

Vascular Plants

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The first vascular plants had a new type of cell that was specialized to conduct water.

Tracheids are hollow cells with thick cell walls that resist pressure. They are connected end to end like a series of drinking straws. They allow water to move through a plant more efficiently than by diffusion alone.

Tracheids are the key cells in xylem, a type of vascular tissue that conducts water. Xylem moves water from roots to leaves.

Vascular tissue called phloem transports solutions of nutrients and carbohydrates produced by photosynthesis from leaves to roots.

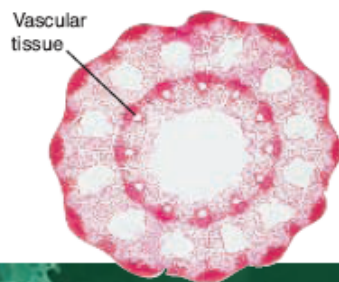
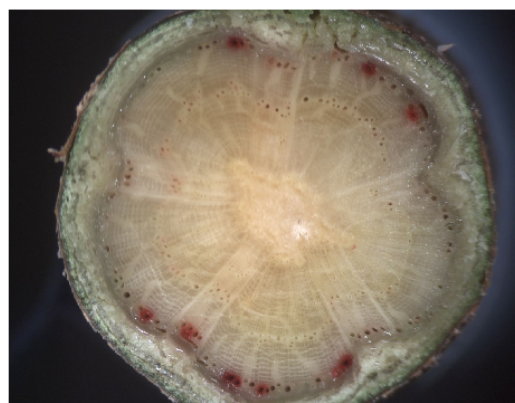
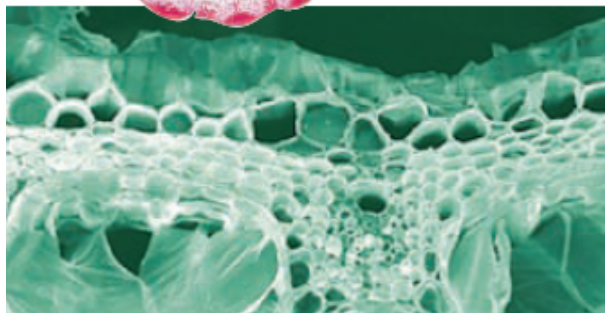


Figure 22-13 Vascular tissue conducts water and nutrients throughout the plant body. It also provides support for the leaves and other organs of the plant. The two types of vascular tissue are xylem, which conducts water, and phloem, which conducts solutions of nutrients. The cross section (top) shows the vascular tissue of the horsetail stem. The bottom photo shows a much-magnified view of tracheids from the xylem of the horsetail.



Seedless Vascular Plants ✓

Ferns and Their Relatives ✓

Seedless vascular plants include club mosses, horsetails and ferns.

Ferns and their relatives have true roots, leaves and stems. }

Roots are underground organs that absorb water and minerals. Water-conducting tissues are located in the center of the root. }

Leaves are photosynthetic organs that contain one or more bundles of vascular tissue. This vascular tissue is gathered into veins made of xylem and phloem. }

Stems are supporting structures that connect roots and leaves, carrying water and nutrients between them. }



Figure 22-14 🌿 Club mosses and horsetails are seedless vascular plants. The club moss *Lycopodium* (left) looks like a tiny pine tree growing on the forest floor. The only living genus of Arthrophyta is *Equisetum*, or horsetail (above).

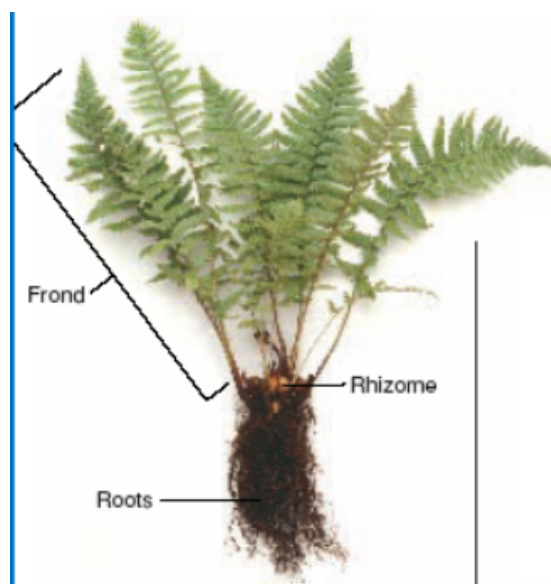
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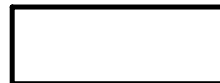
Horsetail, or scouring rush, usually grows about 1 m high and contains crystals of abrasive silica.

Ferns ✓

Ferns belong to the phylum Pterophyta. They have true vascular tissues, strong roots, creeping or underground stems called rhizomes, and large leaves called fronds. }



▲ **Figure 22–15** Ferns are easily recognized because of their delicate leaves, which are called fronds. Fronds grow from a rhizome, which grows horizontally through the soil. **Applying Concepts** *Is the plant shown a sporophyte or a gametophyte?*



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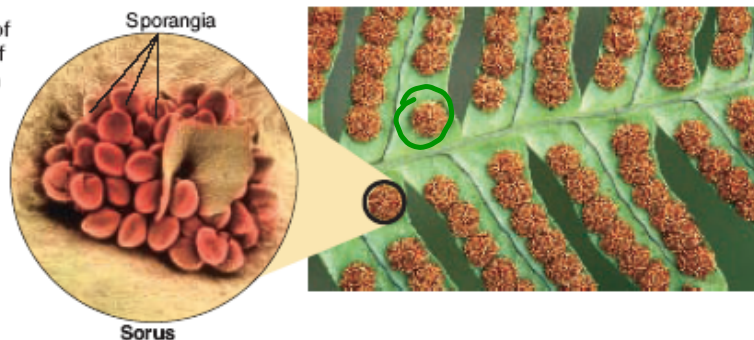
Ferns can thrive in areas with little light. They are most abundant in wet or at least seasonally wet habitats around the world.

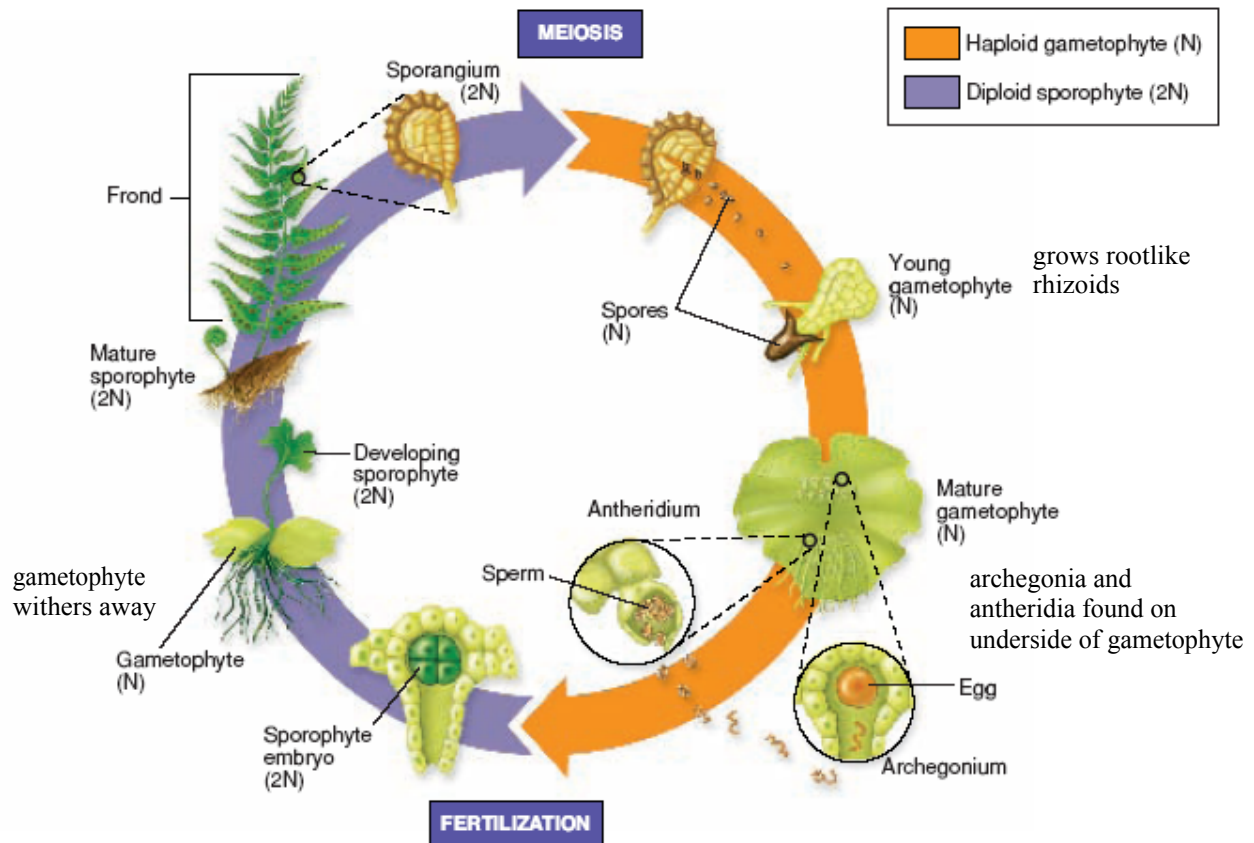
Life Cycle of Ferns (Page 562) ✓

Ferns and other vascular plants have a life cycle in which the diploid sporophyte is the dominant stage.

Fern sporophytes develop haploid spores on the underside of their fronds in tiny containers called sporangia (singular: sporangium). Sporangia are grouped into clusters called sori (singular: sorus).

► **Figure 22-16** Many clusters of sporangia form on the underside of fern leaves—each cluster is called a sorus. In each sporangium, cells undergo meiosis to produce spores. **Inferring** Are these spores haploid or diploid?





▲ **Figure 22-17** In the life cycle of a fern, the dominant and recognizable stage is the diploid sporophyte. The tiny, heart-shaped gametophyte grows close to the ground and relies on dampness for the sperm it produces to fertilize an egg. The young sporophyte grows from the gametophyte.

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A Fiddlehead is a fern so young and new that it hasn't yet "unfurled" and opened its leaves. The end is still curled in a tight spiral, ready to unroll as the sun warms it and it gathers strength and size. This spiral shape reminds many people of the end of a violin, hence the name "Fiddlehead."



Ostrich Fern Fiddlehead
Matteuccia struthiopteris

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