruberances. *Verrucosisporites trisecatus* Balm. & Henn., *V. bullatus* Balm. & Henn. and *V. parmatus* Balm. & Henn. differ in exine ornamentation.

? *Verrucosisporites* sp.

Pl. 1, Fig. 7

The only spore is circular, 18 μ in diameter; trilete or other mark is not seen. Exine covered with uniformly and sparsely distributed verrucae, numbering about 15 at the spore equator.

As there is no definite evidence of a tetrad mark, it is difficult to assign it to *Verrucosisporites* with certainty.

Horriditriletes Bharad. & Sal. 1964

Genotype — *Horriditriletes curvibaculosus* Bharad. & Sal. 1964

Horriditriletes curvibaculosus Bharad. & Sal.

Pl. 1, Figs. 8, 9

Holotype — Bharadwaj & Salujha, 1964, pl. 2, fig. 34.

The spores are triangular, 23-39 μ in size with straight to slightly convex sides and rounded angles. Trilete is usually distinct, rays 1/2 to 2/3 spore radius long with blunt ends. Exine is baculate, bacula cylindrical, usually curved, much longer than broad, with ± blunt apices. The bacula are ± 1·5 μ broad at the base and 2-4 μ long, and number 10-18 at the margins.

Horriditriletes novus Tiwari

Pl. 1, Figs. 10, 11

Holotype — Tiwari, 1965, pl. 1, fig. 23.

Spores triangular to roundly triangular, with ± straight to convex sides, 42 to 50 μ in size. Trilete faintly discernible, rays ± 2/3 spore radius long. Exine thick with scattered bacula, 1·5-2 μ broad and equally long, remainder of the exine finely granulate.

Comparison — *Horriditriletes curvibaculosus* is smaller in size with very few, sparsely arranged, slender, much longer than broad bacula. *H. brevis* Bharad. & Sal. differs in overall size and shape as well as in exine ornamentation. *H.* sp. B of Bharadwaj & Salujha (1964, PL. 2, FIG. 44) compares favourably and probably belongs to this species.

Turma — ***Zonales* (B. & K.) Pot. 1956**
Subturma — ***Zonotriletes* Waltz 1935**

Indeterminate

Pl. 1, Fig. 13

The only spore is ± subtriangular; along the equator of the central body, which is microverrucose, a thin, 8 μ broad zona-like structure is present. Body outline has a rimmed effect and trilete is not seen.

The spore has a superficial resemblance to *Cirratriradites* Wils. & Coe but cannot be assigned to that genus because of the apparent absence of the trilete.

Turma — ***Monoletes* Ibrah. 1933**
Subturma — ***Azonomonoletes* Luber 1935**
Infraturma — ***Psilamonoleti* Hamm. 1955**

***Latosporites* Pot. & Kr. 1954**

Genotype — *Latosporites latus* (Kos.) Pot. & Kr. 1954

Latosporites colliensis (B. & H.) Bharad.

Pl. 1, Fig. 14

Holotype — Balme & Hennelly, 1956a, pl. 1, fig. 1.

The spores are oval, longitudinal axis being 78-97 μ, with a distinct monolete extending for about 2/3 of the long axis. Exine is laevigate, thin and usually folded. In general the present forms show same features as those described from the Raniganj coalfield by Bharadwaj (1962; PL. 4, FIGS. 72, 73).

Latosporites sp.

Pl. 1, Fig. 15

The spores are ± oval in shape, 48-58 μ long with a distinct monolete which is ± 2/3 of the long axis. Exine is thin, laevigate and sometimes folded.

Latosporites sp. differs from *L. latus* and *L. colliensis* in its smaller size. *Laevigatosporites ovalis* Kos. (which is referable to *Latosporites*) is comparable in size, but differs in having a thick, rarely folded exine and a shorter monolete.

Infraturma — ***Ornati* Pot. 1956**
***Thymospora* Wils. & Venkatach. 1963**

Genotype — *Thymospora thiessenii* (Kos.) Wils. & Venkatach. 1963

Thymospora sp.

Pl. 1, Fig. 16

The spores are ± oval, 23-46 μ in long axis with a distinct monolete extending to ± 2/3 of the long axis. Exine is verrucose, verrucae are of variable height and densely packed.

Due to insufficient number of spores a detailed comparison could not be made.

Anteturma — ***Pollenites* Pot. 1931**
Turma — ***Saccites* Erdtm. 1947**
Subturma — ***Monosaccites* (Chital.) Pot. & Kr. 1954**

Most of the Lower Gondwana miospores recently included in the two series Apertacorpiti and Amphisacciti were formerly included in a single series, viz. Triletisaccites, and a single genus, viz. *Nuskoisporites*. Recently Lele (1964, 1965) made a critical study of the forms of *Nuskoisporites* from the northern hemisphere and found that these forms are quite different from those of the southern hemisphere Nuskoisporites-complex. Hence he separated the southern monosaccate trilete forms from *Nuskoisporites* and created three new genera, viz. *Plicatipollenites*, *Virkkipollenites* and *Stellapollenites*. Bharadwaj & Tiwari (1964) created two more genera, viz. *Barakarites* and *Parasaccites* for certain other grains formerly included in the genus *Nuskoisporites*. Presently it has been found that some similar forms can be differentiated from the above genera on the basis of organizational and structural dissimilarities. These have, therefore, been segregated here under a new name *Parastriopollenites*, placed under a new series '*Parasacciti*'.

Infraturma — ***Parasacciti* ser. nov.**

Diagnosis — Trilete, monosaccate miospores showing double-sided saccus attachment, leaving equal and overlapping saccus-free areas both proximally as well as distally.

Discussion — The double-sided saccus attachment, from the Gondwanaland, was first reported by Bharadwaj & Tiwari (1964)

in *Parasaccites*. In such condition the saccus is attached subequatorially, both on proximal as well as distal surfaces of the central body, leaving equal bladder-free areas on both the faces. This double-sided saccus-attachment has been reported for two more forms, viz. *Crucisaccites* (LELE & MAITHY, 1964) and *Stellapollenites* (LELE, 1965). This form of saccus attachment was called as 'Para-condition of saccus attachment' by Bharadwaj & Tiwari and as 'Amphilateral saccus attachment' by Lele, who used it in a broad sense so as to encompass equal to unequal, overlapping to crossed encroachment of the saccus on the two faces of the central body. He believed that 'para-condition of saccus' was only a particular pattern of 'Amphilateral saccus attachment'. However, it would seem advisable to distinguish between the two. In one case the saccus encroachment is equal on both sides and is overlapping, as well as conforms to overall outline of the miospore. In the other case the saccus encroachment is mostly unequal, never conforms to body outline and the encroachment on two surfaces is usually 'crossed'. Hence a new series is proposed to include *Parasaccites* and *Parastriopollenites* where saccus encroachment is equal and overlapping.

***Parastriopollenites* gen. nov.**

Genotype — Parastriopollenites rajmahalensis gen. et sp. nov.

Diagnosis — Miospores monosaccate; circular, subcircular, triangular or subtriangular; central body circular, subcircular, triangular or subtriangular, usually conforming to the overall shape of the grain, distinct to indistinct, intramicroreticulate; trilete distinct to obscure, rays equal or unequal, from 1/3 body radius to almost equal to body radius in length; body sometimes showing two zones — an outer lighter one and an inner denser one, the inner denser zone traversed by cross-connected channels forming irregular to regular areas (areoles) on both proximal and distal surfaces; saccus attached subequatorially both on proximal as well as on distal surfaces of central body, fine intrareticulate, sometimes with a distinct marginal thickening — a limbus, saccus outline regular to sinuous.

Description — One of the chief distinguishing features of the genus is the para-condition of sac-attachment which is produced by the subequatorial attachment of the saccus both on the proximal and distal surfaces of the central body. This condition is not easy to make out unless the material is exceptionally well-preserved like the present one. A careful l-o analysis shows first the reticulum of the saccus on one side, next the body outline and lastly the reticulum of the saccus of the other side. In cases where the central body is diffused this condition is made out only after a careful l-o analysis. In some cases it seems that the saccus fully covers the central body on the distal surface but this condition is rather imperceptible as the intrareticulation of the saccus is almost as fine as that of the central body. The saccus mostly appears denser than the central body but in a few cases the central body is comparatively much darker than the saccus. The extent of the saccus from the body equator was found to be almost consistent and thus obviously becomes an important feature. In certain cases the saccus is distinctly two-zoned — the outer denser zone being comparatively much narrower with coarser and radially elongated meshes. This zone may be a limbus. This character again was found to be consistent within certain type of miospores and hence it evidently is an important character.

The central body varies in shape usually conforming with the overall outline of the miospore and may be distinct to diffused. The structure of the central body is mostly intramicroreticulate with very fine meshes having complete to broken muri and a small lumina. However, in some cases the body becomes corroded and there it is difficult to decipher the ornamentation. Occasionally the central body is two-zoned — an inner denser and an outer lighter zone. The inner zone gives the appearance of an inner body but it does not possess a distinct outline to show that it is distinct from the central body. Infact in most cases the inner zone gradually and imperceptibly passes into the outer lighter zone. The central body is traversed by irregularly orientated channels which are cross-connected and in some cases form a perfect reticulum. In the genus *Barakarites* Bharad. & Tiw. such structures have been

called as reticulate striations which term, however, does not seem to fit to the presently described miospores since here they are mostly irregular and discontinuous. It is probably better to call them just as striations or channels. These grooves or channels are found on both the proximal as well as the distal faces of the central body but the extent of their development varies from specimen to specimen and as such is a valuable help in grouping of these miospores. In some cases the central body shows irregular fold-like structures — mostly along the channels — but these have been found usually to occur only in one type of miospores. In still another type, the exine of the 'areoles' swells out forming protruberances which are fairly conspicuous to indistinct and variable in number. It is doubtful if much taxonomic importance can be attached to this particular character at generic level. The central body some times folds itself at the margins like a piece of paper. This condition seems to suggest that in such cases the equatorial rim of the central body is free of saccus and that the sac is attached subequatorially. A body infold system such as reported for *Plicatipollenites* is not found in the present group of miospores.

The trilete is not consistently developed. Usually it is obscure and occasionally it is rather weak. Only in few instances a clear and distinct mark is observed. The rays of the trilete vary in width and length. They may be all equal in size or one may be comparatively bigger than the other two which are usually equal sized. The length of the rays may vary from 1/3 body radius to 3/4 body radius, but never reaching the periphery of the central body. The width of the rays may be equal throughout or the rays may be truncate or tapering. The angles between the rays are equal.

Comparison — The known monosaccate trilete forms from the Lower Gondwanas fall under the following genera — *Plicatipollenites* Lele, *Virkkipollenites* Lele, *Parasaccites* Bharad. & Tiw. and *Barakarites* Bharad. & Tiw. *Plicatipollenites* and *Virkkipollenites* differ in the absence of double-sided saccus attachment and the channels on the central body. Beside *Plicatipollenites* is characterized by a peculiar body infold system which is not found in *Parastriopollenites*. In para-condition of sac-attachment the present genus resembles *Parasaccites* but differs from it in the presence of the channel-system on the central body. The closest resemblance to the present genus is shown by *Barakarites*. From the photographs these two genera can never be told apart. Besides having a similar saccus reticulum, both possess channels on the central body and some forms of both genera show a limbus-like structure. The chief distinguishing feature of the present genus is the para-condition of sac attachment. Further in *Barakarites* the central body is intramicropunctate whereas in *Parastriopollenites* the central body is intramicroreticulate.

Some other trilete monosaccate genera are: *Nuskoisporites* (Pot. & Kl.) Kl., *Microsporites* Dijkt. and *Endosporites* Wils. & Coe. These are all distinguished from the present genus by a saccus which completely envelops the central body. *Florinites* Schopf *et al.* is distinguished by the enclosure of proximal pole of the central body by the saccus. Peppers (1964) figures a monosaccate miospore, from the late Pennsylvanian Cyclothems in the Illinois basin, in which the distal surface of the body shows polygonal areas (areolae). However, as details are not known a satisfactory comparison could not be made.

Parastriopollenites rajmahalensis sp. nov.

Pl. 1, Figs. 17, 18

Holotype — Pl. 1, Fig. 17.

Locus typicus — Near Bargo, Bansloi valley, Santhal Parganas, Bihar.

Diagnosis — Miospores circular to subcircular, measure 117-195 $\mu \times$ 109-183 μ, holotype 148 $\mu \times$ 140 μ. Central body distinct, circular to subcircular, conforms to overall outline of the miospores, with a denser central region, measures 105-160 $\mu \times$ 94-148 μ, in holotype 120 $\mu \times$ 124 μ. Body exine intramicroreticulate, proximally as well as distally uneven narrow channels form polygonal areolae. Trilete distinct, rays equal or unequal, 1/2-2/3 of body radius in length. Saccus narrow, extends for 6-18 μ from body equator, attached subequatorially both on proximal as well as distal sides, uniformly fine intrareticulate.

Parastriopollenites gondwanensis sp. nov.

Pl. 2, Fig. 19

Holotype — Pl. 2, Fig. 19.

Locus typicus — Near Bargo, Bansloi valley, Santhal Parganas, Bihar.

Diagnosis — Miospores subcircular to oval, measure 133-206 μ × 129-160 μ, holotype 164 μ × 146 μ. Central body obscure to distinct, subcircular to oval, sometimes with slightly thicker central region, conforms to overall outline of the miospore, measures 101-187 μ × 70-144 μ, in holotype 142 μ × 128 μ. Exine intramicroreticulate, proximally as well as distally uneven narrow channels crisscross the central body forming an irregular pattern, usually body exine folds along the channels but a true fold rim is never formed. Trilete obscure to distinct, rays either all equal or one longer than the rest two, 1/2-2/3 of body radius in extent. Saccus narrow, extends for 6-15 μ from body equator, attached subequatorially both on the proximal as well as distal surfaces, uniformly fine intrareticulate.

Comparison — It differs from the genotype in overall shape and in less regular — rather irregularly disposed channels.

Parastriopollenites triangularis sp. nov.

Pl. 2, Fig. 20

Holotype — Pl. 2, Fig. 20.

Locus typicus — Near Bargo, Bansloi valley, Santhal Parganas, Bihar.

Diagnosis — Miospores subtriangular to roundly triangular, measure 121-195 μ × 117-175 μ, holotype 121 μ × 128 μ. Central body distinct, subtriangular to roundly triangular, conforms to overall shape of the miospore, measures 94-152 μ × 104-160 μ, in holotype 100 μ × 110 μ, usually with a thicker central zone. Exine intramicroreticulate, proximally as well as distally uneven narrow channels form irregular patterns. Trilete obscure to clear, rays all equal or one larger than the other two, ± 1/2-4/5 of body radius in extent. Saccus narrow, extending for 6-20 μ from the body equator, subequatorially attached both on the proximal as well as distal surfaces, uniformly fine intrareticulate, muri thick, lumina small.

Comparison — It differs from the genotype in the shape of the miospores as well as in irregular arrangement of the channels. *Parastriopollenites gondwanensis* has a different shape.

Parastriopollenites sinuosus sp. nov.

Pl. 2, Fig. 21

Holotype — Pl. 2, Fig. 21.

Locus typicus — Near Bargo, Bansloi valley, Santhal Parganas, Bihar.

Diagnosis — Subcircular to roundly triangular miospores, measure 120-150 μ × 140-164 μ, holotype 144 μ × 158 μ. Central body usually obscure, circular to subcircular, measures 110-120 μ × 110-130 μ, in holotype 120 μ × 130 μ. Body exine intramicroreticulate, shows both proximally as well as distally narrow, uneven channels which cross-connect to form irregular areas, on which the exine sometimes swells out giving protuberances. Trilete obscure. Saccus usually narrow, undulated or ± lobate in outline due to the formation of thick radial folds or frills along the periphery, fine intrareticulate, muri thick, lumina small.

Comparison — It differs from all species of the genus in having thick frills on the saccus.

Parastriopollenites limbatus sp. nov.

Pl. 2, Fig. 22

Holotype — Pl. 2, Fig. 22.

Locus typicus — Near Bargo, Bansloi valley, Santhal Parganas, Bihar.

Diagnosis — Miospores subtriangular to roundly triangular, measure 124-126 μ × 146-158 μ, holotype 132 μ × 158 μ. Central body ill-defined. Body exine intramicroreticulate, shows both proximally as well as distally narrow, uneven channels which cross-connect to form broad irregular areas, sometimes minor folds develop along the channels. Trilete obscure. Saccus narrow, subequatorially attached both on the proxima las well as the distal sides, two-zoned, the outer zone thicker, comparatively narrow-looking sort of a limbus, fine intrareticulate, muri thick, sometimes broken, lumina small.

Comparison — From the genotype this species differs in its shape, ill-defined body, irregular areas on the central body, obscure trilete and limbus-like structure. From other species of the genus too it differs in the presence of a limbus-like structure besides other differences.

Parastriopollenites giganteus sp. nov.

Pl. 3, Fig. 25

Holotype — Pl. 3, Fig. 25.

Locus typicus — Near Bargo, Bansloi valley, Santhal Parganas, Bihar.

Diagnosis — Miospores subcircular, measure 164-180 μ × 176-204 μ, holotype 164 μ × 178 μ. Central body obscure to perceptible, subcircular conforming to overall outline, measures 150-152 μ × 150-154 μ, in holotype 152 μ × 154 μ. Body exine intramicroreticulate, both proximally as well as distally irregular and cross-connecting channels present, in the centre exine ruptures forming a slit which looks like a monolete. Tetrad mark not seen. Saccus narrow, subequatorially attached both on proximal as well as distal sides of central body, extends for 8-20 μ from body equator, fine intrareticulate.

Comparison — This species differs from all other species of this genus in its much larger size.

Parasaccites Bharad. & Tiw. 1964

Genotype — *Parasaccites korbaensis* Bharad. & Tiw. 1964

Parasaccites densus sp. nov.

Pl. 2, Fig. 23

Holotype — Pl. 2, Fig. 23.

Locus typicus — Near Bargo, Bansloi valley, Santhal Parganas, Bihar.

Diagnosis — Miospores subcircular, holotype measures 109 μ × 117 μ. Central body subcircular, thick, denser than the saccus, measures 94 μ × 101 μ in holotype. Body exine intramicroreticulate. Trilete distinct, rays ± 1/3 of body radius in length. Saccus narrow, extends for 8 μ from body equator in holotype, subequatorially attached both proximally as well as distally, fine intrareticulate, muri thick, lumina small.

Comparison — It differs from the genotype in having an uniformly thick, denser than the saccus, central body.

Infraturma — *Apertacorpiti* Lele, 1964

Plicatipollenites Lele 1964

Genotype — *Plicatipollenites indicus* Lele 1964

Plicatipollenites gondwanensis (B. & H.) Lele

Pl. 3, Figs. 26, 27

Holotype — Balme & Hennelly, 1956b, pl. 7, fig. 66

The miospores are circular to subcircular and measure 116-164 μ × 129-195 μ. The body is more or less distinct, almost circular and measures 74-113 μ in diameter. The exine ornamentation is usually corroded but in few cases an intramicroreticulate structure is seen. The trilete is faint to distinct with almost uniformly broad rays extending to about 1/2 the radius of the central body. Near the zone of distal attachment of the saccus a dark rim is seen which is the result of the infolding of the central body. The infold system is usually polygonal but in some cases it tends to become triangular. The infold system tends to lie well away from the body periphery. The saccus is usually wide, ± 1/2 the body radius in width, sometimes being as wide as or more than the body radius. The saccus is coarsely reticulate, meshes tending to be radially disposed, outline of the saccus undulated.

Remarks — Most of the grains agree well with the diagnosis of this species. There are certain grains which show some variations but as they are not supported by enough evidence, they have been for the present put under *Plicatipollenites gondwanensis*. These grains show an infold system which tends to become ± triangular and is almost flat without showing any noticeable angularity and overlap. If this character is found to persist in a large number of specimens, then such specimens may need placing under a separate species. Some other specimens show a polygonal or trapezoidal body but in the lack of enough evidence, these too have been provisionally included in *P. gondwanensis*.

Virkkipollenites Lele 1964

Genotype — *Virkkipollenites triangularis* (Mehta) Lele 1964

Virkkipollenites triangularis (Mehta) Lele

Pl. 3, Fig. 28

Holotype — Mehta, 1944, pl. 1, fig. 1.

Miospores roundly triangular, 117-139 μ × 101-129 μ in size; central body ± circular to roundly triangular, 78-113 μ in size; trilete mark obscure to invisible, exine intramicroreticulate. Saccus proximally equatorial, distally subequatorial, 10-27 μ wide, intrareticulation coarse, meshes radially orientated.

Remarks — The miospores while agreeing with Lele's specimens in overall description show greater range in overall size of the spore as well as that of the central body.

This character being of no importance, the present miospores are, therefore, placed under *Virkkipollenites triangularis*.

Virkkipollenites mehtae Lele

Pl. 2, Fig. 24

Holotype — Lele, 1964, pl. 2, fig. 19.

Miospores circular to subcircular or oval, 90-121 μ × 86-117 μ in size, a central body circular to oval, conforming to overall shape of spore, 66-98 μ in diameter, thin but discernible, exine intramicroreticulate; trilete obscure to distinct, 1/2-2/3 body radius. Saccus proximally equatorial, distally subequatorial, 8-20 μ broad (mean 12 μ), coarsely reticulate, meshes radially orientated.

Remarks — The present miospores have besides a greater size, a trilete mark which is faint to distinct unlike in the specimens of Lele (1964) where it is obscure. However, as this may be due to preservation in the latter case, the present specimens are well placed in *Virkkipollenites mehtae*.

Virkkipollenites obscurus Lele

Pl. 3, Fig. 29

Holotype — Lele, 1964, pl. 2, fig. 17.

Miospores subcircular, 125-187 μ × 125-183 μ; Central body obscure, thin, circular to subcircular, 86-105 μ × 62-105 μ, exine intramicroreticulate; trilete obscure. Saccus proximally equatorial, distally diffuse, 24-35 μ broad, coarsely intrareticulate.

Remarks—Lele (1964) described *Virkkipollenites obscurus* as having fine intrareticulation of the saccus. I have re-examined some of his specimens and found that the saccus is coarsely intrareticulate as in the present specimens.

There are certain grains which show a circular to subcircular, diffuse to faint central body and a distinct trilete mark. The central body is comparatively denser. But as these characters have not been found consistently such specimens have been included in *V. obscurus*.

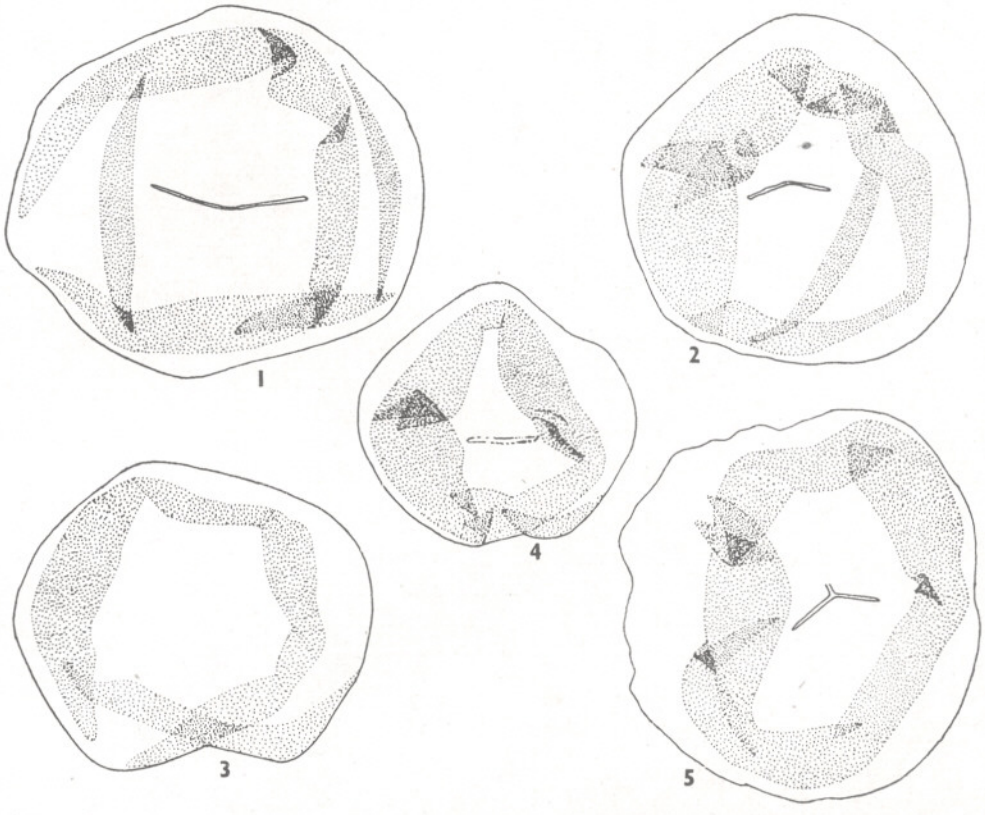
Infraturma — *Vesiculomonoraditi* (Pant) Bhard. 1954

***Potonieisporites* Bhard. emend. Bharad. 1964**

Genotype — Potonieisporites novicus Bhard. 1964

This genus was established by Bhardwaj (1954) for certain monosaccate miospores showing a proximal monolete and a distal fold system, on the central body. The organization in the miospores of *Potonieisporites* is found in the *in situ* pollen grains of *Lebachia, Ernestiodendron* and *Walchianthus* (BHARADWAJ, 1964a). Organizationally the pollen grains of these three genera are closely similar to each other. On the basis of new and detailed information obtained from the study of *in situ* pollen grains of these genera Bharadwaj (1964b) redefined the genus *Potonieisporites*. He now includes *Sahnites* Pant and *Vestigisporites* (B. & H.) Hart in *Potonieisporites*. The monolete and the vertical twinfolds individually or collectively, with the monosaccate nature and other characteristics distinguish *Potonieisporites* from other miospore genera. *Hoffmeisterites* Wilson has earlier been shown to be a junior synonym of *Potonieisporites* (WILSON & VENKATACHALA, 1964).

The miospores belonging to this genus in the present assemblage are invariably bilateral and oval. The central body is circular, rhomboidal or trapezoid in polar view and on the proximal face bears a monolete which is occasionally bent and sometimes gives off a small side branch and thus simulates a trilete. On the distal side the central body is usually infolded forming a fold-system usually consisting of a single series of folds — rarely two series as in the genotype. Sometimes the folds form a complete ring while at other times there are two vertical folds joined by two horizontal folds. The body infold system shows a gradual change from distinct two series of folds to no folds whatsoever which supports the merger of *Sahnites* and *Vestigisporites* with *Potonieisporites* (TEXT-FIGS. 1-19). The shape of the central body is, to a large extent, controlled by the nature of the infold system. Organizationally these grains are so similar to *Plicatipollenites* that in cases where the tetrad mark is not seen or is bent with a side branch, it is very difficult to differentiate between them. In such cases the only criterion to distinguish between them is the radial symmetry in *Plicatipollenites* and a bilateral symmetry in *Potonieisporites*. But *Potonieisporites* grains are not always bilateral as Bharadwaj (1964b) describes circular grains also under this genus. Visualizing such a condition where the grain is circular with a single series of infold system and an obscure tetrad mark, the only criterion which could serve



TEXT-FIGS. 1-5 — *Potonieisporites*, showing variations in the body infold system and in the nature of the monolete. (× Ca.500). Slides 2328, 2332, 2331, 2321 and 2329 respectively.

to differentiate between them is the percentage of the grains in overall assemblage. That is, if the assemblage is dominated by typical *Plicatipollenites* then such grains may be referred to it and if typical *Potonieisporites* is in greater proportions then the ill-defined grains may be referred to this genus. The central body usually shows an intramicroreticulate structure. In some cases, however, the ornamentation becomes corroded and sometimes 4-6 μ wide polygonal areas appear on the central body. The saccus is equatorially attached to the central body on the proximal side. Distally the saccus is subequatorially attached and the zone of attachment may lie near to or far away from the equator of the central body. The breadth of the girdling saccus is relatively lesser along the shorter axis than along the longer axis of the entire grain.

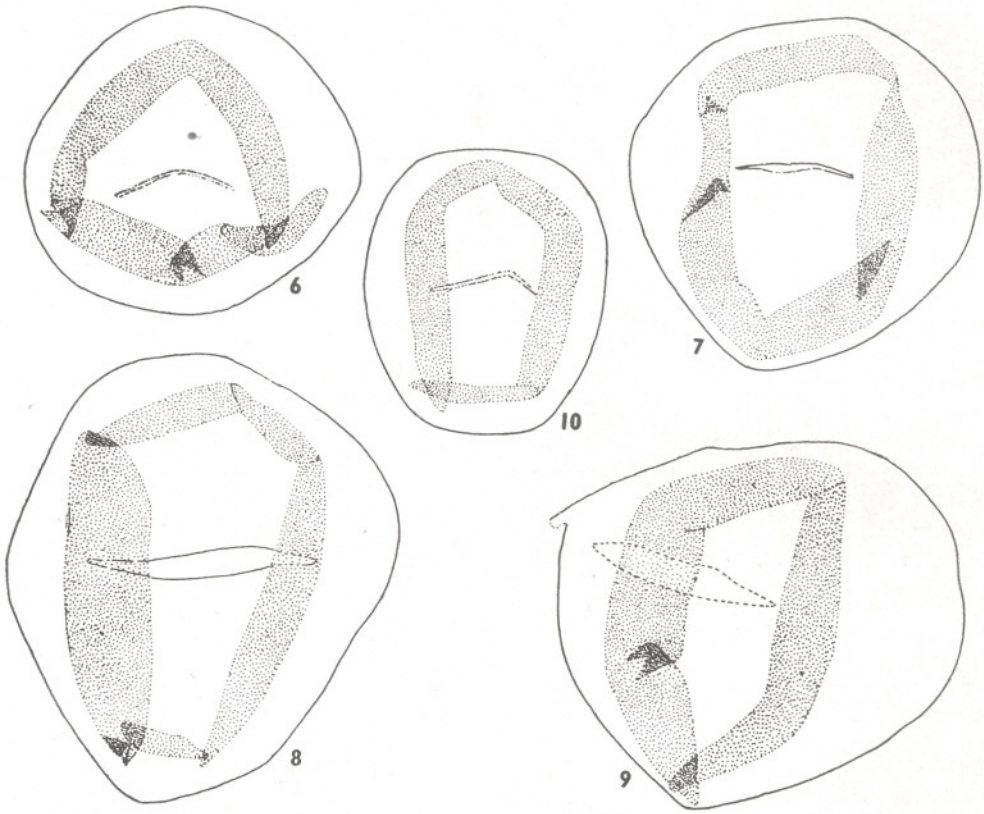
The characters used to delimit the species of this genus in the present assemblage are the presence or absence and nature of the body infold system, extent of distal zone of saccus attachment from body equator and the shape of the central body.

Potonieisporites cf. *P. novicus* Bhard.

Pl. 4, Fig. 30

Holotype — Bhardwaj, 1955, pl. 2, fig. 13.

In the present assemblage there are only two miospores which answer the description of this species. The miospores are monosaccate, bilateral and oval-circular. They measure 160-180 μ × 140-150 μ. The central body is rhomboid and measures ± 100 μ × 95 μ. Monolete is distinct but bent. Body exine is intramicroreticulate. The distal infold system comprises two series of folds as in the holotype. Saccus is coarsely intrareticulate and distal zone of attachment is removed from the body equator.



TEXT-FIGS. 6-10 — *Potonieisporites*, showing variations in the body infold system and in the nature of the monolete. (× Ca.500). Slides 2330, 2341, 2317, 2341 and 2342 respectively.

Potonieisporites lelei sp. nov.

Pl. 4, Fig. 31

Holotype — Pl. 4, Fig. 31.

Locus typicus — Near Bargo, Bansloi valley, Santhal Parganas, Bihar.

Diagnosis — Miospores monosaccate, bilateral, oval to oval-elliptical, 152-190 μ × 115-130 μ in size, holotype 190 μ × 130 μ. Central body circular to subcircular, 68-84 μ × 68-88 μ in size, in holotype 84 μ × 88 μ, exine intramicroreticulate, structure sometimes corroded, rarely with small, 4-6 μ broad reticuloid areas on the central body. Monolete distinct to obscure, usually bent, sometimes with a small side branch and thus simulating a trilete. Saccus attachment proximally equatorial, distally subequatorial, broader along the long axis than along the short axis of the miospore. Distal zone of saccus attachment close to body equator; a ± regular and circular body infold system develops along the distal zone of attachment. Saccus coarsely intrareticulate.

Comparison — This species differs from the genotype in having only one series of folds forming a ± regular circular infold system as against the double series of folds in the latter.

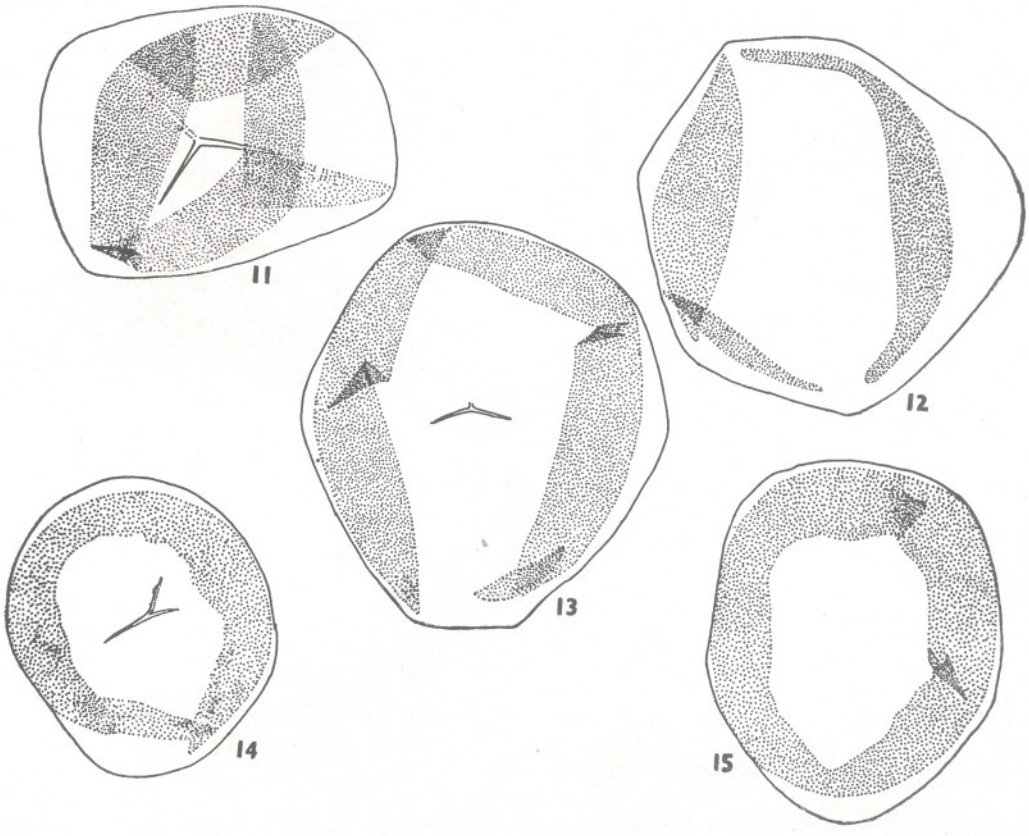
Potonieisporites densus sp. nov.

Pl. 4, Fig. 32

Holotype — Pl. 4, Fig. 32.

Locus typicus — Near Bargo, Bansloi valley, Santhal Parganas, Bihar.

Diagnosis — Miospores monosaccate, bilateral, oval to oval circular, 148-160 μ × 110-120 μ, holotype 160 μ × 120 μ.



TEXT-FIGS. 11-15 — *Potonieisporites*, showing variations in the body infold system and in the nature of the monolete (× Ca.500). Slides 2330, 2343, 2331, 2344 and 2330 respectively.

Central body irregularly and variously shaped, rectangular, trapezoid or rhomboid, 80-90 μ × 78-94 μ, in holotype 90 μ × 94 μ, exine intramicroreticulate. Monolete distinct to obscure, straight or bent, sometimes simulates a trilete. Saccus attachment proximally equatorial, distally subequatorial, distal zone of attachment far removed from the body equator and ± bilateral. Body infold system develops along this distal attachment, usually consisting of four components of which the two vertical folds are larger. Saccus broader along the long axis than along the shorter axis of the miospore. Saccus coarsely intrareticulate.

Comparison — From the genotype it differs in having only one series of folds. From *Potonieisporites lelei* it differs in the shape of the body infold system and also in far removed distal zone of saccus attachment.

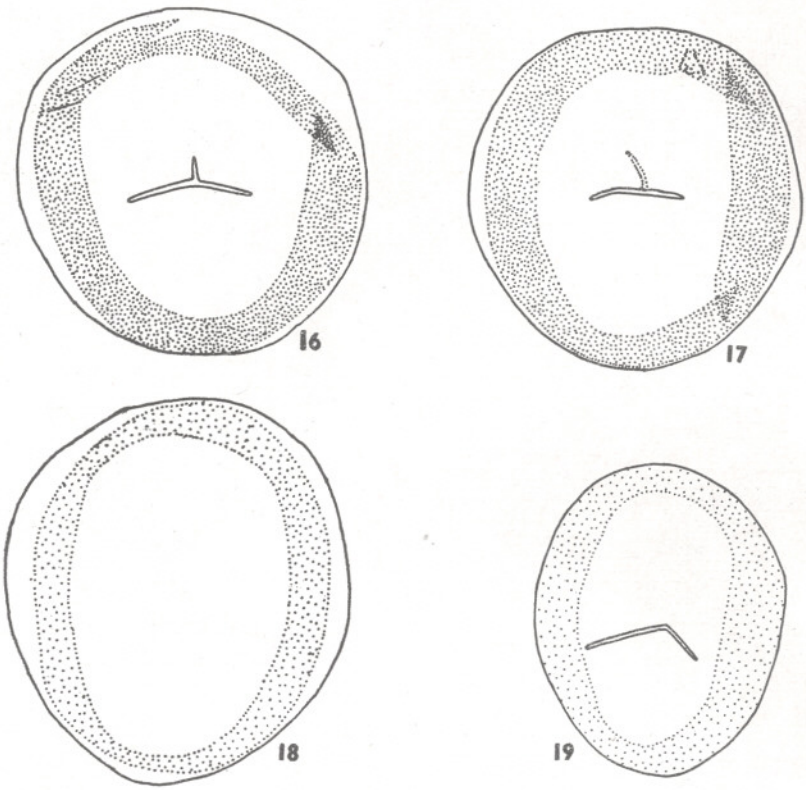
Potonieisporites diffusus (Maithy) Bharad.

Pl. 5, Fig. 39

Holotype — Maithy, 1965, pl. 5, fig. 30.

The miospores are monosaccate, bilateral, oval to suboval, and measure 86-121 μ × 129-172 μ. Central body outline is ill-defined and diffuse, the body is thinner than the saccus. The monolete is distinct to obscure. Body ornamentation is intramicroreticulate. Distal zone of saccus attachment is diffuse and the body infold system is absent. The saccus reticulation is coarse.

Remarks — Maithy (1962) in his Ph.D. thesis described this miospore as *Vestigisporites diffusus*. Bharadwaj (1964b) included *Vestigisporites* in *Potonieisporites* but Maithy (1965) probably disagreeing with his view kept *Vestigisporites diffusus* separate from *Potonieisporites*. As explained



TEXT-FIGS. 16-19 — *Potonieisporites*, showing variations in the body infold system and in the nature of the monolete. (× Ca.500). Slides 2330, 2344, 2332 and 2345 respectively.

elsewhere there is a gradual change from *Potonieisporites* to *Vestigisporites* and as such I am convinced that *V. diffusus* should be placed in *Potonieisporites*. This species differs from *P. novicus*, *P. lelei* and *P. densus* in the absence of body infold system. *P. rudis* (B. & H.) Bharad. has fine meshed saccus intrareticulation and *P. methoris* (Hart) Bharad. is smaller in size and has a distinct central body.

Infraturma — *Amphisacciti* Lele 1965

***Crucisaccites* Lele & Maithy 1964**

Genotype — Crucisaccites latisulcatus Lele & Maithy 1964

cf. *Crucisaccites latisulcatus* Lele & Maithy

Pl. 5, Fig. 40

Holotype — Lele & Maithy, 1964, pl. 1, fig. 1.

In the present assemblage there are some miospores resembling *Crucisaccites* but as the number is not sufficient and the preservation is not very good, these are provisionally referred to *C. latisulcatus*. The miospores are oval in overall shape with a well to ill-defined subcircular central body. The miospores measure 164-180 μ × 125-150 μ. No definite ornament is visible on the surface of the body and there is no evidence of a tetrad mark. The saccus is attached bilaterally on both the proximal and distal sides of the central body and the two zones of attachment are at right angles to each other.

Infraturma — *Aletesacciti* Leschik

***Densipollenites* Bharad. 1962**

Genotype — Densipollenites indicus Bharad. 1962

Densipollenites indicus Bharadwaj

Pl. 5, Fig. 41

Holotype — Bharadwaj, 1962, pl. 6, fig. 103.

Circular to subcircular irregularly preserved miospores, 117-156 μ in longest dia-

meter with a circular to subcircular central body, usually transparent and well to ill-defined. Central body 78-89 μ × 82-89 μ in size, without any mark or striations, exine ornamentation corroded or indistinct. Saccus is finely intrareticulate on one side and coarsely reticulate on the other side, usually with a number of folds.

Remarks — These specimens have a larger central body as compared to the genotype and some of the specimens show a slight thickening along the equator of the central body. Sometimes the body is light brown and ill-defined or may be lost.

Infraturma — *Striasacciti* Bharad. 1962

***Striomonosaccites* Bharad. 1962**

Genotype — Striomonosaccites ovatus Bharad. 1962

Striomonosaccites cf. *S. ovatus* Bharad.

Pl. 5, Fig. 42

Holotype — Bharadwaj, 1962, pl. 7, figs. 107,108.

Almost circular spores, 82-126 μ in size with an oval central body measuring 78-97 μ in the longest diameter. The central body bears 7-8 simple or forked striations on its proximal face, the area between the striations being intramicroreticulate. The saccus reticulation has fine to medium sized meshes.

The specimens while showing close resemblance with *Striomonosaccites ovatus* differ in having an oval body as compared to the circular to subcircular central body in the genotype.

Striomonosaccites invisus sp. nov.

Pl. 5, Fig. 43

Holotype — Pl. 5, Fig. 43.

Locus typicus — 3/4 mile SE of Alubera, Bansloi valley, Rajmahal Hills.

Diagnosis — Circular to subcircular miospores with an indistinct to faintly discernible central body bearing 5-7 striations on its proximal face, area in between the striations being intramicroreticulate.

Description — Holotype almost circular, 145 μ in size with a faintly discernible central body. Miospores range in size from 145 to 245 μ. The central body is thin and bears 5-7 striations on its proximal face, the area in between the striations being microreticulate ornamented. Saccus reticulation has medium sized meshes.

Comparison — The present species differs from the genotype in its much larger size, indistinct central body and saccus intrareticulation.

Subturma — *Disaccites* Cookson 1947
Infraturma — *Podocarpoiditi* Pot., Thoms. & Thierg. 1950

***Platysaccus* (Naum.) Pot. & Kr. 1954**

Genotype — Platysaccus papilionis Pot. & Kl. 1954

Platysaccus sp.

Pl. 6, Fig. 46

The pollen grains are bilateral, disaccate, diploxylonoid and measure 57-121 μ × 75-171 μ. The central body is ± circular, 31-66 μ in diameter, and devoid of triradiate mark or the striations. The exine is microverrucose ornamented. The sacci are subspherical, laterally and distally coming close together leaving a narrow saccus-free distal area. Saccus intrareticulation comprises small to medium sized meshes.

***Cuneatisporites* Leschik 1955**

Genotype — Cuneatisporites radialis Leschik 1955

Cuneatisporites sp.

Pl. 6, Fig. 47

The specimens are bilateral, disaccate, diploxylonoid, 86-132 μ × 105-195 μ in size with a vertically oval, light to dense central body. The central body is intramicroreticulate ornamented and measures 37-97 μ × 32-86 μ. The sacci are ± subspherical, coarsely intrareticulate with thin muri, meshes are upto 8 μ broad. The distal zone of saccus attachment is straight and the distal sulcus is narrow.

Infraturma — *Striatiti* Pant emend. Bharad. 1962

***Striatites* Pant emend. Bharad. 1962**

Genotype — Striatites sewardii (Virkki) Pant 1955

Striatites cancellatus (B. & H.) Pot.

Pl. 4, Fig. 33

Holotype — Balme & Hennelly, 1955, pl. 2, fig. 11.

The pollen grains are bilateral, disaccate, 39-74 μ × 70-94 μ in size. Central body

is circular to subcircular, 31-58 μ in diameter and bears 5-9 simple or forked striations on the proximal face, the exine in between the striations being microverrucose ornamented. The sacci are subspherical, usually larger than the body, distally inclined, laterally and distally coming close together leaving a narrow saccus-free distal area. Saccus intrareticulation consists of fine to medium-sized meshes.

Striatites obtusus Bharad. & Sal.

Pl. 6, Fig. 48

Holotype — Bharadwaj, & Salujha, 1964, pl. 6, fig. 98

The pollen grains are bilateral, disaccate, diploxylonoid and 75-125 μ × 125-195 μ in size. The central body is circular to subcircular, 51-74 μ in diameter with 5-9 striations on the proximal face. The interconnections between the striations are few and the exine is microverrucose ornamented. The sacci are close laterally, distally leaving a 4-15 μ wide saccus-free area.

Remarks — The present grains while agreeing with the holotype differ in having a larger size range.

Striatites sp.

Pl. 4, Fig. 34; Pl. 5, Fig. 44

The pollen grains are bilateral, disaccate, diploxylonoid, 72-75 μ × 101-133 μ in size with a ± trapezoid central body, 39-51 μ × 39-47 μ in size and having 5-7 simple striations on the proximal face. The exine in between the striations is microverrucose. The sacci are subspherical, distally and laterally coming close together leaving a 8-10 μ wide saccus-free distal area. Saccus intrareticulation consists of medium-sized meshes.

Remarks — *Striatites* sp. differs from *S. sewardii* and *S. cancellatus* in being comparatively larger in size. *S. majus* is a larger form with vertically oval to circular central body as compared to trapezoid central body of *Striatites* sp. *Striatites* sp. (HϕEG & BOSE, 1960; PL. 35, FIG. 7) shows a close resemblance with the present specimens.

Lahirites Bharad. 1962

Genotype — *Lahirites raniganjensis* Bharad. 1962

Lahirites raniganjensis Bharad.

Pl. 6, Fig. 49

Holotype — Bharadwaj, 1962, pl. 12, fig. 172

The pollen grains are bilateral, disaccate, diploxylonoid, 136-164 μ long with a circular to subcircular central body, 55-86 μ in diameter. On the proximal face of the central body 5-8 simple or forked striations are present which are cross-connected by many vertical striations. The exine in between the striations is intramicropunctate. The sacci are subspherical, laterally as well as distally separated leaving a 12-30 μ wide saccus-free area. Saccus intrareticulation of medium to coarse sized meshes.

Lahirites parvus Bharad. & Sal.

Pl. 7, Fig. 54

Holotype — Bharadwaj & Salujha, 1964, pl. 9, fig. 131.

The pollen grains are bilateral, disaccate, diploxylonoid and 117-175 μ long. The central body is subcircular, 78-97 μ in diameter and bears 6-9 simple or forked striations on the proximal face without any interconnecting striations. The exine in between the striations is intramicropunctate. The sacci are subspherical, laterally close, distally leaving a 6-20 μ broad, slightly biconvex saccus-free area.

Remarks — While agreeing with the holotype in other characters, the present specimens differ being larger in size.

Lahirites communis sp. nov.

Pl. 4, Figs. 35, 36

Holotype — Pl. 4, Fig. 35.

Locus typicus — 3/4 mile S.E. of Alubera, Bansloi valley, Santhal Parganas, Bihar.

Diagnosis — Pollen grains small, disaccate, bilateral, 66-90 μ in size, holotype measures 90 μ. Central body subcircular, dense brown, 25-43 μ in size, with 5-9 horizontal striations on the proximal face without interconnections, exine in between the striations intramicropunctate. Distal attachment of the sacci full length, straight, leaving a narrow, 4 μ wide saccus-free area. Saccus intrareticulation of fine to medium sized-meshes.

Comparison — *Lahirites communis* differs from the genotype in its smaller size, appa-

rent lack of any vertical connecting striations and the narrow saccus-free distal area. From other species of the genus too it differs in having a dense central body.

Lahirites sp. cf. *L. incertus* Bharad. & Sal.
Pl. 6, Fig. 50

Holotype — Bharadwaj & Salujha, 1964 pl. 8, fig. 122.

The specimens are disaccate, bilateral and diploxylonoid having a size range of 122-199 μ. The central body is subcircular, 51-62 μ in diameter, with 5-10 horizontal striations with few to many interconnections. The exine in between the striations is intramicropunctate. The sacci are subspherical, distally forming a narrow, 4 μ wide, and straight saccus-free area. Saccus intrareticulation consists of medium to big sized meshes.

Remarks — The nearest approach to the present specimens is in *Lahirites incertus* Bharad. & Sal. but the Raniganj specimens are comparatively smaller in size.

Hindipollenites Bharad. 1962

Genotype — Hindipollenites indicus Bharad. 1962

Hindipollenites rajmahalensis sp. nov.
Pl. 6, Fig. 51

Holotype — Pl. 6, Fig. 51.

Locus typicus — Near Bargo, Bansloi valley, Santhal Parganas, Bihar.

Diagnosis — Pollen grains bilateral, disaccate, diploxylonoid, holotype 156 μ long. Central body circular with a prominent marginal rim and 6 horizontal striations on the proximal face with a few and sparse interconnections. Exine in between the striations intramicropunctate. Sacci more than hemispherical, distally and laterally close, distal saccus attachment partial length, distal sulcus 1-2 μ wide. Saccus pitcher-shaped with a broad neck, intrareticulation mediumly coarse.

Comparison — Hindipollenites rajmahalensis differs from the genotype in a number of characters, the chief diagnostic characters being its bigger size, circular central body and mediumly coarse saccus intrareticulation. From *H. oblongus* (BHARADWAJ & SALUJHA, 1964) it differs in having finely intrapunctate structure of the body exine and lesser number of vertical connecting striations.

Hindipollenites sp.
Pl. 6, Fig. 52

The pollen grain is 152 μ long, disaccate, bilateral with a circular central body, 70 μ in diameter. On the proximal face of the central body there are about 9 horizontal striations with many interconnections. Exine is intramicropunctate in between the striations. The sacci are laterally separated but distally come close together leaving a very narrow distal sulcus. Sacci are almost twice the height of the central body, pitcher-shaped with a broad neck. Saccus intrareticulation is coarse with thick and broken muri.

Remarks — As there is only one specimen, a detailed study of variations has not been possible. From the three known species of the genus it seems to differ in the saccus intrareticulation.

Lunatisporites Leschik emend. Bharad. 1962

Genotype — Lunatisparites acutus Leschik 1955

Lunatisporites fuscus Bharad.
Pl. 4, Fig. 37

Holotype — Bharadwaj, 1962, pl. 14, figs. 189, 190

The pollen grains are bilateral, disaccate, distinctly diploxylonoid and 90-117 μ long. The central body is vertically oval with both ends bluntly pointed and measures 55-56 μ × 39-47 μ. Central body bears 6-7 horizontal striations on its proximal face, the exine in between the striations is intramicroreticulate. The sacci are slightly more than hemispherical, finely intrareticulate, laterally coming close together. Zones of distal attachment convex, distal saccus-free area biconvex.

Lunatisporites gondwanensis sp. nov.
Pl. 7, Fig. 55

Holotype — Pl. 7, Fig. 55.

Locus typicus — Near Bargo, Bansloi valley, Santhal Parganas, Bihar.

Diagnosis — Pollen grains bilateral, disaccate, diploxylonoid, 144-170 μ long, holotype 145 μ, Central body circular to subcircular, largest central body 86 μ × 94 μ, in holotype 78 μ, with 6-8 simple or forked striations on the proximal face, exine in between the striations intramicroreticulate. Sacci slightly hemispherical, 97-105 μ high,

laterally close together and coarsely intrareticulate, reticulum sometimes incomplete with thick muri. Distal zone of saccus attachment convex, distal sulcus biconvex, 31-41 μ at its widest.

Comparison — *Lunatisporites fuscus* differs in having a vertically oval central body and fine intrareticulation of the saccus.

Lunatisporites santalensis sp. nov.

Pl. 7, Fig. 56

Holotype — Pl. 7, Fig. 56.

Locus typicus — Near Bargo, Bansloi valley, Santhal Parganas, Bihar.

Diagnosis — Pollen grains bilateral, disaccate, holotype 152 μ long. Central body vertically oval, in holotype 74 μ × 99 μ, with 4-8 simple or forked horizontal striations on the proximal face, exine in between the striations intramicroreticulate, central body wall folded inwards forming two characteristic vertical semilunar infolds. Sacci 113-116 μ high with fine intrareticulation, thick muri, and small lumina. Distal zone of saccus attachment convex, distal sulcus biconvex, 29-98μ at its widest.

Comparison — In *Lunatisporites fuscus* the central body is smaller and the distal sulcus is comparatively narrow. In *L. gondwanensis* the saccus intrareticulation is coarse.

Stroterspores Wilson 1962 (*sensu* Venkatachala & Kar, 1964)

Genotype — *Stroterspores communis* Wilson 1962

Stroterspores fusus (B. & H.) comb. nov.

Pl. 5, Fig. 45

Holotype — Balme & Hennelly, pl. 1, fig. 7.

The pollen grains are bilateral, disaccate and diploxylonoid measuring 95-148 μ. The central body is subcircular to circular, 43-66 μ in diameter with 6-9 simple or forked striations without any interconnections, the exine in between the striations intramicroreticulate. Sacci are subspherical, larger than the body, laterally and distally slightly separated, leaving a 8-15 μ wide saccus-free distal area. Saccus intrareticulation consists of small sized meshes.

Stroterspores rotundus sp. nov.

Pl. 7, Fig. 57

Holotype — Pl. 7, Fig. 57.

Locus typicus — Near Bargo, Bansloi valley, Santhal Parganas, Bihar.

Diagnosis — Pollen grains roundly bilateral, disaccate, 130-195μ long, holotype 152 μ. Central body subcircular to vertically oval, 105-156 μ in size, 7-12 simple or forked striations on the proximal face without interconnections; exine in between the striations intramicroreticulate. Sacci hemispherical, narrow as compared with the central body, laterally and distally coming close together leaving a narrow saccus-free distal area; saccus intrareticulation coarse, muri thick and often broken.

Comparison — In its roundly bilateral form *Stroterspores rotundus* is distinct from the other species of the genus. *S. fusus* is smaller in size with a circular to subcircular central body and a fine meshed saccus intrareticulation. *S. octistriatus* (HART, 1960) comb. nov. besides being much smaller in size has a wider saccus-free distal area. The holotype of *Lunatisporites goraiensis* (POTONIÉ & LELE, 1961) shows features comparable with those of *Stroterspores* in general and approaches to a certain extent nearer *S. rotundus*.

Stroterspores ovatus sp. nov.

Pl. 7, Fig. 58

Holotype — Pl. 7, Fig. 58.

Locus typicus — 3/4 mile S.E. of Alubera, Bansloi valley, Santhal Parganas, Bihar.

Diagnosis — Pollen grains bilateral, disaccate, diploxylonoid, 125-183 μ long, holotype 183 μ. Central body subcircular to vertically oval, 66-117 μ × 55-94 μ, with 4-8 simple or forked striations on the proximal face without any interconnections, exine in between the striations intramicroreticulate. Sacci subspherical, distally inclined, distally and laterally close, leaving a 2-8 μ wide straight saccus-free distal area. Saccus intrareticulation double, i.e. fine meshes inside the coarser ones, meshes near the margins often radially directed.

Comparison — *Stroterspores rotundus* differs from the present species in being roundly bilateral. The closely allied pollen grain is *Stroterspores diffusus* (Bharad. & Sal.) Venkatach. & Kar (1964) but that too differs in having a hexagonal central body and a wide saccus-free distal area.

Stroterspores globosus sp. nov.

Pl. 7, Fig. 59

Holotype — Pl. 7, Fig. 59.

Locus typicus — Near Bargo, Bansloi valley, Santhal Parganas, Bihar.

Diagnosis — Pollen grains disaccate, diploxylonoid, 117-144 μ long with a horizontal oval to circular central body, sometimes exhibiting a marginal thickening. Central body 62-78 μ in diameter, with 6-10 horizontal striations with few to many interconnections; exine in between the striations intramicroreticulate. Sacci subspherical, higher than the central body, distally inclined leaving a 12-15 μ broad saccus-free distal area. Saccus intrareticulation of medium-sized meshes with thick and broken muri.

Comparison — *Strotersporites rotundus* has a roundly bilateral shape as compared to distinctly bilateral form of *S. globosus*. Further the central body in *S. rotundus* is subcircular to vertically oval as compared to horizontally oval central body in *S. globosus*. *S. ovatus* has a different saccus intrareticulation.

Strotersporites perfectus sp. nov.

Pl. 7, Fig. 60

Holotype — Pl. 7, Fig. 60.

Locus typicus — Near Bargo, Bansloi valley, Santhal Parganas, Bihar.

Diagnosis — Pollen grains bilateral, disaccate, 133-174 μ in size, holotype 172 μ. Central body circular to horizontally oval, 62-117μ in diameter, with 5-8 horizontal striations, exine in between the striations intramicroreticulate. Sacci as high as or slightly higher than the central body, subspherical, laterally and distally separated, leaving 20-43 μ wide saccus-free distal area. Saccus intrareticulation of medium to big sized meshes.

Comparison — *Strotersporites globosus* while resembling in size and shape differs in having a narrow saccus-free distal area and medium coarse saccus intrareticulation with thick muri. *S. ovatus* has double intrareticulation of the saccus and a narrow saccus-free distal area. *S. rotundus* besides being of different shape has a vertically oval central body. Other species of the genus also do not compare.

Kosankeisporites Bharad. 1954

Genotype — *Kosankeisporites elegans* (Kos.) Bhard. 1955

? *Kosankeisporites* sp.

Pl. 7, Fig. 61

The pollen grains are distinctly bilateral and disaccate and measure 128-183 μ in length. Central body is rhomboid or vertically oval, 55-105 μ × 58-94 μ, with 6-11 horizontal striations, which are forked but without any vertical cross connections. Exine in between the striations intramicroreticulate. Sulcus deep, slightly wider in the middle, floor unspecialized.

Remarks — *Kosankeisporites* as described originally by Bhardwaj (1955) from the Saar and recently recorded from the Raniganj stage (BHARADWAJ, 1962) has a microverrucose body and a few zigzag regulae on the proximal face. None of the southern spores assigned to this genus show the zigzag regulae — a character much emphasized in connection with the Saar specimens. On the contrary the Indian grains possess distinct horizontal striations as in the other striate disaccate genera of the Southern Hemisphere. Of the few specimens found in the present material, the presence of a well-defined deep sulcus is very evident. Besides this solitary common feature, the grains do not agree with *Kosankeisporites* as they possess an intramicroreticulate body and clear horizontal striations. The assignment of the few specimens to *Kosankeisporites* is thus open to doubt.

Faunipollenites Bharad. 1962

Genotype — *Faunipollenites varius* Bharad. 1962

Faunipollenites varius Bharad.

Pl. 8, Fig. 62

Holotype — Bharadwaj, 1962, pl. 18, fig. 230

The pollen grains are disaccate, bilateral and haploxylonoid. They are 124-168 μ long and 82-94 μ high. Central body outline is well-defined with proximal face bearing 7-8 horizontal, simple or forked striations; exine in between the striations is intramicroreticulate. The sacci are hemispherical, coarsely intrareticulate; distal zone of saccus attachment is ill-defined.

Remarks — The grains described here are slightly bigger in size than those originally included in the species.

Faunipollenites bharadwajii sp. nov.

Pl. 8, Fig. 63

Holotype — Pl. 8, Fig. 63.

Locus typicus — 3/4 mile S.E. of Alubera, Bansloi valley, Santhal Parganas, Bihar.

Diagnosis — Pollen grains disaccate, bilateral, haploxylonoid, 152-180 μ long, holotype 179 μ. Central body ill-defined, proximally bearing 7-10 simple or forked striations, exine in between the striations intramicroreticulate. Sacci hemispherical, distally inclined leaving a narrow, ill-defined distal sulcus; saccus intrareticulation coarse.

Comparison — The genotype is longish bilateral, smaller in size with fewer proximal striations and a wider sulcus. *Faunipollenites* sp. A (BHARADWAJ & SALUJHA, 1964; P. 210, PL. 11, FIG. 151) compares favourably with the present specimens and probably belongs to this new species.

Faunipollenites sp.

Pl. 8, Fig. 64

The pollen grains are disaccate, roundly bilateral with longer axis measuring 145-242 μ. The central body is ill-defined and is intramicroreticulate. It bears 4-10 simple or forked striations on its proximal face. Saccus intrareticulation is coarse.

Remarks — In its body structure and roundly bilateral shape the pollen resembles *Stroterisporites rotundus* sp. nov. (p. 274). But the body outline and the distal saccus attachment of the present specimens are ill-defined which characters are more consistent with the genus *Faunipollenites*. In view of the lack of more satisfactorily preserved specimens, the few grains are perhaps at best referable to *Faunipollenites*.

Infraturma — *Rectistriati* Bharad. 1962

***Distriatites* Bharad. 1962**

Genotype — Distriatites bilateris Bharad. 1962

Distriatites bilateris Bharad.

Pl. 9, Fig. 69

Holotype — Bharadwaj, 1962, pl. 22, figs. 281, 282

The pollen grains are bilateral, disaccate, 146-195 μ long with a subcircular to rhomboid central body, 77-109 μ in diameter. On one face the central body bears 8-9 horizontal striations while on the other face 4-8 vertical striations occur. The saccus attachment is ill-defined and the saccus intrareticulation consists of medium-sized meshes.

Remarks — Bharadwaj (1962) has included under *Distriatites bilateris* some abnormal pollen in which case each of the two sacci have an additional lobe. At first sight these grains may thus appear to possess four sacci attached to a central body. In the present material there is a single pollen grain (PL. 8, FIG. 65) which shows similar features. It is provisionally compared with *D. bilateris* although it is evident that the shape of the body is different from that found in *D. bilateris*.

Infraturma — *Disacciatrileti* (Leschik) Pot. 1958

***Limitisporites* Leschik, 1956**

Genotype — Limitisporites rectus Leschik 1957

Limitisporites latus Leschik

Pl. 8, Fig. 66

Holotype — Leschik, 1956, pl. 21, fig. 16.

The pollen grains are bilateral, disaccate, diploxylonoid and 156-164 μ long. The central body is ± hexagonal, 62-70 μ in diameter, with a ± bent monolete on the proximal face and two biconvex, secondary folds running along the lateral axis of the spore on the distal side. The sacci are subspherical, distal zone of saccus attachment convex leaving a biconvex saccus-free distal area. Saccus intrareticulation consist of large meshes.

***Fimbriaesporites* Leschik 1959**

Genotype — Fimbriaesporites globsus Leschik 1959

Fimbriaesporites major Hφeg & Bose

Pl. 9, Fig. 70

Holotype — Hφeg & Bose, 1960, pl. 28, fig. 5.

The pollen grains are bilateral disaccate, diploxylonoid with a horizontally oval to circular central body, sometimes with a marginal thickening. Size range of the grains is 121-140 μ × 175-210 μ and that of the central body 58-74 μ × 66-82 μ. The central body proximally bears polygonal to irregular areas forming a frilled ring of projections. Central body exine is microverrucose. Sacci are subspherical, laterally and distally coming close together leaving a narrow saccus-free distal zone. Saccus intrareticulation of medium sized meshes.

? *Fimbriaesporites* sp.

Pl. 8, Fig. 67

The grains are bilateral, 90-117 μ × 113-140 μ in size with a vertically oval to circular central body, 50-58 μ × 39-58 μ, showing irregular areas marked by faint grooves on the proximal face, exine microverrucose. Saccus condition difficult to determine, whether mono- or disaccate. Saccus intrareticulation of medium-sized meshes.

***Sulcatisporites* Leschik emend. Bharad. 1962**

Genotype — *Sulcatisporites interpositus* Leschik 1955

Sulcatisporites sp.

Pl. 8, Fig. 68

Pollen grains ± subcircular, disaccate, with an indistinct, nonstriated central body; size range 121-175 μ × 101-136 μ. Sacci hemispherical, placed close to each other, leaving a 4-10 μ wide, ill-defined saccus-free distal area. Saccus intrareticulation coarse.

Remarks — These specimens compare favourably with *Sulcatisporites* sp. B. of Bharadwaj & Salujha (1964, P. 212; PL. 12, FIG. 161).

Subturma — *Polysaccites* Cookson 1947
Infraturma — *Trisacciti* Leschik

***Trochosporites* Wilson 1962**

Genotype — *Trochosporites reniformis* Wils. 1962

Trochosporites sp.

Pl. 9, Fig. 71

The solitary grain is asymmetrical, trisaccate, 132 μ in size with an oval central body, 62 μ × 55 μ. Sacci subequatorially attached leaving a ± oval saccus-free distal area. Saccus intra-reticulation of medium sized meshes.

Remark — The genotype is smaller in size with lesser extent of sacci.

Turma — *Polyplicates* Erdtm. 1952

***Gnetaceaepollenites* Thierg. 1938**

Genotype — *Gnetaceaepollenites ellipticus* Thierg. 1938

Gnetaceaepollenites grandis sp. nov.

Pl. 9, Fig. 72

Holotype — Pl. 9, Fig. 72.

Locus typicus — Near Bargo, Bansloi valley, Santhal Parganas, Bihar.

Diagnosis — Pollen grains elliptical with rounded or broadly pointed and curved margins, 78-101 μ × 100-210 μ in size. Two to four prominent folds present on the exine, exine ± 1·5 μ thick and intrabaculate.

Comparison — *Gnetaceaepollenites ellipticus* is smaller in size and is known from the Tertiary horizon. *G. sinuousus* (B. & H.) Bharad. is smaller in size with only two folds and has a smooth exine. Cf. *Gnetaceaepollenites* sp. (BHARADWAJ & SALUJHA, 1964) is smaller in size with only two folds.

cf. *Gnetaceaepollenites* sp.

Pl. 9, Fig. 73

The solitary grain is oblong with bluntly pointed ends and is 148 μ × 114 μ in size. The prominent folds are present on the exine running almost the full length of the grain. Exine ± 2 μ thick, microverrucose.

***Vittatina* Luber 1940**

Genotype — *Vittatina subsaccata* Samoilow. 1953

Vittatina globosa sp. nov.

Pl. 6, Fig. 53

Holotype — Pl. 6, Fig. 53.

Locus typicus — Near Bargo, Bansloi valley, Santhal Parganas, Bihar.

Diagnosis — Pollen grains subcircular, sometimes with one or two folds at right angles to the plane of striations, 86-121 μ in diameter. Exine thick bearing 8-15 striations, intramicropunctate.

Comparison — *Vittatina globosa* differs from the genotype in its subcircular shape and larger size range. Other species of the genus also do not compare.

Turma—*Monocolpates* Ivers. & T-Smith 1950
Infraturma — *Intortes* (Naum.) Pot. & Kr.

***Ginkgocycadophytus* Samoilow.**

Genotype — *Ginkgocycadophytus caperatus* (Luber) Samoilow. 1953

cf. *Ginkgocycadophytus cymbatus* (B. & H.) Pot. & Lele

Pl. 4, Fig. 38, Pl. 9, Fig. 74

Holotype — Balme & Hennelly, 1956a, pl. 3, fig. 55.

The pollen grains are ± spindle-shaped, 54-64 μ long, ends tapering or ± rounded, exine granulose, colpus not distinct.

Turma — *Aletes* Ibrah. 1933

Subturma — *Azonaletes* (Luber) Potonié & Kremp 1954

Infraturma — *Reticulonapiti* (Erdtman) Bose & Kar 1966

***Greinervillites* Bose & Kar 1966**

Genotype — Greinervillites undulatus Bose & Kar, 1966

Greinervillites undulatus Bose & Kar

Pl. 1, Fig. 12

Holotype — Bose & Kar, pl. 1, fig. 6.

Spore subcircular, ± 120 μ in diameter, margin undulated; exine thick, muri irregular, membranous forming broadly reticulate pattern, lumina distinct, exine laevigate.

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EXPLANATION OF PLATES

(All magnifications × 500)

All slides and photo-negatives are registered with and deposited at the repository of Birbal Sahni Institute of Palaeobotany, Lucknow.

PLATE 1

1. ? *Punctatisporites* sp., Slide No. 2327, Photo No. 1401.
2. *Cyclogranisporites* sp., Slide No. 2327, Photo No. 1402.
3. *Lophotriletes* cf. *L. rectus* Bharad. & Sal., Slide No. 2309, Photo No. 1403.
4. *Granulatisporites* sp., Slide No. 2329, Photo No. 1404.
5. *Verrucosisporites varius* sp. nov., Slide No. 2326, Photo No. 1405.
6. *Verrucosisporites varius* sp. nov., Slide No. 2307, Photo No. 1406.
7. ? *Verrucosisporites* sp., Slide No. 2309, Photo No. 1474.
8. *Horriditriletes curvibaculosus* Bharad. & Sal., Slide No. 2307, Photo No. 1407.
9. *Horriditriletes curvibaculosus* Bharad. & Sal., Slide No. 2308, Photo No. 1408.
10. *Horriditriletes gondwanensis* sp. nov., Slide No. 2340, Photo No. 1409.
11. *Horriditriletes gondwanensis* sp. nov., Slide No. 2339, Photo No. 1410.
12. *Greinervillites undulatus* Bose & Kar, Slide No. 2306, Photo No. 1411.
13. Indeterminate, Slide No. 2340, Photo No. 1412.
14. *Latosporites colliensis* (B. & H.) Bharad., Slide No. 2321, Photo No. 1413.
15. *Latosporites* sp., Slide No. 2308, Photo No. 1414.
16. *Thymospora* sp., Slide No. 2310, Photo No. 1415.
17. *Parastriopollenites rajmahalensis* gen. et sp. nov., Slide No. 2312, Photo No. 1416.
18. *Parastriopollenites rajmahalensis* gen. et sp. nov., Slide No. 2317, Photo No. 1417.

PLATE 2

19. *Parastriopollenites gondwanensis* sp. nov., Slide No. 2331, Photo No. 1418.
20. *Parastriopollenites triangularis* sp. nov., Slide No. 2312, Photo No. 1419l.
21. *Parastriopollenites sinuosus* sp. nov., Slide No. 2313, Photo No. 1420.

22. *Parastriopollenites limbatus* sp. nov., Slide No. 2317, Photo No. 1421.
23. *Parasaccites densus* sp. nov., Slide No. 2332, Photo No. 1422.
24. *Virkkipollenites mehtae* Lele, Slide No. 2311, Photo No. 1423.

PLATE 3

25. *Parastriopollenites giganteus* sp. nov., Slide No. 2318, Photo No. 1424.
26. *Plicatipollenites gondwanensis* (B. & H. Lele, Slide No. 2328, Photo No. 1426.
27. *Plicatipollenites gondwanensis* (B. & H.) Lele, Slide No. 2330, Pnoto No. 1426.
28. *Virkkipollenites triangularis* (Mehta) Lele, Slide No. 2313, No. 1427.
29. *Virkkipollenites obscurus* Lele, Slide No. 2327, Photo No. 1428.

PLATE 4

30. *Potonieisporites* sp. cf. *P. novicus* Bharad., Slide No. 2328, Photo No. 1429.
31. *Potonieisporites lelei* sp. nov., Slide No. 2330, Photo No. 1430.
32. *Potonieisporites densus* sp. nov., Slide No. 2330, Poto No. 1431.
33. *Striatites cancellatus* (B. & H.) Pot., Slide No. 2338, Photo No. 1432.
34. *Striatites* sp., Slide No. 2302, Photo No. 1433.
35. *Lahirites communis* sp. nov., Slide No. 2325, Photo No. 1434.
36. *Lahirites communis* sp. nov., Slide No. 2309, Photo No. 1435.
37. *Lunatisporites fuscus* Bharad., Slide No. 2323, Photo No. 1436.
38. cf. *Ginkgocycadophytus cymbatus* (B. & H.) Pot. & Lele, Slide No. 2310, Photo No. 1437.

PLATE 5

39. *Potonieisporites diffusus* (Maithy) Bharad., Slide No. 2327, Photo No. 1438.
40. cf. *Crucisaccites latisulcatus* Lele & Maithy, Slide No. 2312, Photo No. 1439.
41. *Densipollenites indicus* Bharad., Slide No. 2305, Photo No. 1440.
42. *Striomonosaccites ovatus* Bharad., Slide No. 2332, Photo No. 1441.
43. *Striomonosaccites invisus* sp. nov., Slide No. 2336, Photo No. 1442.
44. *Striatites* sp., Slide No. 2303, Photo No. 1443.
45. *Strotersporites fusus* (B. & H.) comb. nov., Slide No. 2310, Photo No. 1444.

PLATE 6

46. *Platysaccus* sp., Slide No. 2334, Photo No. 1445.
47. *Cuneatisporites* sp., Slide No. 2301, Photo No. 1446.
48. *Striatites obtusus* Bharad. & Sal., Slide No. 2312, Photo No. 1447.
49. *Lahirites raniganjensis* Bharad., Slide No. 2311, Photo No. 1448.
50. *Lahirites* sp. cf. *L. incertus* Bharad. & Sal., Slide No. 2314, Photo No. 1449.
51. *Hindipollenites rajmahalensis* sp. nov., Slide No. 2319, Photo No. 1450.
52. *Hindipollenites* sp., Slide No. 2312, Photo No. 1451.
53. *Vittatina globosa* sp. nov., Slide No. 2325. Photo No. 1452.

PLATE 7

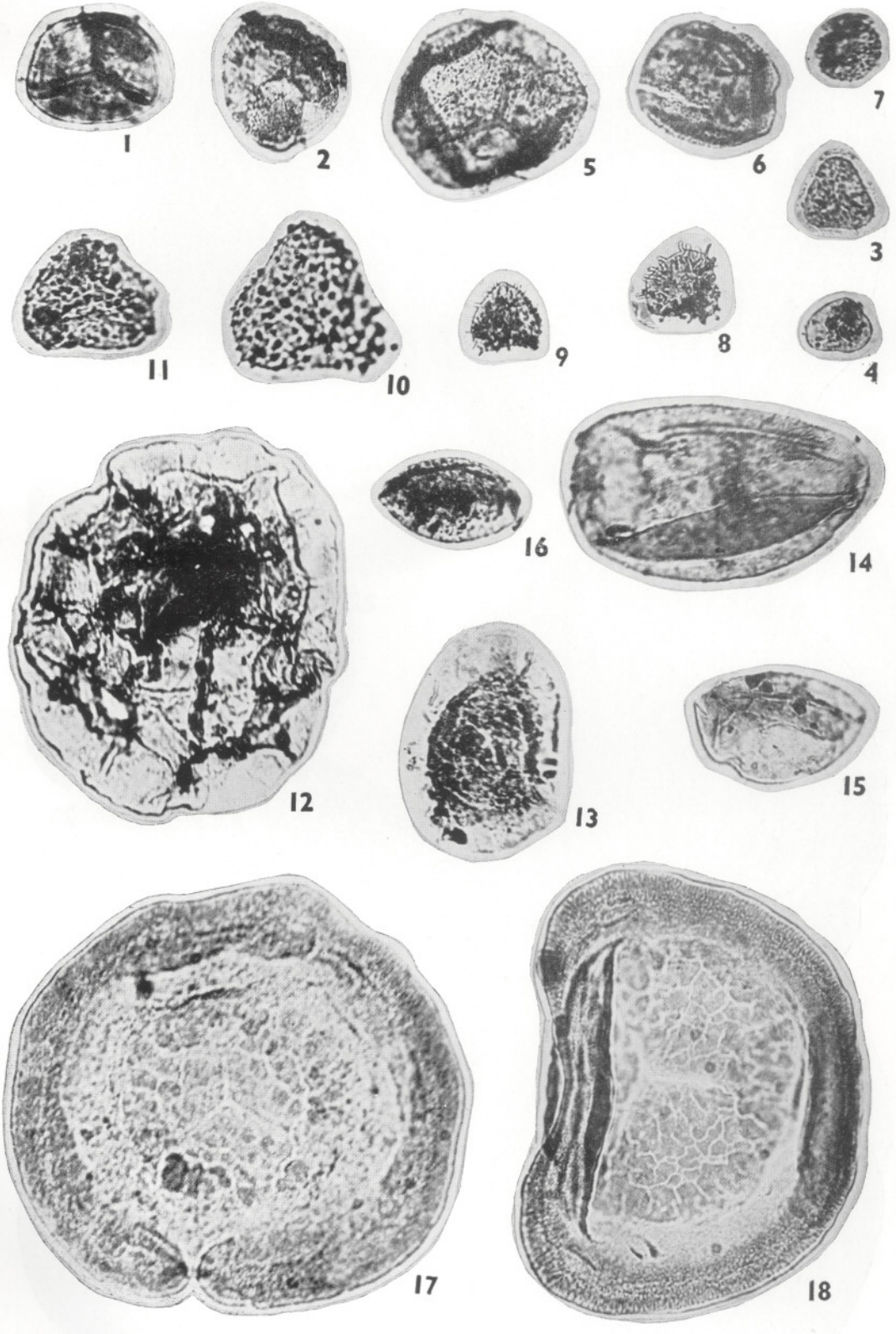
54. *Lahirites parvus* Bharad. & Sal., Slide No. 2313, Photo No. 1453.
55. *Lunatisporites gondwanensis* sp. nov., Slide No. 2316, Photo No. 1454.
56. *Lunatisporites santalensis* sp. nov., Slide No. 2318, Photo No. 1455.
57. *Strotersporites rotundus* sp. nov., Slide No. 2313, Photo No. 1456.
58. *Strotersporites ovatus* sp. nov., Slide No. 2318, Photo No. 1457.
59. *Strotersporites globosus* sp. nov., Slide No. 2312, Photo No. 1458.
60. *Strotersporites perfectus* sp. nov., Slide No. 2320, Photo No. 1459.
61. ? *Kosankeisporites* sp., Slide No. 2315, Photo No. 1460.

PLATE 8

62. *Faunipollenites varius* Bharad., Slide No. 2324, Photo No. 1461.
63. *Faunipollenits bharadwajii* sp. nov., Slide No. 2337, Photo No. 1462.
64. *Faunipollenites* sp., Slide No. 2335, Photo No. 1463.
65. ? *Distriatites bilateris* Bharad., Slide No. 2332, Photo No. 1464.
66. *Limitisporites latus* Leschik, Slide No. 2312, Photo No. 1465.
67. ? *Fimbriaesporites* sp., Slide No. 2336, Photo No. 1466.
68. *Sulcatisporites* sp., Slide No. 2333, Photo No. 1467.

PLATE 9

69. *Distriatites bilateris* Bharad., Slide No. 2312, Photo No. 1468.
70. *Fimbriaesporites major* Hφeg & Bose, Slide No. 2311, Photo No. 1469.
71. *Trochosporites* sp., Slide No. 2304, Photo No. 1470.
72. *Gnetaceaepollenites grandis* sp. nov., Slide No. 2334, Photo No. 1471.
73. cf. *Gnetaceaepollenites* sp., Slide No. 2315, Photo No. 1472.
74. cf. *Ginkgocycadophytus cymbatus* (B. & H.) Pot. & Lele, Slide No. 2308, Photo No. 1474.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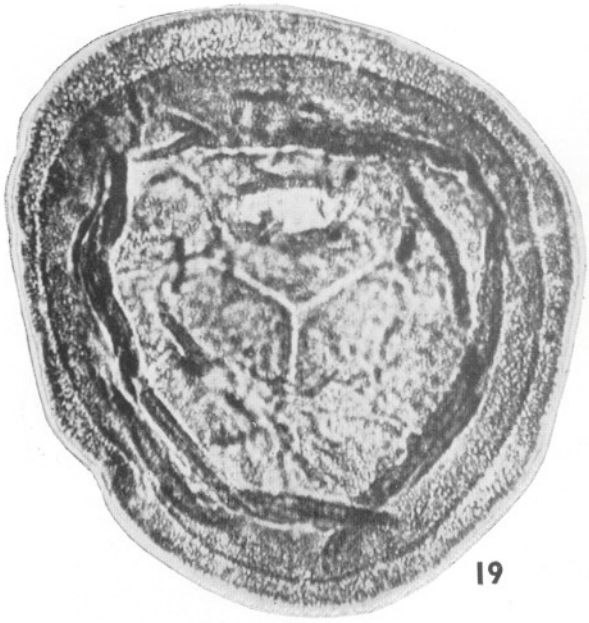
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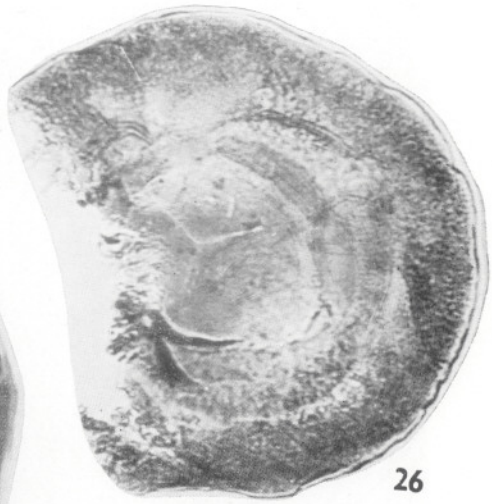

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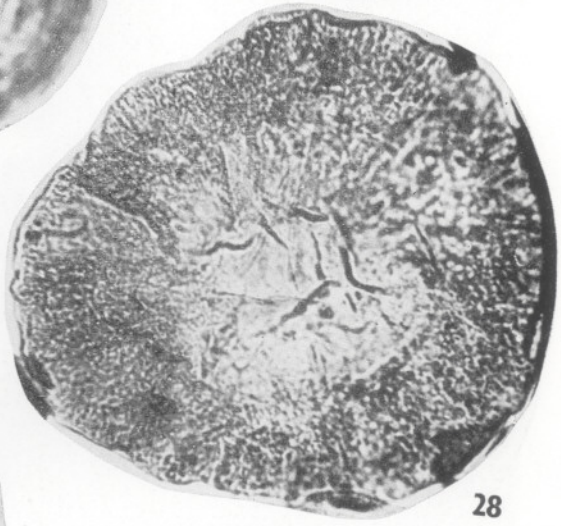

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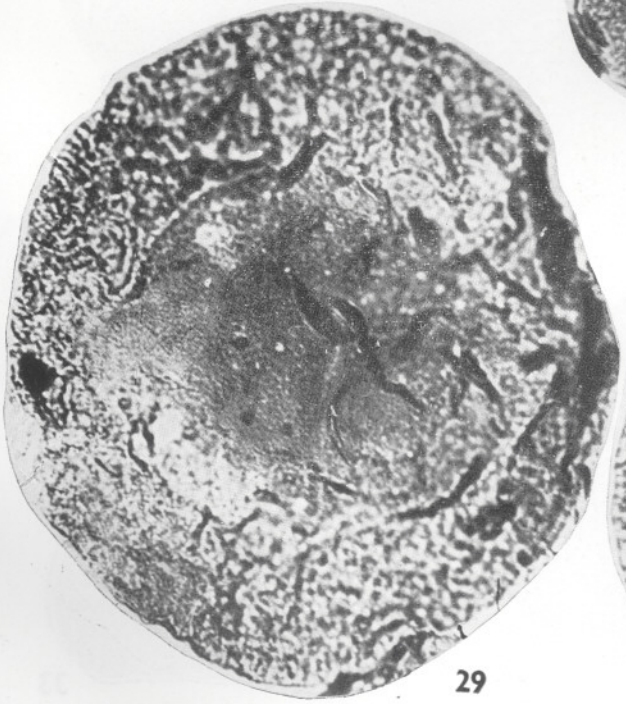

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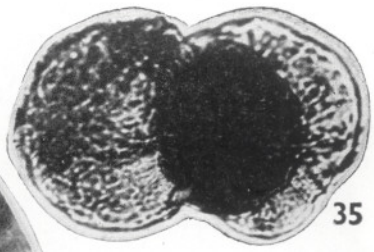
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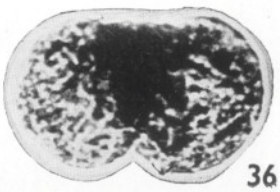
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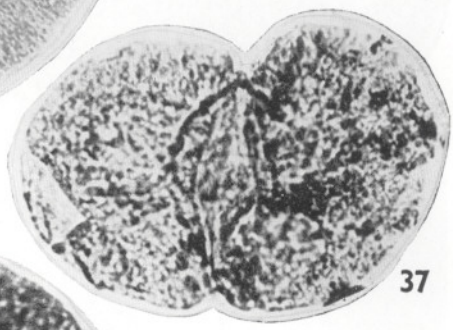
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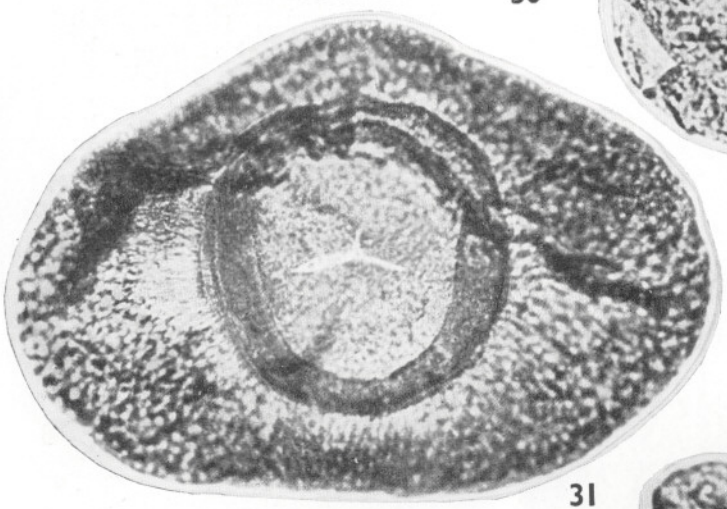
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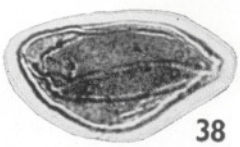
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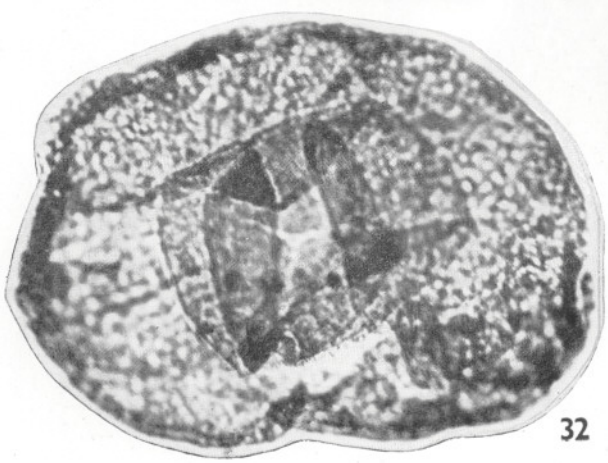
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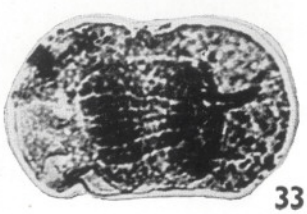
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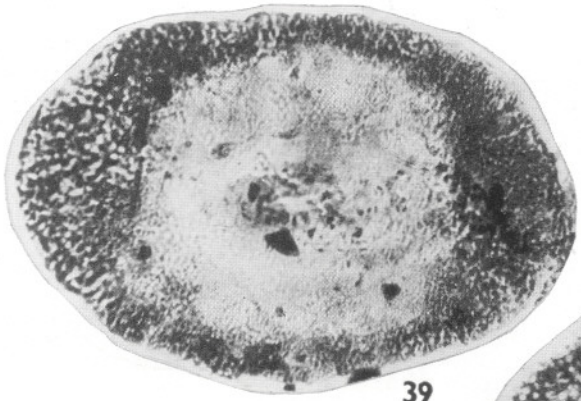

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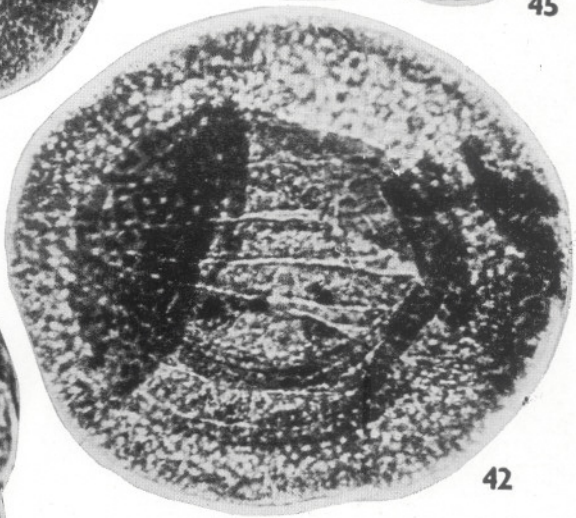

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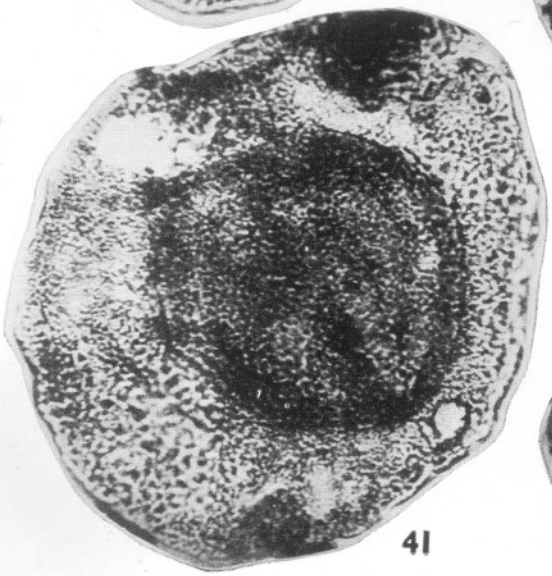

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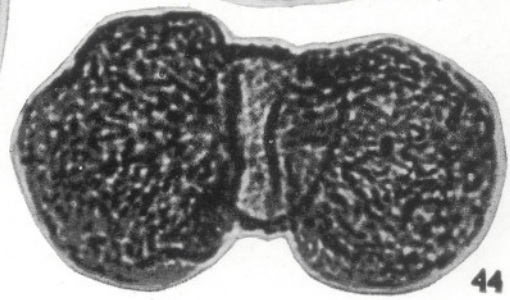

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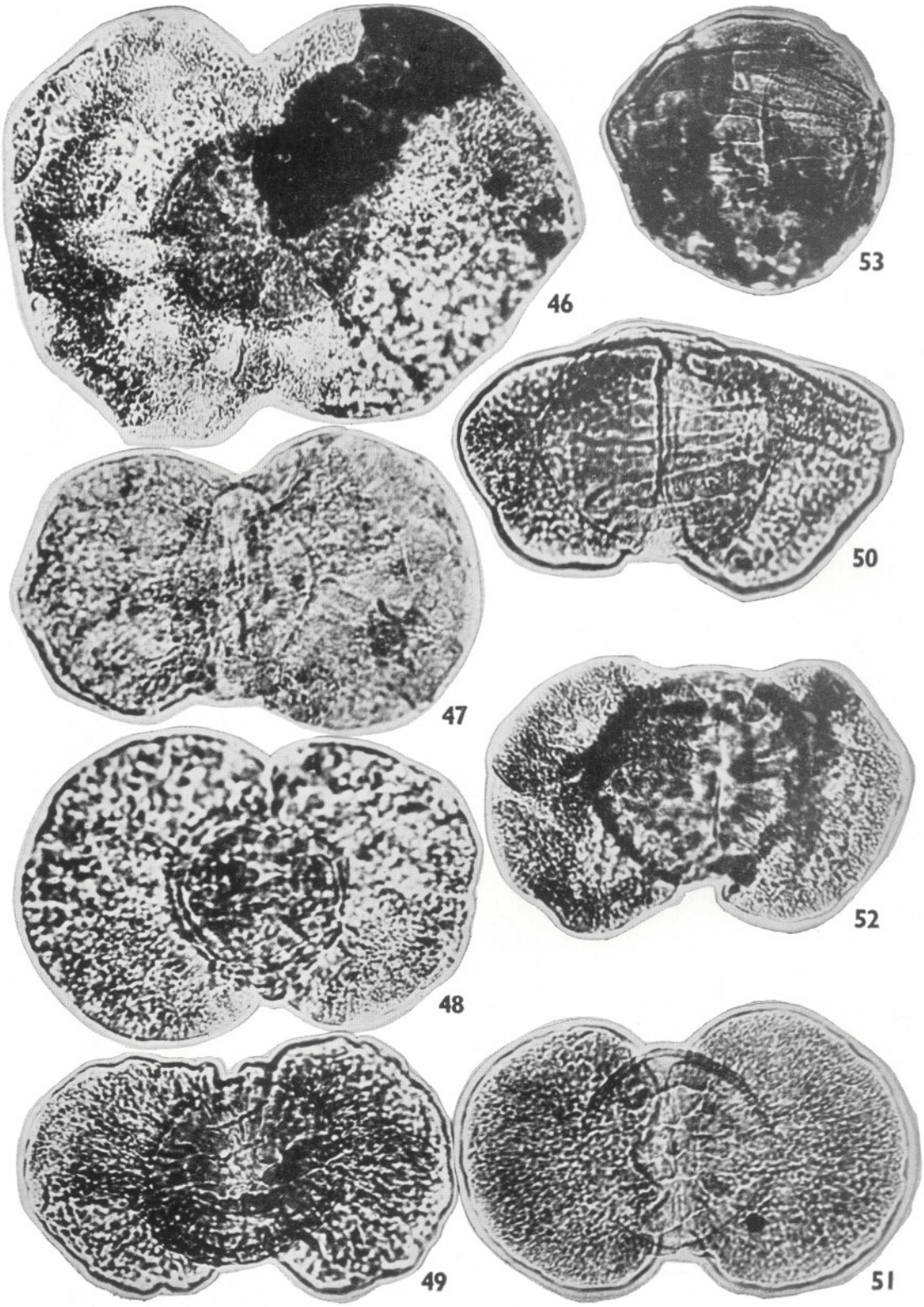
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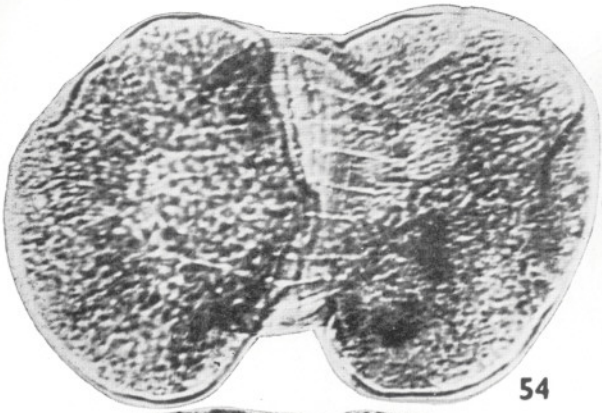
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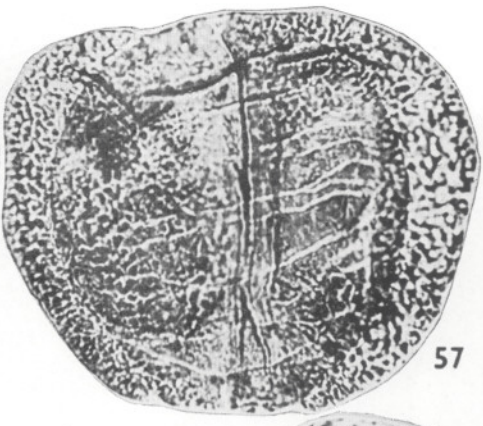
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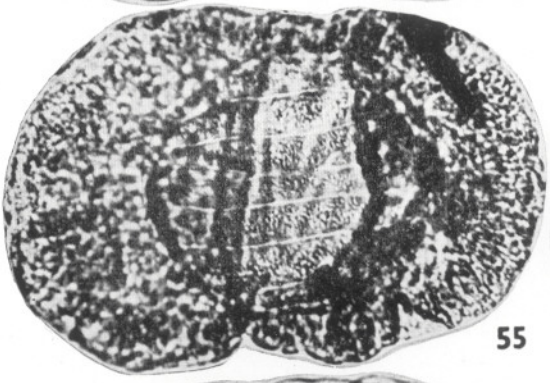
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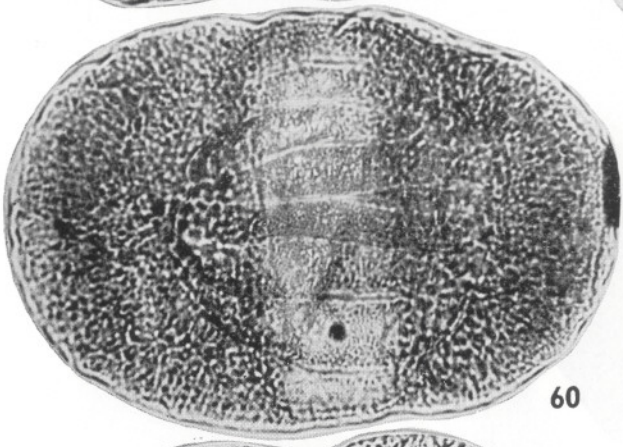
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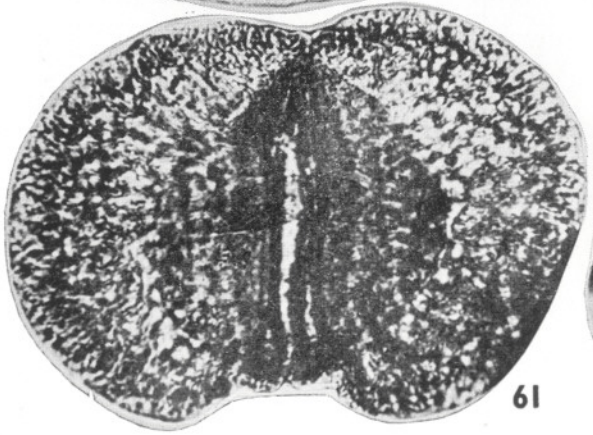
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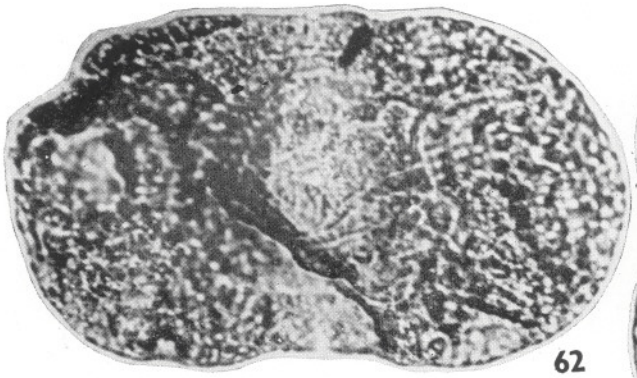
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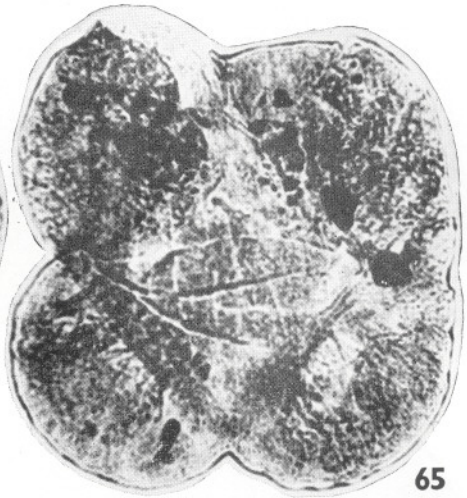
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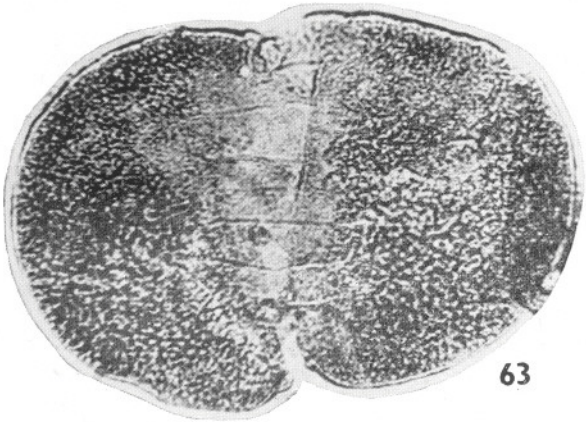
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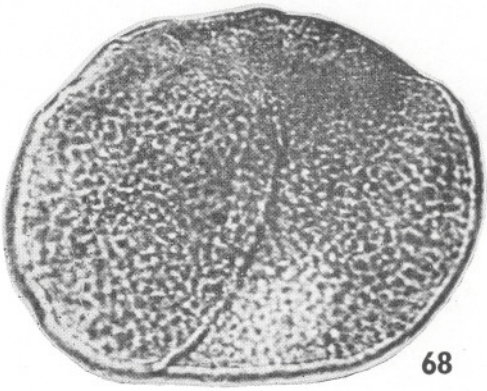
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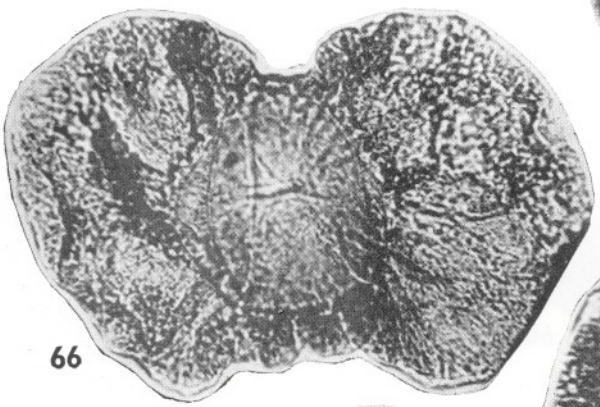
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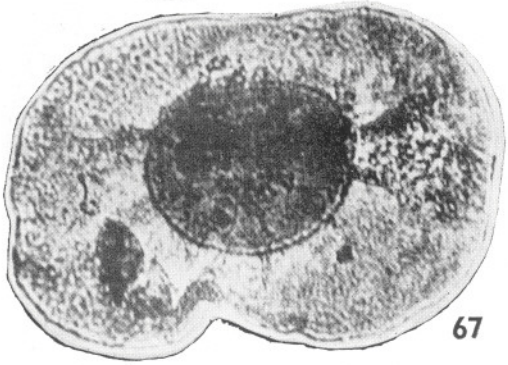
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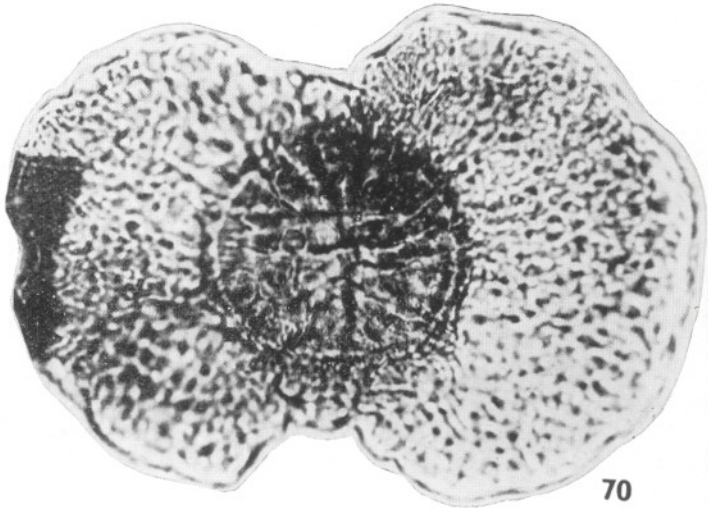

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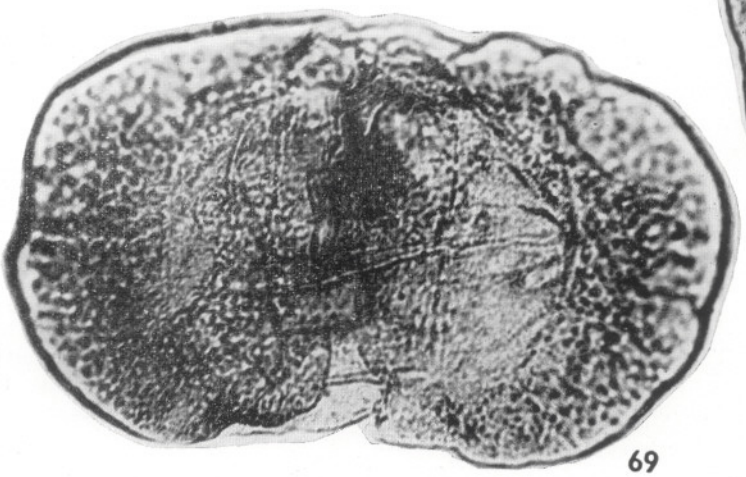

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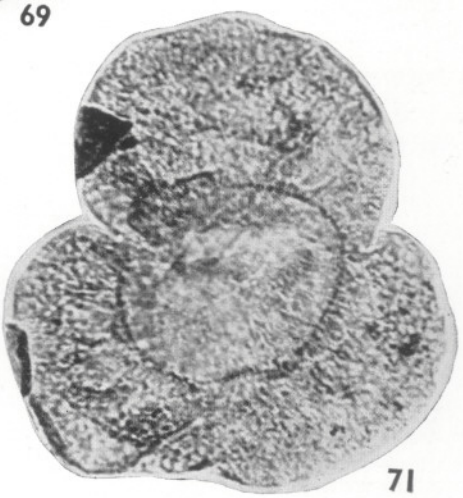

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