

Palynology: Principles, Techniques, and Applications in Botanical and Environmental Research

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Abstract: *Palynology is the study of pollen grains, spores, and other very small organic-walled particles called palynomorphs.*

These tiny structures help scientists learn about plants, their environments, the history of the Earth, and how environments have changed over time. Palynology uses tools like microscopes, chemical methods, and statistical analysis to look at the shapes and how these particles are spread out. Pollen grains are made in large numbers and are strong because they have a special substance called sporopollenin in their walls, which helps them survive for a very long time in sediments. This makes palynology useful for understanding what plants were around in the past, what the climate was like, and how ecosystems changed. Today, palynology is also used in areas like forensics, archaeology, studying honey, and searching for oil. This article looks at the history of palynology, the methods used, the features of pollen, and how it is applied in various scientific fields.

Keywords: Palynology; pollen morphology; spores; palynomorphs; paleoecology; pollen analysis; forensic palynology; plant taxonomy