







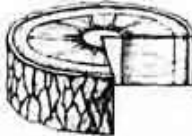
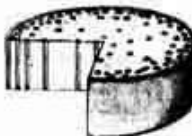






MONOCOTS versus DICOTS

The Two Classes of Flowering Plants

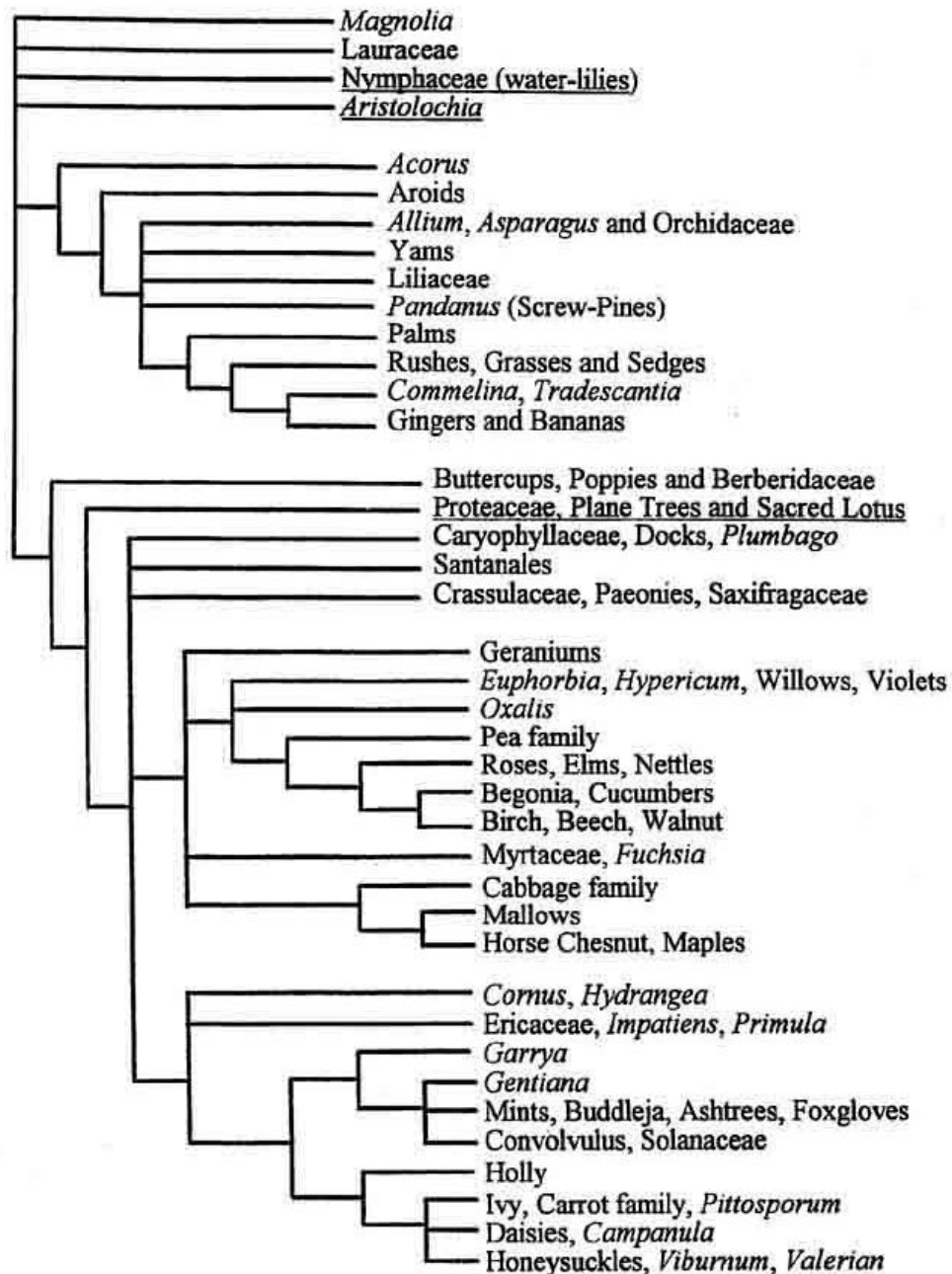
Traditionally, the flowering plants have been divided into two major groups, or classes: the Dicots and the Monocots. In 1682, John Ray published his *Methodus Plantarum Nova*, in which Dicotyledons and Monocotyledons were first given formal taxonomic standing. This system was popularized by the French botanist Antoine Laurent de Jussieu in his *Genera Plantarum* of 1789, a work which improved upon, and gradually replaced, the system of plant classification devised by Linnaeus. An alternative name that was used for these classes was **Exogens** (those that grew externally, i.e. the trunk developed rings) and **Endogens** (those that grew internally, i.e. the new vascular bundles in a monocot stem that prevent it enlarging its trunk).

The table summarizes the major morphological differences between monocots and dicots; each character is discussed in more detail below.

| | Dicotyledons | Monocotyledons | |
|---|---|--|---|
|  | EMBRYO: Two cotyledons (seed leaves) present; endosperm present or lacking in the seed. | EMBRYO: One cotyledon (seed leaf), present; endosperm frequently present in the seed. |  |
|  | ROOTS: The primary root often persists and becomes a strong taproot, with smaller secondary roots. | ROOTS: The primary root is of short duration and is soon replaced by adventitious roots, which form a fibrous root system or sometimes a bundle of fleshy roots. |  |
|  | GROWTH FORM: May be either herbaceous or woody. | GROWTH FORM: Mostly herbaceous; a few are arborescent (tree-like). |  |
|  | POLLEN: Basically tricolpate (having three furrows or pores). | POLLEN: Basically monolepate (having one furrow or pore). |  |
|  | VASCULAR SYSTEM: Usually consists of a ring of primary bundles with a cambium, and secondary growth in diameter of the stem; stem differentiated into cortex and stele. | VASCULAR SYSTEM: Consists of numerous scattered bundles, without definite arrangement and in a ground parenchyma; cambium only exceptionally present; no differentiation into cortical and stelar regions in stems. |  |
|  | LEAVES: Usually net-veined (pinnate or palmate), usually broad in shape and seldom sheathing at the base; petiole (stalk) commonly developed and often bearing stipules. | LEAVES: Usually parallel-veined, commonly oblong or linear in shape and often sheathing at the base; petiole (stalk) seldom developed and stipules absent. |  |
|  | FLOWERS: Parts are usually in fours or fives. | FLOWERS: Parts are usually in threes or multiples of three. |  |

Even after the general acceptance of Monocots and Dicots as the primary groups of flowering plants, botanists did not always agree upon the placement of families into one or the other class. There are monocots that possess characters more typical of dicots: The Yams (*Dioscoreaceae*) and *Smilax* have broad, reticulate-veined leaves; *Potamogeton* (pondweeds) is one of several monocots to have floral parts

in multiples of four. Other plants have a mix of characters which do not occur together in most other flowering plants. For instance, the Water-lilies (Nymphaeaceae) have reticulate venation in their leaves, and what may be a single cotyledon in the embryo (it is not clear whether it is a single-lobed cotyledon, or two that have become fused). The water lilies also have a vascular arrangement in their stem similar to that of monocots. This "fuzziness" in the definitions of Monocotyledons and Dicotyledons is not simply the result of poor botany. Rather, it is a real phenomenon resulting from the shared ancestry of the two groups. With the development of molecular techniques in this century it has been possible to develop a more complete evolutionary tree of plants using changes in the DNA sequence. Some of these families are now referred to as **Paleoherbs** (Ancient herbs). The three groups of paleoherbs are Aristolochiales (birthwort, Dutchman's pipe), Piperales (pepper vine, lizard's tails), and Nymphaeales (waterlilies).



Despite the problems in recognising basal angiosperm taxa, the standard distinctions between dicots and monocots are still quite useful. It must be pointed out, however, that there are many exceptions to these characters in both groups, and that no single character in the list will infallibly identify a flowering plant as a monocot or dicot.