

Glossary of pollen and spore terminology

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Abstract

The glossary of pollen and spore terminology was first presented to the international palynological community as the final outcome of the Working Group on Palynological Terminology at the 8th International Palynological Congress in Aix-en-Provence in 1992. It became widely accepted as reference guide for palynologists to assist in the preparation of accurate and consistent descriptions of their material. It also serves as a practical source of information for non-specialists who wish to understand the meaning of the large number of existing palynological terms.

The history of the glossary began in 1972 at the 3rd IPC at Novosibirsk when the working group on palynology was established. Throughout its history the project has been a collaborative effort with contributions from many palynologists, representing all branches of the discipline. Only through this long and elaborate procedure, with input from many people, it has been possible to produce the glossary.

The entries are arranged alphabetically and are accompanied by simple schematic illustrations where appropriate. These contain the minimum amount of information needed to explain the feature. Moreover, to simplify the recognition of pollen and spore wall layers, colours have been used to indicate the corresponding layers.

The first edition had 547 terms of which 339 have been accepted and recommended for use. In the second edition, a further 41 terms have been added with their appropriate illustrations. Of these, 10 have been accepted and 31 rejected for a variety of reasons. Where necessary, illustrations have been revised. An extensive list of consulted literature has been added.

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PREFACE TO THE FIRST EDITION

This **Glossary of Pollen and Spore Terminology** is presented to the international palynological community at the occasion of the 5th anniversary of the LPP Foundation. The publication of the Glossary concludes a project of the Working Group on Palynological Terminology, functioning under the auspices of the International Federation of Palynological Societies (IFPS). Under conve-
norship of Wim Punt, an international committee of pollen morphologists has made an up-to-date compilation of the wide diversity of technical terms so far used in the description of pollen and spores—both modern and fossil.

Wim Punt, Stephen Blackmore, Siwert Nilsson and Annick Le Thomas have to be congratulated with the results of their effort. Under the technical editorship of Peter Hoen, who was also responsible for most of the illustrations, the format of their Glossary has become fully in harmony with the twofold objective of the terminology project. Besides being a useful reference guide for palynologists who have to provide accurate descriptions of their material, the Glossary may also serve as a practical source of information for non-specialists who have to understand the meaning of an ever-increasing number of palynological terms.

Utrecht, December 1993
LPP Foundation,
Henk Visscher (Chairman)
Henk Brinkhuis (Director)

PREFACE TO THE SECOND EDITION

The first edition of the Glossary of Pollen and Spore Terminology was presented to the international palynological community in 1994. During the past 11 years it has served its purpose well, but during this time several more terms have been proposed and introduced. Moreover, a number of mistakes were detected and some drawings needed adaptation. For all these reasons the present authors considered a second, revised edition of the glossary should be prepared.

The setup of the glossary is not changed at all as it has proven its usefulness. We have kept the use of indications bold for accepted terms and normal text for rejected terms and synonyms. The indications for plural and adjective of the terms has also been maintained. The most important difference is the use of colours for the drawings. We had in mind that different colours may be useful to indicate the different layers more easily. The meaning of the colours is given in the Introduction.

Finally, this second edition is dedicated to the late Dr. Siwert Nilsson who, in fact, was the initiator of the first edition. His continuous support to carry on with the project has much helped us to finish the final manuscript.

Utrecht, December 2005

the text and the illustrations and, for those who may be interested, records the history of the project.

INTRODUCTION

The terminology used in palynology has long been recognised as a deterrent to those who are not specialists in the subject. We hope that this glossary will make the subject more widely accessible at the same time as simplifying the application of palynological terms without losing any precision. We recognise that the Glossary is not perfect, and anticipate that revisions will be needed in the future.

This introduction sets out the objectives of the glossary, explains the format that has been followed in

OBJECTIVES

The objective of the project has been to provide a concise manual of terminology that can be used to clarify the communication of information concerning pollen grains and spores.

It is hoped that this will help to make palynological literature more accessible to non-specialists and to beginners in the field. In this way it should encourage an increasingly standardised approach to the description of pollen grains and spores.

We have tried to keep the glossary as simple as possible so that it can easily be used without much previous experience of palynology.

THE FORMAT OF THE GLOSSARY

The entries are arranged alphabetically. The form that appears first (the singular, plural or adjectival form of the term) is generally the most commonly used form, although if all forms are widely used the singular is given first. A number of terms are mainly, or exclusively, used as adjectives.

Where the term is printed in **bold** typeface this indicates that the term is in current usage and is recommended for continued use. Where the head word is printed in normal text this indicates that an alternative term should be used in preference. The definitions and literature references provided for such terms are included because they may be helpful in interpreting the literature. In each case the preferable or synonymous term is indicated.

Cross references are also given to terms that indicate the opposite condition (antonyms) and to related terms (indicated by “see also”). A comment is provided where this may help in the application of a term, or to qualify the circumstances in which it is applied.

The literature reference given for each term is not necessarily the earliest publication in which the term was used but has been selected as a helpful source of further information.

ILLUSTRATIONS

Simple schematic illustrations have been provided where appropriate. These contain the minimum amount of information needed to explain the feature. Some conventions have been used:

- Where both equatorial view and polar view are shown, the equatorial view (e) is generally given to the left of the polar view (p).
- Drawings of pollen grains or spores seen in equatorial view are always shown with the distal pole uppermost.

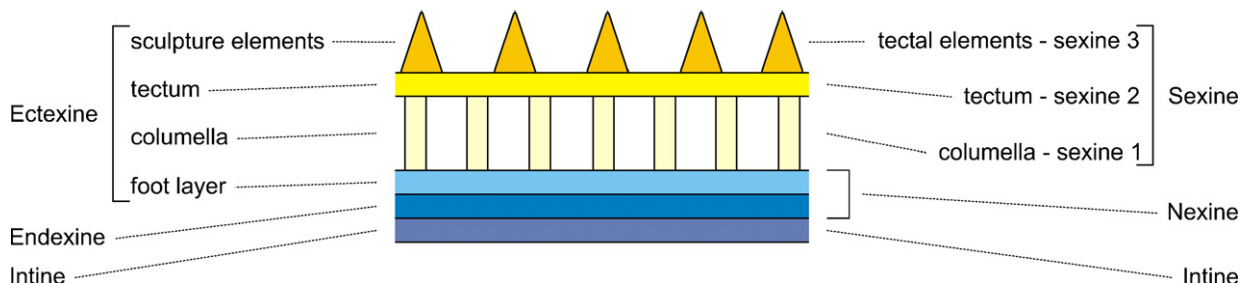


Fig. 1. Two different systems used to describe the exine stratification.

- Features of ornamentation are generally illustrated by a surface view on the left and a sectional view to the right.
- Arrows have been used to indicate the particular part of the diagram to which the term applies. In other cases the feature referred to is shaded. In some cases both arrows and shading have been used.
- A solid line is used to indicate a feature visible at the surface whilst a dotted line indicates a feature that lies below the surface, or behind another feature.
- A standardised section of a pollen wall, illustrated below (Fig. 1), is used as the basis of a number of the diagrams referring to wall stratification.
- Colours are used to indicate the different layers (Fig. 2).

THE HISTORY OF THE GLOSSARY

This glossary is the outcome of a initiative that began with the establishment, under the auspices of the International Commission for Palynology (now, the International Federation of Palynological Societies) of a Working Group on Palynological Terminology. With Jan Muller as Secretary, the Working Group communicated by means of circulars and questionnaires distributed among its members. Siwert Nilsson took on the role of Secretary of the Working Group between the 4th International Palynological Congress in Lucknow (1976) and the 5th IPC held in Cambridge in 1980. A report of the progress made by the Group was published by Nilsson and Muller (1978).

At the 5th IPC it was proposed that the Working Group should work towards the publication of a glossary that would summarise and explain palynological terminology. After the Cambridge IPC Stephen Blackmore became Secretary and questionnaires continued to be circulated, in an effort to establish the approaches to terminology that could be adopted in a glossary. However, as previous experience had shown, relatively few palynologists replied, calling

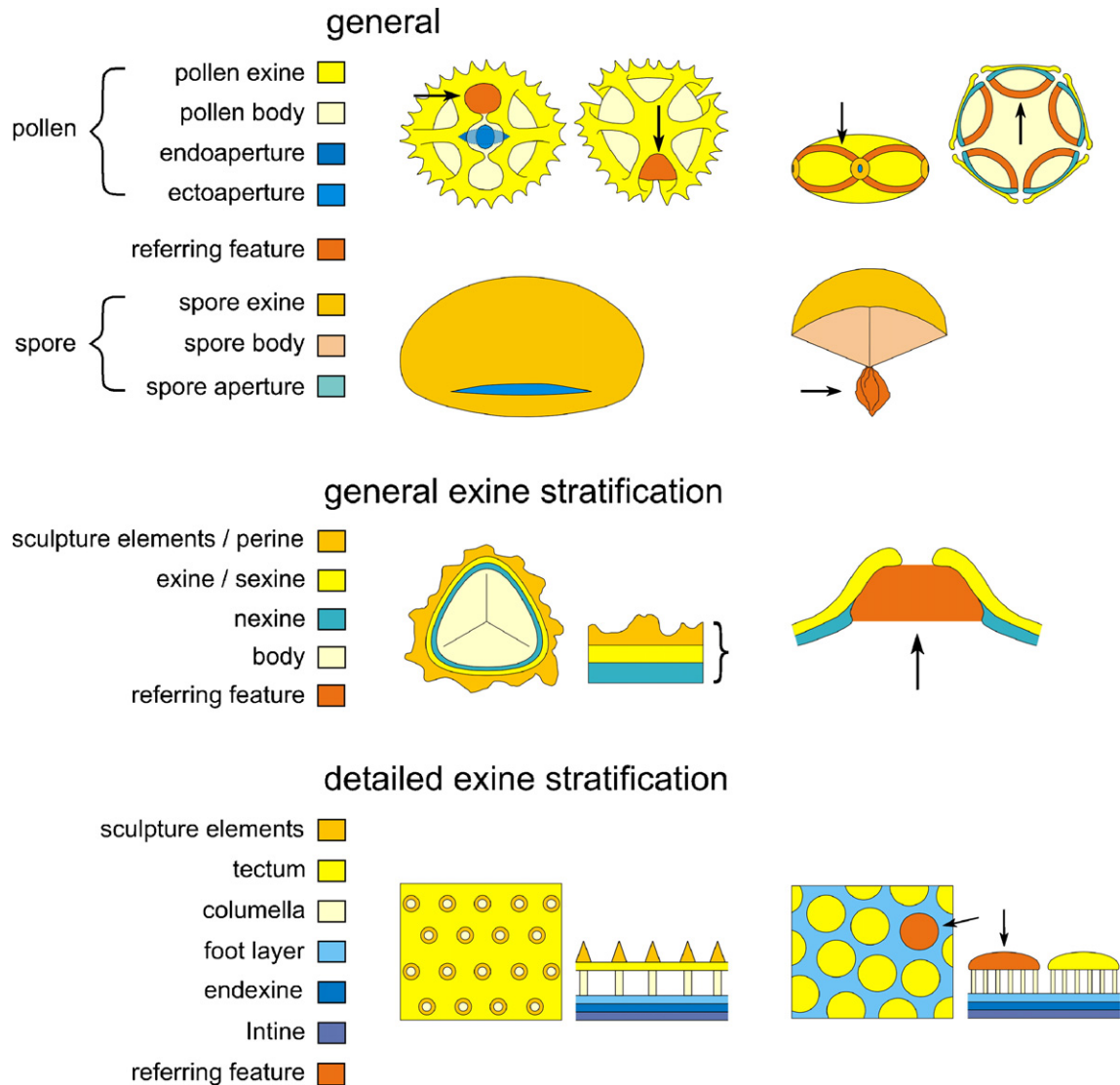


Fig. 2. Colour scheme used in the drawings of the terms.

into question the utility of the Group's methodology. During a lively debate at the 6th IPC in Calgary (1984), the Working Group was dissolved with the intention of seeking a more rapid method of progress.

A revitalised Working Group, with Wim Punt as Secretary, emerged at the 7th IPC in Brisbane (1988). Punt offered to convene a small committee that would start working on drafting a glossary. It was agreed that drafts of the glossary would be circulated as widely as possible so that the text could be revised as thoroughly as possible before publication (Report in *Palynos* 12,2, 1989). To achieve this, it was decided that draft manuscripts would be circulated to the representatives

of each of the societies affiliated to the IFPS and to all members of the newly convened Working Group.

Wim Punt then acted as convener of a committee consisting of Stephen Blackmore, Siwert Nilsson and Annick Le Thomas. The First Draft, with a red cover, was circulated in 1989 and stimulated considerable interest. A Second Draft, with an orange cover, followed in 1990 and again drew many comments and suggestions from the Working Group. These comments were incorporated in a Third Draft, not widely distributed, which also included the very detailed comments of palaeopalynologists Al Traverse and Jan Jansonius.

In April 1991, at the invitation of Knut Fægri the committee met in Bergen to revise the Third Draft and to consider the illustration and publication of the resulting glossary. The process of reconciling outstanding differences of opinion and revising the definitions, started in Bergen, was subsequently continued at meetings in Utrecht and London.

In August 1992 an illustrated version of the Third Draft was prepared by Peter Hoen and distributed at the 8th IPC in Aix-en-Provence in a pale yellow cover as the First Concept. Once again the project benefited from the detailed comments of many palynologists. These have been included in this edition.

It will be clear, from the history of the project, that this has been a collaborative project, with contributions from many palynologists, from all branches of the discipline. Only through this long and rather elaborate procedure it has been possible to produce the present

glossary, which we hope goes some way towards meeting the original objectives of the project.

ACKNOWLEDGEMENTS

As in its first edition, the second of the Glossary has much benefited greatly from the advise and expertise of a number of palynologists. We are in particular grateful for the remarks and critical comment of Dr. J. Jansonius and Dr. M. Harley.

We thank the technical staff of the Elsevier Geoscience Journals Department for their help and continuous encouraging support in making the Glossary project a success.

Last but not least we would like to thank Prof. Dr. A. Lotter and the members of the Laboratory of Palaeobotany and Palynology for their everlasting support of this project.

THE GLOSSARY

In all drawings, the distal pole is on top, the proximal pole at the bottom, unless otherwise specified. e = equatorial view, p = polar view; H = high level, L = low level. The terms printed in **bold** are preferred.

A-, an-

A prefix indicating the absence of a feature, as for example in **alete**.

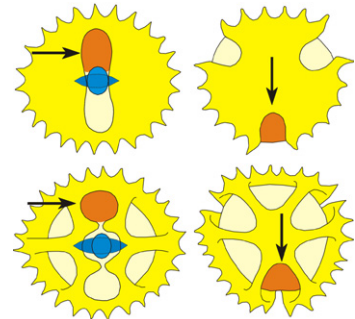
A-type tetrad (Moar, 1993)

A tetrad in which the aborted cells (1–3 in number) are clearly associated with the fertile grain(s). Example: *Cyathodes juniperina* (Epacridaceae). See also: S-type tetrad, T-type tetrad.

Abporal lacuna (pl. abporal lacunae) (Wodehouse, 1928)

A lacuna in a lophate pollen grain situated at the end of an ectoaperture that is divided by sexinous ridges into two or more lacunae. Example: *Sonchus oleraceus* (Compositae).

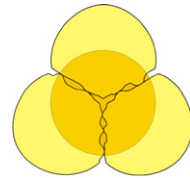
See also: **lacuna**, **lophate**.



Acalymmate (adj.) (Van Campo and Guinet, 1961)

Describing tetrads or polyads in which the sexine/ectexine of each monad is well differentiated, but does not form a single continuous envelope around the unit. Example: *Drosera* (Droseraceae).

Antonym: **calymmate**.



Acanthomamilla (Balme, 1988)

A biform sculptural element consisting of a hemispheroidal base, surmounted by a sharply contracted spine. Examples: *Acinosporites*, *Dibolisporites*.

Acetolysis (Erdtman, 1960a)

A widely used technique for preparing pollen and spore exines for study.

Acolpate (adj.) (Moar, 1993)

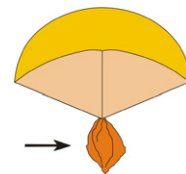
Without **colpi**.

Acrolamella (pl. acrolamellae, adj. acrolamellate) (Li and Batten, 1986)

A leaf-like tapering segment on the proximal pole of a megaspore. Example: *Arcellites*.

Comment: An acrolamella is a special form of **gula**, represented by leaf-like segments.

See also: **gula**, **trifolium**.



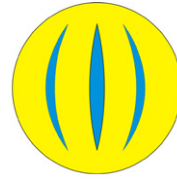
Actuopalynology (Hulshof and Mantén, 1971)

The study of pollen grains and spores of extant plants.

Antonym: **palaeopalynology**.

See also: **pollen analysis**.

Adequate (adj.) (Reitsma, 1970)
Synonym of **spheroidal**.



Aeropalynology (Erdtman, 1969)

The study of palynomorphs found in the atmosphere.

-al

A suffix for of, relating to, or characterized by. Example: tectal.

Alete (adj.) (Erdtman, 1943)

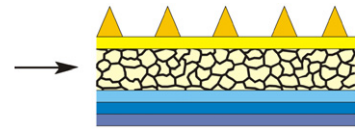
Describing a spore without a laesura.

See also: **-lete**, **laesura**.

Alveolate (adj.) (Van Campo, 1971)

Describing a type of sexine/ectexine structure, in which the infratectal layer is characterised by partitions forming compartments of irregular size and shape. Example: *Pinus* (Pinaceae).

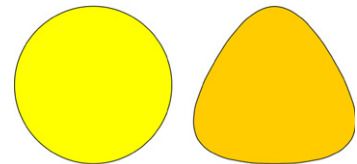
See also: **columella**, **granular exine**.



Amb (Erdtman, 1952)

The outline of a pollen grain or spore seen in polar view.

Comment: The term does not necessarily coincide with the **equatorial outline**. The term is especially useful for the outline of spores seen in polar view, because of their heteropolar shape.

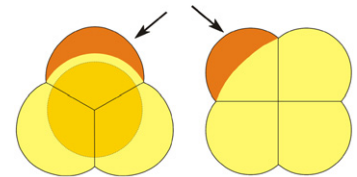


Ana-(Erdtman and Vishnu-Mittre, 1956)

A prefix indicating the position of features, such as apertures, on the **distal** face. Examples: *Nymphaea* (Nymphaeaceae), *Sparganium* (Typhaceae).

Antonym: **cata-**.

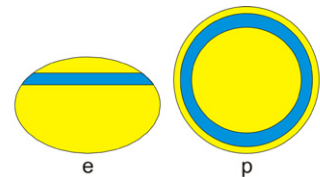
See also: **zona-**.



Anazonasulcate (adj.) (Walker and Doyle, 1975)

Describing a pollen grain with a ring-like **sulculus** situated between the equator and the distal pole.

Antonym: **catazonasulcate**.



Ancyrate (adj.) (Balme, 1988)

Bearing sub-cylindrical or tapering processes which divide at their distal extremities into anchor-shaped or multifurcate tips.

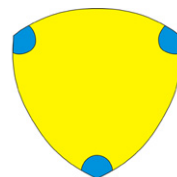
Angulaperturate (adj.) (Erdtman, 1952)

Describing an equatorially aperturate pollen grain with the apertures situated at the angles of the outline in polar view. Example: *Corylus* (Betulaceae).

Antonym: **planaperturate**.

Comment: The term is useful for describing the position of apertures, but should be avoided as a description of equatorial outline.

See also: **sinu-aperturate**, **fossaperturate**.



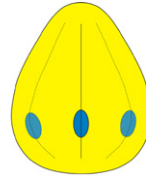
Angustimurate (adj.) (Erdtman, 1952)

With narrow **muri**.

Comment: Erdtman restricted the term to muri up to 1/5th of the diameter of the lumina.

Anisopolar (adj.) (Erdtman, 1947)

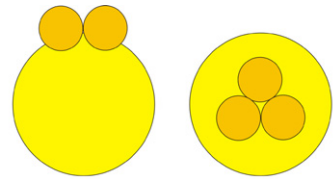
Synonym of **heteropolar**.



Anisodiametric tetrad

General term for tetrads which members are differing in size. Example: **seed-megaspore** tetrads.

Antonym: **isodiametric tetrad**.

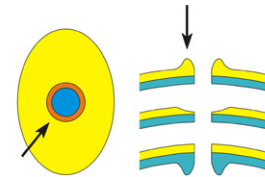


Annulus (pl. annuli, adj. annulate)

An area of the exine surrounding a pore that is sharply differentiated from the remainder of the exine, either in ornamentation or thickness (Jackson, 1928).

Comment: Although the correct Latin spelling is anulus, the form used throughout the botanical literature is annulus.

See also: **aspis, costa, margo**.



Anulus (Beug, 1961)

Orthographical variant of **annulus**.

Anteturma (pl. anteturmae) (Potonié, 1956)

An artificial grouping of fossil spores and pollen in the **turma**-system of Potonié.

Comment: Turmae are grouped under two large headings the **anteturmae** Sporites and Pollenites.

See also: **infraturma, subturma, turma**.

Aperture (adj. aperturate) (Erdtman, 1947)

A specialized region of the (sporoderm, that is thinner than the remainder of the sporoderm and generally differs in ornamentation and/or in structure.

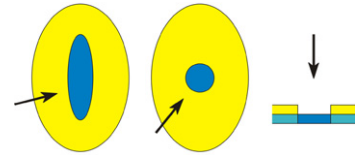
Comment: Apertures are described as simple if they are present in only one wall layer, or compound if they affect more than one layer of the wall. In compound apertures the shape of apertures may differ between layers.

Ectoapertures occur in the sexine/ectexine, **endoapertures** in the nexine/endexine, and **mesoapertures** are sometimes found in an intermediate position between an ecto- and endoaperture. Various types of apertures are recognised on the basis of their shape (see, **colpus, laesura, porus, sulcus, ulcus**), position (see, **ana-, cata-, zona-, zono-**) or fusion (see, **syn-**). In living pollen grains or spores the apertures usually function as sites of germination, they may also provide routes for transfer of water and other substances, and play a part in **harmomegathy**. The term is often used in conjunction with a prefix or suffix, as for example in, **ectoaperture, endoaperture, inaperturate, omniaperturate, pseudoaperture, triaperturate**.

Aperture membrane (Erdtman, 1952)

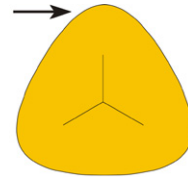
The exine which forms the floor of an ectoaperture.

Comment: Depending on the type of **ectoaperture** these may be **colpus membranes** or **pore membranes**, usually representing the nexine. The membrane may be partially or completely covered by an **operculum**.

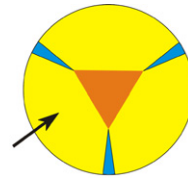
**Apex** (pl. apices)

A general term for the tip of an organ (Jackson, 1928).

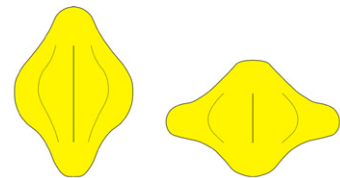
Comment: In fossil spores applied to the tip or corner of a trilete spore.

**Apicalfeld** (Beug, 1961)

Synonym of **apocolpial field**.

**Apiculate** (adj.) (Fægri and Iversen, 1950)

Describing the shape of a pollen grain that has slightly protruding polar caps. Example: *Adonis aestivalis* (Ranunculaceae).

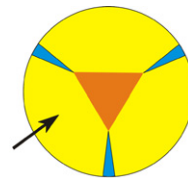
**Apiculate elements** (Smith and Butterworth, 1967)

Projections from the general surface. Examples: **bacula**, **pila**, **verrucae**, **spines**.

Apocolpial field (Punt et al., 1974)

A region at the pole of a **parasyncolpate** pollen grain, delimited by the margins of the anastomosing colpi.

See also: **apocolpium**.

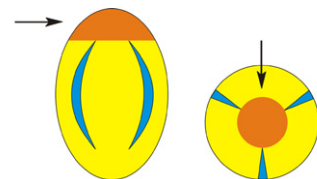
**Apocolpium** (pl. apocolpia) (Erdtman, 1952)

A region at the pole of a zonocolpate pollen grain delimited by lines connecting the apices of the colpi.

Synonym of **polar area**.

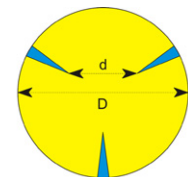
Comment: In the original definition the apocolpium was delimited by the polar limits of the mesocolpia, the more precise definition now used is derived from Iversen and Troels-Smith (1950, polar area).

See also: **apoporium**, **mesocolpium**.

**Apocolpium index** (Punt, 1976)

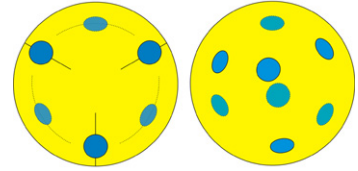
The ratio of the distance between the apices of two ectocolpi (d) of a zonocolpate pollen grain to its equatorial diameter (D).

Synonym of polar area index.



Apolar (adj.) (Erdtman, 1952)

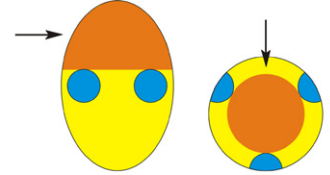
Describing pollen and spores without distinct **polarity**. Example: *Plantago* (Plantaginaceae).

**Apoporium** (pl. apoporia) (Erdtman, 1952)

An area at the pole of a zonoporate pollen grain that is delimited by a line connecting the borders of the pores.

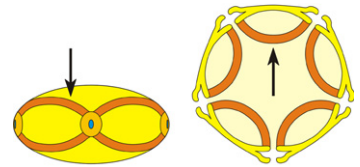
Comment: The term contrasts with apocolpium and is most meaningful in pollen grains with large pores.

See also: **apocolpium**, **mesoporium**.

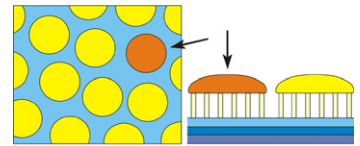
**Arcus** (pl. arcus, adj. arcuate) (Erdtman, 1947)

A locally thickened band of sexine that extends in a sweeping curve from one aperture to another. Example: *Alnus* (Betulaceae).

Comment: In palynological literature the plural is often misspelled as *arci*. However the correct plural is *arcus*.

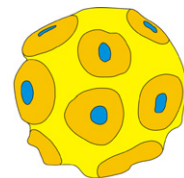
**Areola** (pl. areolae, adj. areolate) (Erdtman, 1947)

A feature of ornamentation in which the sexine/ectexine is composed of circular or polygonal areas separated by grooves which form a negative reticulum. Examples: *Apama* (Aristolochiaceae), *Phyllanthus* spp. (Euphorbiaceae).

**Aspidote** (adj.) (Erdtman, 1952)

An orthographical variant of **aspidate**.

See also: **aspis**.

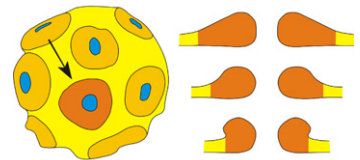
**Aspis** (pl. aspides, adj. aspidate) (Wodehouse, 1935)

A prominently protruding thickening of the **exine** around a pore.

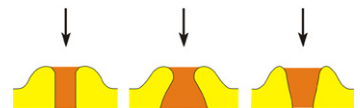
Examples: *Betula* (Betulaceae), *Dorstenia* (Moraceae).

Comment: An *aspis* is a special form of **annulus**, represented by a thickening rather than a thinning.

See also: **atrium**.

**Aspis channel** (Engel, 1980)

Synonym of **pore canal**.



-ate

A suffix for possession of. Example: **porate**.

Atectate (adj.) (Walker and Doyle, 1975)

Describing pollen grains that have an exine with little or no internal structure. Example: *Degeneria* (Degeneriaceae).

Comment: The term was originally intended to describe walls of primitive angiosperms lacking columellae. Related terms include **intectate**, which is used for pollen grains with columellae but without a tectum, and **etectate** which is applied to pollen grains believed to have lost their tectum during phylogeny.

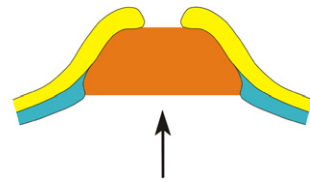
See also: **etectate**, **intectate**, **tectum**.



Atrium (Thomson and Pflug, 1953)

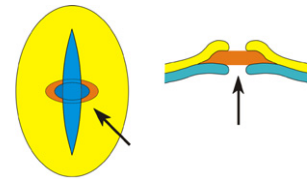
A space within the aperture of a compound pore that has a much larger endopore than the ectopore, so that the **pore canal** widens towards the interior of the grain. Example: *Myrica* (Myricaceae).

See also: **vestibulum**.



Atrium (Punt, 1962)

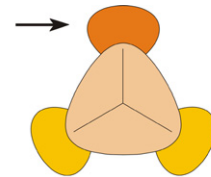
Synonym of **fastigium**.



Auricula (pl. auriculae, adj. auriculate) (Potonié and Kremp, 1955)

Synonym of **valva**.

Comment: The term is mostly used for spores with extreme valva.



Baculum (pl. bacula, adj. baculate) (Potonié, 1934)

A cylindrical, free standing exine element more than 1 μm in length and less than this in diameter. Example: *Raistrickia saetosa*.

See also: **columella**, **pilum**.



Bilateral (adj.)

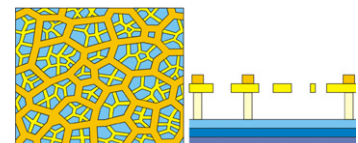
Describing pollen and spores having a single, principal plane of symmetry.

Comment: According to Walker and Doyle (1975) bilaterally symmetrical objects could more correctly be described as anisobisymmetric, but because of the familiarity of the term bilateral it was used by them.



Bireticulate (adj.) (Bor, 1979)

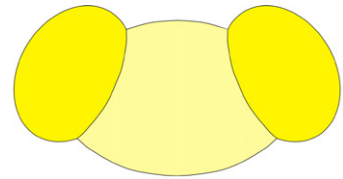
A two-layered reticulum consisting of a suprareticulum supported by a microreticulate tectum. Examples: *Entelea arborescens* (Tiliaceae), *Phyllanthus oppositifolius* (Euphorbiaceae), *Salvia azurea* (Lamiaceae).



Bisaccate (adj.) (Potonié and Kremp, 1954)

Describing pollen with two **sacci**. Example: *Pinus* (Pinaceae).

See also: **saccus**, **protosaccus**, **pseudosaccus**.

**Brachy-**

A prefix for short.

Synonym of **brevi-**.

Brevi-

A prefix for short. Example: **brevicolpate**.

Breviaxe (adj. breviauxal) (Van Campo, 1966)

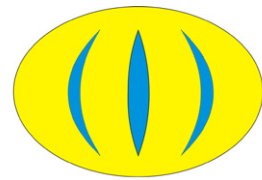
Pollen grains with a polar axis that is shorter than their equatorial diameter.

Synonym of **oblate** (s.l.).

Antonym: longiaxe.

Comment: Thomson and Pflug (1953) recognised **Brevaxones** a group of mid-Cretaceous and later angiosperm pollen grains that was contrasted with **Longaxones**.

See also: **successiform**.

**Breviaxy** (Van Campo, 1966)

A phyletic series of pollen forms ranging from subspheroidal tricolpate, to tricolporate, to oblate tricolporate.

See also: **successiform**.

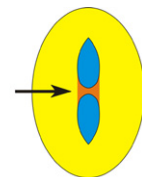
Brevissimi-

A prefix for very short.

Bridge (Fægri and Iversen, 1950)

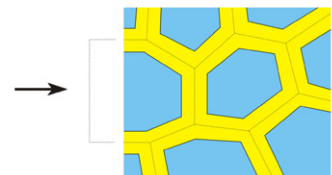
A feature in which the margins of the colpi are raised in the equatorial region and connected with each other, forming a bridge over the ectocolpus and dividing it into two parts. Example: *Hemandraenia* (Connaraceae).

See also: **demicolpus**.

**Brochus** (pl. brochi, adj. brochate) (Erdtman, 1952)

A brochus consists of one lumen of a reticulum and half of the width of the adjacent muri.

See also: **heterobrochate**, **homobrochate**, **lumen**.

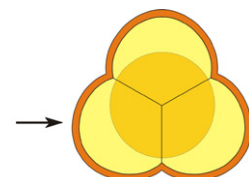
**Callose wall** (Mangin, 1899)

Part of the **special wall**.

Calymmate (adj.) (Van Campo and Guinet, 1961)

Describing tetrads or polyads in which the sexine/ectexine of each monad is well differentiated and forms a continuous envelope around the unit. Example: *Acacia* (Mimosaceae).

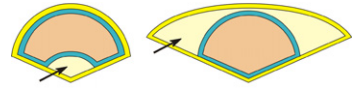
Antonym: **acalymmate**.



Camera (pl. camerae, adj. camerate) (Neves and Owens, 1966)

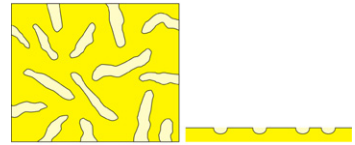
A cavity formed by the separation of two wall layers in spores that lacks an infrastructure.

See also: **cavus**, **pseudosaccus**, **saccus**.



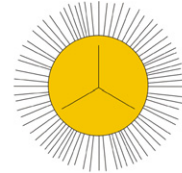
Canaliculate (adj.) (Potonié, 1934)

Synonym of **fossulate**.



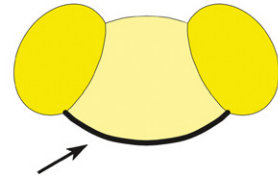
Capillus (pl. capilli, adj. capillate) (Potonié and Kremp, 1955)

Synonym of **fimbria**.



Cappa (pl. cappae) (Erdtman, 1957)

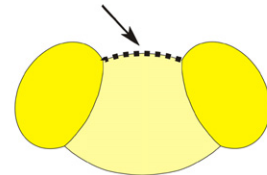
The thick-walled proximal side of the corpus of a saccate pollen grain.



Cappula (pl. cappulae) (Erdtman, 1957)

The thin-walled distal side of the corpus of a saccate pollen grain.

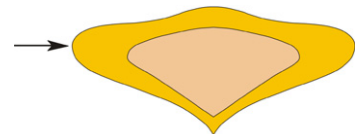
Synonym of **leptoma**.



Capsula (pl. capsulae, adj. capsulate) (Pocock, 1961a)

An outer structure of a spore projecting at the equator and completely enclosing the spore body.

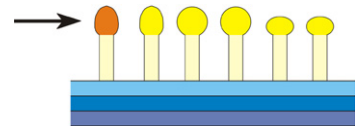
See also: **cingulum**, **patina**.



Caput (pl. capita, adj. capitate) (Erdtman, 1952)

The expanded apex (head) of a columella.

See also: **columella**, **pilum**.

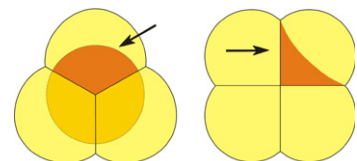


Cata- (Erdtman and Vishnu-Mittre, 1956)

A prefix indicating the location of features, such as apertures, on the proximal face.

Antonym: **ana-**.

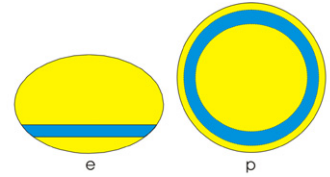
See also: **zona-**.



Catazonasulcate (adj.) (Walker and Doyle, 1975)

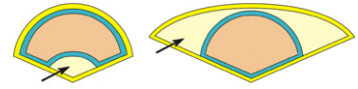
Describing a pollen grain with a ring-like **sulculus** situated between the equator and the proximal pole.

Antonym: **anazonasulcate**.

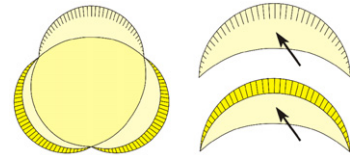
**Cavate** (adj.)

In spore terminology, a synonym for camerate.

See also: **camera**.

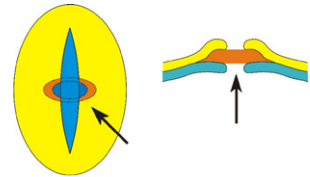
**Cavea** (pl. caveae, adj. caveate) (Skvarla and Larson, 1965)

A cavity between two layers of the exine extending to the colpus margin where the layers meet. Example: *Ambrosia* (Compositae).

**Caverna** (pl. cavernae) (Thomson and Pflug, 1953)

Synonym of **fastigium**.

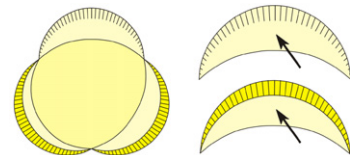
Comment: Originally a distinction was made between a separation of two layers of the ectexine, which was called a praecaverna, and a separation within the endexine, a postcaverna. The term is not used to describe recent pollen grains.

**Cavium** (Thomson and Pflug, 1953)

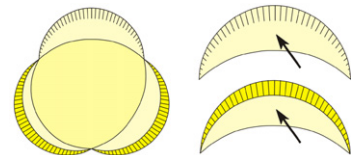
A subpolar chamber formed at the end of three anastomosing cavernae.

Cavum (pl. cava, adj. cavate) (Fægri and Iversen, 1989)

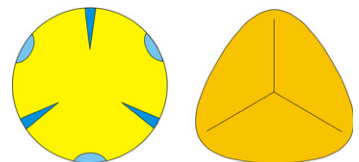
Synonym of **cavea**.

**Cavus** (sensu Skvarla and Turner, 1966)

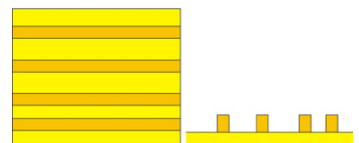
Synonym of **cavea**.

**Centrosymmetrical** (adj.) (Straka, 1964)

Synonym of **radially symmetric**.

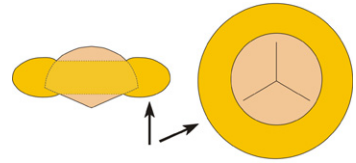
**Cicatricose** (adj.) (Potonié, 1934)

Describing spores marked with scars. Example: *Cicatricosisporites*.

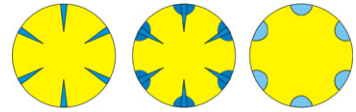


Cingulum (pl. cingula, adj. cingulate) (Potonié and Kremp, 1955)

A thick outer structure of a spore that projects at the equator, but does not extend over the distal or proximal face. Example: *Densosporites anulatus*. See also: **capsula**, **patina**.

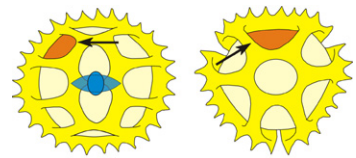
**Circumaperturate** (adj.) (Straka, 1964)

Describing a pollen grain with equatorial apertures that are regularly arranged around a circular outline.

**Circumpolar lacuna** (pl. circumpolar lacunae) (Wodehouse, 1928)

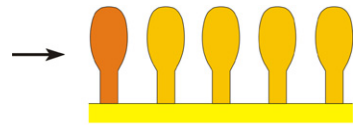
A lacuna in lophate pollen grain immediately adjacent to a polar lacuna that is not part of the apertural system.

See also: **lacuna**, **lophate**.

**Clava** (pl. clavae, adj. clavate) (Iversen and Troels-Smith, 1950)

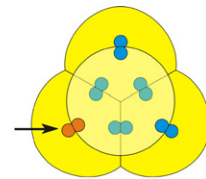
A club-shaped element of the sexine/ectexine that is higher than 1 μm, with diameter smaller than height and thicker at the apex than the base.

See also: **baculum**, **columella**, **gemma**, **pilum**.

**Coaperturate** (adj.) (Beug, 1961)

Describing permanent tetrads in which the apertures of neighbouring monads join. Examples: *Erica* (Ericaceae), *Periploca* (Periplocaceae).

See also: **syncolp(or)ate**, **Fischer's law/rule**.

**Colpodiporate** (adj.) (Selling, 1947)

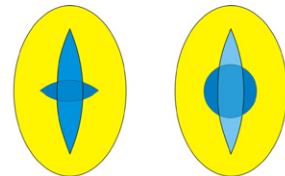
Synonym of **diploporate**.

**Colpororate** (adj.) (Moar, 1993)

A compound aperture characterised by an ectoaperture, a shorter lalongate mesoaperture and a lalongate endoaperture. Example: *Sonchus* (Compositae).

Comment: This term describes a compound aperture with a mesoaperture.

See Also: **mesoaperture**.

**Colpoid** (Erdtman, 1952)

Apertures more or less similar to colpi but less clearly defined in outline.

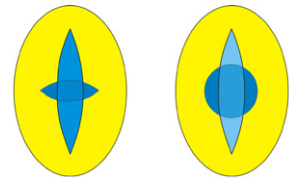
Colporoidate (adj.) (Erdtman, 1952)

Describing pollen grains with colpi and indistinct ora.

Colporus (pl. colpori, adj. colporate) (Erdtman, 1945a)

A compound aperture consisting of an ectocolpus with one or more endoapertures.

Comment: The term is most commonly used in its adjectival form, colporate.

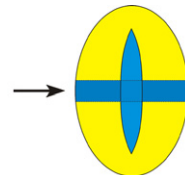
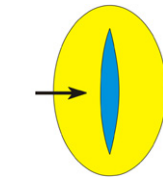
**Colpus** (pl. colpi, adj. colpate) (Erdtman, 1943)

An elongated, aperture with a length/breadth ratio greater than 2.

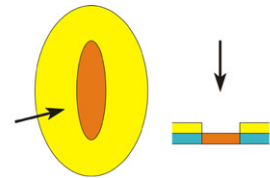
Comment: Some authors restrict the term to a meridional aperture (and contrast this with a distal or proximal **sulcus**), but since shape is the defining criterion the term is equally applicable to other locations (for example, **pantocolpate** pollen). The precise meaning is often indicated by the use of a prefix, as for example in, **ectocolpus**, **endocolpus**, **syncolpate**.

Colpus equatorialis (pl. colpi equatoriales) (Iversen and Troels-Smith, 1950)

Synonym of **endocingulum**.

**Colpus membrane** (Iversen and Troels-Smith, 1950)

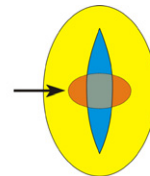
The aperture membrane of a colpus.



Colpus transversalis (pl. colpi transversales) (Wodehouse, 1935; Fægri and Iversen, 1950)

Synonym of **endocolpus**.

See also: **endoaperture**.

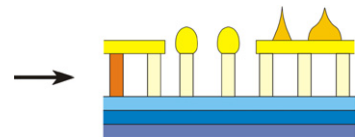


Columella (pl. columellae, adj. columellate) (Iversen and Troels-Smith, 1950)

A rod-like element of the sexine/ectexine, either supporting a **tectum** or a **caput**.

Comment: The difference between a baculum and a columella in current usage is, that a baculum is always a free standing element of sculpturing, whereas a columella is part of the structure.

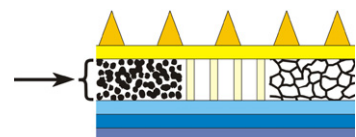
See also: **baculum**, **pilum**.



Columellae layer (Reitsma, 1970)

Synonym of **infractectum**.

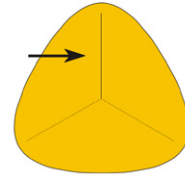
See also: **interstitium**.



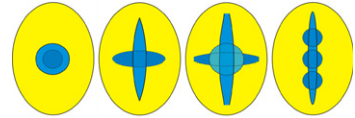
Commissure (Harris, 1955)

The slit or line of dehiscence in the laesura.

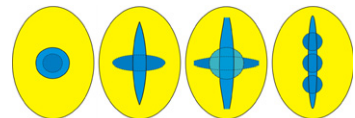
See also: **laesura**.

**Composite aperture** (Erdtman, 1952)

Synonym of **compound aperture**.

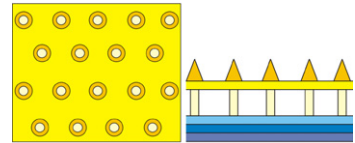
**Compound aperture** (Erdtman, 1969)

An **aperture** with two or more components that are situated in more than one wall layer.

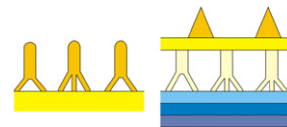
**Concordant pattern** (Fægri and Iversen, 1989)

A pattern in a tectate pollen grain in which the arrangement of the columellae is the same as that of the elements upon the tectum. Example: *Lilium* (Liliaceae).

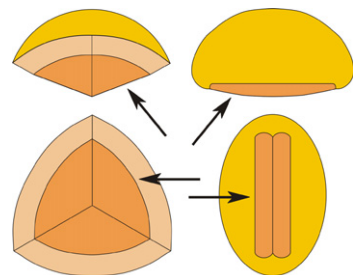
Antonym: **discordant pattern**.

**Conjunctate** (adj.) (Skvarla and Larson, 1965)

With bacula or columellae which are branched proximally into two or more parts.

**Contact area** (Potonié, 1934)

Area on the proximal face of a spore interpreted as having been formed in contact with the other members of the tetrad. Example: *Retusotriletes pythovii*.

**Conus** (pl. coni) (Potonié and Kremp, 1955)

Cone-shaped elements on the surface of spores in which the height is less than two times the basal diameter and the apex is pointed, blunt or rounded. Example: *Lophotriletes mosaicus*.

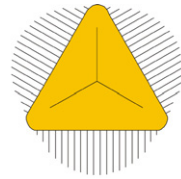
Comment: The term is only used in spore terminology and is more or less synonymous with **spine**.

**Copropalynology** (Erdtman, 1969)

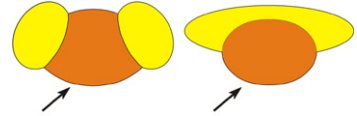
The study of palynomorphs in coprolites or excrement.

Corona (pl. coronae, adj. coronate) (Potonié and Kremp, 1955)

An equatorial or subequatorial extension of a spore, resembling a **cingulum**, but divided into fringe-like elements (fimbria). Example: *Reinschospora speciosa*.

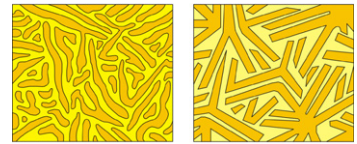
**Corpus** (pl. corpi) (Erdtman, 1957)

The body of a **saccate** pollen grain or **camerate** spore.



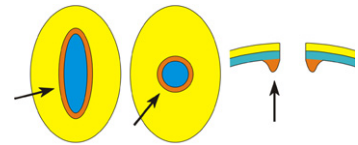
Corrugate (adj.) (Erdtman, 1947)

Synonym of **rugulate**.

**Costa** (pl. costae, adj. costate) (Iversen and Troels-Smith, 1950)

A thickening of the nexine/endexine bordering an endoaperture, or following the outline of an ectoaperture.

Comment: The following forms are used: **costa ectocolpi**, **costa ectopori**, **costa endocinguli**, **costa endocolpi**, **costa endopori**.



Costa equatorialis (pl. costae equatoriales) (Iversen and Troels-Smith, 1950)

Synonym of **costa endocinguli**.

Crassi-

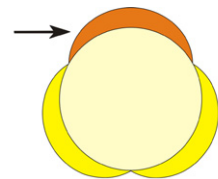
A prefix for thick.

Crassitude (Grebe, 1971)

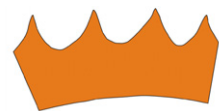
Synonym of a thickening.

Crescentic (adj.) (Fægri and Iversen, 1989)

Describing a pollen grain in polar view with a very thick exine in the medium of the intercolpium, gradually thinning towards the colpi. Example: *Valerianella* (Valerianaceae).

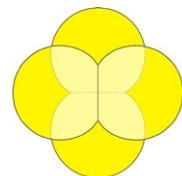
**Crista** (pl. cristae, adj. cristate) (Potonié and Kremp, 1955)

A crest-like ornamentation element, taller than it is wide, characterized by a narrow curved base and a sharp upper edge. Example: *Cristatisporites*.



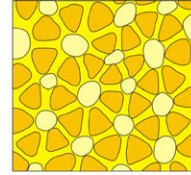
Cross tetrad (Erdtman, 1945b)

Synonym of **decussate tetrad**.



Croton pattern (Erdtman, 1952)

A characteristic type of ornamentation comprising rings of five or six (sometimes more) raised, often triangular, sexine elements arranged around a circular area, usually formed by capitate columellae (**pila**). Example: *Croton*, *Jatropha* (Euphorbiaceae), *Callitriche antartica* (Callitrichaceae), *Pimelea arenaria* (Thymelaeaceae).



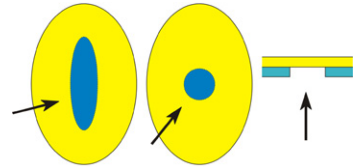
Crustate (adj.) (Erdtman, 1952)

Describing an aperture membrane that is thickly covered with coarse granules.

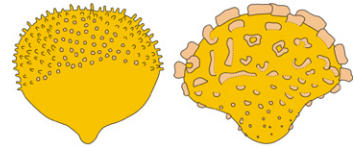
Cryptoaperture (adj. cryptoaperturate) (Thanikaimoni, 1980)

An endoaperture which is not apparent in surface view, because there is no ectoaperture.

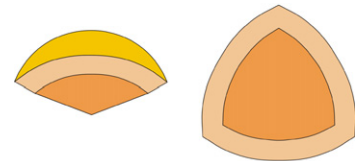
Comment: Examples of such apertures have been described in *Phaleria* (Thymelaeaceae) (Erdtman, 1952), *Tetracera* (Dilleniaceae) (Kubitzki and Baretta-Kuipers, 1969) and *Phyllanthus* (Euphorbiaceae) (Meewis and Punt, 1983).

**Cryptopolar** (Gupta and Udar, 1986)

Describing a spore in which the distal and proximal faces have dissimilar sculpturing and which lacks tetrad mark. Example: *Calobryum dentatum*, *Haplomitrium hookeri*.

**Cryptospore** (Richardson et al., 1984; Strother, 1991)

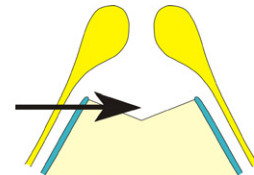
Non-marine alete **sporomorph** with well differentiated contact areas but without (haptotypic) features such as laesurae.



Cuneus (pl. cunei) (Batten and Christopher, 1981)

A structure formed by the termination of the inner wall layer at the endogerminal which gives rise to a shallow V-shaped atrium that points towards the centre of the grain. Example: *Pseudotrudopollis*.

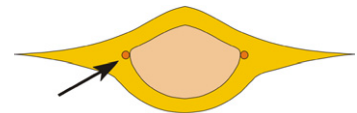
Comment: This term is used in descriptions of the fossil Normapolles group. See also: incidence.



Cuniculus (pl. cuniculi) (Sullivan, 1964)

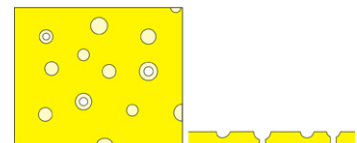
A space between the margin of the spore body and the inner face of the equatorially expanded spore wall, located at the equator.

See also: **camera**.



Cupulate (Gupta and Udar, 1986)

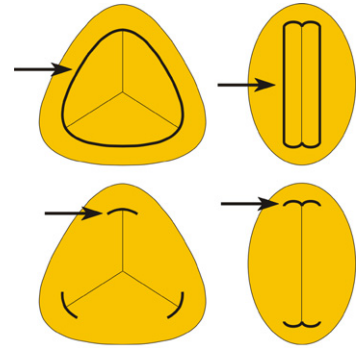
Synonym of **foveolate**.



Curvatura (pl. *curvaturae*) (Potonié, 1934)

A line in trilete spores, extending from the extremities of the ends of the radii of the laesura and thus delimiting the contact areas. Examples: *Laevigatisporites glabratus*, *Divisisporites divisus*.

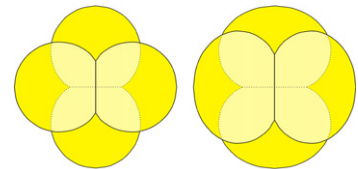
Comment: **Curvaturae perfectae** are continuous around the proximal face whereas **curvaturae imperfectae** are present as forked extensions that do not join.

**Curvimurate** (adj.) (Erdtman, 1952)

Describing pollen grains with curved muri.

Decussate tetrad (Walker and Doyle, 1975)

A multiplanar tetrad of pollen grains or spores arranged in two pairs lying across one another, the pairs (dyads) more or less at right angles to each other. Example: *Orophea* (Annonaceae).

**Demicolpus** (pl. *demicolpi*, adj. *demicolpate*) (Erdtman, 1952)

An ectocolpus divided into two parts. Example: *Amylothea* (Loranthaceae).

See also: **bridge**.

**Di-**

A prefix for two.

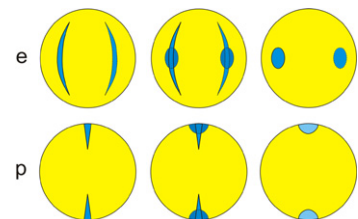
Comment: Examples: **dicolpate**, **dicolporate**, **diporate**, **disulcate**, **disulculate**, **diulculate**.

Dicolpate, **dicolporate**, **diporate** (adj.) (Iversen and Troels-Smith, 1950)

Describing pollen grains with two ectocolpi, two compound apertures or two pores.

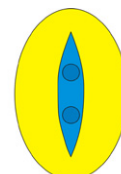
Comment: The terms belong to the system of pollen classes introduced by Iversen and Troels-Smith.

See also: **disulcate**, **monoaperturate**, **pantoaperturate**, **tricolpate**, **zonoaper-urate**.

**Dicolporate** (adj.) (Cranwell, 1953)

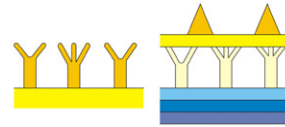
Synonym of **diporate**.

Comment: The same term refers to a pollen class in the system of Fægri and Iversen (1950).



Digitate (adj.) (Skvarla and Larson, 1965)

With bacula or columellae which are branched distally into two or more parts. Example: *Polygonum bistorta* (Polygonaceae).

**Diorate** (adj.) (Erdtman, 1952)

Synonym of **diploporate**.

**Diploporate** (adj.) (Fægri and Iversen, 1964)

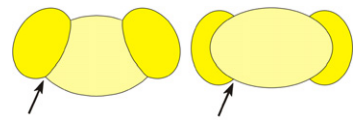
Describing an ectocolpus with two endoapertures. Example: *Didymeles* (Didymelaceae).

See also: **endoaperture area**.

**Diploxytonoid** (adj.) (Traverse, 1988)

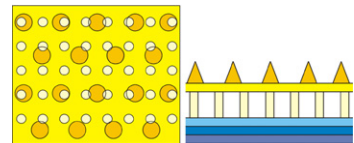
Describing bisaccate pollen grains in which the outline of the sacchi in polar view is discontinuous with the outline of the corpus so that the grains seem to consist of three distinct, more or less oval parts.

See also: haploxytonoid, **Haploxyton-type**, **Sylvestris-type**.

**Discordant pattern** (Fægri and Iversen, 1989)

A pattern in a tectate pollen grain in which the arrangement of the columellae is different from that of the elements on the tectum. Example: *Geranium* (Geraniaceae).

Antonym: **concordant pattern**.

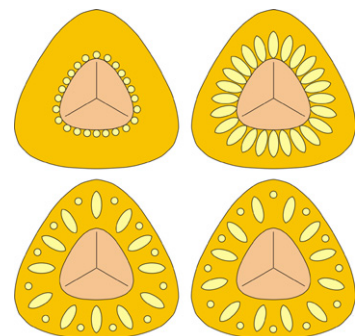
**Dispersal unit**

The morphological unit in which mature pollen grains or spores are shed, which may range from individuals (**monads**), to pairs (**dyads**), groups of four (**tetrads**), or groups of more than four (**polyads**). Larger, indeterminate numbers of pollen grains or spores may also be dispersed as **pollinia** or **massulae**.

Dissections (Couper and Grebe, 1961)

Rounded to elongated cavities in a cingulum or zona. Example: *Vallatisporites ciliaris*.

Synonym of **vacuoles**.



Distal (adj.)

A common descriptive term (Jackson, 1928) used in contrast to **proximal**, applied in palynology to features on the surface that face outward in the tetrad stage (Wodehouse, 1935).

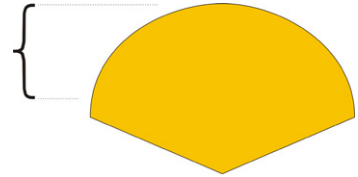
Antonym: **proximal**.

See also: **ana-**, **cata-**, **polarity**.

Distal face (Erdtman, 1952)

That part of a palynomorph that faces outwards the centre of the tetrad, between equator and distal pole.

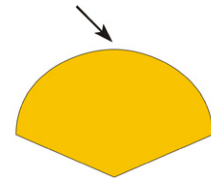
Antonym: **proximal face**.

**Distal pole** (Erdtman, 1952)

The centre of the surface of the distal face.

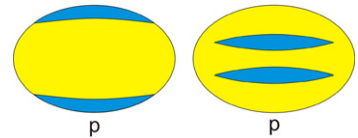
Antonym: **proximal pole**.

See also: **distal**.

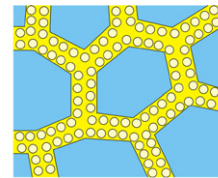
**Disulcate** (adj.) (Selling, 1947; Harley, 1998)

Describing pollen grains with sulci arranged in pairs. Two types of disulcate pollen are distinguished: **equatorial disulcate**, with opposing, equatorially arranged sulci and **distal disulcate** with paired sulci lying parallel to the long axis of the pollen grain on the distal face. Examples: *Metroxylon salomonense* (Palmae) (equatorial disulcate), *Chamaerops humilis* (Palmae) (distal disulcate).

See also: **dicolpate**, **dicolporate**, **diporate**, **geminicolpate**.

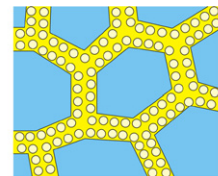
**Duplibaculate** (adj.) (Erdtman, 1952)

Synonym of **duplicolumellate**.

**Duplicolumellate** (adj.) (Reitsma, 1970)

With columellae in two rows under each murus. Example: *Polygonum persicaria* (Polygonaceae).

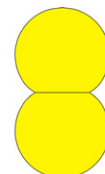
See also: **pluricolumellate**, **simplicolumellate**.

**Dyad**

General term for two microspores (pollen grains or spores) united as a dispersal unit.

Comment: A developmental dyad stage occurs prior to tetrad formation in plants with successive meiosis.

See also: **dispersal unit**.



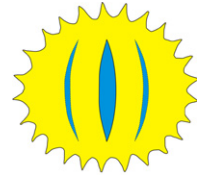
Echinate (adj.) (sing. echinus, pl. echinae) (Wodehouse, 1928)

Describing pollen and spores with an ornamentation comprising spines longer than 1 μm .

Comment: Although the correct Latin spelling for the plural is echini, the form used throughout the palynological literature is echinae.

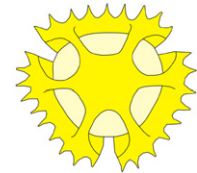
Comment: (Erdtman (1952) recommended the term spinose, but in his usage spines were defined as longer than 3 μm and smaller features as spinules (adj. spinulose).

See also: **microechinate**, **spine**, spinule.

**Echinolophate** (adj.) (Wodehouse, 1928)

Describing a **lophate** pollen grain with echinate ridges.

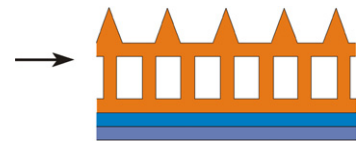
See also: **fenestrate**, **psilolophate**.

**Ectexine** (sensu Fægri, 1956)

The outer part of the exine, which stains positively with basic fuchsin in optical microscopy and has higher electron density in conventionally prepared TEM sections. Orthographical variant: ektexine.

Comment: Ectexine includes the **foot layer** (nexine 1), if present. Erdtman introduced the term in 1943, but used sexine in his later publications.

See also: **sexine**, **endexine**.

**Ecto-**

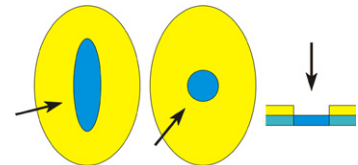
A prefix for outer.

Ectoaperture (Van Campo, 1958)

An aperture in the outer layer of the sporoderm.

Comment: Examples: **ectocolpus**, **ectopore**.

See also: **endoaperture**, **mesoaperture**.

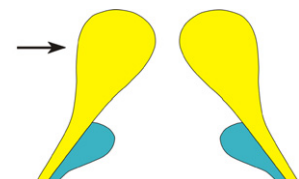
**Ectointine** (Freytag, 1968)

Synonym of **exintine**.

Ektannulus (pl. ektannuli) (Batten and Christopher, 1981)

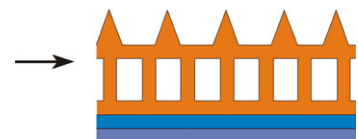
An abrupt thickening of the outer wall layer in the region of the exogerminal. Example: *Krutzschipollis*.

Comment: This term is used in descriptions of the fossil Normapolles group for part of an annulus.

**Ektexine** (Erdtman, 1943)

Orthographic variant of **ectexine**.

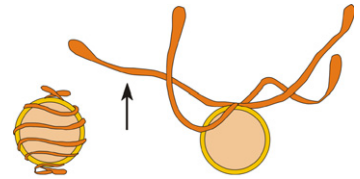
Comment: The original spelling was soon superseded by the latinized spelling “ectexine” in the publications of Erdtman and others.

**Ekto-**

Orthographical variant of the prefix **ecto-**.

Elater

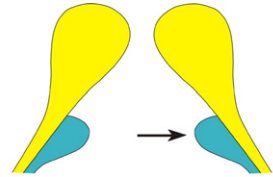
A spirally twisted, filamentous band attached to certain spores and some fossil pollen grains (Jackson, 1928). Example: *Equisetum* (Equisetaceae).



Endannulus (pl. endannuli) (Thomson and Pflug, 1953)

An annulus formed by the endexine of a pollen grain. Example: *Atlantopollis*.

Comment: This term is used in description of the fossil Normapolles group.



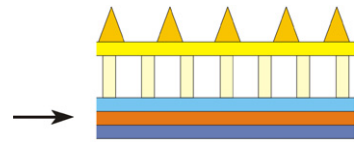
Endexine (sensu Fægri, 1956)

The inner part of the exine which remains relatively unstained with basic fuchsin in optical microscopy and has a lower electron density in conventionally prepared TEM sections.

Synonym of nexine 2 (Erdtman, 1960b).

Comment: Originally endexine was defined simply as the inner of the two main layers of the exine (Erdtman, 1943) to which Erdtman later applied the term nexine. However, as more recently defined, endexine does not include the **foot layer** (nexine 1) which is considered part of the ectexine.

See also: **ectexine**.



Endintine (Kress and Stone, 1982)

The inner, cellulosic zone of the intine which is adjacent to the cytoplasm and in fluorescence microscopy stains positively with PAS calcofluor.

Antonym: **exintine**.

Orthographical variant: endointine.

Endo-

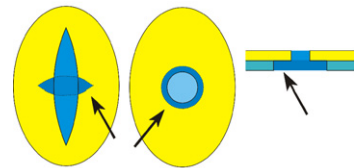
A prefix for inner.

Endoaperture (Van Campo, 1958)

An aperture in the inner layer of the sporoderm, often the inner aperture of a **compound aperture**.

Comment: Examples are: **endocingulum**, **endocolpus**, **endopore**.

See also: **ectoaperture**, **mesoaperture**.

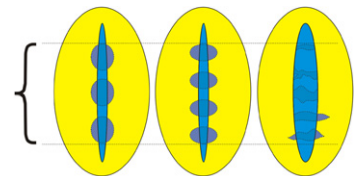


Endoaperture area (Verbeek-Reuvers, 1976)

The region of the nexine of a single compound aperture which encloses a number of endoapertures.

Comment: The term is used where the number of endoapertures is more than two and also where the endoapertures are not sharply delimited. Examples: *Deplanchea* (Bignoniaceae), *Phyllanthus* spp. (Euphorbiaceae).

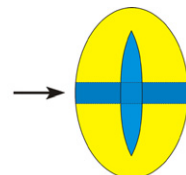
See also: **colpodiporate**, **diploporate**.



Endocingulum (pl. endocingula, adj. endocingulate) (Reitsma, 1966)

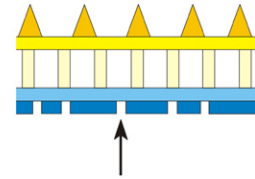
A ring-shaped endoaperture continuous around a pollen grain and lying in the equatorial plane. Example: *Polygonum convolvulus* (Polygonaceae).

Synonym of **colpus equatorialis** and **zonorate**.



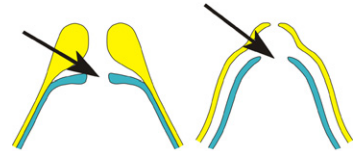
Endocrack (Oldfield, 1959)

An irregular groove occurring in the inner surface of the nexine/endexine and readily apparent in acetolysed pollen. Example: *Anemone nemorosa* (Ranunculaceae).



Endogerminal (adj.) (Batten and Christopher, 1981)

Describing an aperture in the inner wall layer.
 Comment: This term, used in descriptions of the fossil Normapolles group, is essentially synonymous with **endoaperture**.

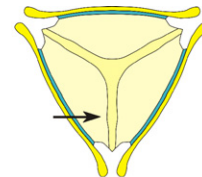


Endointine (Freytag, 1968)

Orthographic variant of **endintine**.

Endoplica (pl. endoplicae) (Thomson and Pflug, 1953)

A fold or swelling of the inner wall layer.
 Comment: A term originally used for features in fossil pollen of the genus *Triatriopollenites*, and later used in the fossil Normapolles group where endoplicae are present as Y-shaped structures centred over the poles.

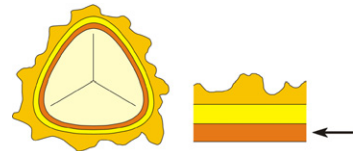


Endosculpture (Van Campo, 1971)

Sculpturing occurring on the inner surface of the nexine/endexine.

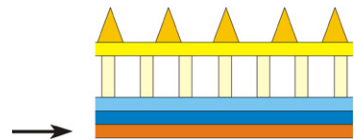
Endospore

The innermost layer of a spore wall (Jackson, 1928).
 Comment: It is probably homologous with the **intine** of a pollen grain. Also used as a synonym for the **corpus** in camerate spores. Mycologists use the term for spores formed on the inside of a sporangium.
 See also: **exospore**, **perispore**.



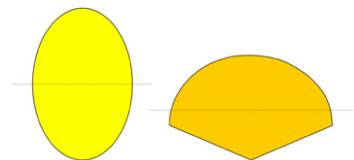
Endosporium (Erdtman, 1943)

Synonym of **intine**.



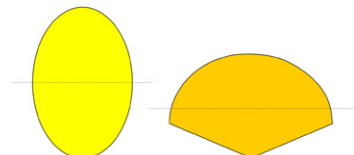
Equator (Wodehouse, 1935)

The dividing line between the distal and proximal faces of a pollen grain or spore.
 See also: **equatorial diameter**, **equatorial plane**.



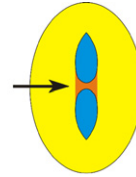
Equatorial axis

Often misappropriately used as a synonym of **equatorial diameter**.



Equatorial bridge (Moore and Webb, 1978)

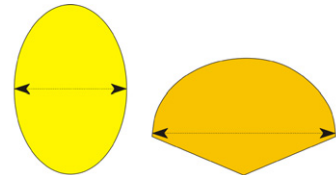
Synonym of **bridge**.



Equatorial diameter (Erdtman, 1943)

A line, lying in the equatorial plane, perpendicular to the polar axis and passing through it.

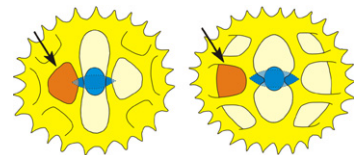
Comment: In bilateral palynomorphs the longest line is usually taken to be the equatorial diameter.



Equatorial lacuna (pl. equatorial lacunae) (Wodehouse, 1928)

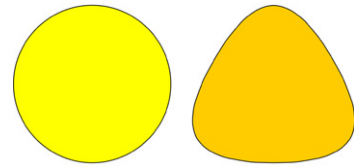
A lacuna situated on the equator in the mesocolpial region of a lophate pollen grain. Example: *Tragopogon pratensis* (Compositae).

See also: **lacuna**.



Equatorial limb

Synonym of **equatorial outline**.

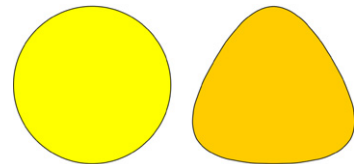


Equatorial outline

General description of the equator when a pollen grain is seen in polar view.

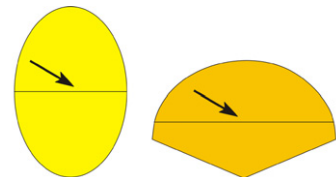
Synonym of limb.

See also: **amb**.



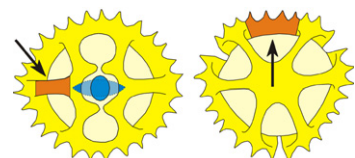
Equatorial plane (Fægri and Iversen, 1950)

The plane perpendicular to the polar axis and lying midway between the poles.



Equatorial ridge (Wodehouse, 1928)

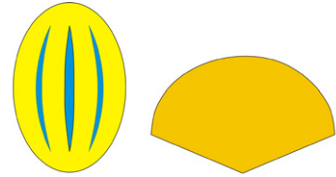
A ridge lying along the equator in the mesocolpial region, usually applied to lophate pollen grains. Example: *Cichorium intybus* (Compositae).



Equatorial view (Erdtman, 1943)

The view of a pollen grain or spore where the equatorial plane is directed towards the observer.

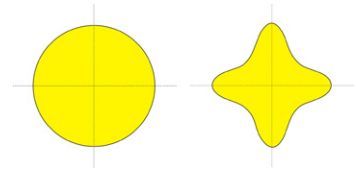
Antonym: **polar view**.



Equiaxe (adj. equiaxial) (Van Campo, 1966)

Pollen grains with a polar axis equal to the equatorial diameter.

See also: **breviaxe**, **longiaxe**.



Erect (adj.) (Reitsma, 1970)

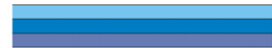
Synonym of **prolate**.



Etectate (adj.) (Walker, 1976)

Describing pollen grains interpreted as having lost their tectum during evolutionary development.

See also: **atectate**, **intectate**, **tectum**.



Eu-

A prefix for true.

Comment: When applied to patterns of structuring, such as **eurugulate**, **eustriate** and **eureticulate**, the prefix indicates the arrangement of the columellae. This contrasts with patterns on the tectum which are indicated by the prefix **supra-**.

See also: **supra-**.

Euintine (Kuprianova, 1948)

Synonym of **endintine**.

Eurypalynous (adj.) (Erdtman, 1952)

Describing plant taxa characterized by possession of a great diversity of palynomorphs.

Antonym: **stenopalynous**.

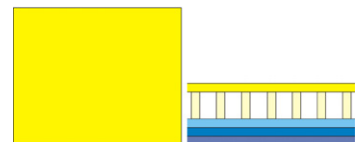
Eutectum (adj. eutectate)

Describing a pollen grain with a continuous tectum.

Synonym of **peritectate**, **tectum imperforatum** and **tectum solidum**.

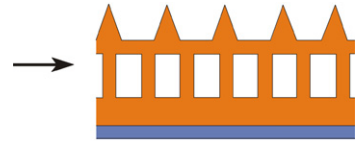
Antonym: **semitectum**.

See also: **tectum**.



Exine (pl. exines, adj. exinal, exinous) (Fritzsche, 1837)

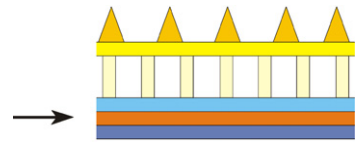
The outer layer of the wall of a **palynomorph**, which is highly resistant to strong acids and bases, and is composed primarily of **sporopollenin**.

**Exine 1** (Erdtman, 1969)

Synonym of **ectexine**.

**Exine 2** (Erdtman, 1969)

Synonym of **endexine**.

**Exintine** (Kress and Stone, 1982)

An outer (pectic) layer of the intine, lying below the nexine, and which stains positively with alcian blue.

Synonym of **ectointine**.

Antonym: **endintine**.

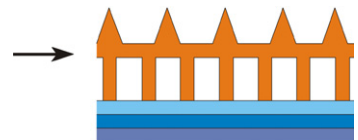
Exitus (Wodehouse, 1935)

The site of exit of the pollen tube from the sporoderm.

See also: **aperture**.

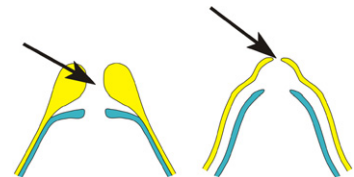
Exoexine (Potonié, 1934)

Synonym of **sexine**.

**Exogerminal** (adj.) (Batten and Christopher, 1981)

Describing an aperture formed in the outer wall layer of the exine.

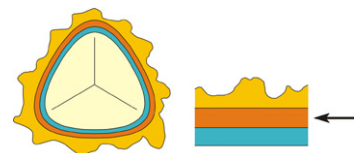
Comment: This term, used in descriptions of pollen of the fossil Normapolles group, is essentially equivalent to **ectoaperture**.

**Exospore**

The outer layer of a spore wall (Jackson, 1928).

Comment: A perispore, if present, lies outside the exospore, and is not part of it. Probably homologous with **exine** in pollen. Mycologists use the term for spores formed on the outside of a sporangium.

See also: **endospore**, **perispore**.



Exosporium (Erdtman, 1943)

Synonym of **exine**.

**Fastigium** (pl. fastigia, adj. fastigiate) (Reitsma, 1966)

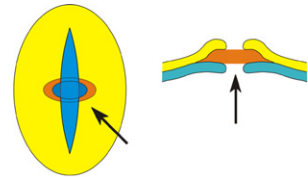
Cavity in a colpiate grain, appearing as a separation of the inner part of the exine from the domed sexine in the region of the endoaperture.

Example: *Hypericum* (Hypericaceae).

Synonym of **caverna**.

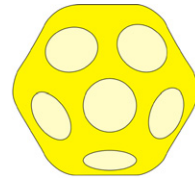
Comment: The term describes a feature morphologically similar to the vestibulum; the latter is restricted to porate pollen grains.

See also: **vestibulum**.

**Fenestrate** (adj.) (Iversen and Troels-Smith, 1950)

Describing a class of pollen grains characterized by large, window-like spaces lacking a tectum.

Comment: The term is accepted as a category in the classification system of Iversen and Troels-Smith (1950) and was especially established to include lophate pollen grains of the Compositae. Although useful for defining a class of pollen grains the term is not recommended in descriptions. Many such grains can be described as lophate.

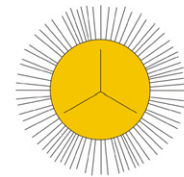
**Fimbria** (pl. fimbriae, adj. fimbriate)

Long, hair-like appendages (Jackson, 1928).

Comment: The term has been used in the descriptions of fossil spores.

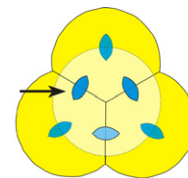
Example: *Radiatisporites radiatus*.

Synonym of **capillus**.

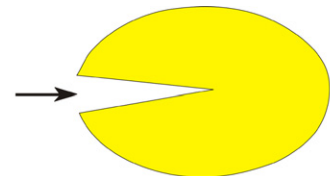
**Fischer's law/rule** (Erdtman, 1952)

The name given to the widespread arrangement in developmental tetrads of tri-aperturate pollen grains whereby the apertures form in pairs at six points in the tetrad. Example: Ericaceae.

See also: **Garside's law/rule**.

**Fissura** (pl. fissurae) (Potonié, 1934)

A sharp, straight split that appears during germination in certain inaperturate pollen grains. Examples: *Taxodium* (Taxodiaceae), *Cupressus* (Cupressaceae).

**Flange**

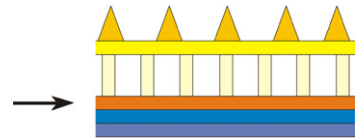
A general term, used to describe equatorial extensions of spores (Jackson, 1928).

Comment: This term is widely used in Palaeozoic spores, but is not precisely defined.

See also: **capsula**, **cingulum**, **corona**, **patina**, **zona**.

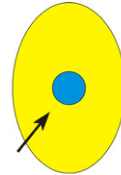
Foot layer (Fægri, 1956)

The inner layer of the ectexine.
 Synonym of nexine 1, pedium and sole.
 See also: **ectexine**.



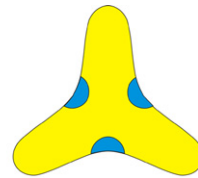
Foramen (pl. foramina, adj. forate, which is an abbreviation of foraminate) (Erdtman, 1952)

Synonym of **pore**.
 Comment: This term is sometimes used in its adjectival form forate (e.g. Walker and Doyle, 1975) which is a synonym of **pantoporate**. A special form of the term is **internal foramen**, which refers to features in the exine for example of certain Compositae and Acanthaceae pollen grains.
 See also: **internal foramen**.



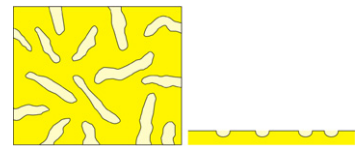
Fossaperturate (adj.) (Erdtman, 1952)

Refers to an equatorially aperturate, lobate pollen grain with the apertures in the indentations between the lobes.
 Comment: The term belongs in the system of ambis as described by Erdtman (1952).
 See also: **angulaperturate**, lobate, **sinu-aperturate**.



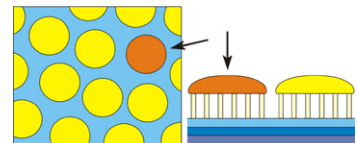
Fossula (pl. fossulae, adj. fossulate) (Fægri and Iversen, 1950)

A feature of ornamentation consisting of an elongated, irregular groove in the surface.
 See also: **foveola**.



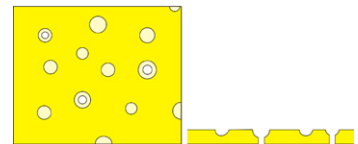
Fossula (Kuprianova, 1948)

Synonym of **areola**.



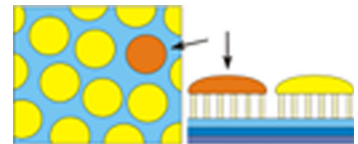
Foveola (pl. foveolae, adj. foveolate) (Erdtman, 1952)

A feature of ornamentation consisting of more or less rounded depressions or lumina more than 1 μm in diameter. The distance between foveolae is greater than their breadth.
 See also: **lumen**, **punctum**.

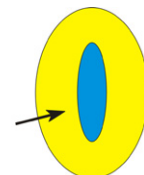


Frustillum (pl. frustilla, adj. frustillate) (Fægri and Iversen, 1964)

Synonym of **areola**.

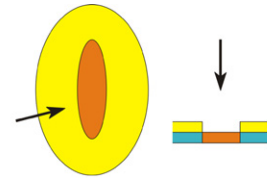
**Furrow**

A common word for an elongate aperture.
 Comment: Examples: **colpus**, **sulcus**, **tenuitas**.



Furrow membrane (Wodehouse, 1935)

Synonym of **colpus membrane**.

**Galea** (pl. galeae, adj. galeate) (Sullivan, 1964)

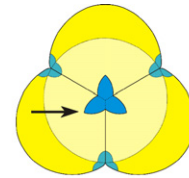
A relatively large element of the outer wall of a spore consisting of a sharply tapering spine and a broad bulbous base.

**Garside's law/rule** (Garside, 1946; Erdtman, 1952)

The name given to an unusual arrangement in developmental tetrads of tri-aperturate pollen whereby the apertures form in groups of three at four points in the tetrad.

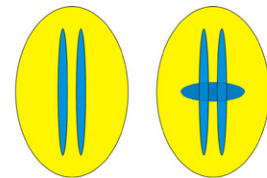
Comment: The name was given by Erdtman to a phenomenon described by Garside, and apparently restricted to Proteaceae.

See also: **Fischer's law/rule**.

**Geminicolpate** (adj.) (Erdtman, 1952)

Describing pollen grains with colpi arranged in pairs.

See also: **pontoperculum**.

**Gemma** (pl. gemmae, adj. gemmate) (Iversen and Troels-Smith, 1950)

A sexine element which is constricted at its base, higher than 1 μm , and that has approximately the same width as its height.

**Generative cell**

The cell in a pollen grain which divides to form male gametes (Jackson, 1928).

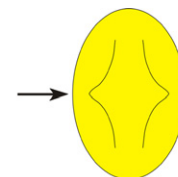
Geniculum (pl. genicula, adj. geniculate) (Potonié, 1934)

A bulge in the equatorial exine of the colpus, often associated with a separation of the sexine from the nexine and the rupturing of the latter.

Examples: *Fraxinus* (Oleaceae), *Quercus* (Fagaceae).

Comment: If the separation forms a cavity the term **fastigium** should be applied.

See also: **fastigium**.

**Germinal aperture** (Wodehouse, 1935)

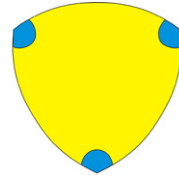
A hole in the furrow membrane through which the pollen tube emerges.

Comment: Examples: germ pore (synonym of **pore**), germinal furrow (synonym of **ectocolpus**).

Synonym of **exitus**.

Goniotreme (adj.) (Erdtman and Straka, 1961)

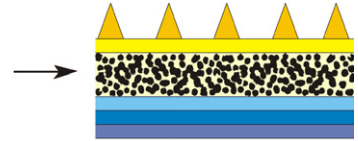
Synonym of **angulaperturate**.



Granular exine (Van Campo and Lugardon, 1973)

A type of exine stratification in which the infratectal layer is composed of more or less rounded, granules rather than of columellae or other structures.

See also: **columella**, **alveolate**.



Granulate granulatus (adj.) (Erdtman, 1947)

With granules.

Granule (pl. granules, adj. granular, granulose)

General word for a small, rounded element.

Granulum (pl. granula, adj. granulate, granulose) (sensu Erdtman, 1952)

A very small and rounded element of the sexine/ectexine that is less than 1 μm in all directions.

Comment: A granulum is the diminutive for granum.

See also: **scabrate**.

Granum (pl. grana) (Potonié, 1934)

The combined elements gemmae and verrucae.

Groove

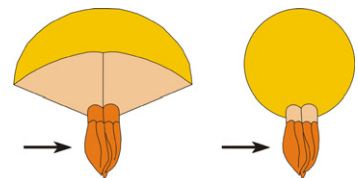
A general descriptive word.

See also: platea luminosa, **striate**.

Gula (pl. gulae, adj. gulate) (Potonié and Kremp, 1955)

A rather ornate projecting, neck-like, extension on the proximal face of a trilete spore. Example: *Lagenicula horrida*.

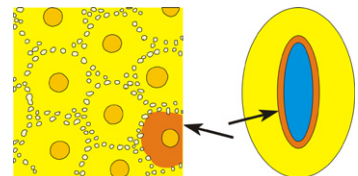
Comment: This term is mainly used in the description of some fossil megaspores.



Halo (Erdtman, 1952; Fægri and Iversen, 1989)

A clear zone around a well defined feature such as a spine or an aperture.

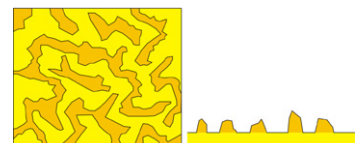
Examples: *Ranunculus acris* (Ranunculaceae), *Valeriana* (Valerianaceae).



Hamulate (adj.) (Kruttsch, 1959)

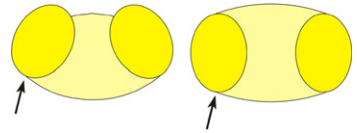
Describing a form of rugulate ornamentation consisting of irregularly arranged, winding, or angular rounded muri of varying thickness, which do not form a distinct reticulum, but rather a maze-like pattern. Example: *Lycopodiella inundata* (Lycopodiaceae).

Comment: Mostly used in spore terminology.



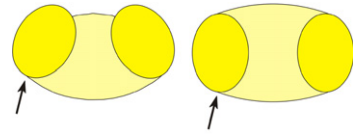
Haploxyton-type (Rudolph, 1935)

Bisaccate pollen in which the outline of the sacci in polar view is more or less continuous with the outline of the corpus, so that the grains appear a more or less smooth ellipsoidal form. Examples: *Pinus cembra*, *Picea* (Pinaceae). See also: diploxytonoid, haploxytonoid, **Sylvestris-type**.

**Haploxytonoid** (adj.) (Traverse, 1988)

Describing bisaccate pollen in which the outline of the sacci in polar view is more or less continuous with the outline of the corpus, so that the grains appear a more or less smooth ellipsoidal form.

See also: diploxytonoid, **Haploxyton-type**, **Sylvestris-type**.

**Harmomegathy** (adj. harmomegathic) (Wodehouse, 1935)

The process by which pollen grains and spores change in shape to accommodate variations in the volume of the cytoplasm caused by changing hydration.

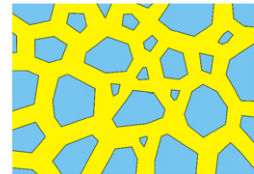
H-endoaperture (Punt and Nienhuis, 1976)

An elaborate endoaperture, consisting of a central part which connects two lateral, longitudinal elongations, forming an “H” shape. Examples: *Cornus* (Cornaceae), *Centaurium* (Gentianaceae).

**Heterobrochate** (adj.) (Erdtman, 1952)

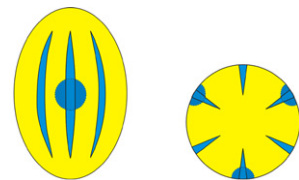
Describing a reticulum with **brochi** of different sizes. Examples: *Adoxa Moschatelina* (Adoxaceae), *Forsythia europaea* (Oleaceae).

See also: **brochus**, **lumen**.

**Heterocolpate** (adj.) (Iversen and Troels-Smith, 1950)

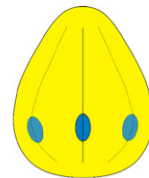
Describing pollen grains with both simple and compound colpi present. Examples: *Lythrum*, *Peplis* (Lythraceae), *Myosotis* (Boraginaceae).

See also: pseudocolpus.

**Heteropolar** (adj.) (Erdtman, 1952)

Describing pollen or spores in which the distal and proximal faces of the exine are different, either in shape, ornamentation or apertural system. Example: *Echium vulgare* (Boraginaceae).

Antonym: **isopolar**.

**Heterosporous** (adj.)

Describing plants producing both **microspores** and **megaspores** (Jackson, 1928).

Antonym: **homosporous**.

See also: **isosporous**.

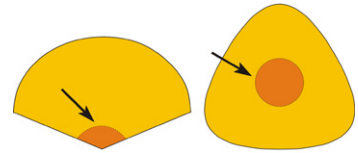
Hilum (pl. hila, adj. hilate) (Erdtman, 1952)

Circular, indistinctly delimited, irregular aperture or thinning in spores.

Examples: *Aequitriradites verrucosus*, *Couperisporites tabulatus*.

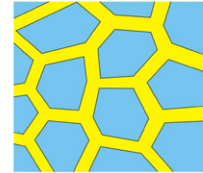
Comment: This kind of feature is present in certain bryophytes and fungi and may occur on the proximal or distal face.

See also: **polumbra**.

**Homobrochate** (adj.) (Erdtman, 1952)

Describing a reticulum with **brochi** of the same sizes. Example: *Armeria maritima* (Plumbaginaceae).

See also: **brochus**, **lumen**.

**Homosporous** (adj.)

Describing plants producing only one kind of spores (Jackson, 1928).

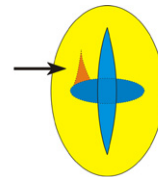
Synonym of **isosporous**.

Antonym: **heterosporous**.

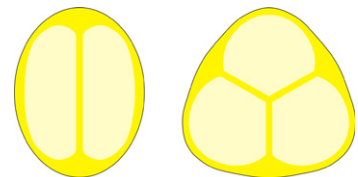
Horn (Huynh, 1970)

An elongated part of an endoaperture, which is curved towards one of the poles. Example: *Anagallis arvensis* (Primulaceae).

See also: **H-endoaperture**.

**Impression mark** (Harley, 1998)

A mark on the proximal face of a pollen grain retained from the post-meiotic stage. This mark can be linear from tetragonal tetrads or Y-shaped from tetrahedral tetrads. Examples: *Nypa fruticans*, *Howea balmooreana* (Palmae).

**In-**

A prefix used to emphasize the absence of a feature, as for example in **inaperturate**.

See also: **A-**.

Inaperturate (adj.) (Iversen and Troels-Smith, 1950)

Describing a pollen grain or spore without apertures. Example: *Populus* (Salicaceae), *Taxus* (Taxaceae).

Comment: The term should be used where apertures are completely absent. If ectoapertures are absent, but endoapertures are present, the pollen is cryptoaperturate.

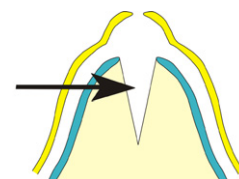
See also: **cryptoaperture**, **omniaperturate**.

Incidence (pl. incidences) (Batten and Christopher, 1981)

A structure formed by the termination of the inner wall layer at the endogerminal which gives rise to a deep V-shaped atrium that points towards the centre of the grain. Example: *Pseudotrudopollis*.

Comment: This term is used in descriptions of the fossil Normapolles group.

See also: **cuneus**.



Infra-

A prefix meaning below or beneath.

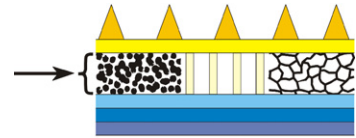
Comment: The term is often used for patterns underneath a complete or partial tectum. Examples: **infrareticulate**, **infrarugulate**, **infrastriate**, **infrastructure**, **infratectate**.

See also: intra-.

Infratectum (pl. infratecta, adj. infratectate) (APLF, 1975)

A general term for the layer beneath the tectum, which may be alveolar, granular, columellar, or structureless.

Synonym of interstitium (Walker and Walker, 1981).

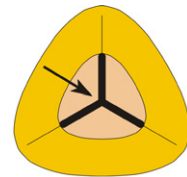
**Infraturma** (pl. infraturmae) (Potonié, 1956)

An artificial grouping of form-genera of spores and pollen in the turma-system of Potonié.

See also: **anteturma**, **subturma**, **turma**.

Inner tetrad mark (Gupta and Udar, 1986)

A tetrad mark at the inner layer of a spore and which does not reach up to the margin when seen in polar view and always smaller than the outer tetrad mark.

**Inordinate** (adj.) (Iversen and Troels-Smith, 1950)

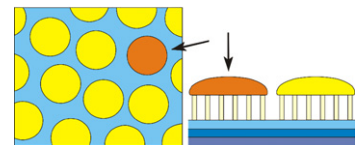
Describing a pollen grain or spore with an arrangement of elements irregularly distributed.

Antonym: **ordinate**.

Comment: The elements can be of structural or sculptural origin. Examples: **columellae** under a **tectum**; **scabrae** on the **tectum**.

Insula (pl. insulae, adj. insulate) (Straka, 1964)

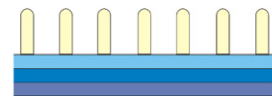
Synonym of **areola**.

**Intectate** (adj.) (Iversen and Troels-Smith, 1950)

Describing pollen grains without a tectum, but with sculpturing.

Examples: *Viscum* (Loranthaceae), *Ilex* (Araliaceae).

See also: **atectate**, **etectate**, **semitectate**, **tectum**.

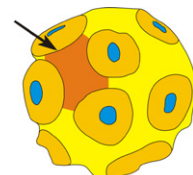
**Inter-**

A prefix for in between.

Comment: In palynology the prefix has been used in many different contexts, from indicating position of apertures to defining areas of the surface.

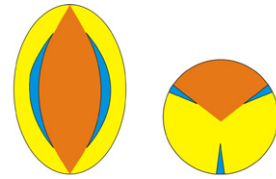
Interaspidium (pl. interaspidia) (Hoen and Punt, 1989)

The area of exine between aspides. Example: *Dorstenia* (Moraceae).

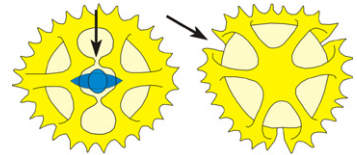


Intercolpium (Fægri and Iversen, 1950)

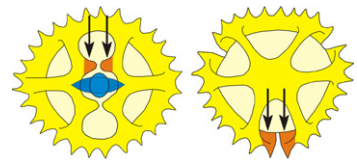
The meridional segment between two colpi and extending to the poles.
 Comment: The terms **mesocolpium** and **apocolpium** are recommended because they enable a more precise subdivision of the pollen surface.
 See also: **apocolpium**, **mesocolpium**.

**Interlacunar gaps** (Wodehouse, 1935)

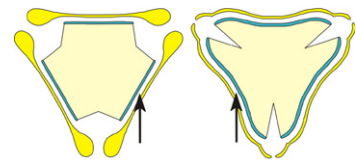
Gaps in the short sexinous ridges which often divide the ectoapertures of lophate pollen grains into lacunae. Example: *Cichorium intybus* (Compositae).
 See also: **lophate**.

**Interlacunar ridges** (Wodehouse, 1935)

Ridges separating the lacunae in lophate pollen grains. Example: *Cichorium intybus* (Compositae).

**Interloculum** (pl. interlocula) (Thomson and Pflug, 1953)

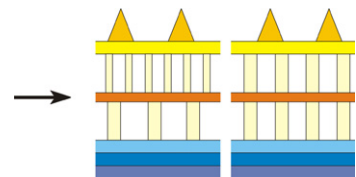
A space between the inner- and outer wall layers that is present around most or all of the pollen grain. Example: *Extratriporopollenites conjunctus*.
 Comment: The term was originally used for features in pollen of the Triatrioperturate category of the fossil Normapollens group.

**Internal foramen** (pl. internal foramina) (Skvarla and Larson, 1965)

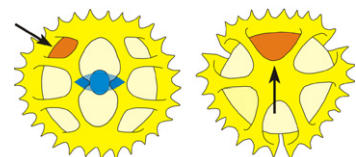
Foramen present within the sexine/ectexine.
 See also: **foramen**.

**Internal tectum** (Skvarla and Larson, 1965)

A more or less continuous layer within the outer sexine/ectexine composed of laterally connected parts of columellae. Examples: *Nigella damascena* (Ranunculaceae), *Chrysanthemum leucanthemum* (Asteraceae).
 Comment: Differs from **infratectum** and **interstitium** in being a single layer rather than referring to a number of elements under the tectum.

**Interporal lacuna** (pl. interporal lacunae) (Wodehouse, 1935)

A lacuna occurring between the ends of two ectoapertures and adjacent to the polar area of a lophate pollen grain. Example: *Tragopogon pratensis* (Compositae).
 See also: **lacuna**.

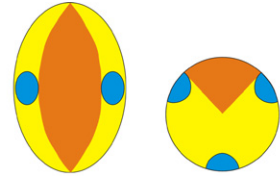


Interporium (pl. interporia) (Iversen and Troels-Smith, 1950)

The meridional segment between two pores extending to the poles.

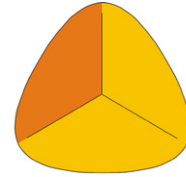
Comment: The terms **mesoporium** and **apoporium** are recommended because they enable a more precise subdivision of the pollen surface.

See also: **apoporium**, **mesoporium**.

**Interradial** (adj.) (Couper and Grebe, 1961)

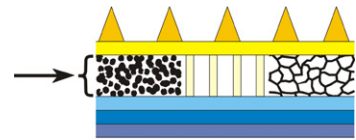
Referring to areas of the proximal face or the equatorial periphery of trilete spores, lying between the radial arms of the laesurae.

Comment: Interradial is also used to indicate the position of apertures with reference to tetrad organisation (Walker and Doyle, 1975).

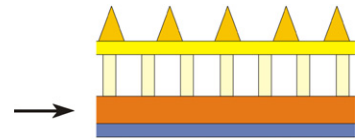
**Interstitium** (Walker and Walker, 1981)

The layer of the exine situated between the nexine and the tectum.

Synonym of **infratectum**.

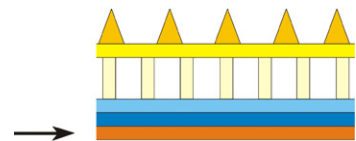
**Intexine** (Potonié, 1934)

Synonym of **nexine**.

**Intine** (Fritzsche, 1837)

The innermost of the major layers of the pollen grain wall underlying the exine and bordering the surface of the cytoplasm.

Comment: The intine is not acetolysis resistant and is therefore absent in conventionally prepared palynological material.



Intra-

A prefix meaning within.

See also: **infra-**.

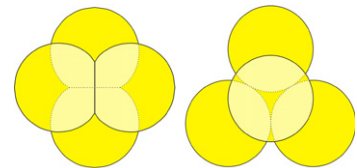
Intrareticulum (adj. intrareticulate) (Iversen and Troels-Smith, 1950)

Synonym of **infrareticulum**.

Isodiametric tetrad

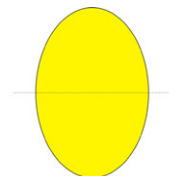
A general term for tetrads in which all members are more or less the same in size.

Antonym: **anisodiametric tetrad**.

**Isopolar** (adj.) (Erdtman, 1947)

Describing a pollen grain or spore in which the proximal and distal faces of the exine are alike.

Antonym: **heteropolar**.



Isospore

A spore of a plant producing only one kind of spore (Jackson, 1928).
See also: **miospore**.

Isosporous (adj.)

Describing plants producing only one kind of spore (Jackson, 1928).
Synonym of **homosporous**.
Antonym: **heterosporous**.

Kyrtome (Potonié and Kremp, 1955)

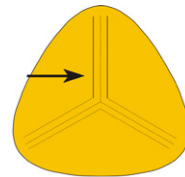
A more or less arcuate fold or band in the **interradial** areas outside the laesurae of trilete spores. Examples: *Ahrensisporites guerickei*, *Concavisorites rugulatus*.
Comment: Some palynologists prefer to use **torus** for separate interradianal bands, and **kyrtome** for a connected feature.
See also: **torus**.

**Labrum** (pl. labra, adj. labrate) (Thomson and Pflug, 1953)

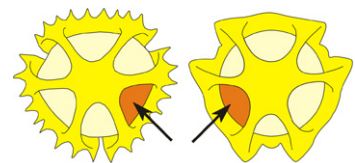
Protruding part of the exine at the pores of porate pollen grains.
Example: *Lusatipollis*.
Comment: This feature is especially prominent in many representatives of the fossil pollen of the Normapolles group.
See also: **vestibulum**.

**Labrum** (pl. labra, adj. labrate) (Couper and Grebe, 1961)

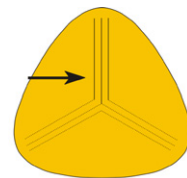
The elevated and/or thickened part of a laesura between the **commissure** and the remainder of the proximal surface.
See also: **margo**.
Comment: The term is mainly used in the descriptions of fossil spores. Because of possible confusion with the term **labrum** (sensu Thomson and Pflug, 1953) it is, however, suggested to use the term **margo** instead.

**Lacuna** (pl. lacunae, adj. lacunate) (Wodehouse, 1928)

A depressed area surrounded by ridges in **lophate** pollen grains.
See also: **abporal lacuna**, **circumpolar lacuna**, **equatorial lacuna**, **interporal lacuna**, **paraporal lacuna**, **polar lacuna**, **poral lacuna**.

**Laesura** (pl. laesurae, suffix-lete) (Erdtman, 1946)

The arm of a proximal fissura or scar of a spore.
Comment: A monolete spore has one laesura, a trilete spore three (although some palynologists consider a trilete spore to have a single triradiate laesura). A laesura comprises a **commissure** which may be bordered by a **margo (labrum)**.
See also: **monolete**, **trilete**.



Laevigate (adj.)

A general term for smooth, as if polished (Jackson, 1928).

Synonym of **psilate**.

Orthographical variant: levigate.

Comment: Although the correct Latin spelling is levigate, the spelling laevigate is accepted throughout the botanical literature (Jackson, 1928).

The term has mostly been used in the descriptions of fossil spores.

Example: *Laevigatisporites*.

Lalongate (adj.) (Erdtman, 1952)

Describing the shape of a transversely elongated endoaperture. Example: *Filipendula* (Rosaceae).

See also: **lolongate**.

**Lamella** (pl. lamellae, adj. lamellar, lamellate)

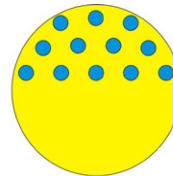
A general term for a thin layer (Jackson, 1928).

Latimurate (adj.) (Erdtman, 1952)

Describing a pollen grain or spore with broad muri.

Latiporate (adj.) (Norem, 1958)

Describing pollen grains with pores in one hemisphere only. Examples: *Juglans*, *Carya* (Juglandaceae).

**Latitudinal** (adj.)

A general descriptive term, in palynology applied to features which run in lines parallel to the equator.

Antonym: **longitudinal**.

See also: **sulcus**.

Layer

A general term. Applied in palynology to any distinct stratum of the sporoderm (APLF, 1975).

-lept (Erdtman, 1969)

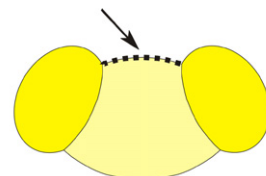
A suffix for thin, indicating that a pollen grain has a **leptoma**.

Leptoma (Erdtman and Straka, 1961)

A thin area at the distal pole of a pollen grain, presumed to function as an aperture. Example: *Pinus* (Pinaceae).

Comment: substitute term for cappula.

See also: **tenuitas**.

**-lete** (Erdtman, 1969)

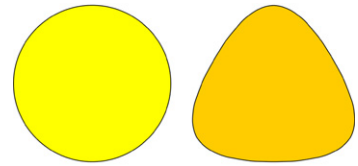
A suffix to denote the presence (or absence) of laesura. Examples: **alete**, **monolete**, **trilete**.

Levigate (adj.)

Orthographical variant of **laevigate**.

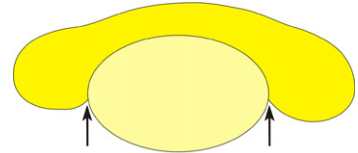
Limb (Wodehouse, 1935)

Synonym of **equatorial outline**.



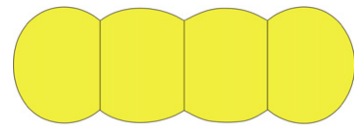
Limbus (Potonié and Kremp, 1955)

A sharp narrow crease of the saccus or pseudosaccus where the outer and inner exine layers are fused. Example: *Nuskoisporites dulhuntyi*.



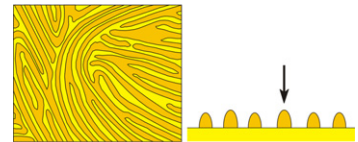
Linear tetrad (Erdtman, 1945b)

A uniplanar tetrad in which the four members are arranged in a row. Example: *Typha* spp. (Typhaceae). See also: **tetrad**.



Lira (pl. lirae) (Erdtman, 1952)

A narrow ridge which forms the murus in a striate pattern. Synonym of **murus** and vallum.

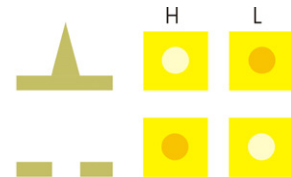


LO-analysis (Erdtman, 1952)

A method for analyzing patterns of sexine organization by means of light microscopy.

Comment: This method is valuable for elucidating exine patterns. When focused at high level (H), raised sexine elements appear bright (Lux), whereas holes in the tectum are relatively dark (Obscuritas). At lower focus (L) holes become lighter and the sexine elements become darker.

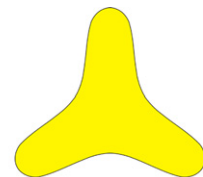
See also: **LO-pattern**, **OL-pattern**.



Lobate (adj.) (Kuyll et al., 1955)

Describing an equatorially aperturate pollen grain with a lobed shape in polar view.

Comment: Belongs to a system of shapes combined with the position of the apertures as introduced by Kuyll et al.



Lolongate (adj.) (Erdtman, 1952)

Describing the shape of a longitudinally elongated endoaperture.

Example: *Rumex* spp. (Polygonaceae).

See also: **lalongate**.



Longi-

A prefix for long.

Longiaxe (adj. logiaxal) (Van Campo, 1966)

Pollen grains with a polar axis longer than their equatorial diameter.

Synonym of **prolate** (s.l.).

Antonym: **breviaxe**.

Comment: Thompson and Pflug (1953) recognised Longaxones as a group of mid-Cretaceous and younger angiosperm pollen contrasted with Brevaxones.

**Longitudinal** (adj.)

A general descriptive term, in palynology applied to features which run in lines between the poles.

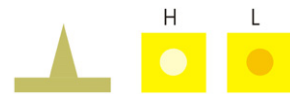
Antonym: **latitudinal**.

See also: **lolongate**.

LO-pattern (Erdtman, 1952)

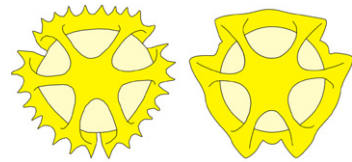
A pattern of ornamentation that appears to show “bright islands” at high focus (H) and that become dark at low focus (L), observed when using LO-analysis.

Comment: The reverse of OL-pattern.

**Lophate** (adj.) (Wodehouse, 1935)

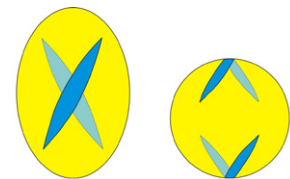
Describing a pollen grain in which the outer exine is raised in a pattern of ridges (lophae) surrounding depressions (lacunae). Example: *Hieracium* (Compositae).

See also: **echinolophate**, **psilolophate**.

**Loxocolp(or)ate** (adj.) (Erdtman and Straka, 1961)

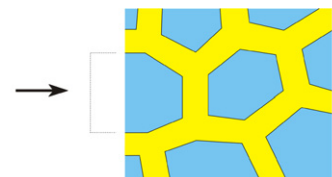
Describing zonocolp(or)ate pollen with ectocolpi arranged so that they converge in pairs.

Comment: Such apertures generally occur in aberrant grains with more than the typical number of apertures.

**Lumen** (pl. lumina) (Potonié, 1934)

The space enclosed by the muri.

See also: **brochus**, **reticulum**.

**Macrospore**

General term for the larger spores of heterosporous vascular plants (Jackson, 1928).

Antonyms: **microspore** (in the general botanical sense);

miospore (in the sense of Guennel, 1952).

Comment: In dispersed fossil spores where it is not always possible to determine whether the parent plants were heterosporous the term indicates size only (usually >200 µm).

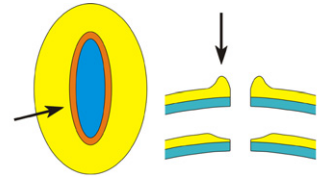
See also: **megaspore**.

Maculate (adj.) (Potonié, 1934)

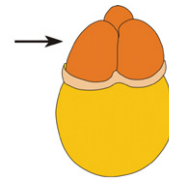
A general descriptive term. In palynology it can be applied to pollen grains or spores with a spotted exine, often due to variations in internal exine structure. Example: *Maculatisporites*.

Margo (pl. margines, adj. marginate) (Iversen and Troels-Smith, 1950)

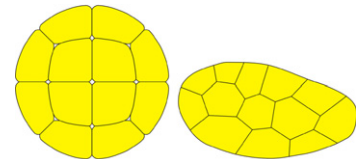
An area of exine around an ectocolpus that is differentiated from the remainder of the sexine, either in ornamentation or by difference in thickness. See also: **annulus**, **labrum**.

**Massa** (pl. massae) (sensu Potonié, 1956)

A specialised structure composed of aborted spores and tapetal material found on certain megaspores and often referred to as a floating apparatus. Applied only to megaspores. Examples: *Azolla* (Azollaceae), *Cytosporites varius*.

**Massula** (pl. massulae, adj. massulate)

A general term for aggregations of pollen grains dispersed as a unit (Jackson, 1928). Examples: Mimosaceae, Periplocaceae. See also: **dispersal unit**, **polyad**, **pollinium**.



Medine (Saad, 1963)

A term applied to a faintly lamellated, acetolysis resistant layer considered to be situated between intine and exine. See also: mesine.

Megaspore

A general term for large spores of heterosporous vascular plants (Jackson, 1928). See also: **microspore**, **macrospore**.

Meiosis (adj. meiotic)

The reduction division of chromosomes (Jackson, 1928).

Meiospore

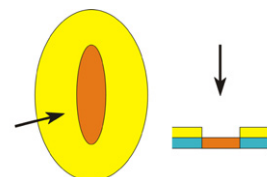
General term for a spore produced by meiosis (Jackson, 1928).

Melissopalynology (Maurizio and Louveaux, 1960)

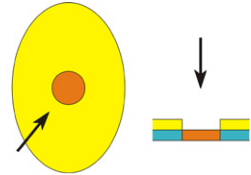
The study of pollen grains collected by bees, and/or found in honey. Comment: The variants melitopalynology (Erdtman, 1952) and melittopalynology (Fægri and Iversen, 1975) are sometimes encountered.

Membrana colpi (pl. membranae colpi) (Iversen and Troels-Smith, 1950)

Synonym of **colpus membrane**.



Membrana pori (pl. membranae pori) (Iversen and Troels-Smith, 1950)
 Synonym of **pore membrane**.

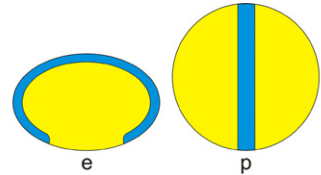


Meridional (adj.) (Fægri and Iversen, 1950)

Describing longitudinal features on the surface of a pollen grain or spore which run along lines perpendicular to the equator.

Meridionosulcus (adj. meridionosulcate) (Sampson, 1976)

A meridional sulcus. Example: *Degeneria vitiensis* (Degeneriaceae).
 See also: **zonasulcus**.



Mesine (Rowley, 1959)

A laminated, electron-dense layer considered to lie between the intine and the exine.

Comment: Probably the same as the medine, but defined on different methods of microscopy.

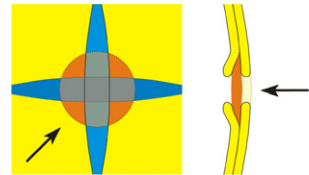
See also: medine.

Meso-

A prefix meaning middle.

Mesoaperture (adj. mesoaperturate) (Thanikaimoni, 1980)

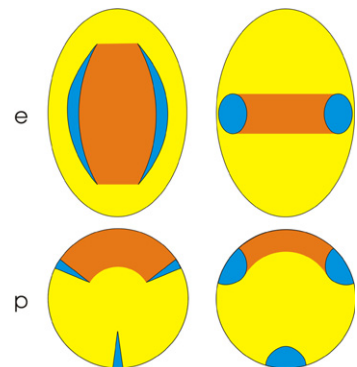
The middle part of a compound aperture in which there is also an ectoaperture and an endoaperture. Example: *Polygonum aviculare* (Polygonaceae).



Mesocolpium (pl. mesocolpia) and **Mesoporium** (pl. mesoporia) (Erdtman, 1952)

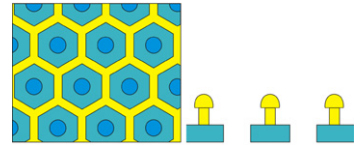
The area of a pollen grain surface delimited by lines between the apices of adjacent colpi or the margins of adjacent pores.

See also: **apocolpium**, **apoporium**, **intercolpium**, **interporium**.



Metareticulum (adj. microreticulate) (Borsch and Bathlott, 1998)

A reticulum which is characterized by the consistent presence of one porate aperture in each lumen. Examples: *Froelichia floridana* (Amaranthaceae), *Viviania rosea* (Vivianiaceae), *Kallstroemia maxima* (Zygophyllaceae).

**Micro-**

A prefix for small.

Comment: In palynology, generally used to denote features less than 1 μm .

Examples: **microechinate**, **microverruca**.

See also: **nano-**.

Microreticulum (adj. microreticulate) (Praglowski and Punt, 1973)

A reticulate ornamentation consisting of muri and lumina smaller than 1 μm .

See also: **reticulum**.

Microspore

A general term for the smaller spores of heterosporous plants, that is, the spores from which the microgametophyte develops (Jackson, 1928).

Antonyms: **macrospore**, **megaspore**.

Comment: The term is sometimes used in palaeopalynology for small spores generally, whether homosporous, microspores or even small megaspores. This usage should be avoided, in favour of the term miospore or small spore, but only if it is not known the plant is homosporous or not. A pollen grain is the microgametophyte of a seed plant. In developmental studies, a pollen grain is sometimes referred to as microspore until microspore mitosis.

See also: **miospore**, **pollen**.

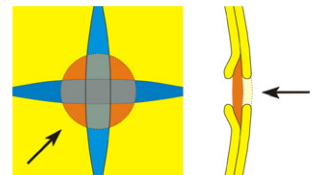
Microsporocyte

A general term for the mother cell of a microspore or pollen grain (Jackson, 1928).

See also: **pollen mother cell**.

Middle part (Punt and Rentrop, 1973)

Synonym of **mesoaperture**.

**Miospore** (Guennel, 1952)

A general term for all fossil plant spores smaller than 200 μm , regardless of whether they are isospores, microspores, small megaspores, prepollen or pollen grains.

Antonym: **macrospore**.

See also: **microspore**, **pollen**.

Mitosis

A general term for nuclear division involving no reduction of chromosomes (Jackson, 1928).

Monad (Selling, 1947)

A pollen grain or spore dispersed as an individual unit, rather than in association with others, such as in a dyad, tetrad or polyad.

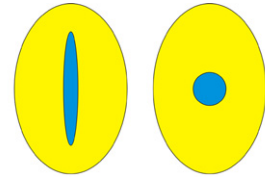
Mono-

A prefix for one.

Monoaperturate (adj.)

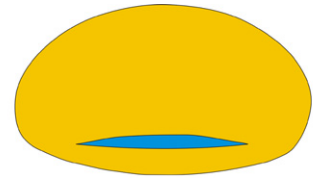
Describing a pollen grain or spore with a single aperture.

Comment: Examples: **monocolpate** (Iversen and Troels-Smith, 1950), **monoporate** (Iversen and Troels-Smith, 1950) **monosulcate** (Erdtman, 1952).

**Monolete** (adj.) (Erdtman, 1943)

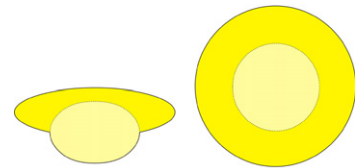
Describing a spore with a single laesura. Example: *Dryopteris* (Dryopteridaceae).

See also: **trilete**.

**Monosaccate** (adj.) (Potonié and Kremp, 1954)

Describing a pollen grain with a single saccus. Example: *Florinites antiquus*.

See also: **bisaccate**.

**Morphon** (Van der Zwan, 1979)

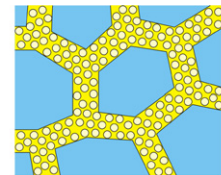
A group of form-species exhibiting continuous variation of morphological characteristics in a single time sequence (“horizontal” variation).

Comment: Many authors use the word “complex” in a very similar way.

See also: **palynodeme**.

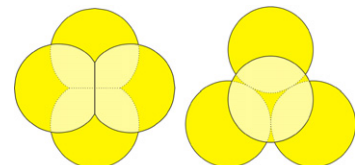
Multibaculate (adj.) (Erdtman, 1952)

Synonym of **pluricolumellate**.

**Multiplanar tetrad** (Walker and Doyle, 1975)

A tetrad in which the individual members are arranged in more than one plane.

Comment: Decussate and tetrahedral tetrads are multiplanar, whereas rhomboidal, linear and T-shaped tetrads are uniplanar.



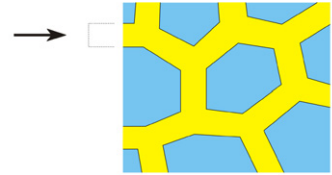
Murornate sculpture elements (Smith and Butterworth, 1967)

Elevations of the general surface. Examples: **cristae**, **muri**.

Murus (pl. muri) (Erdtman, 1943)

A ridge that is part of the ornamentation and, for example, separates the lumina in a reticulate pollen grain or the striae in striate pollen grain.

Comment: Muri in striate patterns are sometimes called valla (Iversen and Troels-Smith, 1950) or lirae (Erdtman, 1952).

**Nano-** (Erdtman, 1969)

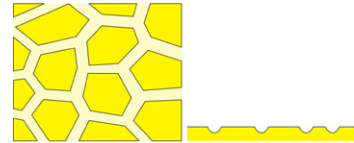
A prefix for elements smaller than 0.5 μm .

See also: **micro-**.

Negative reticulum (Erdtman, 1943)

A general term used to describe patterns of ornamentation in which sexine areas are separated by narrow, reticulately arranged grooves.

See also: **areola**, frustillum.

**Nexine** (Erdtman, 1952)

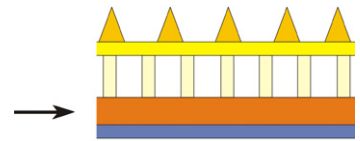
The inner, non-sculptured part of the exine which lies below the sexine.

Antonym: **sexine**.

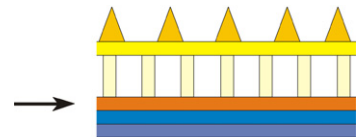
Comment: Although the term **endexine** as originally defined (sensu Erdtman, 1943) was more or less synonymous with nexine it no longer is because endexine is now invariably used in the sense of Fægri (1956).

Nexine and sexine are distinguished on purely morphological criteria, whereas ectexine and endexine differ in their staining properties. The two sets of terms therefore have slightly different applications.

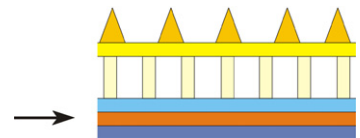
See also: **endexine** (sensu Fægri, 1956).

**Nexine 1** (Erdtman, 1966a)

Synonym of **foot layer**, pedium, sole.

**Nexine 2** (Erdtman, 1966a)

Synonym of **endexine**.

**Non-aperturate** (adj.) (Fægri and Iversen, 1950)

Synonym of **inaperturate**.

Normapolles (Pflug, 1953)

A group of Cretaceous and Lower Palaeogene pollen, usually triporate, with a complex pore apparatus.

NPC-classification (Erdtman and Straka, 1961)

A morphological system for classifying pollen grains and spores that was based on the number, position and character of their apertures.

Nudate (adj.) (Punt et al., 1976)

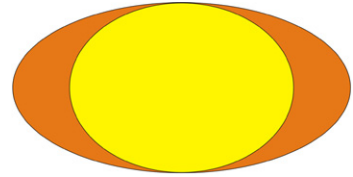
Synonym of **psilate**.

Oblate (adj.) (Erdtman, 1943)

Describing the shape of a pollen grain or spore in which the polar axis is shorter than the equatorial diameter.

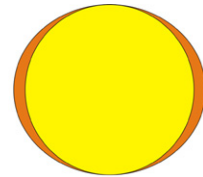
Comment: This term belongs to the system of shape classes suggested by Erdtman (1943, extended in 1952), based on the measurements of the polar axis (P) and equatorial diameter (E). In this system oblate is defined as a ratio between the polar axis and the equatorial diameter of 0.50–0.75.

See also: **oblate spheroidal**, **P/E ratio**, **peroblate**, **perprolate**, **prolate**, **prolate spheroidal**, **shape classes**, **spheroidal**, **suboblate**, **subprolate**, **subspheroidal**.

**Oblate spheroidal** (adj.) (Erdtman, 1952)

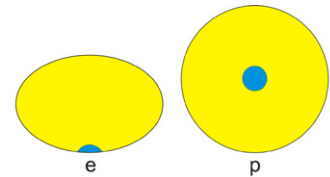
Describing the shape of a pollen grain or spore in which the ratio between the polar axis and the equatorial diameter is 0.88–1.00.

See also: **oblate**, **P/E ratio**, **peroblate**, **perprolate**, **prolate**, **prolate spheroidal**, **shape classes**, **spheroidal**, **suboblate**, **subprolate**, **subspheroidal**.

**Ocellus** (pl. ocelli, adj. ocellate) (Grebe, 1971)

Synonym of **cata-ulcus**.

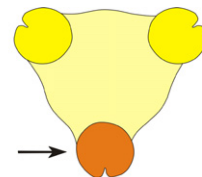
See also: **ulcus**.

**Oculus** (pl. oculi, adj. oculate) (Thomson and Pflug, 1953)

The much enlarged part of the pore structure in pollen of the fossil Normapolles group. Example: *Oculopollis*.

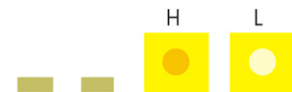
Comment: The enlarged part is a swelling of the outer wall layer on one or both surfaces of a grain in the region of an exogerminal. An annulus is uniformly thick and completely surrounds the exogerminal region.

See also: **annulus**.

**OL-pattern** (Erdtman, 1952)

A pattern of ornamentation that appears to show “dark islands” at high focus (H) and that become bright at low focus (L).

Comment: The reverse of a **LO-pattern**.

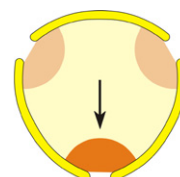
**Omniperturate** (adj.) (Thanikaimoni, 1984)

Describing a pollen grain in which the exine is very thin or absent and the intine is thick, so that no specific apertural region can be distinguished and thus the whole surface can be considered apertural in nature.

Oncus (pl. onci) (Hyde, 1955)

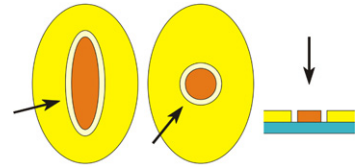
A lens-shaped structure that is not resistant to acetolysis and occurs beneath the apertures of many kinds of pollen grains. Example: *Corylus* (Betulaceae).

See also: **Zwischenkörper**.



Operculum (pl. opercula, adj. operculate) (Wodehouse, 1935)

A distinctly delimited sexineectexine structure which covers part of an ectoaperture and which is completely isolated from the rest of the sexine. See also: **pontoperculum**.

**Optical (cross-) section**

The image seen in optical microscopy when the plane of focus is half way through a palynomorph.

Orbicule (pl. orbicules, adj. orbicular)

A general term, applied in palynology for an orbicular granule of sporopollenin.

Synonym of **Ubisch body**.

Ordinate (adj.) (Iversen and Troels-Smith, 1950)

Describing a pollen grain or spore with an arrangement of elements regularly distributed.

Antonym: **inordinate**.

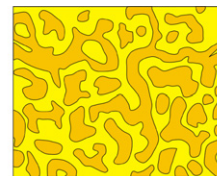
Comment: The elements can be of structural or sculptural origin. Examples: **columellae** under a **tectum** forming a **reticulum** (example: *Vaccaria pyramidata*, Caryophyllaceae); **scabrae** on the tectum (example: *Alchemilla glabra*, Rosaceae) arranged in a regular pattern.

Ornamentation (Potonié, 1934)

A general term that is useful for describing the organisation of features. See also: **pattern**, **sculpture**.

Ornate (adj.) (Erdtman, 1953)

Describing a reticulate ornamentation consisting of broad, curved muri and lumina that are often anastomosing. Example: *Ceiba aesculifolia* (Bombacaceae).

**Orthocolpate** (adj.) (Erdtman and Straka, 1961)

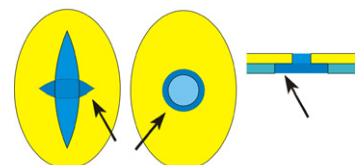
Describing a pollen grain with the colpi in the most common position, perpendicular to the equator.

Comment: This term is not needed in most instances, where **zonocolpate** would suffice, but exists to contrast with the term **loxocolpate**.

**Os** (pl. ora, adj. orate) (Erdtman, 1952)

Synonym of **endoaperture**.

Comment: The term is now mainly used in so far as that ora is a component of the terms colporus and pororate.



Outline

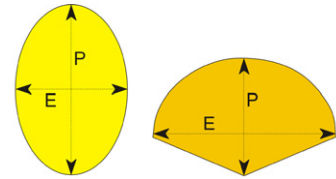
A general descriptive word. Applied in descriptive terms like **equatorial outline** and **outline in polar view**.

P/E ratio (Erdtman, 1943)

The ratio of the length of the **polar axis (P)** to the **equatorial diameter (E)**.

Comment: Erdtman suggested a widely used system of shape classes defined on the basis of P/E ratios.

See also: **oblate**, **oblate spheroidal**, **peroblate**, **perprolate**, **prolate**, **prolate spheroidal**, **shape classes**, **spheroidal**, **suboblate**, **subprolate**, **subspheroidal**.



Palaeopalynology (Mantel, 1966)

The study of fossil **palynomorphs**.

Antonym: **actuopalynology**.

Palynodebris (Manum, 1976)

All palynomorph-sized particles in a sediment excluding those that actually are palynomorphs but including, for example, wood fragments, cuticles and some animal remains.

See also: **phytoclast**.

Palynodeme (Visscher, 1971)

A group of palynomorph species (form-species) that intergrade and represent the reflection of a known or hypothetical plant species.

Comment: As originally used the concept was phylogenetic and referred to characters changing in time (“vertical” change). The term is, however, misused by some authors as if synonymous with morphon and the less formal term “complex”.

See also: **morphon**.

Palynofacies (Combaz, 1964)

The assemblage of **phytoclasts** found in a particular sediment, such as palynomorphs, wood fragments, cuticles, etc.

Comment: The term is actually used in two senses, namely the palynolithofacies and palynobiofacies.

See also: **phytoclast**.

Palynogram (Erdtman, 1952)

A diagram summarising the main morphological features of a palynomorph.

Palynology (Hyde and Williams, 1944)

The study of pollen grains and spores and of other biological materials that can be studied by means of palynological techniques.

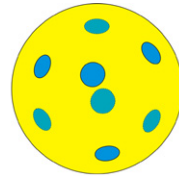
Comment: A number of subdisciplines may be recognised, including **palaeopalynology**, **aeropalynology**, **melissopalynology** and **pollen analysis**.

Palynomorph (Tschudy, 1961)

A general term for all entities found in palynological preparations.
 Comment: In addition to pollen grains and spores, the term encompasses acritarchs, dinoflagellates and scolecodonts, but not other microfossils, such as diatoms, that are dissolved by hydrofluoric acid.

Panporate (adj.) (Erdtman and Vishnu-Mittre, 1956)

Synonym of **pantoporate**.

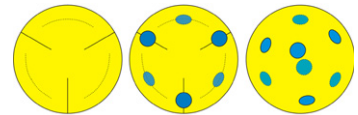
**Panto-, Pan-**

A prefix for global distribution.
 Synonym of peri-.

Pantoaperturate (adj.) (Erdtman and Vishnu-Mittre, 1956)

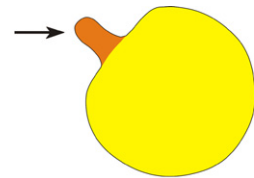
Describing a pollen grain with apertures spread over the surface sometimes forming a regular pattern.

Comment: Such pollen grains may be, for example, **pantocolpate**, **pantocolporate** or **pantoporate**. The terms based on the prefix peri- as used in the classification of pollen types of Iversen and Troels-Smith (1950) are not recommended.



Papilla (pl. papillae, adj. papillate) (Wodehouse, 1935)

A small protuberance.
 Comment: The term is mostly used in describing pollen of Taxodiaceae (Gymnospermae).



Papilla (pl. papillae, adj. papillate) (Traverse, 1955)

A general term, applied in palynology to parallel sided exinous elements with rounded apices, less than 1 µm in length.
 See also: **scabrate**.

Paracavate (adj.) (Balme, 1988)

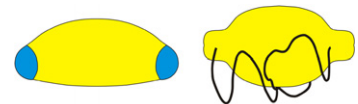
An exine in which the intexine is clearly defined but in which its degree of separation from the exoexine is uncertain or indeterminate. Example: *Ancyrospora langii*.

Paraisopolar (Pragłowski et al., 1983)

Describing a pollen grain whose polar faces differ only in the attachment of **viscin threads** to the proximal pole.

Synonym of **subisopolar**.

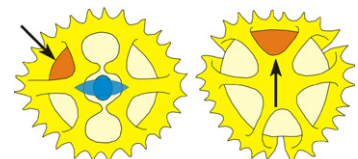
Comment: Most pollen grains with viscin threads have polar faces of which one is less/more convex than the other.



Paraporal lacuna (pl. paraporal lacunae) (Wodehouse, 1935)

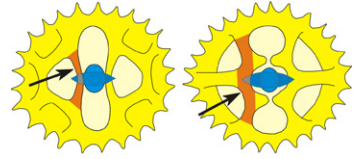
A lacuna of a lophate pollen grain lying in the mesocolpial region adjacent to one side of an equatorial ridge. Example: *Taraxacum officinale* (Compositae).

See also: **lacuna**.



Paraporal ridge (Wodehouse, 1935)

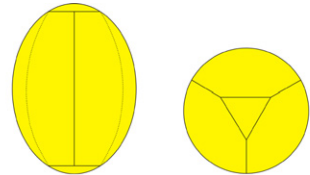
A ridge bounding a pore, extending in a meridional direction. Applied to a lophate pollen grain. Examples: *Tragopogon pratensis*, *Taraxacum officinale* (Compositae).



Parasyncolpate (adj.) (Erdtman, 1952) and **parasyncolporate** (Van der Ham, 1977)

Describing **syncolp(or)ate** pollen grains in which the apices of the colpi divide into two branches and anastomose towards the poles, delimiting an isolated area known as the **apocolpial field**. Examples: *Nymphoides peltata* (Menyanthaceae), *Eugenia* (Myrtaceae).

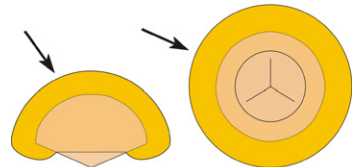
See also: **syncolp(or)ate**, **apocolpial field**.



Patella (pl. patellae, adj. patellate) (Pocock, 1961a)

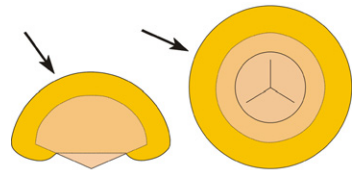
Synonym of **patina**.

See also: **capsula**, **cingulum**.



Patina (adj. patinate) (Butterworth and Williams, 1958)

A thickening of the exine of spores that extends over the entire surface of one hemisphere. Example: *Cingulatisporites*, *Patellasporites*.

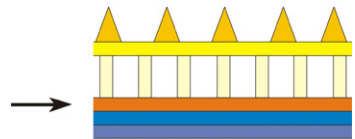


Pattern

A general word, applied in palynology either to surface features or infratectal elements, such as columellae.

Pedium (Erdtman, 1966b)

Synonym of **foot layer**.



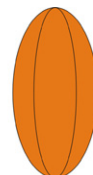
Per-

A prefix for 1. Extremely, and 2. Through.

Comment: In palynological terms the prefix is often used for complete (e.g. in perpectate) or very (e.g. in peroblate).

Pererect (adj.) (Reitsma, 1970)

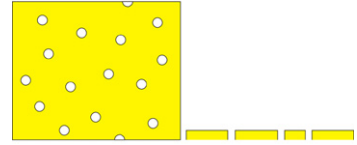
Synonym of **perprolate**.



Perforate (adj.) (Iversen and Troels-Smith, 1950)

A general adjective indicating the presence of holes, applied in palynology to holes less than 1 μm in diameter and generally situated in the tectum.

See also: **punctum**, scrobiculus.



Peri-

Synonym of **panto-**.

Comment: Iversen and Troels-Smith (1950) used the term peri- (as for example, in pericollate, periporate and pericolliporate) in their classification of **pollen types**, but terms based on **panto-** are much more widely used.

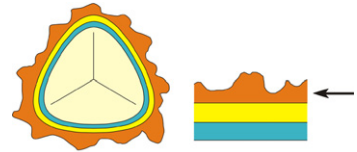
See also: **pantoaperturate**.

Perine (Erdtman, 1943)

A sporoderm layer that is not always acetolysis resistant and is situated around the exine of many spores. Example: *Pteridium* (Hypolepidaceae).

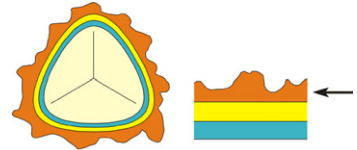
Synonym of **perispore**.

Comment: The term **perine** should be used in conjunction with sexine and nexine, whereas **perispore** should be used with exospore and endospore.

**Perinium** (Jackson, 1928)

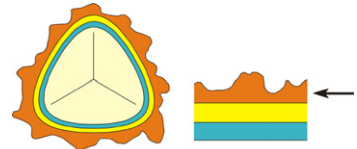
Synonym of **perine**.

Comment: A latinised form of the term **perine**.

**Perispore** (Russow, 1872)

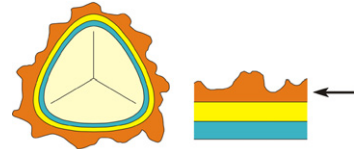
Synonym of **perine**.

See also: **endospore**, **exospore**.

**Perisporium** (Erdtman, 1943)

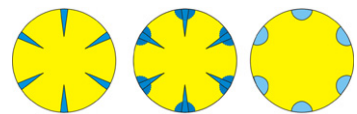
Synonym of **perine**.

Comment: A latinised form of the term **perispore**.

**Peritrema** (adj.) (Erdtman and Straka, 1961)

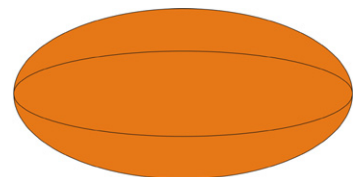
Describing a pollen grain with equatorial apertures situated around an outline that is circular in polar view.

Comment: The term is not recommended because it is based upon the suffix -trema.

**Peroblate** (adj.) (Erdtman, 1943)

Describing the shape of a pollen grain or spore in which the ratio between the polar axis and the equatorial diameter is less than 0.50.

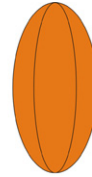
See also: **oblate**, **oblate spheroidal**, **P/E ratio**, **perprolate**, **prolate**, **prolate spheroidal**, **shape classes**, **spheroidal**, **suboblate**, **subprolate**, **subspheroidal**.



Perprolate (adj.) (Erdtman, 1943)

Describing the shape of a pollen grain or spore in which the ratio between the polar axis and the equatorial diameter is more than 2.

See also: **oblate**, **oblate spheroidal**, **P/E ratio**, **peroblate**, **prolate**, **prolate spheroidal**, **shape classes**, **spheroidal**, **suboblate**, **subprolate**, **subspheroidal**.

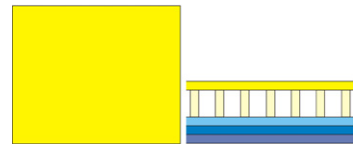
**Per-reticulate** (adj.) (Fægri and Iversen, 1975)

Structural elements fused distally forming an open reticulum.

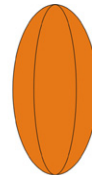
Comment: It applies to the same structure as **eureticulate**, but is defined on a different basis.

Pertectate (adj.) (Erdtman, 1969)

Synonym of **eutectate**.

**Pertransverse** (adj.) (Reitsma, 1970)

Synonym of **perprolate**.

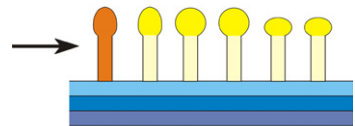
**Phytoclast** (pl. phytoclasts)

A general term for plant-derived, more or less resistant-walled, particle occurring in a sediment.

See also: **palynodebris**.

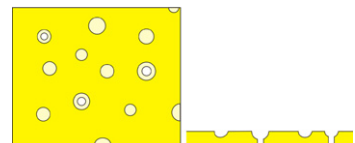
Pilum (pl. pila, adj. pilate) (Erdtman, 1952)

A sexine element, usually standing directly on the nexine, consisting of a rod-like part (**columella**) and a swollen apical part (**caput**).

**Pitted** (adj.)

A general term for small depressions (Jackson, 1928).

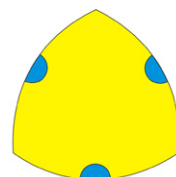
Synonym of **foveolate** (in palynology).

**Planaperturate** (adj.) (Erdtman, 1952)

Describing a pollen grain with an angular outline, in which the apertures are situated in the middle of the sides when seen in polar view, rather than at the angles. Example: *Tilia* (Tiliaceae).

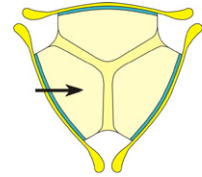
Antonym: **angulaperturate**.

Comment: The term is useful for describing the position of apertures, but should be avoided as a description of equatorial outline.



Platea (pl. plateae) (Thomson and Pflug, 1953)

Areas of the inner wall layer separated by a triradiate channel extending between the endogerminals of a Normapolles pollen grain. Example: *Pompeckjoidaepollenites*.

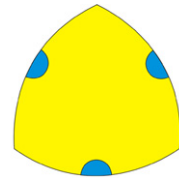
**Platea luminosa** (pl. plateae luminosae) (Iversen and Troels-Smith, 1950)

Synonym of **groove**.

Comment: The term was introduced for use in striate pollen and to contrast with **lumina**, which was restricted to reticulate pollen.

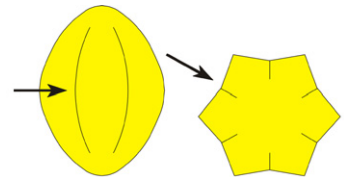
Pleurotreme (adj.) (Erdtman and Straka, 1961)

Synonym of **planaperturate**.

**Plica** (pl. plicae, adj. plicate) (Thomson and Pflug, 1953)

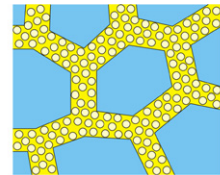
A general term for a fold, applied in palynology to ridge-like folds of the exine in *Ephedra* (Ephedraceae) and *Lusatipollis*.

See also: **polyPLICATE**, **taenia**.

**Pluricolumellate** (adj.) (Reitsma, 1970)

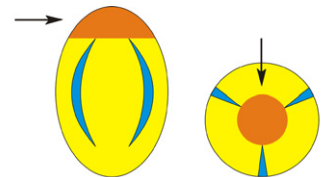
With the columellae arranged in several rows beneath each murus.

See also: **duplicolumellate**, **simplicolumellate**.

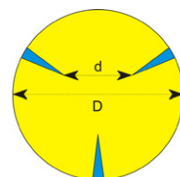
**Polar area** (Iversen and Troels-Smith, 1950)

Synonym of **apocolpium**.

Comment: In spores often used for the area around a pole.

**Polar area index (PAI)** (pl. polar area indices) (Iversen and Troels-Smith, 1950)

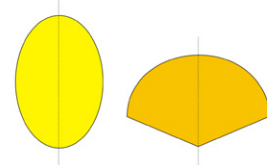
Synonym of **apocolpium index**.



Polar axis (pl. polar axes) (Wodehouse, 1935)

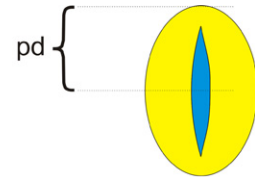
The straight line between the distal and proximal poles of a pollen grain or spore.

See also: **equatorial diameter**, **polarity**.



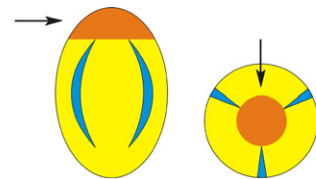
Polar distance (Punt, 1984)

The vertical distance from the equator to the pole (pd).



Polar field (Beug, 1961)

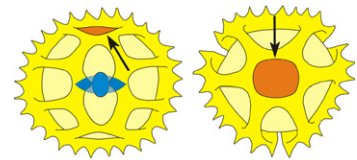
Synonym of **apocolpium**.



Polar lacuna (pl. polar lacunae) (Wodehouse, 1928)

A lacuna situated at the pole of a lophate pollen grain.

See also: **lacuna**, **lophate**.

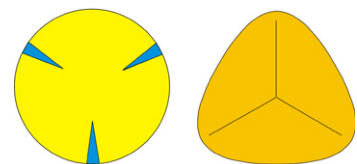


Polar view (Erdtman, 1943)

A view of a pollen grain or spore in which the polar axis is directed towards the observer.

Antonym: **equatorial view**.

See also: **amb**.



Polarity

The condition of having distinct poles (Jackson, 1928).

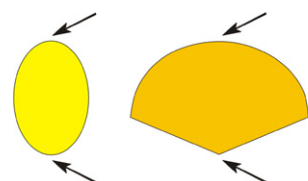
Comment: The polarity of palynomorphs may be determined from their orientation in tetrads, or by inference from the distribution of apertures, or other features.

See also: **apolar**, **heteropolar**, **isopolar**.

Pole (Wodehouse, 1935)

Either of the two extremities of the **polar axis**.

See also: **polar axis**.



Pollen (Linnaeus, 1750)

The microgametophyte of seed plants, developed from the microspore.
See also: **spore**, **microspore**.

Pollen analysis (Von Post, 1916)

The study of assemblages of dispersed palynomorphs such as those isolated from samples of peat.
See also: **palynology**.

Pollen cement (Heslop-Harrison, 1968)

Synonym of **pollenkitt**.

Pollen class (pl. pollen classes) (Fægri and Iversen, 1950)

An artificial grouping of pollen grains that share a distinctive character, or suite of characters. Such classes are useful in identification keys and may be subdivided into more restrictive categories, **pollen types** and **pollen groups**. Example: tricolpate class.

Pollen coat (Knox, 1984)

Synonym of **pollenkitt**.

Pollen group (Punt, 1971)

A pollen morphological category, subsidiary to a **pollen type**, including a number of pollen grains that show intergrading characters but no distinguishing characters.
See also: **pollen class**, **pollen type**.

Pollenkitt (Knoll, 1930)

A sticky material, produced by the tapetum, that may hold **pollen** grains together during dispersal.
See also: **tryphine**.

Pollen mother cell

Synonym of **microsporocyte**.

Pollen type (Punt, 1971)

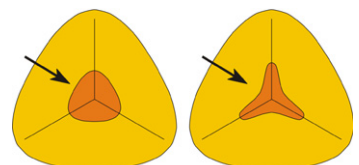
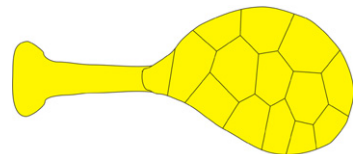
A pollen morphological category, subsidiary to a **pollen class**, and including pollen grains which can be distinguished either by one distinct character or by a unique combination of characters.
See also: **pollen class**, **pollen group**.

Pollinium (pl. pollinia)

A general term for aggregations of many pollen grains, which form dispersal units (Jackson, 1928). Examples: *Asclepiadaceae*, *Orchidaceae*.
See also: **dispersal unit**, **massula**.

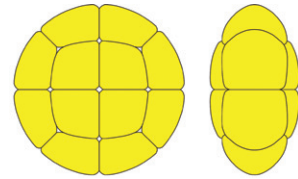
Polumbra (Balme, 1988)

A darkened triangular or subcircular area centred on the proximal pole. Example: *Retusotriletes distinctus*.
Comment: The feature appears to be most commonly observed in specimens that have lost a perisporal outerexoexinal layer.
See also: **hilum**.



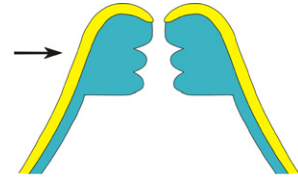
Polyad (Iversen and Troels-Smith, 1950)

A **dispersal unit** comprising more than four pollen grains. Example: *Acacia* (Mimosaceae).

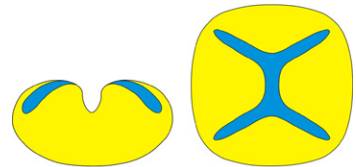
**Polyannulus** (pl. polyannuli, adj. polyannulate) (Batten and Christopher, 1981)

A structure in which the sexine of the outer aperture has multiple layers each with its own thickening. Example: *Atlantopollis*.

Comment: This term refers especially to pollen grains of the fossil Normapolles group.

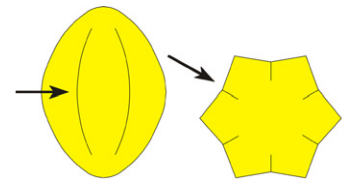
**Polychotomosulcate** (adj.) (Walker and Walker, 1986)

Describing a pollen grain with a many branched sulcus.

**PolyPLICATE** (adj.) (Iversen and Troels-Smith, 1950)

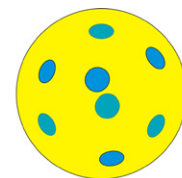
Describing a pollen grain with more than three meridional ridges (**plicae**) separated by deep grooves. Example: *Ephedra* (Ephedraceae).

See also: **plica**, **striate**, **taenia**.

**Polyporate** (adj.) (Moar, 1993)

With many pores.

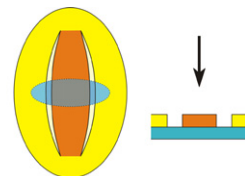
Synonym of **pantoporate** and **zonoporate**.

**Pontoperculum** (pl. pontopercula, adj. pontoperculate) (Erdtman, 1952)

A type of **operculum** that is not completely isolated from the remainder of the sexine but linked to it at the ends of the aperture. Example:

Sanguisorba officinalis (Rosaceae), *Passiflora tetandra* (Passifloraceae).

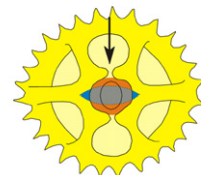
See also: **geminicolpate**.

**Poral lacuna** (pl. poral lacunae) (Wodehouse, 1928)

A lacuna of a lophate pollen grain surrounding an endoaperture, which communicates with adjacent abporal lacunae via interlacunar gaps.

Example: *Cichorium intybus* (Compositae).

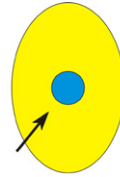
See also: **lacuna**, **lophate**.



Pore (pl. pores, adj. porate) (Jackson, 1928; Wodehouse, 1935)

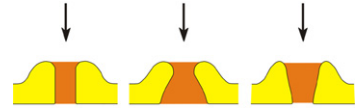
A general term, applied in palynology to a circular or elliptic aperture with a length/breadth ratio less than 2.

See also: **aperture**, **porus**, **ulcus**.

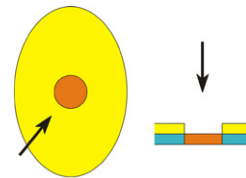
**Pore canal** (Thomson and Pflug, 1953)

The space between the ectopore and the endopore.

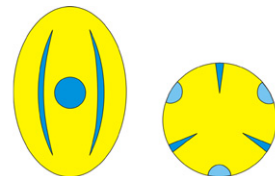
See also: **aspis channel**.

**Pore membrane** (Wodehouse, 1935)

The **aperture membrane** of a pore.

**Poro-colpate** (adj.) (Clarke et al., 1979)

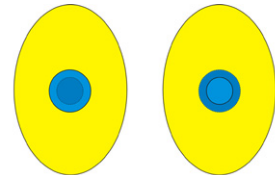
Describing a pollen grain with an arrangement of apertures in which colpi alternate with pores round the equator. Example: *Pardoglossum* (Boraginaceae).

**Pororate** (adj.) (Erdtman, 1952)

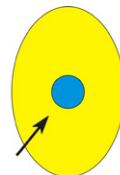
Describing a pollen grain with compound apertures in which both the ectoaperture and the endoaperture are pores and the two are not congruent. Example: *Myrica gale* (Myricaceae).

Comment: Pollen grains that have congruent ectopores and endopores are generally simply referred to as **porate**.

See also: **colporate**.

**Porus** (pl. pori, adj. porate) (Potonié, 1934)

Synonym of **pore**.

**Pre-**

A prefix for before.

Comment: As for example in **prepollen**, **pretectum**.

Prepollen (Renault, 1896; Chaloner, 1970)

The microspores of certain extinct seed plants characterised by proximal apertures and presumed proximal germination, rather than the distal, equatorial or other typical apertures of seed plant pollen grains.

Primexine (Heslop-Harrison, 1963)

A developmental precursor of at least part of the exine (the sexine/ectexine), formed during the tetrad stage that is composed largely of polysaccharides and therefore lacks resistance to acetolysis.

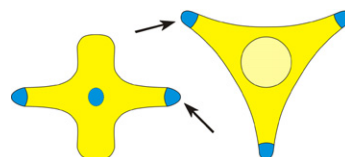
Pro- (Heslop-Harrison, 1963)

A prefix indicating a developmental precursor of a feature. Example: **probaculum**.

Projectate (adj.) (Mchedlishvili, 1961)

Describing a pollen grain in which the apertures are borne on the ends of strongly projecting arms. Example: *Aquilapollenites*.

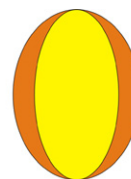
See also: **triprojectate**.

**Prolate** (Erdtman, 1943)

Describing the shape of a pollen grain or spore in which the polar axis is larger than the equatorial diameter.

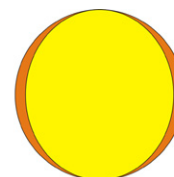
Comment: This term belongs to the system of shape classes suggested by Erdtman (1943, and extended in 1952), based on the measurements of the polar axis (P) and equatorial diameter (E). In this system prolate is defined as a ratio between the **polar axis** and the **equatorial diameter** of 1.33–2.00.

See also: **oblate**, **oblate spheroidal**, **P/E ratio**, **peroblate**, **perprolate**, **prolate spheroidal**, **shape classes**, **spheroidal**, **suboblate**, **subprolate**, **subspheroidal**.

**Prolate spheroidal** (Erdtman, 1952)

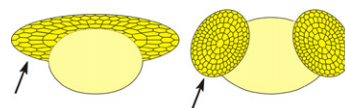
Describing the shape of a pollen grain or spore in which the ratio between the polar axis and the equatorial diameter is 1.00–1.14.

See also: **oblate**, **oblate spheroidal**, **P/E ratio**, **peroblate**, **perprolate**, **prolate**, **shape classes**, **spheroidal**, **suboblate**, **subprolate**, **subspheroidal**.

**Protosaccus** (pl. protosacci, adj. protosaccate) (Scheuring, 1974)

A saccus which is completely filled with an alveolar structure. This feature is used in the description of pollen in the Perm-Trias. Example: *Lueckisporites virkkiae*.

Comment: For extant saccate pollen grains don't show this character it is considered to be primitive. See also: **bisaccate**, **monosaccate**, **pseudosaccus**, **saccus**.

**Proximal**

A common descriptive term (Jackson, 1928) used in contrast to **distal**, applied in palynology to features on the surface that faces towards the centre of the tetrad during development (Wodehouse, 1935).

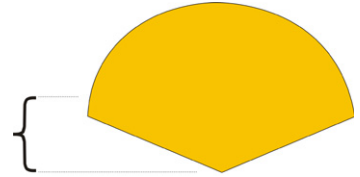
Antonym: **distal**.

See also: **ana-**, **cata-**, **polarity**.

Proximal face (Erdtman, 1952)

That part of a palynomorph which faces towards the centre of the tetrad, between equator and proximal pole.

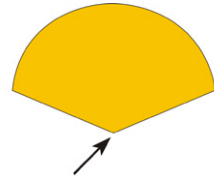
Antonym: **distal face**.

**Proximal pole** (Wodehouse, 1935)

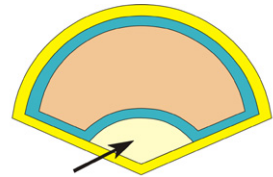
The centre of the proximal face.

Antonym: **distal pole**.

See also: **proximal**.

**Proximocavate** (adj.) (Balme, 1988)

An exine in which the exoexine is detached, or partly detached, from the intexine only on the proximal face.

**Pseudoaperture** (adj. pseudoaperturate) (Thanikaimoni, 1980)

A thinning of the exine which, although superficially resembling an aperture, is not associated with a thickening of the intine and is presumed not to function as an exitus.

See also: pseudocolpus, pseudopore.

Pseudocolpus (pl. pseudocolpi, adj. pseudocolpate) (Iversen and Troels-Smith, 1950)

A colpus-like pseudoaperture. Example: *Myosotis* (Boraginaceae).

See also: **heterocolpate**.

Pseudopore (pl. pseudopores, adj. pseudoporate) (Iversen and Troels-Smith, 1950)

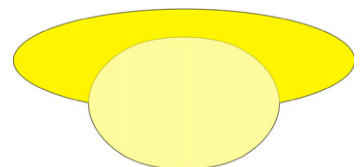
A pore-like pseudoaperture.

Comment: The term has also been used for the leptoma of certain coniferous pollen.

Pseudosaccus (pl. pseudosacci, adj. pseudosaccate) (Grebe, 1971)

An extensive, **saccus**-like separation in the wall of a spore resembling a saccus, but lacking the characteristic alveolate infrastructure. Example: *Grandispora spinosa*.

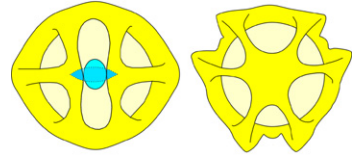
See also: **camera**, **saccus**.

**Psilate** (adj.) (Wodehouse, 1928)

Describing a pollen or spore with a smooth surface.

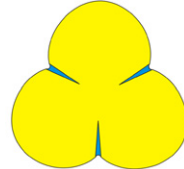
Psilolophate (adj.) (Wodehouse, 1935)

Describing a lophate pollen grain which lacks spines.
See also: **echinolophate**, **lophate**.

**Ptychotreme** (adj.) (Erdtman and Straka, 1961)

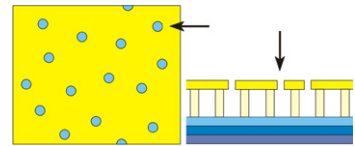
With apertures situated in invaginations of the outline, when seen in polar view.

Comment: The term is not recommended because it is based upon the suffix-treme.

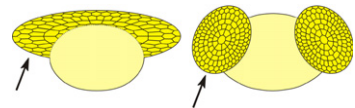
**Punctum** (pl. puncta, adj. punctate) (Erdtman, 1952)

A rounded or elongate tectal perforation, less than 1 μm in length or diameter.

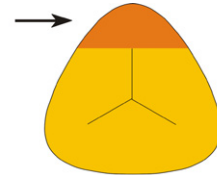
See also: **foveola**, **scrobiculus**, **tectum perforatum**.

**Quasisaccus** (pl. quasisacci, adj. quasisaccate) (Meyen, 1988)

Synonym of **protosaccus**.

**Quasitectate** (adj.) (Balme, 1988)

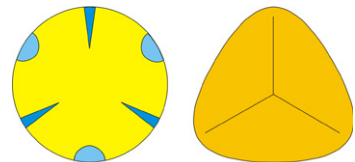
A spore exine in which the outer and inner, more or less homogeneous, layers are separated by a clearly defined mesexinous layer of discontinuous columellate elements, simulating those that characterise many angiosperm pollen.

**Radial**

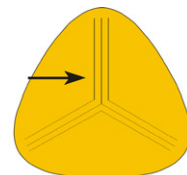
A general term describing features radiating from a centre. Applied in palynology to the region of a spore beyond the ends of the **laesurae**.

Radially symmetric (adj.) (Nilsson and Muller, 1978)

Describing a pollen grain or spore with two or more vertical planes of symmetry, but, if only two such planes are present, then their axes are of equal length.

**Radius**

A general term, used in palynology for a **laesura** in trilete spores.



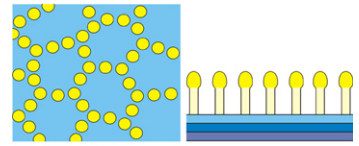
Rectimurate (adj.) (Erdtman, 1952)

Describing a pollen grain or spore with more or less straight muri.

Reticuloid (adj.) (Moar, 1993)

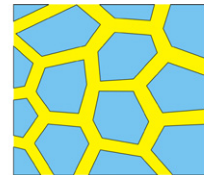
With bacula arranged in a more or less reticulate pattern.

Synonym of **retipilate**.

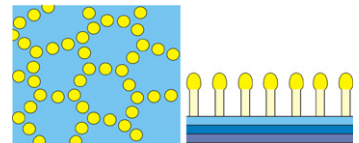
**Reticulum** (pl. reticula, adj. reticulate) (Pragłowski and Punt, 1973)

A network-like pattern consisting of lumina or other spaces wider than 1 μm bordered by elements narrower than the lumina.

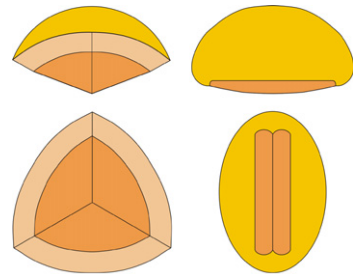
See also: **microreticum**.

**Retipilate** (adj.) (Erdtman, 1952)

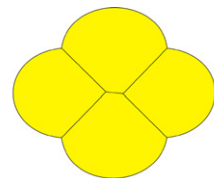
Describing a reticulum formed by rows of pila instead of muri. Example: *Callitriche* (Callitrichaceae).

**Retusoid** (adj.) (Traverse, 1988)

Describing a spore with prominent contact areas and curvaturae. Example: *Retusotriletes*.

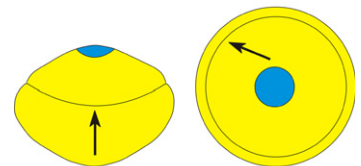
**Rhomboidal tetrad** (Erdtman, 1945b)

A uniplanar tetrad in which the proximal faces of two individual members are in direct contact and the remaining two are separated, giving a rhomboidal outline to the tetrad. Example: *Epipactis palustris* (Orchidaceae).

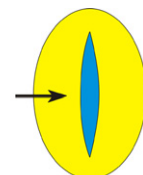
**Rimula** (pl. rimulae, adj. rimulate) (Pflug, 1953)

The sub-equatorial aperture that encircles pollen grains of the Classopollis group. Example: *Corollina* (Classopollis).

Comment: Potonié (1934) used rimula to refer to short colpi, but the term is no longer used in this sense.

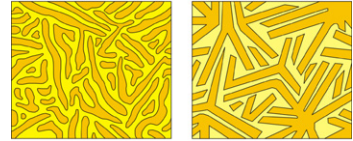
**Ruga** (pl. rugae, adj. rugate) (Potonié, 1934, emend. Erdtman, 1945a)

Synonym of **colpus**.



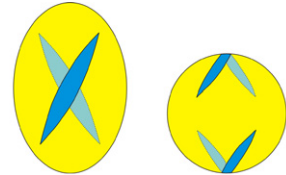
Rugulate (adj., n. rugula, pl. rugulae) (Iversen and Troels-Smith, 1950)

Describing a type of ornamentation consisting of elongated sexine elements more than 1 μm long, arranged in an irregular pattern that is intermediate between striate and reticulate. Examples: *Sedum* (Crassulaceae), *Ulmus* (Ulmaceae), *Camptotriletes corrugatus*.



Rupate (adj.) (n. rupus, pl. rupi) (Erdtman, 1952)

Synonym of **loxoaperturate**.



S-type tetrad (Moar, 1993)

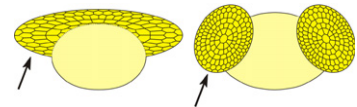
A tetrad in which only one member is fully developed. Example: *Leucopogon fasciculatus* (Epacridaceae).

See also: A-type tetrad, T-type tetrad.

Saccoid (adj.) (Brugman, 1983)

A saccus-like expansion of the exine with a complex infrastructure consisting of a three dimensional network of sexine elements, extending to and fused with the nexine.

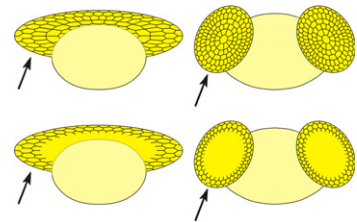
See also: **camera**, **protosaccus**, **pseudosaccus**, **saccus**.



Saccus (pl. sacci, adj. saccate) (Erdtman, 1952)

A saccus formed by an expansion of the exine of a pollen grain and at least partly filled with an alveolate infrastructure.

See also: **bisaccate**, **camera**, **protosaccus**, **pseudosaccus**.



Scabrate (adj.) (sing. scabra, pl. scabrae) (Iversen and Troels-Smith, 1950)

Describing elements of ornamentation, of any shape, smaller than 1 μm in all directions. Examples: *Quercus* (Fagaceae), *Artemisia* (Compositae).

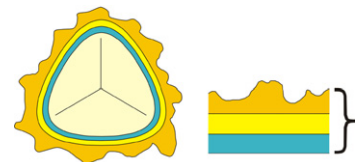
Comment: Ornamentation elements larger than 1 μm are described according to their shape, for example, **baculum**, **clava**, **gemma**, **verruca**.

See also: granulum.

Sclerine (Erdtman, 1952)

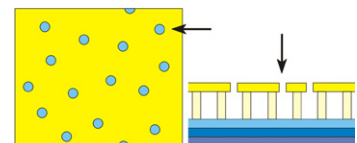
A term encompassing both exine and perine that can be used whether a perine is present or not; sporoderm excluding the intine.

See also: **sculptine**.



Scrobiculus (pl. scrobiculi, adj. scrobiculate) (Potonié, 1934)

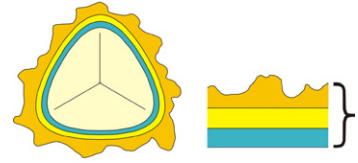
Synonym of **punctum**.



Sculptine (Erdtman, 1948)

A term encompassing both exine and perine (**sclerine**) but excludes the nexine and so provides a neutral term for the sculptured layer when there is doubt whether the pattern belongs to the exine or the perine.

See also: **sclerine**.

**Sculptural density** (Balme, 1988)

The estimated number of sculptural elements in an area of $100 \mu\text{m}^2$ of the surface of the exine.

Sculpture (Kuprianova, 1948)

Orthographical variant of **sculpturing**.

Sculpturing (adj. sculptured) (Potonié, 1934)

The surface relief, or topography, of a pollen grain or spore.

Comment: Pragłowski (1975) provided a circumscription of this term which would restrict its application to tectate pollen grains.

See also: **pattern, ornamentation, structure**.

Seed-megaspore

A large, functional megaspore associated with three small, presumably aborted spores present in some fossil lycopsids. Example: *Cystosporites*.

Semi-erect (adj.) (Reitsma, 1970)

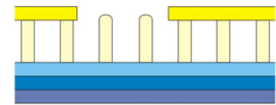
Synonym of **subprolate**.

Semitectum (adj. semitectate) (Fægri and Iversen, 1964)

A partially discontinuous tectum in which the tectal perforations are equal to or wider than the muri and usually larger than $1 \mu\text{m}$ in diameter.

Antonym: **eutectum**.

See also: **tectum**.

**Semitransverse** (adj.) (Reitsma, 1970)

Synonym of **suboblate**.

Sexine (Erdtman, 1952)

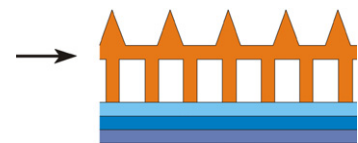
The outer, sculptured layer of the exine, which lies above the nexine.

Antonym: **nexine**.

Comment: Although the term ectexine as originally defined (sensu Erdtman, 1943) was more or less synonymous with sexine, it no longer is because ectexine is now invariably used in the redefined sense of Fægri (1956).

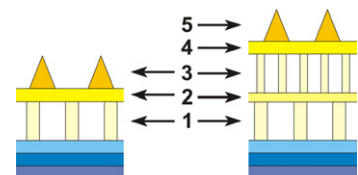
Unlike ectexine, sexine does not include the foot layer. Sexine and nexine are distinguished on purely morphological criteria, whereas ectexine and endexine differ in their staining properties. The two sets of terms are therefore suited for slightly different applications.

See also: **ectexine**.

**Sexine 1, 2, 3, 4, 5** (Reitsma, 1970)

A system of sexine stratification in which sexine 1 is the innermost and sexine 5 in the outermost layer of the sexine.

Comment: Usually the sexine consists of 3 layers (sexine 1 = columellae; sexine 2 = tectum; sexine 3 = sculpture elements).



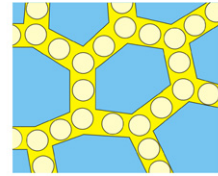
Shape classes (pl.) (Erdtman, 1943)

Categories of pollen and spore shape based on the relations between polar axis (P) and equatorial diameter (E).

See also: **oblate**, **oblate spheroidal**, **P/E ratio**, **peroblate**, **perprolate**, **prolate**, **prolate spheroidal**, **suboblate**, **subprolate**.

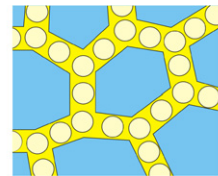
Simplibaculate (adj.) (Erdtman, 1952)

Synonym of **simplicolumellate**.

**Simplicolumellate (adj.) (Reitsma, 1970)**

With a single row of columellae under each murus. Example: *Viburnum opulus* (Caprifoliaceae).

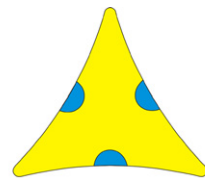
See also: **duplicolumellate**, **pluricolumellate**.

**Sinu-aperturate (adj.) (Erdtman, 1952)**

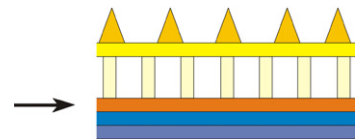
Describing a pollen grain in which the equatorial apertures are situated in the middle of concave sides when seen in polar view.

Comment: The term belongs to the system of amb defined by Erdtman.

See also: **amb**, **angulaperturate**, **planaperturate**.

**Sole (APLF, 1975)**

Synonym of **foot layer**.

**Special wall (Beer, 1911)**

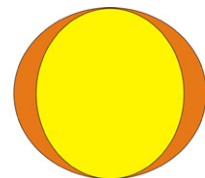
Pollen mother-cell wall

Spheroidal (Erdtman, 1943)

Describing the shape of a pollen grain or spore in which the polar axis and the equatorial diameter are approximately equal.

Comment: This term belongs to the system of shape classes suggested by Erdtman (1943), and extended in 1952), based on the measurements of the polar axis (P) and equatorial diameter (E). In this system spheroidal is defined as a P/E ratio of 0.88–1.14.

See also: **oblate spheroidal**, **prolate spheroidal**.

**Spina (pl. spinae) (Potonié, 1934)**

Synonym of **Spine**.

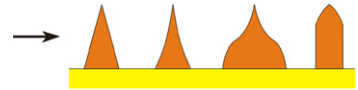


Spine (adj. spiny/spinose) (Erdtman, 1952)

A general word, applied in palynology to long and tapering pointed elements, exceeding 1 μm .

Comment: In Erdtman's (1952) definition spines were defined as more than 3 μm long (in contrast to spinules which were shorter than this) but since the maximum size of features that may be prefixed with micro- is 1 μm the present definition provides consistency with other terms.

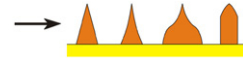
See also: **echinate**.

**Spinule** (adj. spinulose) (Erdtman, 1952)

Small spines, less than 3 μm in length.

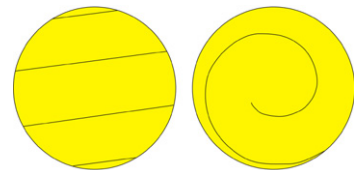
Comment: The size distinction made by Erdtman between spinules and spines is not consistent with other size criteria used in palynology.

See also: **spine**.

**Spiraperturate** (adj.) (Erdtman, 1952)

Describing a pollen grain with one or more spiral apertures. Example: *Eriocaulon aquaticum* (Eriocaulaceae).

Comment: In the pollen classes of Iversen and Troels-Smith (1950), spiraperturate pollen was included in the syncolpate class.

**Spore**

A general term for the usually microscopic, unicellular, asexual or sexual reproductive units of cryptogams and fungi (Jackson, 1928).

See also: **pollen**, **microspore**.

Sporoderm (Bischoff, 1833)

The entire wall of a pollen grain or spore.

Sporomorph (Erdtman, 1947)

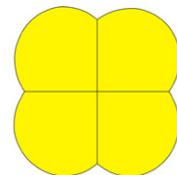
A general term for spore-like palynomorphs.

Sporopollenin (Zetsche and Vicari, 1931)

The name given to the acetolysis resistant biopolymers which make up most of the material of the exine.

Square tetrad (Erdtman, 1945b)

Synonym of **tetragonal tetrad**.

**Stenopalynous** (adj.) (Erdtman, 1952)

Describing plant taxa characterized by only a slight variation in their palynomorphs.

Antonym: **eurypalynous**.

Stephano-

Synonym of **zono-**.

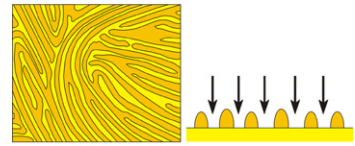
Comment: Fægri and Iversen (1950) used the prefix (as for example, in stephanocolpate, stephanocolporate, stephanoporate) in their classification of pollen types.

Stratum (APLF, 1975)

A subdivision of a major layer of the sporoderm.

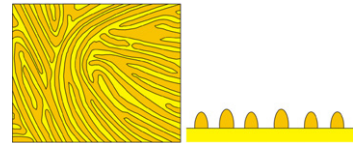
Striae (pl.) (sing. stria) (Fægri and Iversen, 1950)

Grooves between elongated sculpturing elements.

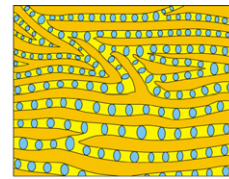
**Striate** (adj.) (Iversen and Troels-Smith, 1950)

A general descriptive term applied in palynology to elongated, generally parallel elements separated by grooves.

Comment: The positive elements of striate ornamentation may also be referred to as muri.

**Striato-reticulate** (adj.) (Erdtman, 1952)

Describing a pattern in which parallel or subparallel muri are cross-linked to form a reticulum in the grooves. The connections between the muri lie on a single level or different levels. Example: *Gentiana pneumonathe* (Gentianaceae).

**Structure** (adj. structurated, structured) (Potonié, 1934)

The internal construction of the pollen or spore wall.

See also: **sculpturing**, **pattern**, **ornamentation**.

Sub-

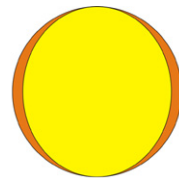
A prefix for under, or less than.

Subechinate (Wodehouse, 1928)

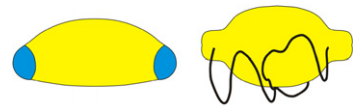
Synonym of **microechinate**.

Suberect (adj.) (Reitsma, 1970)

Synonym of **prolate spheroidal**.

**Subisopolar** (adj.) (Walker and Doyle, 1975)

Describing a pollen grain or spore in which the proximal and distal faces are slightly different. Examples: one face is convex and the other is less convex (*Banksia*, Proteaceae); on one face viscin threads are connected (*Oenothera*, Onagraceae).

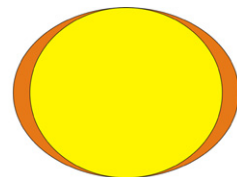
**Sub-layer**

Synonym of **stratum**.

Suboblate, (adj.) (Erdtman, 1952)

Describing the shape of a pollen grain or spore in which the ratio between the polar axis and the equatorial diameter is 0.75–0.88.

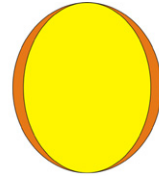
See also: **oblate**, **oblate spheroidal**, **P/E ratio**, **peroblate**, **perprolate**, **prolate**, **prolate spheroidal**, **shape classes**, **spheroidal**, **subprolate**, **subspheroidal**.



Subprolate (adj.) (Erdtman, 1952)

Describing the shape of a pollen grain or spore in which the ratio between the polar axis and the equatorial diameter is 1.14–1.33.

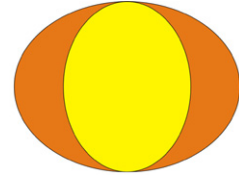
See also: **oblate**, **oblate spheroidal**, **P/E ratio**, **peroblate**, **perprolate**, **prolate**, **prolate spheroidal**, **shape classes**, **spheroidal**, **suboblate**, **subspheroidal**.

**Subspheroidal** (adj.) (Erdtman, 1952)

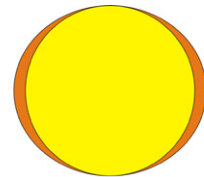
Describing the shape of a pollen grain or spore in which the ratio between the polar axis and the equatorial diameter is 0.75–1.33.

Comment: This shape class includes **suboblate**, **oblate spheroidal**, **prolate spheroidal** and **subprolate**.

See also: **oblate**, **oblate spheroidal**, **peroblate**, **P/E ratio**, **perprolate**, **prolate**, **prolate spheroidal**, **shape classes**, **spheroidal**, **suboblate**, **subprolate**.

**Subtransverse** (adj.) (Reitsma, 1970)

Synonym of **oblate spheroidal**.

**Subturma** (pl. subturmae) (Potonié, 1956)

A group of form-genera of fossil spores or pollen in the **turma**-system of Potonié.

See also: **anteturma**, **infraturma**, **turma**.

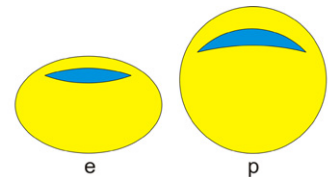
Successiform (Van Campo, 1967)

Referring to a phyletic series of pollen types with increasing numbers of apertures, ranging from tricolpate to pantocolpate and pantoporate.

Sulculus (pl. sulculi, adj. sulculate) (Erdtman, 1952)

An elongated latitudinal ectoaperture not situated at a pole.

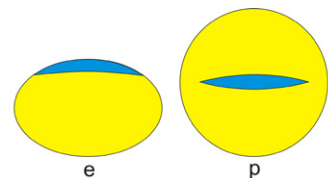
See also: **sulcus**.

**Sulcus** (pl. sulci, adj. sulcate) (Erdtman, 1952)

An elongated latitudinal ectoaperture situated at the distal or proximal pole of a pollen grain.

Comment: A **sulcus** has the same shape as a colpus, but differs in orientation. Sulci are essentially latitudinal apertures whereas colpi are essentially longitudinal apertures. Sulci may be distal (**anasulcate**), proximal (**catasulcate**) or extend right around the grain (**zonasulcate**).

See also: **ana-**, **colpus**, **zona-**.



Supra-

A prefix for above.

Comment: In palynology this prefix is mostly used for features on top of the tectum, as for example in **suprareticulate**, **suprarugulate**, **suprastriate**.

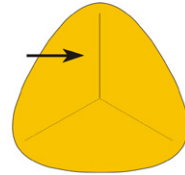
Supratectal (adj.) (Erdtman, 1969)

Indicating the position of features, such as spines, on the top of the tectum.

Suture (Potonié and Kremp, 1955)

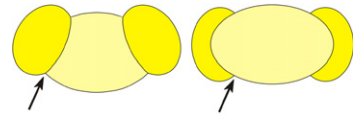
Synonym of **commissure**.

See also: **laesura**.

**Sylvestris-type** (Rudolph, 1935)

Bisaccate pollen grains in which the outline of the sacchi in polar view is discontinuous with the outline of the corpus so that the grains seem to consist of three distinct, more or less oval parts. Examples: *Pinus sylvestris*, *Abies* (Pinaceae).

See also: diploxylonoid, haploxylonoid, **haploxylon-type**.

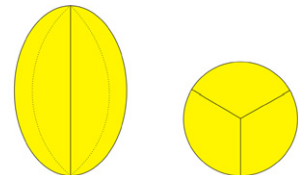
**Syn-**

A prefix indicating the fusion or anastomosis of features.

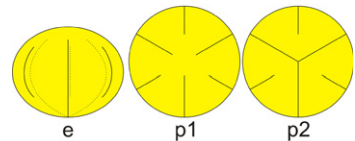
Syncolp(or)ate (adj.) (sensu Erdtman, 1952)

Describing a pollen grain with two or more simple (or compound) colpi the ends of which anastomose at the pole. Example: *Primula farinosa* (Primulaceae).

Comment: The term was used in a wider sense by Iversen and Troels-Smith (1950) for other forms with fused apertures such as **spiraperturate** and **parasyncolp(or)ate**.

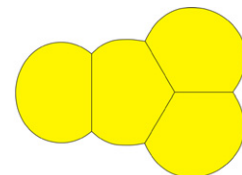
**Synrugoidate** (adj.) (Erdtman, 1952; Jalan and Kapil, 1964)

Describing a pollen grain with six colpi of which three are long and meeting at one pole and three are short and not meeting at either pole. Example: *Schisandra grandiflora* (Schisandraceae).

**T-shaped tetrad** (Walker and Doyle, 1975)

A **uniplanar tetrad** in which two of the members are perpendicular to the other two so that tetrad has the shape of the letter “T”. Example: *Typha* spp. (Typhaceae).

See also: **tetrad**.

**T-type tetrad** (Moar, 1993)

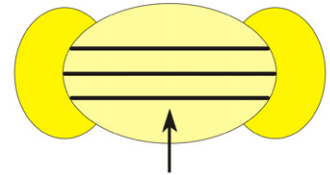
A tetrad in which all four members are fully developed. Example: *Pentachondra pumila* (Epacridaceae).

See also: A-type tetrad, S-type tetrad.

Taenia (pl. taeniae, adj. taeniate) (Leschik, 1956)

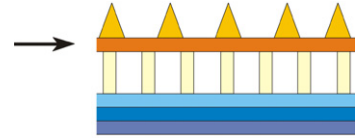
One or more strap-like, more or less parallel strips of exine on the proximal and/or distal sides of the corpus of certain fossil gymnospermous pollen grains. Examples: *Striatites*, *Vittatina*.

See also: **polylicate**.

**Tectum** (pl. tecta, adj. tectate) (Iversen and Troels-Smith, 1950)

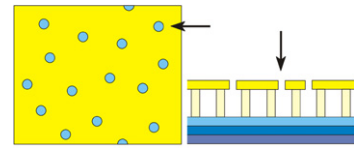
The layer of sexine, which forms a roof over the columellae, granules or other infratectal elements.

See also: **eutectum**, **semitectum**, tegillum.

**Tectum perforatum** (adj. tectate perforate) (Iversen and Troels-Smith, 1950)

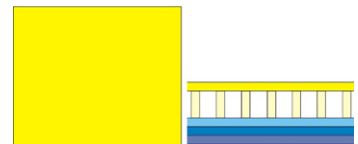
A tectum with perforations smaller than 1 μm in diameter.

See also: **punctum**.

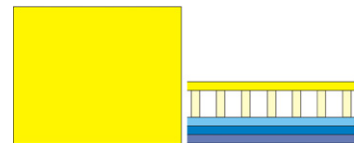
**Tectum imperforatum** (adj. tectate imperforate) (Walker and Doyle, 1975)

With a continuous tectum, without perforations.

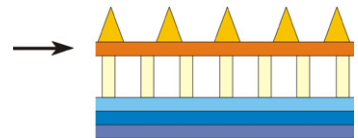
Synonym of **eutectum**.

**Tectum solidum** (Fægri and Iversen, 1975)

Synonym of **eutectum**.

**Tegillum** (pl. tegilla, adj. tegillate) (Erdtman, 1952)

Synonym of **tectum**.

**Tenui-** (Erdtman, 1952)

A prefix for thin.

Comment: Erdtman often used this prefix in combination with other terms (e.g. tenuimarginate) but thinness is subjective; it is preferable to use alternative descriptions.

Tenuitas (pl. tenuitates) (Potonié, 1934)

A general term for a thinning, that has been applied to many different situations in palynology.

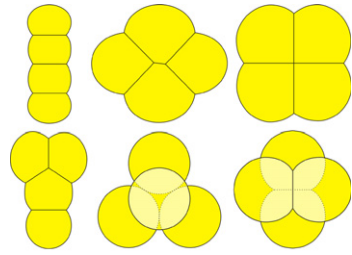
Comment: The term was used by Potonié to describe endoapertures, by Potonié and Kremp (1955) for sulci and has sometimes been used for the distal thin parts in the exine of the Circumpolles group (*Corollina*).

Tetrad

A general term for a group of four united pollen grains or spores, either as a dispersal unit or as a developmental stage.

Comment: Tetrads may be **uniplanar**, with all members lying in the same plane (for example, **linear**, **rhomboidal**, **tetragonal** and **T-shaped** tetrads) or **multiplanar**, with members in more than one plane (for example, **decussate** or **tetrahedral** tetrads).

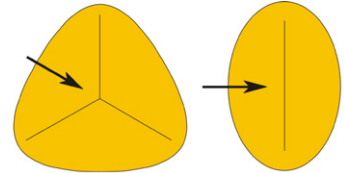
See also: **dispersalunit**, **monad**, **dyad**.



Tetrad mark (Couper and Grebe, 1961)

The monolete or trilete mark on the proximal face of a spore or, more rarely, a pollen grain.

See also: **trilete mark**, **Y-mark**.



Tetrad stage

The period during post-meiotic development when the four microspores or megaspores are united by the presence of a temporary **special wall**.

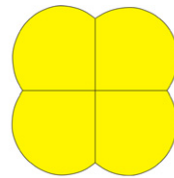
Comment: The tetrad stage ends at the start of the free spore stage, when the special cell wall is reabsorbed.

Tetragonal tetrad (Grebe, 1971)

A **uniplanar tetrad** in which all four members are in contact at the centre of the tetrad so that, in the correct orientation, the adjacent walls form a cross.

Example: *Uvariastrum hexaloboides* (Annonaceae).

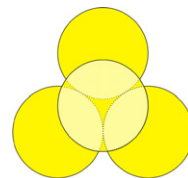
See also: **tetrad**.



Tetrahedral tetrad (Grebe, 1971)

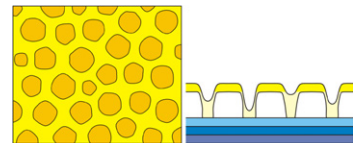
A multiplanar tetrad in which each member is in contact with three others, so that the centres of the grains define a tetrahedron. Example: *Erica* (Ericaceae).

See also: **decussate tetrad**, **tetrad**.



Tilia structure (Praglowski, 1971)

A sexine structure describing a pertacte tectum provided with funnel-like concavities of which the bottoms coalesce with a single underlying columella, to form one unit.



Torus (pl. tori) (Thomson and Pflug, 1953)

An arcuate invagination or protuberance of the exine more or less paralleling the laesura of a Spore in the interradial area.

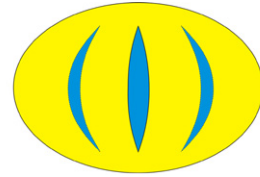
See also: **kyrtome**, **labrum**.



Transverse (adj.) (Reitsma, 1970)

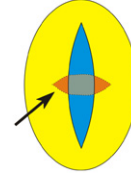
Synonym of **oblate**.

Comment: Transverse has also been used to indicate the orientation of latitudinal features. It is also commonly used to indicate a section cut through the equatorial plane of a pollen grain.



Transversal furrow (Iversen and Troels-Smith, 1950)

Synonym of **endocolpus**.



Trema (pl. tremata) (Erdtman and Straka, 1961)

Synonym of **aperture**.

See also: -treme.

-treme (Erdtman and Straka, 1961)

A suffix synonymous with **aperture**.

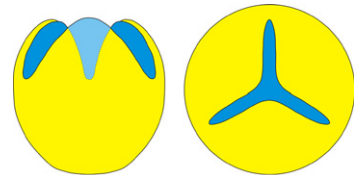
Comment: The -treme system of aperture classes suggested by Erdtman and Straka was intended to replace that of Iversen and Troels-Smith (1950). The system included atreme, monotreme, ditreme, tritreme, tetratrema, pentatrema, hexatrema, polytrema, anomotreme, pleotreme and stephanotreme.

Tri-

A prefix for three.

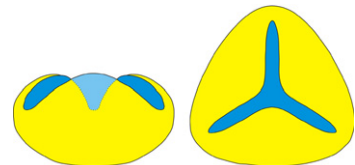
Trichotomocolpate (adj.) (Erdtman, 1945a)

Describing a pollen grain with a three-armed colpus. Example: *Trapa natans* (Trapaceae).



Trichotomosulcate (adj.) (Erdtman, 1952)

Describing a pollen grain with a three-armed sulcus. Example: *Elaeis guineensis* (Palmae).

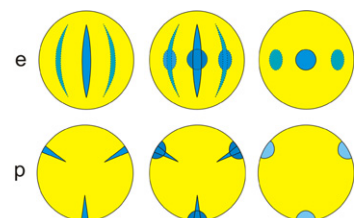


Tricolpate, tricolporate, triporate (adj.) (Iversen and Troels-Smith, 1950)

Describing pollen grains with three ectocolpi, three compound apertures or three pores.

Comment: The terms belong to the system of pollen classes introduced by Iversen and Troels-Smith (1950).

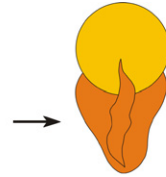
See also: **monoaperturate, pantoaperturate, zonoaperturate**.



Trifolium (pl. trifolia) (Potonié, 1956)

A three-bladed, proximal feature arising from the proximal pole of a megaspore. Example: *Capulitriletes*.

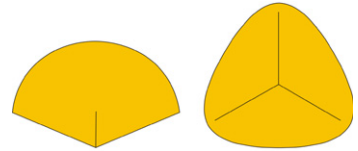
See also: **acrolamella**, **gula**.

**Trilete** (adj.) (Erdtman, 1943)

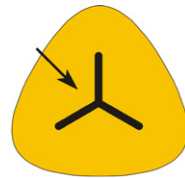
Describing a spore with three **laesurae**, thus showing a **trilete mark**.

Example: *Pteridium* (Hypolepidaceae).

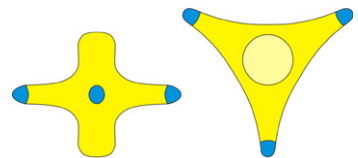
See also: **alete**, **laesura**, **monolete**.

**Trilete mark**

The triradiate mark of a trilete spore.

**Triprojectate** (adj.) (Mtchedlishvili, 1961)

Describing **projectate** pollen with three projecting arms on which the apertures are situated, as for example in the Triprojectacites group of fossil pollen grains. Example: *Aquilapollenites*.

**Tryphine** (Erdtman, 1969)

A material deposited on the surface of pollen grains by the breakdown of the tapetum and differing from **pollenkitt** in that it contains membranous components derived from organelles.

See also: **pollenkitt**.

Tuberculate (adj.)

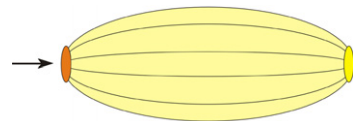
A general term for beset with knobby projections or excrescences (Jackson, 1928).

Tubulus (pl. tubuli) (Erdtman, 1952)

A general term for a small channel, applied in palynology to a channel through the nexine.

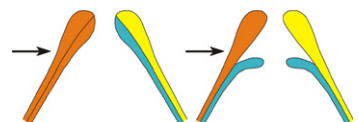
Tula (pl. tulae, adj. tulate) (Jansonius and Pocock, 1969)

A sexinal inflation in gymnospermous pollen at the end of the axis of the distal sulcus or leptoma. Example: *Ovalipollis*.

**Tumescence** (pl. tumescences) (Batten and Christopher, 1981)

A gradual increase in thickness of the wall layer(s) from a point in the equatorial interradial region to the germinal aperture. Example: *Megatriopollis*.

Comment: This term is used in descriptions of the fossil Normapolles group.



Turma (pl. turmae) (Potonié, 1956)

An artificial suprageneric grouping of form-genera of fossil spores and pollen.

Comment: The following groups are recognised in the system: **anteturma**, **turma**, **subturma**, and **infraturma**.

Turriiform (Balme, 1988)

Biform sculptural elements consisting of a capitate basal portion surmounted by a sharply contracted distal spine. Example: *Dibolisporites*.

Ubisch body (pl. ubisch bodies) (Rowley, 1963)

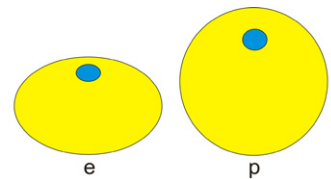
A distinctive, orbicular granule of sporopollenin produced by the tapetum, particularly in plants with secretory tapeta.

See also: **orbicule**.

Uculus (pl. uculi, adj. ucculate) (Walker and Doyle, 1975)

A rounded ectoaperture not situated at a pole. Example: Poaceae.

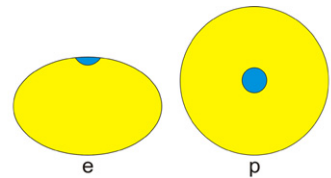
See also: **ulcus**.

**Ulcus** (pl. ulci, adj. ulcerate) (Erdtman, 1952)

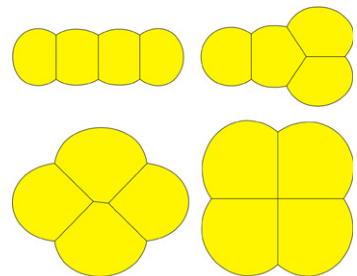
A rounded ectoaperture situated at the distal or proximal pole of a pollen grain. Examples: *Sparganium* (Sparganiaceae), *Typha* (Typhaceae).

Comment: An ulcus has the same shape as a **pore**. Ulci may be distal (**ana-ulcerate**) or proximal (**cata-ulcerate**).

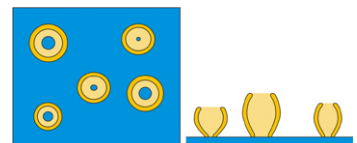
See also: **ana-**, **cata-**, **pore**, **ulculus**.

**Uniplanar tetrad** (Walker and Doyle, 1975)

A tetrad in which the individual members lie more or less in one plane.

**Urceolate** (adj.) (Ferguson et al., 1983)

Describing a type of ornamentation consisting of urn-shaped elements situated on the footlayer. Example: *Pinanga aristata* (Palmae).

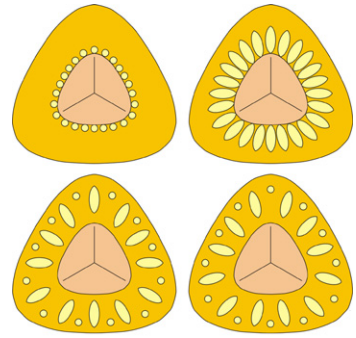


Vacuoles (Grebe, 1971)

Rounded to elongated spaces within an exinous structure, e.g. a **cingulum** or **zona**. Example: *Vallatisporites ciliares*.

Synonym of dissections.

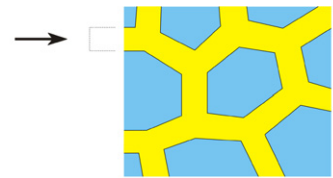
Comment: In botanical sense, vacuole is a general term for a liquid filled cellular component (Jackson, 1928). In Latin it means a hollow space, and in this sense this term is used.

**Vallum** (pl. valla) (Iversen and Troels-Smith, 1950)

Synonym of **murus**.

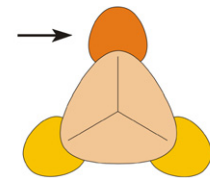
Comment: Sometimes used to describe a single, broad, raised feature in certain fossil spores.

See also: lira.

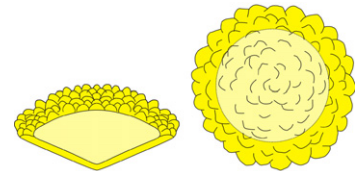
**Valva** (pl. valvae, adj. valvate) (Potonié and Kremp, 1955)

Radial thickenings in the areas beyond the ends of the laesurae of trilete spores. Example: *Triquitrites tribullatus*.

Comment: The term auriculate (Potonié and Kremp, 1955) refers to an extremely valvate condition.

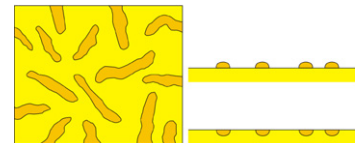
**Velum** (pl. vela, adj. velate) (Thomson and Pflug, 1953)

A feature of a monosaccate pollen grain in which the saccus is convoluted. Example: *Tsuga* (Pinaceae).

**Vermiculate** (adj.) (Kosanke, 1950; Harris, 1955)

A general descriptive term used to describe winding features.

Comment: Vermiculate has been used by Kosanke (1950) and Harris (1955) to describe depressions (**fossulae**). Others use the term for raised structures (**muri**) in **rugulate** pollen and spores.

**Verruca** (pl. verrucae, adj. verrucate) (Iversen and Troels-Smith, 1950)

A wart-like sexine element, more than 1 μm wide, that is broader than it is high and is not constricted at the base. Example: *Plantago* (Plantaginaceae).

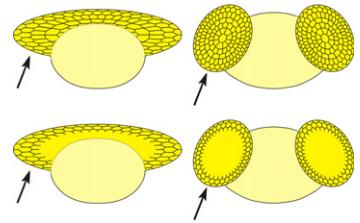
**Verrucose** (adj.) (Erdtman, 1969)

Synonym of **verrucate**.



Vesiculate (adj.) (Iversen and Troels-Smith, 1950)

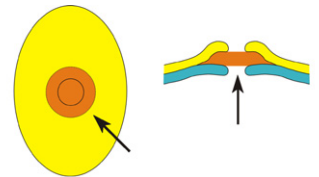
Synonym of **saccate**.



Vestibulum (pl. vestibula, adj. vestibulate) (Potonié, 1934)

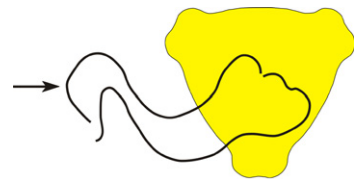
A separation between layers of the exine forming a cavity between the inner and outer pores. For example: *Betula* (Betulaceae).

See also: **atrium**, **fastigium**.



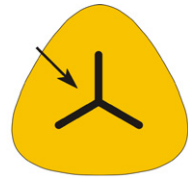
Viscin thread (pl. viscin threads)

A general botanical term (Jackson, 1928), applied in palynology for an acetolysis resistant, sporopollenin thread arising from the exine of a pollen grain, usually from the proximal surface. Example: *Oenothera* (Onagraceae).



Y-mark (Potonié, 1934)

Synonym of **trilete mark**.



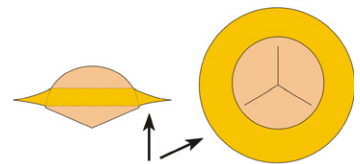
Z-layer (Heslop-Harrison, 1979)

Synonym of **exintine**.

Zona (pl. zonae, adj. zonate) (Potonié and Kremp, 1955)

A thin outer structure of a spore that projects at the equator, but does not extend over the distal face or proximal face. Example: *Cirratiradites saturni*. Comment: The term is especially applied for many representatives of fossil spores. Example: *Kraeuselisporites*.

See also: **cingulum**, **corona**.



Zona- (adj. zonate) (Walker and Doyle, 1975)

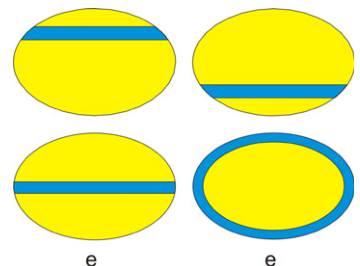
Prefix indicating ring-like.

Comment: The prefix **zona-** is used in conjunction with a suffix indicating the type of aperture.

Zona-aperturate (adj.) (Walker and Doyle, 1975)

Describing a pollen grain with a ring-like aperture.

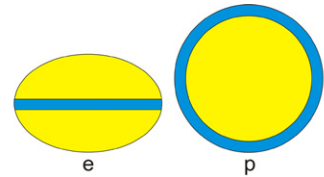
Comment: The range of ring-like apertures includes for example: **anazonasulculus** (1), a ring-like sulcus in the distal hemisphere; **catazonasulculus**, a ring-like sulcus in the proximal hemisphere; **zonasulculus**, a ring-like sulcus around the equator; and **zonasulcus** (2), a meridional ring-like sulcus perpendicular to the equator.



Zonasulculus (Walker and Doyle, 1975)

A ring-like sulculus around the equator. Example: *Nymphaea violacea* (Nymphaeaceae).

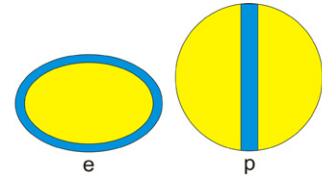
See also: **meridionosulcus**.



Zonosulcus (Walker and Doyle, 1975)

A meridional ring-like sulcus perpendicular to the equator. Example: *Laurelia novaezelandiae* (Monimiaceae).

See also: **meridionosulcus**.



Zoni- (sensu Erdtman and Vishnu-Mittre, 1956)

Synonym of **zono-**.

Zoni- (sensu Walker and Doyle, 1975)

Prefix indicating a latitudinal orientation.

Zono- (Erdtman and Straka, 1961)

A prefix indicating features located equatorially.

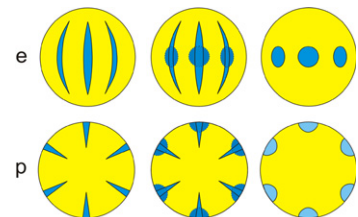
See also: **ana-**, **cata-**, **stephano-**.

Zonoaperturate (adj.) (Erdtman and Straka, 1961)

Describing a pollen grain with apertures situated only at the equator.

Comment: Pollen classes with zonoaperturate pollen include, **zonocolpate**, **zonocolporate**, **zonoporate**. Originally Erdtman and Vishnu-Mittre (1956) introduced the prefix zoni-, but later Erdtman and Straka (1961) changed the ending of the prefix to **zono-**.

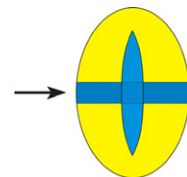
See also: **stephano-**.



Zonorate (adj.) (Erdtman, 1952)

Describing a pollen grain with a continuous endoaperture (**os**) around the equator.

Synonym of **endocingulum**.



Zwischenkörper (pl.) (Fritzsche, 1837)

A lens-shaped body below the aperture of certain unacetolysed pollen grains.

Comment: The feature resembles an **oncus** but is treated as distinct because some pollen grains have both features.

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