STUDY MATERIAL

# VIVEKANANDA COLLEGE THAKURPUKUR

NAAC Accredited Grade—A

# BOTANY

(HONOURS)

# Aperture Types in Spores and Pollens

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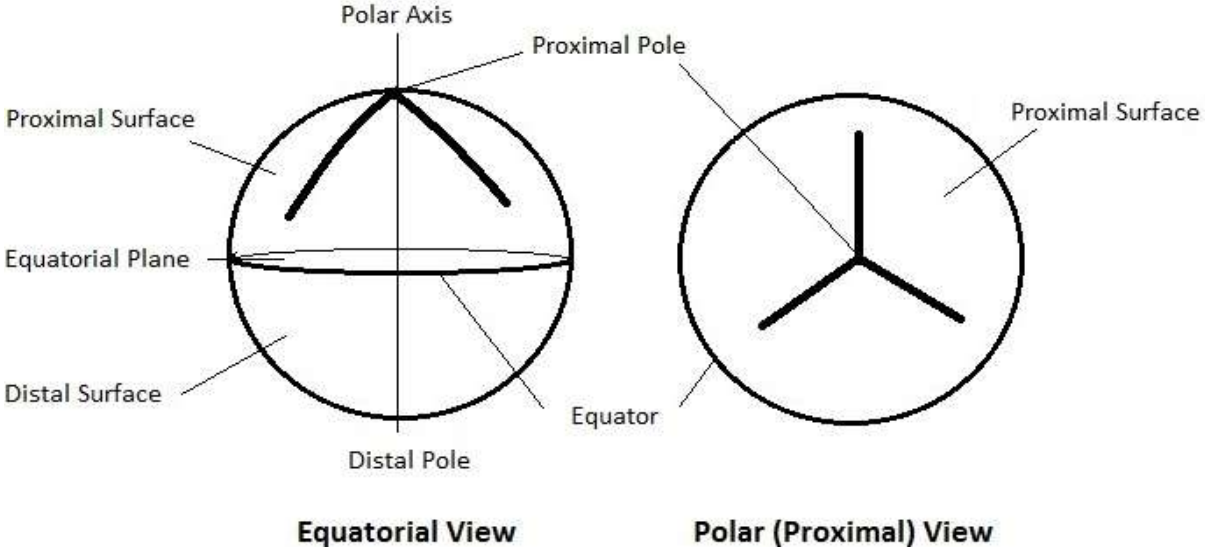
**Apertures in Spores and Pollens**

The **aperture**, also known as **trema** (pl. **tremata**), of a **spore**[1] or **pollen**[2] is a specific area of its **sporoderm**[3], in the form of a **thin area** or **opening** in the **exine**[4], through which its soft inner material is discharge during **germination**[5]. The aperture, an important morphological feature, is present in most spores and pollens which are termed as **aperturate**. However, the aperture is absent in some spores and pollens which are called **inaperturate** or **atreme** (e.g. *Potamogeton*). Furthermore, the **sexine**[6] is either absent or extremely thin (*i.e.* thinner than the **intine**[7]) and therefore the entire surface of the sporoderm is apertural in many inaperturate pollen grains which are better termed as **omniaperturate** (e.g. *Jatropha*). These apertures represent great diversity in terms of their **number**, **position** and **character** which are central to the **classification** of spores and pollens. The general morphology of a typical cryptogamic spore is shown in the following diagram (Fig. 1).

**Figure 1:** General morphology of a trilete spore in equatorial view and polar view.




(Modified from Playford and Dettmann, 1996).

**Aperture Types**

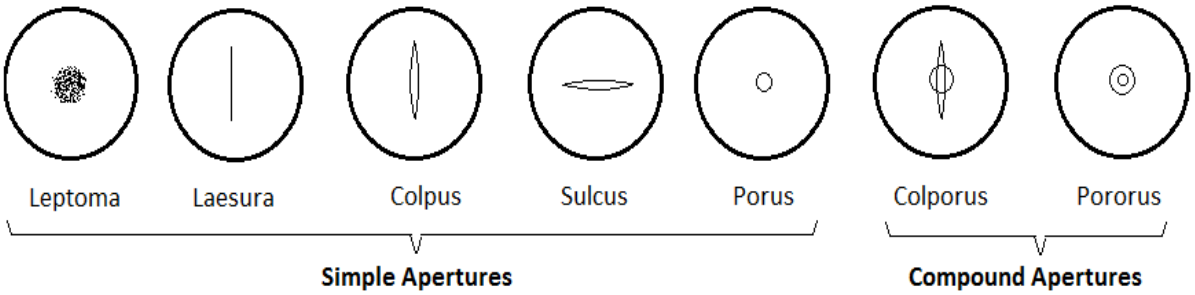
The **aperture types** found in **spores** and **pollens** are essentially based on their morphological **characters**. The important apertures types are illustrated in the following diagrams (Fig. 2). This **weak area** of the **sporoderm** is structurally either a **thin area** or an **opening** in the sporoderm (exine) and these are broadly grouped as **simple** and **compound**.

[1] These, in the broadest sense, are the asexual or sexual reproductive units of cryptograms, *i.e.* bacteria, fungi, algae, bryophytes and pteridophytes.
[2] These are the microspores of seed plants, *i.e.* gymnosperms and angiosperms.
[3] It is the wall of spores and pollens.
[4] It is the outer, thick, resistant, sporopolleninous layer of the sporoderm.
[5] This occurs through a proximal pole in spores and a distal pole in pollens.
[6] It is the outer, *s*culptured layer of the *exine*.
[7] It is the inner, thin, soft, cellulosic layer of the sporoderm.

**Simple Apertures**

These are **simple** thin areas or openings present in the exine of spores and pollens (Fig. 2). The aperture type in the form of a **simple thin area** is rare and is called **leptoma** (pl. **leptomata**) and the pollen grain with one leptoma is called **monolept** (e.g. Euphorbiaceae). The aperture types in the form of **simple openings** are more common and diverse. These may be a simple **slit-like narrow opening** called **laesura** (pl. **laesurae**) and the spore with **one laesura** is called **monolete** (e.g. *Psilotum*) or **three** (**trifurcated**) **laesurae** is called **trilete** (e.g. *Lycopodium*); a simple **boat-like elongated opening** (length/breadth ratio >2) called **colpus** (pl. **colpi**) if it is **meridional** and the pollen grain is called **colpate** (e.g. Brassicaceae) or **sulcus** (pl.**sulci**) if it is **latitudinal** and the pollen grain is called **sulcate** (e.g. Magnoliaceae); or a simple **pore-like circular opening** (length/breadth ratio <2) called **porus** (pl. **pori**) if it is **equitorial** and the pollen grain is called **porate** (*e.g.* Ulmaceae) or **ulcus** (pl. **ulci**) if it is **distal** and the pollen grain is called **ulcerate** (e.g. Gramineae). Sometimes, the colpus or sulcus may be a trifurcated opening called **trichotomocolpus** or **trichotomosulcus** and the pollen grain is called **trichotomocolpate** or **trichotomosulcate** (e.g. Palmae).

**Figure 2:** Apertures types in the spores and pollens of land plants. Broadly, simple apertures and compound apertures.




(Modified from Playford and Dettmann, 1996).

**Compound Apertures**

These are **compound** (or **composite**) thin areas or openings present in the exine of spores and pollens (Fig. 2). Their **ectoapertures** present in the outer exine (*i.e*. **sexine**) are **incongruent** with **endoapertures** present in the inner exine (*i.e*. **nexine**[8]). The ectoaperture is commonly in the form of openings such as the boat-like (length/breadth ratio >2) **colpus** or the pore-like (length/breadth ratio <2) **porus** while the endoaperture is in the form of the pore-like opening (length/breadth ratio <2) called **os** (pl. **ora**). The most common types of composite apertures are: "the os in coplus" called **colporus** (pl. **colpori**) and the pollen grain is called **colporate** (e.g. Solanaceae); and "the os in a porus" called **pororus** (pl. **porori**) and the pollen grain is called **pororate** (e.g. *Betula*). Pollen grains with well-developed colpi but weakly-developed ora (*i.e.* **oroids**) are called **colporoidate** (e.g. *Salix*) but those with weakly-developed colpi (i.e. **colpoids**) but well-developed ora are called **colpoidorate** (e.g. *Alangium*). Similarly, pollen grains with well-developed pori but weakly-developed ora (*i.e.* **oroids**) are called **pororoidate** (e.g. *Symphonia*) but those with weakly-developed pori (*i.e.* **poroids**) but well-developed ora are called **poroidorate** (e.g. *Lythrium*).

[8] It is the inner, *n*on-sculptured layer of the *exine*.

**Further Reading**

Bhattacharya, Kashinath, Manas R. Majumdar and Swati Gupta-Bhattacharya (2011). *A Textbook of Palynology*. Kolkata: New Central Book Agency Pvt. Ltd.

Bignot, Gerard (1985). *Elements of Micropaleontology*. Boston: International Human Resources Development Corporation.

Erdtman, Gunnar (1972). *An Introduction to Palynology*. New York: Hafner.

Armstrong, Howard A. and Martin D. Brasier (2005) *Microfossils*. Oxford: Blackwell Publishing.

Moore, Peter D. and Judith A. Webb (1978) *An Illustrated Guide to Pollen Analysis*. London: Hodder & Stoughton.

Playford, G. and M.E. Dettmann (1996). Spores. In: Jansonius, J. and D.C. McGregor (Eds.) *Palynology: Principles and Applications* (*Vol. 1*), pp. 227–260. Dallas: American Association of Stratigraphic Palynologists.