

## Three new miospore genera from the Lower Carboniferous (Viséan) rocks of east Fife, Scotland

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**ABSTRACT**—Three new miospore genera, *Dillspora*, *Oswaldispora* and *Robandispora* are described from the Lower Carboniferous (Viséan) rocks of east Fife. One new species, *Robandispora claytonii* is erected. Two new combinations, *Dillspora disjuncta* and *Oswaldispora xenika*, are proposed and the diagnosis of the latter is emended.

### INTRODUCTION

The author, in Neves *et al.* (1973), described two new miospore taxa under the species names *disjuncta* and *xenika*, which were tentatively assigned to the genus *Rotaspora*. Subsequent study has led to the consideration of these forms as belonging to two new miospore genera, named here as *Dillspora* gen. nov. and *Oswaldispora* gen. nov. respectively. The species formerly designated as *?Rotaspora xenika* is emended. The type species of the newly proposed genera are therefore *Dillspora* (*?Rotaspora*) *disjuncta* Neville in Neves *et al.* (1973) comb. nov. and *Oswaldispora* (*?Rotaspora*) *xenika* Neville in Neves *et al.* (1973) comb. nov. emend. In the author's Ph.D thesis (1969) a further new species, not previously published, was described which was tentatively placed in the genus *Pteroretis*, Felix & Burbridge (1961). This form is now considered to be a distinctive new genus, named here as *Robandispora* gen. nov., and the type species, also described in this paper, is designated *Robandispora claytonii* sp. nov.

The three species referred to above are all morphologically distinct and none can justifiably be assigned to any existing genus. For this reason it has been considered necessary to erect three new genera to accommodate them, even though each is, as yet, monospecific.

For the stratigraphy of the area and the location of the samples discussed, reference should be made to Neves *et al.* (*ibid.*, p.25–26 and text figures 1–4). All holotypes and other figured specimens of the three new genera are housed in the micropalaeontology collection of the Centre for Palynological Studies of the University of Sheffield. The number prefixed by 'ML' is the collection reference number and the second set of figures indicates the sample horizon/slide number. The final numbers, in brackets, are the England finder coordinates.

### SYSTEMATIC DESCRIPTIONS

Anteturma Sporites H. Potonié, 1893  
Turma Triletes (Reinsch) Dettmann, 1963  
Suprasubturma Acameratitrlites Neves and Owens,  
1966  
Subturma Zonotrilites Waltz, 1935  
Infraturma Cingulati (Potonié and Klaus)  
Dettmann, 1963  
Genus *Dillspora* gen. nov.

**Type species.** *Dillspora* (*?Rotaspora*) *disjuncta* Neville in Neves *et al.* (1973) comb. nov.

**Derivation of name.** For my mother Alice Mona (Dill) Neville.

**Diagnosis.** Miospores radial; trilete. Suturae simple or labrate. Spore body circular to triangular. Proximal surface laevigate, although it may show variations in exine thickness. The distal surface possesses either a thickened polar boss and sub-polar thickened ring, both of which may be variably developed and even connected, or the ornament may be limited to irregular rugulae. There is an equatorial extension of the exine which is widest interradially, being reduced or absent at the apices. It may contain invaginations and is laevigate, apart from the distal sculpture which may extend on to it.

**Remarks.** The combination of interradiial extensions of the exine and type of distal sculpture serves to distinguish the genus. Further research may show that forms with proximal ornament also exist.

**Comparison.** *Annulispora* (De Jersey) emend. McKellar (1974), *Knoxisporites* (Potonié & Kremp) emend. Neves (1961), *Polycingulatisporites* (Simoncsics & Kedves) emend. Morbey (1975) and *Taurocusporites* (Stover) emend. Playford & Dettmann (1965) all differ in various aspects, but mainly in lacking an equatorial feature which is widest interradially. *Coronatispora* Dettmann (1963) possesses foveolate to reticulate sculpture. *Camarozonosporites* Pant (1954 ex Potonié, 1956) emend. Klaus (1960) lacks most of the sculptural

elements typical of *Dillspora*. The end members of the latter, which possess only rugulae on the distal surface, may possibly fall within the circumscription of the genus *Camarozonosporites*. However, *Camarozonosporites* was originally described from Cretaceous rocks and the stratigraphic separation and distinctly different morphological variation are therefore considered sufficient to separate the genera. *Camarozonotriletes* Naumova (1939 ex Ishchenko, 1952) emend. Potonié (1958) possesses a sculptured equatorial extension and hence irregular margin. *Rotaspora* (Schemel) emend. Smith and Butterworth (1967) possesses only simple laesurae and has different sculpture, being laevigate to verrucate. In addition the type species of *Rotaspora* (*R. fracta* Schemel, 1950) appears structurally different from other species attributed to the genus, the equatorial feature seeming to overlap on to the proximal surface at the apices. *Dillspora* may superficially resemble *Knoxisporites stephanephorus* Love (1960) but differs by possessing an equatorial extension which is reduced or absent at the apices.

*Dillspora disjuncta* comb. nov.  
(Pl. 1, figs. 1–4)

1973 ?*Rotaspora disjuncta*, Neville in Neves *et al.*, 37–38, pl. 1, figs. 22–23.

**Remarks.** See genus.

**Stratigraphic distribution.** Samples F41–F95 and RA1: Concurrent Range Zones TC, NM and VF, Lower Carboniferous, Asbian – Brigantian.

Genus *Oswaldispora* gen. nov.

**Type species.** *Oswaldispora* (?*Rotaspora*) *xenika* (Neville in Neves *et al.*, 1973) comb. nov. emend.

**Derivation of name.** For my late father Oswald William Neville.

**Diagnosis.** Miospores radial; trilete. Suturae labrate. Spore body circular to triangular. Exine ornamented with irregular rugulae which may be simple, anastomose and terminate freely or delimit irregular lumina. In addition there may be coni and/or verrucae. The ornament is generally coarser on the distal surface and the proximal surface may be laevigate, especially in the polar region. There is an equatorial extension of the exine which is laevigate or infrapunctate and is widest interradially, being reduced or absent at and near the apices. Other invaginations may be present. High distal pole.

**Remarks.** The high distal pole means that on polar or sub-polar compression the distal surface projects beyond the ends of the suturae and also makes the equatorial extension of the exine appear as if it is located on the proximal surface. The combination of interrarial extensions of the exine, the type of ornament and the high distal pole, serves to distinguish this genus.

**Comparison.** *Camarozonosporites* Pant (1954 ex Potonié, 1956) emend. Klaus (1960), *Camarozonotriletes* Naumova (1939 ex Ishchenko, 1952) and *Rotaspora* (Schemel) emend. Smith and Butterworth (1967) all lack the typical ornament and high distal pole of *Oswaldispora* gen. nov. *Coronatispora* Dettmann (1963) lacks the high distal pole and possesses foveolate to reticulate sculpture.

*Oswaldispora xenika* comb. nov. emend.  
(Pl. 1, figs. 5–6)

1960 Spore type 3, Love, p.123, pl. 2, figs. 11–12 and text-fig. 14.

1973 ?*Rotaspora xenika*, Neville in Neves *et al.*, p.38 and pl. 1, figs. 26–27.

### Explanation of Plate 1

Figs. 1–4. *Dillspora disjuncta* comb. nov. ( $\times 1000$ ).

Fig. 1. Holotype, polar compression, focused on equator; ML898, F66/8 (P24).

Fig. 2. Holotype, polar compression, focused on distal boss and annulus; ML898, F66/8 (P24).

Fig. 3. Paratype, oblique polar compression; ML898, F66/8 (E15).

Fig. 4. Oblique polar compression. Note the interrarial invagination in the equatorial structure; ML748, F94/1 (S21).

Figs. 5–6. *Oswaldispora xenika* comb. nov. emend. ( $\times 1000$ ).

Fig. 5. Holotype, polar compression focused on proximal surface; ML900, A11/5 (U34).

Fig. 6. Paratype, oblique polar compression. Note the equatorial structure pulled over on to the proximal surface by a sutura; ML901, RA34/2 (G14/4).

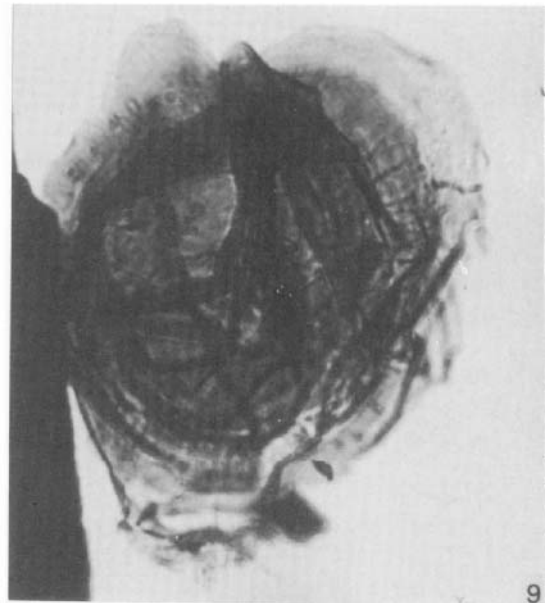
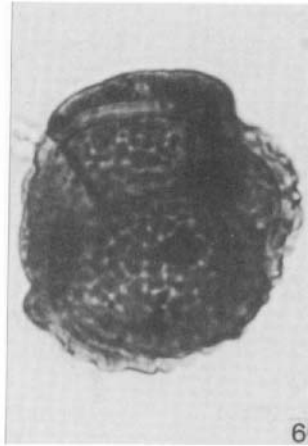
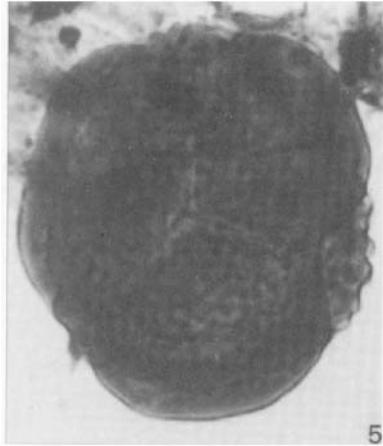
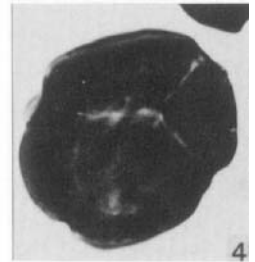
Figs. 7–9. *Robandispora claytonii* gen. et sp. nov. ( $\times 750$ ).

Fig. 7. Paratype, slightly oblique polar compression showing trilete mark and radiating ribs; ML1792, F79/3 (F58/3).

Fig. 8. Holotype, slightly oblique polar compression showing trilete mark and lobate flanges with concentric ribs; ML1793, F79/4 (E27/4).

Fig. 9. Slightly oblique polar compression showing labra and radiating ribs; ML1794, F79/5 (J59/4).

Miospore genera from the Lower Carboniferous of east Fife, Scotland



**Emended diagnosis.** Miospores radial, trilete, suturae straight, extending  $\frac{1}{2}$  of the spore body radius and accompanied by narrow raised labra. Amb of spore body subcircular to broadly rounded triangular. Exine ornamented with irregular rugulae which may be simple but they usually anastomose and terminate freely and may delimit irregular lumina. In addition there may be coni and/or verrucae. The ornament is generally coarser on the distal surface and in the proximal polar region it may be absent. There is an equatorial extension of the exine which is laevigate or slightly infrapunctate and is widest interradially, being reduced or absent at and near the apices. Other invaginations may be present. High distal pole.

**Type locality and horizon.** East Fife coast. Sample All; 4" coal at a depth of 306' 6" in the Anstruther Borehole.

**Description.** Holotype, overall size  $57\mu$ , spore body broadly rounded triangular,  $46\mu$ . Suturae straight, extending about  $\frac{1}{2}$  spore body radius and accompanied by narrow raised labra. Exine ornamented with densely packed irregular rugulae which anastomose and terminate freely, occasionally delimiting lumina. In addition there are a few coni and verrucae. The ornament is coarser over the distal surface, being absent in the proximal polar region. At the apices the ornament projects up to  $1.5\mu$  beyond the spore margin. There is a laevigate equatorial extension of the exine which is widest interradially ( $9\mu$ ) and much reduced or absent at and near the apices. On compression, due to the high distal pole, the base of this extension appears to be inset up to  $5\mu$  from the spore body margin on the proximal surface.

**Dimensions.** Diameter of spore body  $29\mu$  ( $40\mu$ )  $54\mu$  based on 13 measured specimens. Exine up to  $3.5\mu$  thick.

**Remarks.** This species has been emended to take into account the high distal pole. This means that the extension of the exine is equatorial in position and only appears to be situated on the proximal surface, as originally described by the author, due to compression (pl. 1, figs. 5–6). This extension is up to  $13\mu$  wide and may appear inset on the proximal surface up to  $6\mu$  from the spore edge by compression on specimens so far observed. In pl. 1, fig. 6 the equatorial extension of the exine is pulled across on to the proximal surface by a suture at one of the apices.

**Stratigraphic distribution.** Samples F37–F53, A25, RA34, RA75 and WS7: Concurrent Range Zones TC and NM (Subzone DP); Lower Carboniferous, Asbian.

Suprasubturma Cameratitriteles Neves and Owens,  
1966

Subturma Membranatitriteles Neves and Owens,  
1966

Genus *Robandispora* gen. nov.

**Type species.** *Robandispora claytonii* sp. nov.

**Derivation of name.** For my two sons Robert and Andrew.

**Diagnosis.** Miospores radial; trilete. Outline subcircular to extremely irregular. Spore body, formed by the intexine, circular to subcircular, usually folded and either laevigate or sculptured. Suturae straight, simple or partially or completely labrate. The thin laevigate exoexine is closely adpressed to the intexine over most of both surfaces. Near the equator on the proximal surface there is an extension of the exoexine into a membrane with radiating ribs, which extends beyond the margin of the intexine. Close to the equator on the distal surface there are series of extensions of the exoexine into flanges which may at least partially overlap.

**Remarks.** A very complicated morphology which, although being distinctive, has a structure which is not yet fully understood.

**Comparison.** The only genus, so far described, which bears any resemblance to *Robandispora* gen. nov. is *Pteroretis*, Felix and Burbridge (1961). The latter, however, possesses six membranous wings which run from pole to pole and lacks the extensions of the exoexine characteristic of *Robandispora* gen. nov.

*Robandispora claytonii* sp. nov.

**Derivation of name.** For Dr. G. Clayton, in recognition of his valuable work in Lower Carboniferous palynology.

**Diagnosis.** Miospores radial, trilete; amb subcircular to extremely irregular. The spore body is circular to subcircular and is either laevigate or possesses a few small coni projecting from the equator. The spore body (intexine) is usually folded, often intensely. The suturae are straight and extend about  $\frac{2}{3}$  of the body radius and are either simple or partially or completely labrate. The thin laevigate exoexine is closely adpressed to the intexine over most of both surfaces and may be wrinkled. Near to the equator on the proximal surface there is an extension of the exoexine into a membrane with radiating ribs which extends beyond the margin of the intexine. Close to the equator on the distal surface there are series of extensions of the exoexine into flanges which may at least partially overlap. They are usually deeply incised and lobate and may be laevigate, wrinkled or sculptured with concentrically or subconcentrically arranged ribs which may anastomose.

**Holotype.** Pl. 1, fig. 8. Preparation ML1793, F79/4 (E27/4).

**Paratype.** Pl. 1, fig. 7. ML1792, F79/3 (F58/3).

**Type locality and horizon.** East Fife coast. Sample F79; 5" coaly scale 190' below the West Braes Marine Band exposed on the coast between Pathhead and Sandy

Craig just west of Pittenweem.

**Description.** Holotype, overall size  $92\mu$ , spore body  $63\mu$ . Amb deeply incised and lobate. Spore body subcircular, folded, with an exine about  $1\mu$  thick which bears a few conii, up to  $1\mu$  in height, projecting at the equator. Suturæ simple, straight, extending  $\frac{2}{3}$  of the spore body radius. The thin laevigate exoexine is closely adpressed to the intexine over most of both surfaces and bears a few wrinkles. Inset about  $4-5\mu$  from the spore body equator on the proximal surface there is the base of an extension of the exoexine into a membrane which extends about  $7-8\mu$  beyond the spore body margin and possesses fine radiating ribs which are denser towards the base. From near the equator on the distal surface there arise at least two series of lobate extensions of the exoexine into flanges which overlap each other to various degrees and extend up to  $26\mu$  beyond the spore body margin. They possess concentrically or subconcentrically arranged ribs of variable density which may anastomose.

**Dimensions.** Overall  $56-97\mu$ , spore body diameter  $42-64\mu$ . Measurements based on 15 specimens from the type locality.

**Stratigraphic distribution.** Samples F79 and F95 (one specimen): Concurrent Range Zone VF; Lower Carboniferous, Brigantian.

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