SOME SUGGESTIONS ON POLLEN AND SPORE DIAGNOSES

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ABSTRACT—The author discusses the problem of discrepancies in terminology and offers suggestions concerning terminological unification in the case of pollen and spores.

INTRODUCTION

MANY new and important botanical and geological facts have accumulated as a consequence of the increasing activity in fossil pollen and spore research. It is, however, unfortunate that the bright outlook of this branch of micropalaeontology is somewhat marred by the fact that descriptions of the pollen or spore "species" are sometimes rather vague or even imperfect to such an extent that the value of the "species" can rightly be contested. There are probably several reasons for this. A micropalaeontologist without propaedeutical training in the morphology of recent pollen grains and spores will thus hardly realise the great factual possibilities of submitting detailed pollen and spore diagnoses based on symmetry, apertures, shape, sporoderm stratification, etc. Contributory reasons are probably to be found in still prevailing terminological discrepancies, as well as in the fact that, owing to technical difficulties or lack of knowledge, it has not yet been possible to establish a sufficiently detailed and consistent terminology. Thus, pending some penetrating morphological analyses, the term "os", i.e., "the inner part of a composite aperture" should be regarded as a preliminary, collective term for a probably more or less heterogeneous group of morphological features [cf. e. g. the ora in the "colporate" grains in *Mendoncia aspera* (Erdtman 1952, fig. 6D, p. 31), *Geissoloma marginatum* (l. c., fig. 107, p. 183), *Myoporum laetum* (l. c., fig. 161, p. 277), *Penaea mucronata* (l. c., fig. 184A, p. 317), *Rhoiptelea chiliantha* (l. c. Fig. 222, p. 380), *Erythrochiton brasiliensis* (l. c., fig. 226A, p. 389), *Berrya cordifolia* (l. c. fig. 248C, p. 435), and *Leea aequata* (l. c., fig. 257B, p. 451)].

In order to overcome at least some of the terminological discrepancies a few suggestions towards a terminological unification have recently been made (cf. Erdtman and Vishnu-Mittre 1957). In the present note this revised terminology is tentatively applied in a number of elementary pollen diagnoses accompanied by palynograms (× 1000 ; from Erdtman 1952), picturing, in a more or less broad outline, the essential pollen-morphological characters.

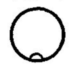
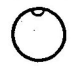
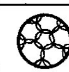
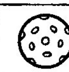
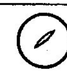
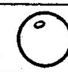
A diagnosis should be sufficiently detailed to make it possible to draw a palynogram on the basis of the data given. Likewise, a palynogram does not fulfil its purpose if a satisfactory pollen or spore diagnosis cannot be based on it. Explicit and consistent diagnoses, preferably accompanied by palynograms, photomicrographs, electron micrographs, etc., will no doubt contribute towards a safer and better approach to the many interesting problems in fossil pollen and spore research.

DIAGNOSES

(for explanation of terms, see fig. 1 and the papers quoted in "References")

Peumus boldus (fig. 2 ; Monimiaceae ; Chile, Werdermann 311) : grains inaperturate, spherical, spinulose (diameter 33 μ, spinules included).

Exine (spinules included) about 2 μ thick, crassisexinous. Spinules about 1—1.5 μ, isometric, equidistant (about 2.5 μ apart). Endosexine baculate (LO).

Faegri and Iversen 1950 Iversen and Troels-Smith 1950	ERDTMAN 1952	POSITION OF APERTURES					Main subdivisions	
		POLAR (proximal)	POLAR (distal)	ZONAL	GLOBAL	UNKNOWN		
	monolete						monolete	Bryophytes Pteridophytes
	trilete	 PROX-FACE					trilete	
	hilate						cataporate	
colpate p.p.	sulcate						anacolpate	Gymnosperms Monocotyledons
porate p.p.	ulcerate						anaporate	
colpate p.p. stephanocolpate	colpate						zonicolpate	Dicotyledons
porate p.p. stephanoporate	porate						zoniporate	
pericolpate	rugate						pancolpate	
periporate	forate						panporate	
colpate							colpate	
porate							porate	

Text-fig. 1—Aperture terminology. (From Erdtman and Vishnu-Mittre 1957.) *Cf.* also Addendum p. 52.

Hedycarya arborea (fig. 3 ; Monimiaceae ; New Zealand) : pollen grains united in ± tetrahedral tetrads (diameter of tetrads 39 μ), inaperturate or, more probably, anatenuate.

Exine about 1 μ thick. Distal face with a diffuse LO-pattern (except at the supposed tenuitas and near the borderline between the individual grains).

Capsicodendron pimenteria (fig. 4 ; Canellaceae ; Brazil, Hoehne 27074) : grains anacolpate, biconvex, 27 (17+10) × 34 × 30 μ. Colpus about 22 × 6 μ.

Exine about 2 μ thick at equator. Sexine as thick as nexine or slightly thinner, smooth, not distinctly stratified.

N.B. The size figures comprise the length of the polar axis (27 μ) and the length of the two equatorial diameters, the colpiferous (34 μ) and the non-colpiferous (30 μ). The figures in parenthesis (17+10) after the polar axis figures indicate that about 17 μ of the polar axis falls within the colpiferous convexity and about 10 μ within the non-colpiferous (cf. also Erdtman 1946).

Lemna gibba (fig. 5 ; Lemnaceae) : grains anaporate, spinulose (diameter 22 μ, spinules not included). Pore circular (diameter about 2 μ).

Exine about 1.5 μ thick (spinules not included). Spinules about 1.5 μ long, ± equidistantly spaced (about 4 μ apart).

Oxalis acetosella (fig. 6 ; Oxalidaceae ; Sweden, Erdtman s.n.) : zonocolpate (3), subprolate (53 × 44 μ). Apocolpium diameter about 14 μ. Colpi with pointed ends, about 1.5 μ broad at equator, tenuimarginate.

Exine about 2.25 μ thick. Sexine thicker than nexine, finely reticulate. Ectos-exinous part of muri thinner than endosexinous.

Myriophyllum spicatum (fig. 7 ; Haloragaceae ; Sweden) : grains zonocolpate (3—5), suboblate (24 × 28 μ), aspidote (diameter of aspides about 5.5 μ). Colpi, when three, meridionally arranged ; when four or five, with their axes biconvergent ; short (according to Wodehouse 2.85 by 11.4 μ).

Exine about 1 μ thick. Sexine thinner than nexine. Colpi margins incrassate (due to thickening of ectonexine ; maximum thickness of colpi margins about 2.5 μ).

N.B. By Faegri and Iversen (1950) the genus *Myriophyllum* is, (i.a.,) mentioned in p. 146 under the class stephanoporate. According to their definitions and the illustrations in p. 131 (l.c.) the pollen grains in *M. spicatum* should be classified as 3-colpate (when provided with three meridional apertures) or as pericolpate (when provided with non-meridional apertures). According to Erdtman 1952, the grains are either 3-colpate or 4-5-rupate.

Cordia alliodora (fig. 8 ; Boraginaceae ; Mexico, Gentle 1561) : grains zonocolpate (3), suboblate (about 26 × 30 μ). Apocolpium diameter about 21 μ. Colpi about 2 μ wide at equator, tenuimarginate. Ora lalongate (about 3 × 11 μ).

Exine about 2 μ thick (spinules not included). Sexine tectate (consisting of suprategillar spinules about 0.5 μ long and 1.5 μ apart, tegillum, and infrategillar bacula), approximately as thick (spinules not included) as nexine.

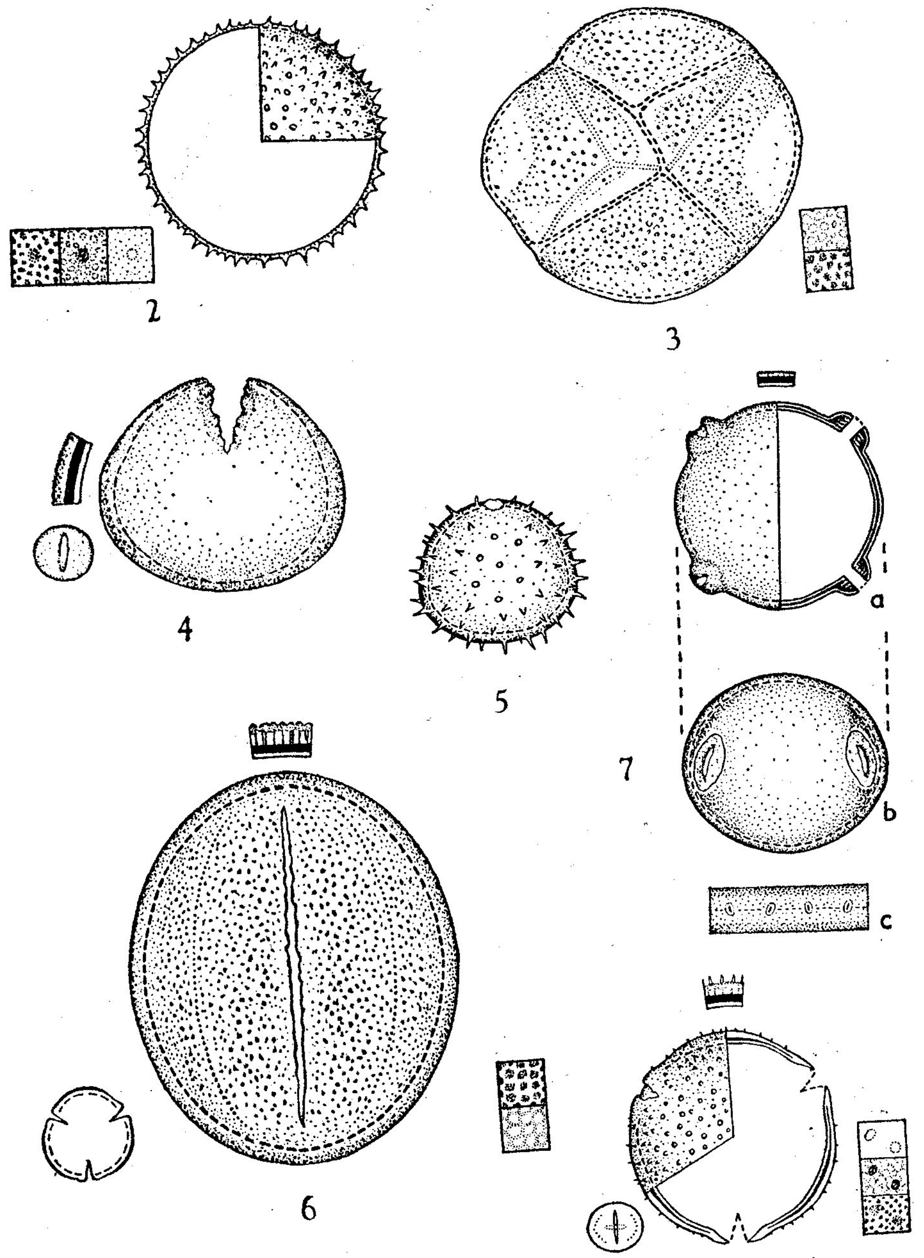
Franklandia fucifolia (fig. 9 ; W. Australia ; Harvey s.n.) : grains zonoporate (3), oblate spheroidal (82 × 92 μ). Pores circular (diameter about 10 μ).

Exine about 14 μ thick. Sexine consisting of densely spaced blunt rods (about 7 μ long by 2 μ broad). Nexine about 7 μ thick.

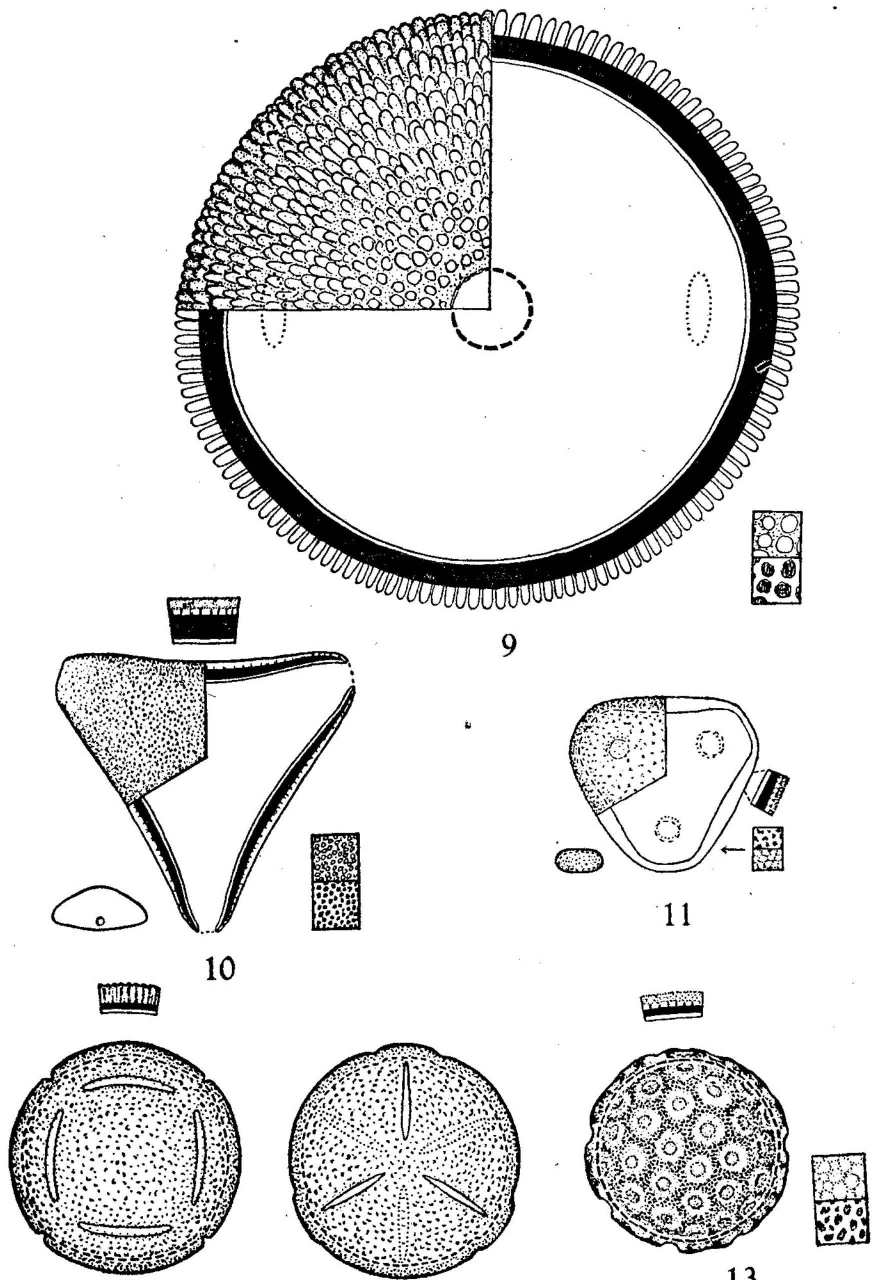
Darlingia spectatissima (fig. 10 ; Proteaceae) : grains subisopolar, zonoporate (3), oblatoid [22 (17+5) × 38 μ], triangular in polar view. Pores tenuimarginate, their diameter about 5 μ.

Exine about 3.3 μ thick. Sexine thinner than nexine, probably tectate. Tegillum slightly thicker than length of supporting bacula.

N.B. "Oblatoid" grains (Erdtman *l.c.*, p. 465) are those subisopolar grains which would be oblate if they were isopolar. A size expressed by the figures 22 × 38 μ, refers to a normal (isopolar) oblate grain, but if expressed by the figures 22 (17+5) × 38 μ, to a subisopolar, biconvex (cf. above under *Capsicodendron*) grain.



Text-fig. 2—*Peumus boldus*. 3—*Hedycarya arborea*. 4—*Capsicodendron pimenteira*. 5—*Lemna gibba*. 6—*Oxalis acetosella*. 7—*Myriophyllum spicatum*. 8—*Cordia alliodora*.



Text-fig. 9-13—*Franklandia fucifolia.* 10—*Darlingia spectatissima.* 11—*Anacolosa lutea.* 12—*Drymaria cordata.* 13—*Salsola tragus.*

Anacolosa lutea (fig. 11 ; Olacaceae ; Fiji, Smith 914) : grains 2-zonoporate, oblate (14.5×23 μ), rounded triangular in polar view. Pores six (opposite the rounded corners and arranged in two zones, with three pores in each), circular (diameter about 3 μ). Diameter of polar apoporia about 10 μ). Height of equatorial apoporium (*vide* postea) about 11.5 μ.

Exine at equator about 2.5 μ thick except at the rounded corners where the thickness is only about 1 μ. Equatorial sexine slightly thinner than nexine (at least where the exine attains its maximum thickness).

N.B. The grains in *Anacolosa lutea* have previously been referred to as 6-forate or 3-diploforate (Erdtman 1952, p. 294). *Dumasia truncata* (Ikuse 1956, p. 96 and pl. 20, fig. 2) also has 2-zonoporate grains. The term apoporium has been defined (Erdtman *l. c.*, p. 460) as a polar area delimited towards the equator by the polar limits of the mesoporia. If, however, there are two (or several) poriferous zones the term apoporium may, as above, be used in a broader sense.

Drymaria cordata (fig. 12 ; Caryophyllaceae ; cult. Uppsala, Sweden) : grains pancolpate (12-colpate), diameter 32 μ. Colpi about 13×1.5 μ. Apices of adjacent colpi about 5 μ apart.

Exine about 2.5 μ thick, crassisexinous.

Salsola tragus (fig. 13 ; Chenopodiaceae ; cult. Vàsterås, Sweden) : grains pantoporate, diameter 27 μ. Pores circular (diameter about 1.5 μ).

Exine about 2 μ thick or slightly less. Sexine about as thick as nexine. Endosexine baculate.

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ADDENDUM

Since the above was written, further suggestions have been made as follows : the monolete, trilete, and cataporate spores in fig. 1, column 3, are monotreme (trema= aperture) and so are also those in columns 4 and 7 ; those in columns 3 are catatreme, those in 4 anatreme, those in 5 zonotreme, and those in 6 pantotreme (pantoporate and pantocolpate respectively).