



The Dawn of Flowering Plants

What was the origin of flowering plants? How did they diversify and spread so rapidly? These are among the most perplexing puzzles of biology. Utilizing fresh approaches and new technologies, scientists may be on the cusp of a solution.

Flowering plants produce seeds encased in a protective covering, or carpel. If we cut into a fruit (e.g., apple, grape, tomato), we will see carpels with seeds. Such plants are called *angiosperms*, meaning “covered seed.” They contrast with more primitive plants like ferns, which reproduce by spores, and with conifers like fir and pine, whose seeds are exposed on scales. Conifers are examples of *gymnosperms*, meaning “naked seeds.”

Gymnosperms emerged about 370 million years ago, during the Paleozoic era, and dominated plant life for the next 250 million years. Scientists have long assumed that flowering plants evolved from gymnosperms. However, no transitional fossil has been found. The earliest fossil flowers were tiny—even microscopic—and lacked showy petals, but they did surround their seeds with a protective carpel.

These starter flowers date to the Cretaceous period, 120 million years ago, when dinosaurs still roamed. Their antecedents must go back even further. *Archaeofructus*, a fossil water plant from China, has been dated 144 to 125 million years ago. After comparing structures, paleobotanists concluded that *Archaeofructus* represents a sister lineage, long since extinct, and not a direct ancestor to living angiosperms.

Geneticists study modern flora for clues to origin and descent. They examined tiny flowers of *amborella*, which grows only in the cloud forests of New Caledonia. *Amborella*'s flower structures seem tentative and fluid. In particular, the carpels are sealed by secretion, not by fused tissue. Is *amborella* a relic from the ancestral lineage? No, it seems to have branched very early from other angiosperms onto its own evolutionary path.

Whatever their origin, flowering plants exploded into a myriad of forms and spread across the planet some 100 to 70 million years ago, an event known as the “great radiation.” This coincided with the development of petals, which attracted insect pollinators. Fragrance was probably a lure as well. Dinosaurs and other herbivores unknowingly contributed to seed distribution via their digestive tracts.

Flowering plants soon eclipsed conifers, cycads and other earlier gymnosperms. Today they comprise 90 per cent of all land plants—some 300,000 species, spun into a kaleidoscope of patterns including grasses, grains, flax, cotton, lilies, peaches, acorns, roses, clover, dandelions, and bluebonnets.

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