

LEAF STRUCTURAL TYPES

Leaf structural type (in contrast to leaf type) deals with specialized modifications of leaves. One basic leaf structural type in vascular plants is whether the leaves are lycophyllous or euphyllous. **Lycophylls** are small, simple leaves with intercalary growth and a single, central vein that joins to the stem without a leaf gap (below).

Lycophylls are found only in lycophytes and are similar to the type of leaf found in the earliest ancestors of vascular plants. **Euphylls** are larger, simple or compound leaves with marginal or apical growth, a leaf gap (region of parenchymatous tissue above the junction of the leaf and stem vasculature), and generally multiple veins. Euphylls are found in ferns, gymnosperms, and angiosperms.

A leaf that is modified in shape and usually smaller than the major photosynthetic leaves is called a **bract**. In angiosperms bracts are typically associated with flowers (flower bracts) or the axes of inflorescences (inflorescence bracts).

A **bractlet** or **bracteole** (also called a **prophyll** or **prophyllum**) is a smaller or secondary bract often borne on the side of a pedicel in flowering plants. The term bract is also used for the largely non-photosynthetic leaves that subtend the ovuliferous scales in conifer cones or that subtend the fascicles or short shoots of members of the pine family (Pinaceae).

The term **scale** is used for a small, non-green leaf, either of a bud (**bud scales**), functioning to protect the delicate apical meristem and leaf primordia, or of an underground rootstock, e.g., along the internodes of a rhizome. Scales can also refer to the reduced bracts of sedge spikelets (Cyperaceae).

Some bract like leaves are found in specific taxonomic groups and are given specialized names. A group of bracts resembling sepals immediately below the true calyx is termed an **epicalyx**, found, e.g., in many members of the Malvaceae. Bracts subtending individual flowers of composites (Asteraceae) are

collectively termed **chaff** or **paleae** (singular, **palea**), e.g., as found in the tribe Heliantheae of that family.

The specialized bracts of the grass (Poaceae) spikelet are given different terms: **glumes**, the two bracts occurring at the base of a grass spikelet; **lemma**, the outer and lower bract at the base of the grass floret; and **palea**, the inner and upper bract at the base of the grass floret.

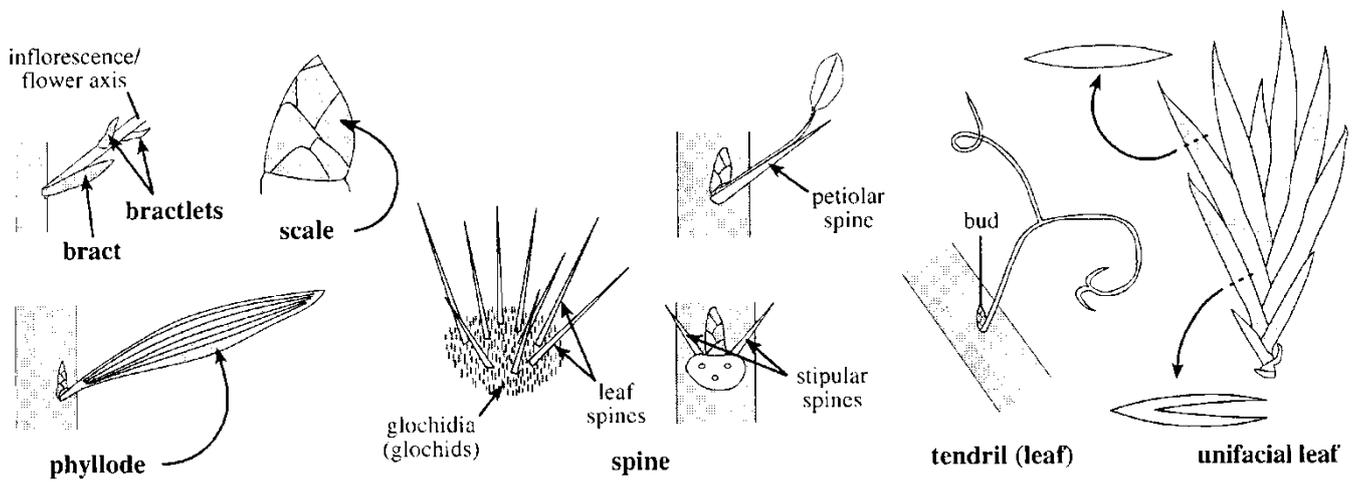
A **phyllary** is one of the involucre bracts subtending a head, as in the Asteraceae. A **spathe** is an enlarged, sometimes colored bract subtending and usually enclosing an inflorescence, e.g., that subtending the spadix of the Araceae.

Phyllodes are leaves that consist of a flattened, bladelike petiole. Phyllodes are found in a group of mostly Australian *Acacia* species (the phyllodinous Acacias) and are derived from ancestrally compound leaves by loss of the rachis and leaflets. A **tendrill** is a coiled and twining leaf or leaf part, usually a modified rachis or leaflet. (Tendrill can also refer to a modified, coiling stem). A **spine** is a sharp-pointed leaf or leaf part. The typical spines of cacti (Cactaceae) are **leaf spines**, as they develop from the entire leaf primordia. A very small, deciduous leaf spine with numerous, retrorse barbs along its length is a **glochidium** (plural, **glochidia** or **glochids**), as found in the areoles of opuntoid cacti. Some taxa have spines that develop from a petiole, midrib, or secondary vein of a leaf, e.g., the **petiolar spines** of *Foquieria* spp. In some palms, e.g., *Phoenix*, the leaflets may be modified into sharp-pointed **leaflet spines**. Many plants, such as the stem-succulent *Euphorbias*, have **stipular spines**; these are typically paired, at the base of a leaf.

A **unifacial leaf** is isobilateral, i.e., flattened side-to-side and having a left and right side, except at the base, where they are often sheathing. Some monocots belonging to several different families have unifacial leaves, notably members of the Iridaceae, the Iris family. A **centric leaf** is one that is cylindrical in shape,

e.g., *Fenestraria* of the Aizoaceae. Centric leaves are sometimes a subcategory of unifacial leaves.

Three types of leaves are very specialized adaptations of carnivorous plants. **Pitcher** leaves are those that are shaped like a container, which bears an internal fluid and functions in the capture and digestion of small animals. Several taxa have pitcher leaves, including *Darlingtonia*, *Nepenthes*, and *Sarracenia*, the pitcher plants. **Tentacular** leaves are those bearing numerous, sticky, glandular hairs or bristles that function in capturing and digesting small animals; these are characteristic of *Drosera* spp., the sundews. **Trap** leaves are those that mechanically move after being triggered, in the process capturing and digesting



Leaf structural types



A



B



C



D



E



F



G



H



I



J



K



L



M



N

Leaf structural types. **A, B.** Phyllode, *Acacia longifolia*. **A.** Mature. **B.** Young, with vestigial, caducous rachillae, representative of ancestral condition. **C.** Tendril, *Lathyrus vestitus*. **D, F.** Spines. **D.** Stipular spines, *Euphorbia* sp. **E.** Petiolar spines, *Fouquieria splendens*. Note mature leaf (above), dehiscence of blade and upper tissue of petiole, leaving petiolar spine (below). **F.** Leaf spines, cactus areole. **G–K.** Leaf modifications of carnivorous plants. **G, H.** Pitcher leaves. **G.** *Nepenthes* sp. **H.** *Sarracenia purpurea*. **I.** Tentacular leaves of *Drosera capensis*. Note glandular trichomes (arrow). **J.** Trap leaf, *Dionaea muscipula*. **K.** Show flower bracts, *Bougainvillea*. **L.** Epicalyx, *Lavatera bicolor*. **M.** Bud scale, *Liquidambar styraciflua*. **N.** Unifacial leaf, *Juncus phaeocephalus*.