

ON SOME ALGAL AND FUNGAL REMAINS FROM TURA FORMATION OF GARO HILLS, ASSAM

R. K. KAR, R. Y. SINGH & S. C. D. SAH

Birbal Sahni Institute of Palaeobotany, Lucknow

ABSTRACT

Attention is drawn to the occurrence of some algal and fungal remains from the Tura Formation of Garo Hills, Assam. The algal microplanktons comprise 7 genera with one species each. The genera *Oligosphaeridium*, *Achomosphaera*, *Hystrichosphaera* and *Hystrichosphaeridium* are well represented while the remaining genera are present in lesser frequencies. The fungal remains are represented by 8 genera and 10 species. One of the genera, viz. *Cucurbitariaceites* is new and is commonly found in the assemblage. The other genera that are commonly found are *Parmathyrites*, *Phragmothyrites*, *Callimothallus* and *Notothyrites*. Stratigraphical value of these remains, if any, will have to wait till the completion of successional studies now in progress.

The presence of algal microplanktons indicates a brackish-water environment of deposition.

IN recent years, rich palynological assemblages have been described from the Tertiary sediments of Assam. However, inspite of the abundant presence of algal and fungal remains throughout the Tertiary succession (SAHNI, SITHOLEY and PURI, 1947, PLS. 14-17), these plant groups have almost been neglected by palynologists in India.

While investigating the sediments of the Tura Formation in Garo Hills, a very rich assemblage of algal and fungal remains was recovered, together with spores and pollen grains. The present study includes a few selected species which are interesting or show morphologically distinct characteristics.

The algal microplanktons include seven species assignable to seven genera while from the fungal remains eight genera and ten species have been selected for the present study. The presence of microplanktons in good frequencies indicate an estuarine to near-shore condition of deposition. Evidence of marine Siju Limestone band overlying the Tura Formation lends support to this contention. The abundance of epiphyllous fungi points towards the prevalence of moist and humid climate favourable for the luxuriant growth of this group of plants.

Genus — *Baltisphaeridium* (Eis.) Down. & Sarj., 1963

Type species — *Baltisphaeridium longispinosum* (Eis.) Eis., 1958

Baltisphaeridium sp. cf. *B. multispinosum*
Singh, 1964

Pl. 1, Fig. 1

Description — Cysts subcircular to circular, 50-60 μ . Cyst wall not more than 1.5 μ thick, processes closely placed, evenly distributed, 15-25 μ long, sometimes slightly tufted at tips.

Remarks — *Baltisphaeridium multispinosum* described by Singh (1964) from the Lower Cretaceous Mannville group, Alberta closely resembles the present specimens in shape, size range and nature of the processes. In the present specimens, the processes are not closely placed as in *B. multispinosum* Singh (1964). For this reason, the present specimens have only been compared with those described by Singh (1964).

The specimens referred as *Hystrichosphaerids* by Biswas (1962, PL. 7, FIG. 41; PL. 8, FIG. 47) very much resemble the present specimens.

The hitherto known species of *Baltisphaeridium* with definite archaeopyle have been transferred to different genera like *Surculosphaeridium*, *Cleistosphaeridium*, *Prolixosphaeridium* and *Exochosphaeridium* by Davey *et al.* (1966-1969). They have restricted *Baltisphaeridium* to accommodate those cysts with or without pylome and spinose processes.

Genus — *Oligosphaeridium* Dav. & Will., 1966

Type species — *Oligosphaeridium complexum* (White) Dav. & Will., 1966

Oligosphaeridium cephalum Sah *et al.*, 1970

Pl. 1, Fig. 2

Description — Cyst \pm oval, 50 \times 30 μ without processes. Archaeopyle apical,

distinct. Tubular processes about 12 in number, long, seems to be hollow with tufted tips. Cyst membrane about 1 μ thick, laevigate.

Remarks — *Hystrichosphaeridium* cf. *H. scaffoldi* Baksi (1962) reported by Sivastava and Banerjee (1969) from the Tertiary subgroups of Assam resembles the present specimens in the presence of few processes but nothing can be said with certainty as the nature of archaeopyle has not been observed by Srivastava and Banerjee (1969).

Genus — *Canningia* Cook. & Eis. (1960), 1961
Type species — *Canningia reticulata* Cook. & Eis., 1960

Canningia sp.

Pl. 1, Fig. 3

Description — Cyst \pm oval, 60 \times 50 μ , archaeopyle apical. Cyst membrane about 1 μ thick, minutely folded.

Comparison — *Canningia* sp. described by Sah *et al.* (1970) is slightly bigger in size than the present specimen. Moreover, the cyst membrane is not much folded and is sculptured with grana and con. *C. ringnesii* Man. (1964) has got a circular cyst and is distinguished from the present species by its ornamentation.

Genus — *Achomosphaera* Evitt, 1963
Type species — *Achomosphaera ramulifera* (Defl.) Evitt, 1963

Achomosphaera operculata Sah *et al.*, 1970

Pl. 1, Fig. 8

Description — Cysts subcircular, 46-60 μ without processes. Archaeopyle precingular. Processes upto 30 μ long, mostly dichotomizing. Cyst membrane about 1.5 μ thick, laevigate.

Genus — *Gonyaulacysta* Defl., 1964
Type species — *Gonyaulacysta jurassica* (Defl.) Sarj., 1966

Gonyaulacysta rara sp. nov.

Pl. 1, Figs. 4-5

Holotype — Pl. 1, Fig. 4, Size 60 μ , Slide No. 3674.

Type locality — Damalgiri, Garo Hills, Assam.

Diagnosis — Oval to subcircular, 60-80 μ , apical appendages well recognizable. Archaeopyle precingular, plates mostly indistinct.

Description — Cyst mostly oval with unequally broad lateral ends. Antapical appendages 10-16 μ long, blunt or slightly tapering. Equatorial plates distinct in some specimens. Sutures slightly raised, laevigate. Archaeopyle rhomboidal to rectangular in shape, antapical appendages not observed in most specimens.

Comparison — *Gonyaulacysta palla* Sarj. (1966) resembles the present species in shape and in apical appendage but is distinguished by its distinct tabulation. *G. whitei* Sarj. (1966) also approximates the present specimens in the nature of blunt apical appendage but is readily separated by its nature of the plate structure.

Genus — *Hystrichosphaera* (Wet.) Dav. & Will., 1966

Hystrichosphaera assamica sp. nov.

Pl. 1, Figs. 6-7

Holotype — Pl. 1, Fig. 6, Size 65 μ , Slide No. 3672

Type locality — Damalgiri, Garo Hills, Assam.

Diagnosis — Cysts oval to subcircular, 60-125 μ . Archaeopyle precingular. Sutures raised. Cyst membrane \pm psilate.

Description — Cysts mostly oval with equal or unequally broad lateral ends. Archaeopyle observed in some specimens, rhomboidal to rectangular in outline. Tabulation not distinct. Processes somewhat blunt, scantily represented.

Comparison — *Hystrichosphaera ramosa* (Ehren.) Dav. & Will. (1966) is distinguishable from the present species by its well developed dichotomizing processes. *H. cingulata* (Wet.) Dav. & Will. (1966) is also separated from the present species by its well developed crests.

Genus — *Hystrichosphaeridium* (Defl.) Dav. & Will., 1966

Type species — *Hystrichosphaeridium tubiferum* (Ehren.), Dav. & Will., 1966

Hystrichosphaeridium assamicum
Sah *et al.*, 1970

P. 1, Fig. 9

Description — Cysts subcircular to circular, 60-80 μ , without processes. Apical

archaeopyle observed in some specimens. Processes 20-30 μ long, mostly with bifurcated tips. Cyst membrane upto 2 μ thick, \pm laevigate.

Hystrichosphaeridium sp.

Pl. 1, Fig. 10

Description — Cysts subcircular, 60 μ , processes 15-20 μ long, evenly placed; with many bifurcations. Apical archaeopyle distinct. Cyst membrane about 1.5 μ thick, \pm laevigate.

Comparison — *Hystrichosphaeridium asamicum* Sah et al. (1970) closely resembles the present species in shape and size, but is distinguished by its strongly built processes which are mostly bifurcating at tips.

Genus — *Cucurbitariaceites* gen. nov.

Type species — *Cucurbitariaceites bellus* sp. nov.

Generic diagnosis — Pseudoperithecia subcircular to circular, 40-120 μ , outer region darker than inner, laevigate. Asci 1-20 μ , equal or unequal in size, cylindrical to somewhat bulging at tips in mature stage. No true paraphyses observed, but in some specimens basal part of asci may join together to form a broad, irregular mesh like structure.

Description — Pseudoperithecia only recovered in present material, margin of pseudoperithecia generally even, sometimes slightly undulated. Outer margin dark brown in colour while inner one is translucent. Asci mostly arise from inner region, they are dark brown in colour, \pm uniformly broad in mature stage, may be upto 60 μ high. In some specimens somewhat swollen tipped, lacerated asci are well developed and show some remnants of spore masses, but no spore could be identified. Immature asci look like pila. In some specimens only mature asci have been observed while in others both mature and immature asci have been noted. Asci develop mostly from inner region of pseudoperithecia and mostly connected with each other at basal region to form a broad polygonal area. While mature asci are adpressed on pseudoperithecia, they provide a wheel like appearance. In some cases asci extend outwards crossing external margin of pseudoperithecia. Asci always develop only from upper surface of

stroma. A rupture is observed in some specimens in central polygonal area bordered by basal parts of asci.

Comparison — *Callimothallus* Dil. (1965) is distinguished from the present genus by its pseudoparenchymatous stroma. *Microthallites* Dil. (1965) approximates the present genus in subcircular to circular shape, but is also differentiated by its pseudoparenchymatous stroma. *Cucurbitariaceites* instituted here is readily separated from all the fossil genera of Pyrenomyces by its circular to subcircular shape, darker outer layer and thin inner layer, in the absence of true paraphyses and the presence of cylindrical asci.

Remarks — The epiphyllous fungal remains from the Tertiary deposits of India and elsewhere have been reported by Kräusel. (1929), Edwards (1922), Cookson (1947), Graham (1952), Rao (1952), Venkatachala and Kar (1969), Jain and Gupta (1970) and others. They mostly belong to the family Microthyriaceae. The present genus seems to be closely comparable to the extant order *Pseudosphaeriales*. This order is confined mostly to the tropical areas, though in some cases they are also reported from the temperate region. The family Cucurbitariaceae and Botryosphaeriaceae belonging to this order closely resemble the present genus in its nature of the pseudoperithecia in possessing outer darker and thinner inner area and in the absence of true paraphyses. Botryosphaeriaceae is, however, differentiated from the Cucurbitariaceae by its clavate asci, whereas in the latter they are \pm cylindrical. Thus the present genus comes very near to the extant family Cucurbitariaceae by its cylindrical asci.

Cucurbitaria is most widely known genus of this family, the other genera are hardly known. So the present genus can only be compared with *Cucurbitaria* (THEISSEN and SYDOW, 1915; BESSEY, 1950 and others).

Cucurbitariaceites bellus sp. nov.

Pl. 1, Figs. 11-15

Holotype — Pl. 1, Fig. 11, Size 120 μ , Slide No. 3681.

Paratype — Pl. 1, Fig. 12, Size 95 μ , Slide No. 3682.

Type locality — Nongwalbibra, Garo Hills, Assam.

Diagnosis — Pseudoperithecia subcircular to circular, 40-120 μ . Peripheral part dark brown, central part translucent, characterized by presence of a polygonal area formed by the interconnection of basal parts of asci. Asci \pm cylindrical, sometimes swollen tipped, always originate from upper surface of stroma.

Description — Polygonal central part of pseudoperithecia shows some rupture in most specimens. Asci when adpressed form a radiating pattern on upper surface of stroma, swollen tipped asci are lacerated in some specimens, they may be upto 60 μ long, mature asci extend outward the margin of pseudoperithecia in most specimens. Asci are more or less of same size in one specimen; but sometimes mature and premature asci intermingle with each other. Asci may be 1-20 in number, generally interconnected with each other, nonseptate.

Cucurbitariaceites sp.

Pl. 1, Fig. 16

Description — Pseudoperithecia large, measuring 100-125 μ in size. Central part in most specimens ruptured. Ascumata hardly represented by 1 or 2 clubshaped, tiny structures. Stroma are characterized by noncellular massive disc with dark brown peripheral part and translucent central part.

Comparison — The present species differs from *C. bellus* by its larger size and smaller number of asci. It is possible that the above specimens may be representing the later stages of development.

Genus — *Parmathyrites* Jain & Gupta, 1970
Type species — *Parmathyrites indicus* Jain & Gupta, 1970

Parmathyrites turaensis sp. nov.

P. 2, Fig. 17

Holotype — Pl. 2 Fig. 17, Size 46 μ , Slide No. 3680.

Type locality — Damalgiri, Garo Hills, Assam.

Diagnosis — Ascumata circular to subcircular, osteolate, hyphae in central part arranged to form \pm polygonal meshes, pseudoparenchymatous structure formed by hyphae, cells more elongated towards

peripheral region. Outer peripheral cells provided with spine like projections.

Description — Ascumata mostly dark brown, one layered, 40-80 μ . Pseudoparenchymatous structure in central part quite distinct from peripheral one. Development of radially elongated cells from central polygonal ones is gradual. Outer peripheral cells generally more thickened, spines are very well developed, upto 60 μ long with bulbous base and pointed tip. In some specimens, a few stromata are found together. Polygonal to rounded cells in central region may form an osteolate structure. In central region, cells are bigger than rest and it also helps to provide this impression.

Comparison — *Parmathyrites indicus* Jain & Gupta (1970) resembles closely the present species in shape, nature of spines and size range, but is distinguished by its presence of radially elongated cells, even in central region. Moreover, the cells in the central region in the present species are comparatively larger than *P. indicus* Jain & Gupta.

Parmathyrites sp.

Pl. 2, Fig. 18

Description — Ascumata flattened, circular, nonosteolate, measuring 75 μ without spinose processes, solitary, one layered thick, hyphae radially arranged, interconnected throughout their length. Central cell \pm triangular, surrounded by a single row of thick walled polygonal cells. Peripheral cells more elongated towards margin and provided with numerous glandular structures. Tangential wall of marginal cells, is produced in the form of long spines. Spines unequal and acute, upto 30 μ long.

Comparison — The present species differs from *Parmathyrites turaensis* in having thick walled, \pm squarish central cells and glandular cavities scattered irregularly in the rest of perithecial cells. Fruit body described by Tilgner (1954) differs from our specimens in lack of definite outlined central cells. The central cell is squarish in Tilgner's specimen whereas it is perfectly triangular in the present one.

P. indicus Jain & Gupta (1970) approximates the present specimen in shape and nature of the pseudoparenchymatous cells,

but the latter has got no glandular bodies. *Parmathyrites* sp. described by Jain and Gupta (1970) closely resembles the present species in possessing broad polygonal cells in central region. It seems that specimen referred to by them as *Parmathyrites* species belongs to the present one. The specimen reported by Tilgner (1954) from the Tertiary brown coal of Germany, in all probability, also belongs to the present species.

Remarks — *Parmathyrites* and the allied genera are well known from the various Tertiary horizons. The peculiar peripheral spiny processes in this genus warrant special attention. The nonosteolate nature of the ascomata readily distinguishes this genus from the other dispersed fossil microthyriaceous ascomata like *Phragmothyrites* Edw. (1922). Osteole is supposed to be an important character in identifying the various Microthyriaceae (HOLM, 1958; CAIN, 1961 and others). Dilcher (1965), however, ignored this character and he placed the different species of non-osteolate and osteolate ascomata in the same artificial genus *Microthallites* Dil., (1965). Jain and Gupta (1970) divided this genus into two to accommodate the osteolate into one genus and the nonosteolate into other.

An osteole, it may be mentioned here, is an opening generally in the central region of the stroma. The development of the osteole may not be distinguishable in all the specimens due to its immaturity or for some other factors. In the dispersed condition it is very difficult to categorise the different specimens by the presence of the osteole only.

Genus — *Phragmothyrites* Edw., 1922

Type species — *Phragmothyrites eocaenicus* Edw., 1922

Phragmothyrites (*Microthyriacites*)
edwardsii (Rao) comb. nov.

Pl. 2, Fig. 22

Holotype — Rao, 1959, Pl. 1, Fig. 4.

Description — Ascomata subcircular, 70-120 μ , margin uneven, pseudoparenchymatous cells well developed, cell wall thickened, radially elongated throughout.

Remarks — Rao (1959) described *Microthyriacites edwardsii* from the Tertiary deposits of Warakalli, India. The genus

Microthyriacites is regarded here as junior synonym to *Phragmothyrites*.

Phragmothyrites sp. cf. *P. eocaenicus*
Edw., 1922

Pl. 2, Fig. 23

Holotype of *P. eocaenicus* Edw., 1922, Pl. 1, Fig. 2.

Description — Perithecium dark brown, subcircular to circular, 80-120 μ . Central part of perithecium ruptured in most specimens. Hyphae radially arranged, interconnected with each other to form pseudoparenchymatous cells throughout perithecium. Cells \pm roundly polygonal in central region, outer cells slightly radially elongated, may be slightly setose in some specimens.

Comparison — *Phragmothyrites eocaenicus* Edw. (1922) closely resembles the present specimens in its size, shape and nature of the pseudoparenchymatous cells. The outer cells in *P. eocaenicus* is less radially elongated and more thickened than the present specimens. *Phragmothyrites* sp. described by Venkatachala and Kar (1969) is very much similar to the present specimens in shape and size, but the former can easily be distinguished by its \pm uniform pseudoparenchymatous cells throughout the stroma and nonsetose marginal cells.

Phragmothyrites sp.

Pl. 2, Fig. 24

Description — Ascomata flattened, subcircular, measuring 80 μ , radiating hyphae interconnected, central cells 4-5 μ in size, squarish to polygonal in shape, thick walled. Peripheral cells highly elongated, thin walled, sometimes setose.

Comparison — *Phragmothyrites* sp. cf. *P. eocaenicus* Edw. (1922) is comparable to the present specimen in size and shape. The present species is, however, differentiated by its broad cells in the central region and highly elongated peripheral cells. *Phragmothyrites edwardsii* (RAO) comb. nov. has more or less uniform pseudoparenchymatous cells throughout the stroma. *Thyriothecium* Type 2 reported by Ramanujam (1963) approximates the present species in its highly elongated, pseudoparenchymatous peripheral

cells, but is devoid of roundly squarish cells in the central region.

Genus — *Callimothallus* Dil., 1965

Type species — *Callimothallus pertusus* Dil., 1965

Callimothallus assamicus sp. nov.

Pl. 2, Figs. 19-20

Holotype — Pl. 2, Fig. 19, Size 80 μ , Slide No. 3668.

Type locality — Damalgiri, Garo Hills, Assam.

Diagnosis — Ascomata flattened, sub-circular to circular, nonosteolate, 50-80 μ . Central cells triangular to polygonal from which radiating rows of cells extend outwards. Central cells porate, pores single, outward cells radially elongated.

Description — Ascomata generally dark brown in colour, margin entire or slightly uneven due to setae. Cells in central region \pm polygonal, pore distinct in almost all specimens. Cells of peripheral region thicker and slightly crenate in some specimens. Spores not observed in outer cells.

Comparison — *Callimothallus assamicus* sp. nov. closely resembles *Callimothallus pertusus* Dil. (1965) in its shape and size range, but the latter is distinguished by its presence of pore almost in all cells except a few in the periphery. *C. quilonensis* Jain & Gupta (1970) is also comparable to the present species in size and shape but it has pore only in the outer cells.

Remarks — *Pseudosphaerialites senii* described by Venkatachala and Kar (1969) from the Tertiary sediments of Kutch is closely comparable to *Callimothallus* Dil. (1965). In all probability *Pseudosphaerialites* Venkat. and Kar (1969) is a junior synonym to *Callimothallus* Dil.

Callimothallus sp. cf. *C. pertusus* Dil., 1965

Pl. 2, Fig. 21

Holotype — *C. pertusus* Dil., 1965; Pl. 5, Fig. 39.

Description — Ascomata subcircular, 98 \times 90 μ , margin uneven, central cells square to polygonal, outline thin. Peripheral cells \pm rectangular, thickened. One pore present in each cell except a few rows in periphery.

Remarks — The present specimen compares very closely with *Callimothallus pertusus* Dil. (1965) in shape, size range and in the presence of pore in most of the cells. The present specimen is, devoid of any cellular thickening in the central region which is quite apparent in *C. pertusus* reported by Dilcher (1965) from the Eocene deposits of Western Tennessee, U.S.A. Hence the present specimen has only compared with *C. pertusus*.

Genus — *Notothyrites* Cook., 1947

Notothyrites sp. cf. *N. padappakarensis* Jain & Gupta, 1970

Pl. 2, Fig. 25

Holotype of *N. padappakarensis* Jain & Gupta, 1970, Pl. 1, Fig. 14.

Description — Ascomata flattened, sub-circular to circular, 80-110 μ , osteolate. Outline undulating, radiating hyphae interconnected throughout their length. Cells squarish to rectangular, 2-4 μ in size, \pm equal throughout stroma. Tangential wall of peripheral cells strongly thickened and entire. Osteole well defined, 15 μ across, hexagonal, distinctly elevated, encircled by two layered of thick walled, brown cells.

Remarks — The present specimens closely resemble *N. padappakarensis* Jain & Gupta (1970) in shape, size range and nature of the osteole; they are, however, distinguished by the presence of nonpapillate cells covering the osteole. For this reason they have only been compared with *N. padappakarensis*.

Notothyrites neyveli described by Ramanujam (1963) from the South Arkot Lignite, Madras is unfortunately not validly published; because he has not provided any text figure or photograph for the specimens described by him (International Code of Botanical nomenclature, 1936-39, p. 39, article 38). *Thyriothecium* Type 3 also recorded by him from the same horizon compares with the present specimens in the presence of a well defined osteole, but is distinguished by its presence of highly dentate marginal cells of the perithecium.

Some of the specimens described by Venkatachala and Kar (1969) as *Sphaerialites ovatus* Venkatachala & Kar (1969, PL. 1, Figs. 8-10) also closely resemble the

present species by its well defined osteole.

Genus — *Pluricellaesporites* (Hamm.) Elsik, 1968

Type species — *Pluricellaesporites melanii* Elsik, 1968

Pluricellaesporites sp.

Pl. 2, Fig. 26

Description — Eight celled, monoporate fungal spores, $100 \times 12 \mu$ in dimension. Cross walls two lobed, each lobe being triangular in surface view. Exine moderately thick and psilate.

Remarks — The present spore is very much similar to *Pluricellaesporites hillsii* Elsik (1968) in shape and internal organization but differs from latter in being quite bigger in size. *Brachysporium* sp. Wil. & Web. (1946) can be distinguished in having largest terminal cell. *Brachysporium minutus* reported by Trivedi and Verma (1970) from the Tertiary coal of Malaya approximates the present species in general organization, but is distinguished by smaller size range.

The spores assignable to the genus *Pluricellaesporites* probably resembles the extant genus *Brachysporium* belonging to fungi imperfecti. Some of the rust fungi also show outward resemblance to the present specimens (GILMAN in WILSON & WEBSTER, 1948).

Genus — *Diporicellaesporites* Elsik, 1968
Type species — *Diporicellaesporites stacyi* Elsik, 1968

Diporicellaesporites sp.

Pl. 2, Fig. 27

Description — Octacellate, fusiform, fungal spores. Pores two, one on each opposite end. Septa thick and folded. Exine thin, psilate.

Comparison — The present species shows a close resemblance to *Diporicellaesporites*

sp. described by Elsik (1968) in shape, size, but differs in having comparatively smaller pores. Moreover, *Diporicellaesporites* sp. is more broad than the present specimens. Specimens photographed by Martin and Rouse (1965) from the late-Tertiary sediments in British Columbia closely resemble the present specimens.

Genus — *Involutisporonites* (Clar.) Elsik, 1968
Type species — *Involutisporonites wilcoxii* Elsik, 1968

Involutisporonites sp.

Pl. 2, Fig. 28

Description — Coiled, laevigate, fungal spores of many cells. Colour light brown, wall less than 1μ thick. Septa thick walled, dark brown. Pores not seen.

Comparison — *Involutisporonites wilcoxii* Elsik (1968) resembles the present species in coiled, laevigate and many celled nature of the spore but is distinguished by its presence of pore. Rao (1969) has also figured a coiled specimen resembling the present species but the former is differentiated by its highly septate nature of the spore.

Remarks — According to Elsik (1968) presence or absence of a pore is not the specific character in this genus. The present specimens are devoid of any pore; but the general organization very much resembles *Involutisporonites*.

Fungal Incertae sedis

TYPE 1

Pl. 2, Fig. 29

Description — Body outline subcircular, $100-136 \mu$, bodies join together to form pseudoparenchymatous cells like structure. Colony two layered, bodies \pm same type on both surfaces. Individual body $10-12 \mu$, \pm squarish to rectangular, thinwalled. Inner region dark brown, internal structure could not be seen.

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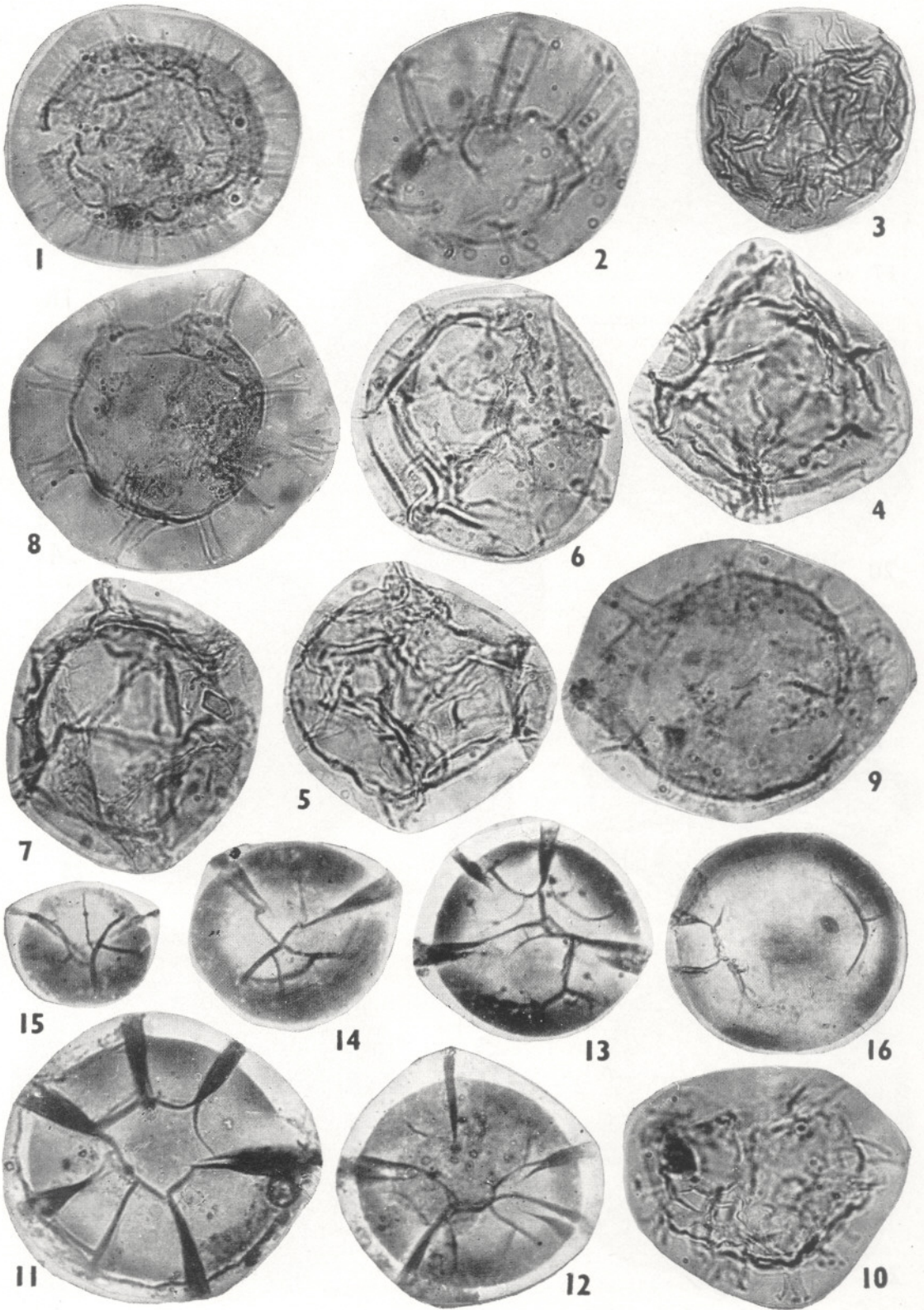
EXPLANATION OF PLATES

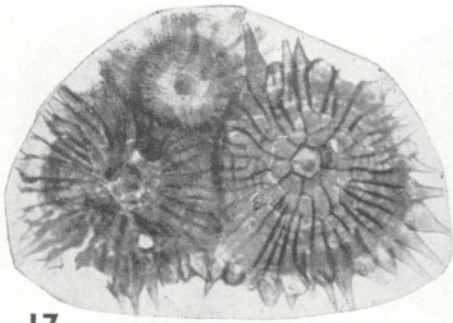
PLATE 1

1. *Baltisphaeridium* sp. cf. *B. multispinosum* Singh Slide No. 3677.
2. *Oligosphaeridium cephalum* Sah *et al.* Slide No. 3678.
3. *Canningia* sp. Slide No. 3672.
- 4-5. *Gonyaulacysta rara* sp. nov. Slide Nos. 3674, 3669.
- 6-7. *Hystrichosphaera assamica* sp. nov. Slide Nos. 3672, 3673.
8. *Achomosphaera operculata* Sah *et al.* Slide No. 3671.
9. *Hystrichosphaeridium assamicum* Sah *et al.* Slide No. 3676.
10. *Hystrichosphaeridium* sp. Slide No. 3679.
- 11-15. *Cucurbitariaceites bellus* gen. et sp. nov. Slide Nos. 3681, 3682.
16. *Cucurbitariaceites* sp. Slide No. 3684.

PLATE 2

17. *Parmathyrites turaensis* sp. nov. Slide No. 3680.
18. *Parmathyrites* sp. Slide No. 3670.
19-20. *Callimothallus assamicus* sp. nov. Slide Nos. 3668, 3675.
21. *Callimothallus* sp. cf. *C. pertusus* Dilcher Slide No. 3674.
22. *Phragmothyrites (Microthyriacites) edwardsii* (Rao) comb. nov. Slide No. 3687.
23. *Phragmothyrites* sp. cf. *P. eocenicus* Edwards Slide No. 3679.
24. *Phragmothyrites* sp. Slide No. 3680.
25. *Notothyrites* sp. cf. *N. padappakarensis* Jain & Gupta, Slide No. 3675.
26. *Pluricellaesporites* sp. Slide No. 3685.
27. *Diporicellaesporites* sp. Slide No. 3683.
28. *Involutisporonites* sp. Slide No. 3686.
29. Fungal *Incertae sedis* Type-1. Slide No. 3688.

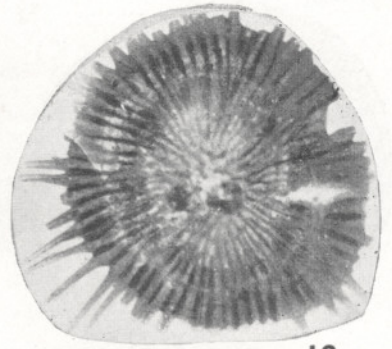




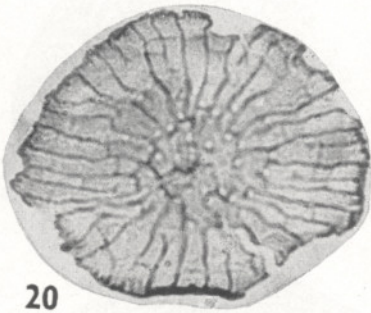
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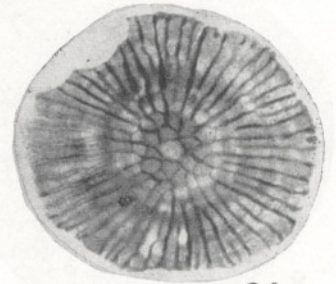
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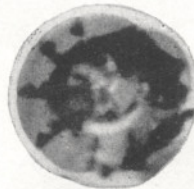
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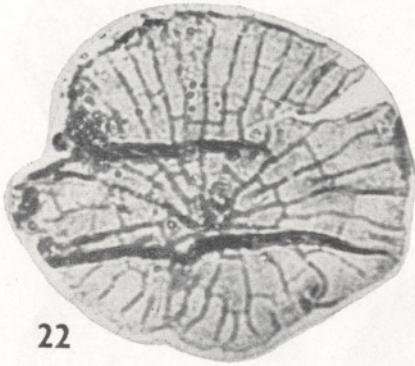
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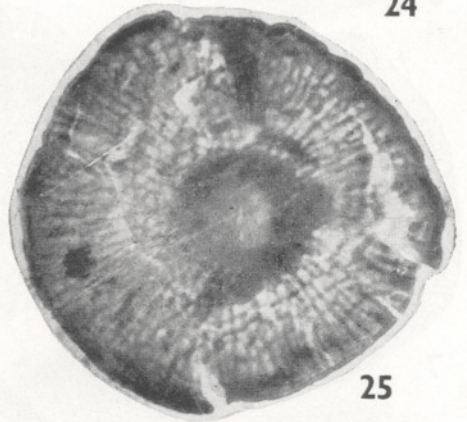
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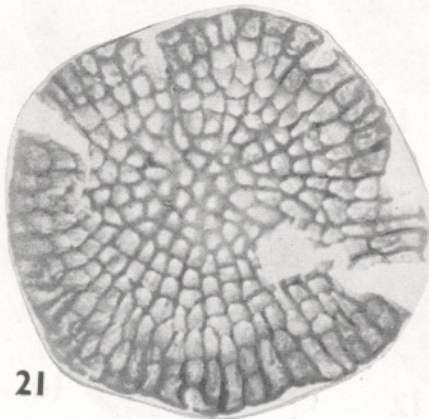
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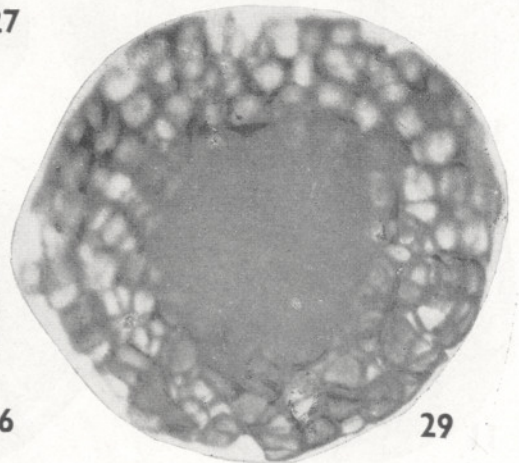
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