

Leaf blades on magnolia floral buds

by John D. Freeman

Occasional development of a leaf blade near the apex of a Magnolia flower bud has probably been observed by many who collect, study, and grow these plants. Discovery of an example of this anomaly on a branch of *M. macrophylla* collected by Harold Hopkins and me at Oak Hill, AL, in May 1985 (see photographs) led to development of this note at his suggestion.

The botanical nature of the structure(s) enclosing Magnolia buds, both vegetative and floral, is somewhat unusual. In most plants the scales covering vegetative buds represent leaves that are reduced in size and specialized to protect bud contents, but not in Magnolia. The outer portions of floral buds in most species consist of perianth segments (actual flower parts) known as sepals, but not in Magnolia.

In the Magnoliaceae both vegetative

and floral buds are entirely enclosed and protected by a pair of leaf parts, the stipules, which may be much larger in the case of floral buds than in either typical Magnolia leaves or vegetative buds. Paired stipules are sometimes apparently fused into one unit (as in Magnolia) or may be present as separate valve-like structures (as in *Liriodendron*). Since the outermost flower parts are enclosed by stipules in Magnolia buds, the outer perianth segments are not primarily protective. When little distinction exists among perianth segments except the relative positions, they are typically called tepals rather than sepals and petals. Abscission scars from stipules produce the rings that encircle young twigs in members of Magnoliaceae. If one tends to think of bud scales of Magnolia in terms of function instead of origin, this can lead to the erroneous assumption that they are morphologically equivalent to the



These photos show the position of the leaf growth appendage on the M. macrophylla flower bud. In left photo the leaf growth arises from the flower bud, which is partly hidden at top by the leaf growth at this camera angle. In right photo, from the other side of the flower bud, the point of leaf attachment is hidden from the camera and the leaf arises from behind the flower bud, while a normal growing shoot with a new leaf appears at the left below the flower peduncle. This budded branchlet was cut and inserted in a container of water for several days, but the bud, though it appears mature, dried up and the flower never opened, leaving a question of whether the leaf growth normally would have fallen away with the spathaceous bract surrounding the bud or remained on the tree.

protective scales covering buds of other plants.

Vegetative leaves that have a blade, a petiole, and stipules, like those of *Magnolia*, are termed *complete* leaves. If one (or more) of these three types of foliar parts should be lacking, that leaf is described as *incomplete*. Incomplete leaves thus may be elaminate (without a blade), epetiolate or sessile (without the petiole), or estipulate (lacking the pair of stipules). Normal bud sheaths of *Magnolia* are elaminate, epetiolate leaves that develop during formation of winter buds. Except in very rare cases the blades and petioles of such specialized leaves simply do not develop. However, just as normal leaves usually have axillary buds, the stipular sheath of a *Magnolia* flower has an axillary bud that later can lengthen the stem from just below where a terminal flower had been formed.

Very little experimental work has been done with stipules, but their absence or presence has been useful in descriptive botany. Among flowering plants in general, presence of stipules is regarded as a primitive feature. They occur in many different forms among diverse plant groups, some of which are considered on other grounds to be relatively advanced. Most members of the rose and bean families have conspicuous stipules. The thorns of black locust (*Robinia*), for example, are stipules. In *Begonia*, a common houseplant representing its own family, they are large and membranous. In the greenbrier (*Smilax*) stipules take the form of tendrils, whereas in cinnamon fern (*Osmunda*) they are flattened, non-green extensions of each leaf base near the juncture of petiole (*stipe*) and rhizome. The word "stipe," used for the petiole of ferns, is the source of the term stipule, meaning a small appendage of the leafbase. Stipules usually occur in pairs at the bases of leaves, but sometimes they are tubular and surround the stem as in smartweed (*Polygonum*). It is best not to predict the form that stipules may assume in a

given species of plant before first making observations.

The form attained by leaves as they differentiate within buds is under the control of many factors operating in concert. These factors include several plant hormones that must interact with the environment to develop a plant's genetic potential. Abnormal leaves represent products of various malfunctions in this complex growth control system. Certain anomalies may show up annually in certain individuals or appear for one season in a plant and never be seen again. It is probable that the growth potential of the primordial cells that might form leaf blades can be altered by the environment as well as the genes themselves. For example, leaf blades may develop on *Magnolia* flower buds more commonly following a mild winter than an extremely cold one because undifferentiated blade tissue is more likely to be killed by the low temperatures and drying in the latter case. Pitcher-leaved *Magnolia* specimens (*MAGNOLIA*, vol. XIX, No. 1, pp. 15-16, and No. 2, p. 19) are another phenomenon attributable to flaws in the system controlling leaf development, and in this case the atypical form appears to have a genetic basis. Indeed, the balance between genetics and environment has numerous manifestations in the genus *Magnolia*.



These leaves of M. officinalis turned to a golden color and remained on the tree for awhile before falling. Sir Peter Smithers thought the effect was attractive, and sent this picture.