Garden Primeval

Soft, moist air ruffles the stiff fronds of giant tree ferns. Water seeps into a pool, where clover-like ferns float across the surface. A serpentine path imprinted with the footprints of long-extinct creatures winds among dark, needle-leaved trees. Under clumps of ferns, a dinosaur egg is hidden. This is the Garden Primeval, an ancient forest as it might have appeared in the mid-Jurassic period of the Mesozoic Era, about 150 million years ago. During this time the climate began to dry. Seedless plants, such as ferns and club mosses that required tremendous amounts of moisture, began to cede territory to the gymnosperms, the first plants to reproduce using seeds.

Though many primitive plants became extinct, present-day survivors of some seedless plants are on display in the Garden Primeval. True ferns, such as the ladder brake fern (*Pteris vittata*), are the familiar ferns seen along streams and moist forest floors throughout the southeastern states and California. Though much smaller than their ancestors, these ferns reproduce in the same way, through spores. Fern leaves, called fronds, can be simple, as in the *Colysis wrightii*, or very divided, as in the fishtail fern (*Nephrolepis falcata*). The plants themselves range in size from the tiny Resurrection fern (*Polypodium polypodioides*) to the tall Australian tree fern (*Cyathea cooperi*). Club mosses, whisk ferns, and horsetails are related to ferns. They reproduce in a similar fashion, but their appearance can be quite different. Most have much smaller leaves than ferns. Trailing spike moss (*Selaginella kraussiana*) is a club moss that looks like a clump of tiny ferns. Rock tassel fern (*Huperzia squarrosa*) looks like a creeping pine branch. Horsetails, represented in the display by the scouring rush (*Equisetum hyemale*) from North America, grow upright and resemble small bamboo plants.

The wind-pollinated gymnosperms, cone-bearing woody shrubs and trees, are represented here by cycads, conifers,

(above)
European water clover (*Marsilea quadrifolia*).

(opposite)
Primitive plants.
Ferns, cycads, club mosses, whisk ferns, and horsetails thrive in the moist air of the Garden Primeval.

ginkgoes, and gnetophytes. The cycads bear seeds in cones, but plants are divided into male and female. The cones of male and female sago palms (*Cycas circinalis*) can be spied in the center of their palm-like crowns, while the cones of the small cycad *Zamia skinneri* are close to the ground. The ginkgo (*Ginkgo biloba*) is another ancient tree that bears its seeds on female plants. Only the male is on display, as the seeds are notoriously foul-smelling. The lush green Norfolk Island pine (*Araucaria heterophylla*), a true conifer, dominates the primeval landscape. In its tropical native habitat off the coast of Australia, it can grow to 200 feet.

(left and below left)
Sago palm (*Cycas circinalis*) male and female.

Though often given the name "palm" ("cycad" derives from the Greek word *cyckos*, meaning palm-like), cycads are actually related to conifers, plants they predate on the evolutionary scale. Among the most primitive living families of seed-bearing plants, cycads do not produce flowers but bear seeds in cones. Individual plants are either female or male—seeds are produced in the female cone and pollen is produced in the male cone. Though delicate and soft like ferns when they are young, cycads grow taller and stiffer as they mature. It may take a century or more for them to reach their usual height of ten feet. Of the several examples of cycads that exist in the U.S. Botanic Garden, one female in the Garden Court has survived since the Wilkes Exploring Expedition returned in 1842.

(above)
Ginkgo (*Ginkgo biloba*).

The unusual leaves of the ginkgo, or maidenhair tree, have inspired artists wherever the tree has flourished. Ginkgoes are gymnosperms, among the first of the seed-bearing plants. A tree is either male or female—the female bears a small, disagreeably smelly fruit. Fossil records show that ginkgoes were widely scattered over the globe, but only one species has survived to modern times. Individual trees can live as long as 3,000 years.

(opposite)
Norfolk Island pine (*Araucaria heterophylla*).

The Norfolk Island pine, a seed-bearing conifer, towers above its ancestors in the Garden Primeval.

(above and opposite)

Sporangia (spore packets) on Australian tree ferns (*Cyathea cooperi*).

True ferns, whisk ferns, horsetails, and club mosses are flowerless plants that survive from the moist, Paleozoic landscape of 350 million years ago. These plants do not produce seeds like conifers and flowering plants. Instead, their reproductive cycle includes a stage that produces spores (spots on the underside of the fronds). Once the spores are dispersed, they must have a moist environment in which to germinate.

(center left)

Fern (*Pseudodrynaria coronans*).

The leaves of ferns, called fronds, range from very simple (undivided) structures to compound (divided) and decompound (highly divided). New fern fronds emerge tightly curled in the familiar "fiddlehead" form and unfurl as they grow.

(above left and bottom)

Fern (*Blechnum brasiliense*).