STUDY MATERIAL

VIVEKANANDA COLLEGE THAKURPUKUR

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BOTANY

(HONOURS & GENERAL)

NPC Classification of Spores and Pollens

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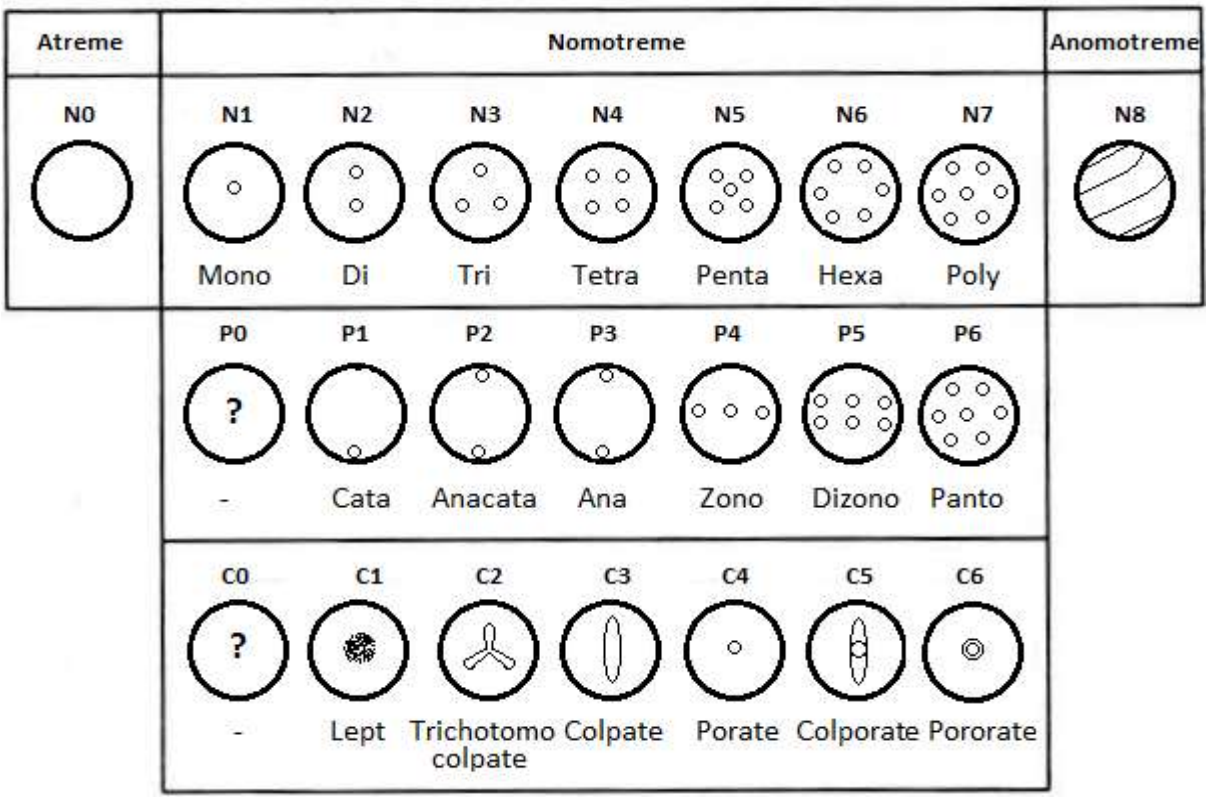
Classification of Spores and Pollens

Spores, in the broadest sense of this term, are the asexual or sexual reproductive units of **cryptograms**, *i.e.* bacteria, fungi, algae, bryophytes and pteridophytes. **Pollens** are the **microspores**[1] of **seed plants**, *i.e.* gymnosperms and angiosperms. Spores are characterized by **proximal germination** while pollens exhibit **distal germination**. The spores and pollens are identified and classified on the basis of their morphological features such as their **unit**, **polarity**, **symmetry**, **size**, **shape**, **aperture**, **sporoderm stratification** and **exine ornamentation**. However, the aperture is central to the classification of spores and pollens.

The NPC System

The **NPC system** of spore-pollen classification is solely based on their apertures (or **tremata**): their **number** (N), **position** (P) and **character** (C) as schematically represented below (Fig. 1). This **artificial system of classification** of spores and pollen originally proposed by Erdtman and Straka (1961) and later revised by Erdtman (1969) is now universally accepted. According to this system each spore or pollen grain is assigned a **three digit** number of which the first digit reveals the **number** of apertures present, the second digit indicates their **position** on the surface of the spore or pollen and the third digit denotes their morphological **character**.

Figure 1: The NPC System of the classification of spores and pollens.



(Modified from Playford and Dettmann, 1996).

[1] The smaller (and more numerous) of the two types of spores produced by heterosporous land plants that develops into the male gametophyte.

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The Number of Apertures

In the NPC system "N" denotes the **numbe**r (Latin *numerus*) of apertures present in a spore or pollen. This ranges from zero to numerous, and can even be uncountable. There are **nine classes** that are abbreviated as **N_0 to N_8**. The class **atreme** (N_0) denotes **inaperturate**[2] spores and pollens. The superclass **nomotreme** (N_1 to N_7) includes seven classes of **aperturate**[3] spores and pollens whose apertures are **countable** as follows: **monotreme** (N_1) with **one**, **ditreme** (N_2) with **two**, **tritreme** (N_3) with **three**, **tetratreme** (N_4) with **four**, **pentatreme** (N_5) with **five**, **hexatreme** (N_6) with **six** and **polytreme** (N_7) with **numerous** (more than six) apertures. The class **anomoatreme** (N_8) also denotes **aperturate** spores and pollens but their apertures are **uncountable** as these are irregular and diffused, rather than being localized, across the surfaces of spores and pollens.

The Position of Apertures

In the NPC system "P" denotes the **position** (Latin *positus*) of apertures on the surface of a spore or pollen. There are **seven classes** that are abbreviated as **P_0 to P_6**. These could be **polar**[4], **zonal**[5] or **global**[6]. The first class (P_0) denotes spores and pollens with uncertain or unknown position of the aperture. **Catatreme** (P_1) is **unipolar** with an aperture present at the **proximal pole**[7]. **Anacatatreme** (P_2) is **bipolar** with two apertures, one at each of the two poles. **Anatreme** (P_3) is also **unipolar** but with an aperture present at the **distal pole**[8]. **Zonotreme** (P_4) has apertures distributed on a line along the equator. **Dionotreme** (P_5) has apertures distributed two lines parallel to the equator. **Pantotreme** (P_6) has apertures distributed throughout the entire surface.

The Character of Apertures

In the NPC system "C" denotes the **character** (Latin *characteris*) of apertures in terms of their structure in a spore or pollen. This could be a **simple thin area**[9] or opening which is **boat-like**[10], or **pore-like**[11]**,** or even **compound**[12]. There are **seven classes** that are abbreviated as **C_0** to **C_6**. The first class (C_0), sometimes termed as **ignote**, represents spores and pollens with uncertain or unknown character of the aperture. **Lept** (C_1) has apertures in the form of thin areas or **leptomata**. **Trichotomocolpate** (C_2) has simple openings in the form of **trifurcated colpi**. **Colpate** (C_3) has simple boat-like elongated openings (length/breadth ratio >2) called **colpi**. **Porate** (C_4) has simple pore-like circular openings (length/breadth ratio <2) called **pori**. **Colporate** (C_5) has complex apertures with **ectoapertures** in the form of **colpi** that are incongruent with the endoapertures (**ora**). **Pororate** (C_6) has complex apertures with **ectoapertures** in the form of **pori** that are incongruent with the **endoapertures** (**ora**).

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[2] Aperture is absent.
[3] Aperture is present.
[4] It is present at the proximal, distal or both the poles.
[5] It is present along or parallel to the equator.
[6] It is present on the entire surface.
[7] It is located at the centre of the tetrad.
[8] It is located at the surface of the tetrad.
[9] It is in the form of leptomata.
[10] It is in the form of colpi (or sulci).
[11] It is in the form of pori.
[12] It is with ectoapertures incongruent with their endoapertures.

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Further Reading

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

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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.