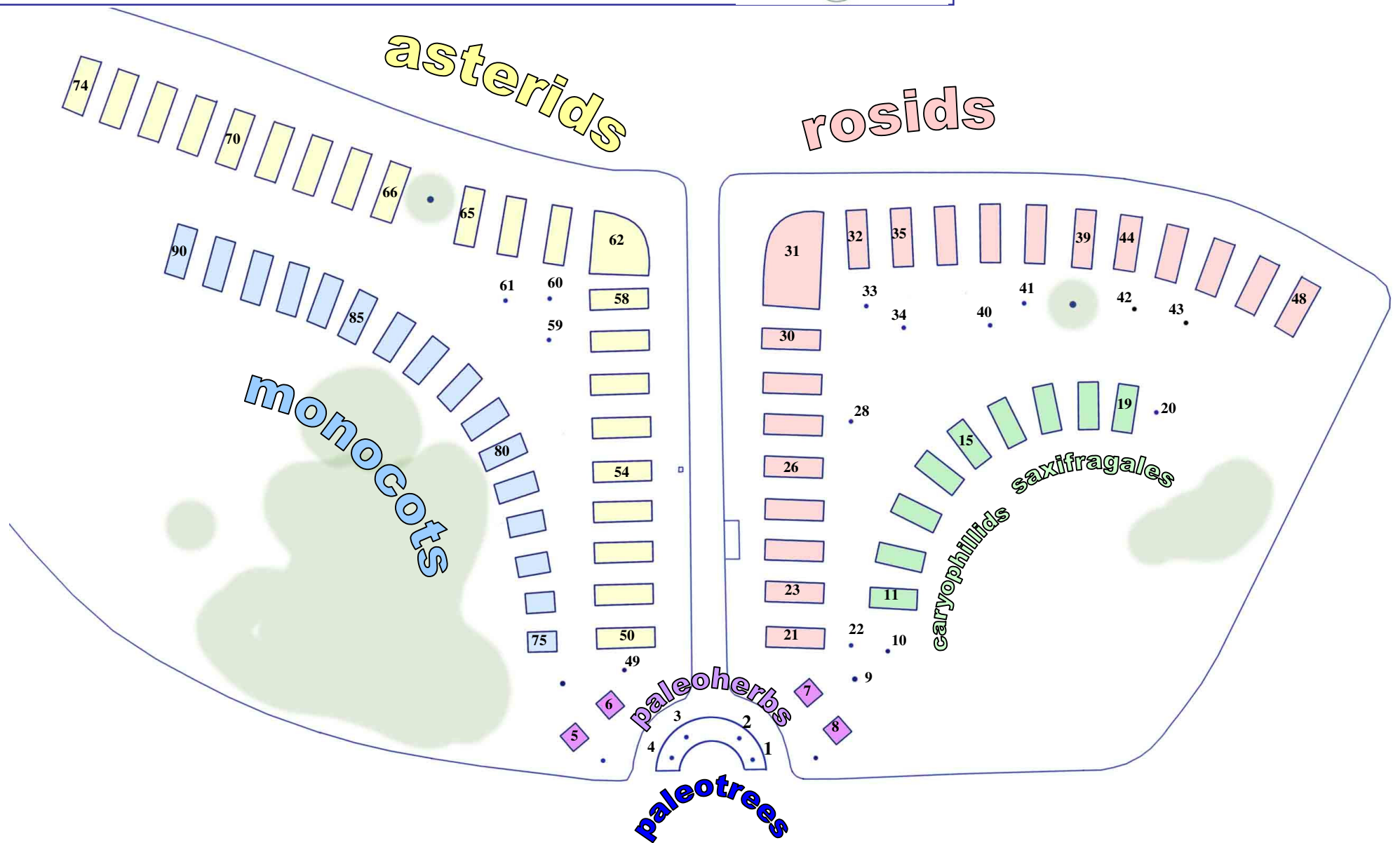


NATIONAL BOTANIC GARDENS, GLASNEVIN

The FAMILY BEDS – student guide

Last updated: March 2006



The Family beds are based upon the *Bentham and Hooker System*, but they are laid out so as to take account of a modern understanding of the evolution of flowering plants by the **Angiosperm Phylogeny Group**. The Sundial lawn provides a central focus indicating the four basic evolutionary lineages of flowering plants: **Paleotrees**, **Paleoherbs**, **Eudicots (9-74)** and **Monocots (75-90)** (see page 4).

- The **Paleotrees (1-4)** and **Paleoherbs (5-8)**, represent a very early divergence, and are now evolutionary relic groups. They are characterised by spirally arranged petals, or very reduced floral parts. Many paleoherbs, and some paleotrees, have aromatic oils.
- To the east (Right) two parallel sets of beds follow the evolution of the many-petalled flower groups. Both sets of beds represent the *Polypetalae* of Bentham & Hooker's system. All these groups are derived from a buttercup-like ancestor.
 - Further away from the path lie the **Caryophyllales (11-15)** and **Saxifragales (16-20)** which we now know diverged from other *Polypetalae* early in evolution. Proteaceae (9) and Plane trees (10) also represent a very early, independent lineage.
 - The beds closer to the path comprise the **Rosids**. The first few beds (**Ranunculaceae**, **Berberidaceae**) are basal to all other **Eudicots** and from them evolved the Proteales, Caryophyllales, Saxifragales, Rosids and Asterids.
- To the west (left) lie the **Asterids (50-74)**, which are equivalent to Bentham & Hooker's *Gamopetalae*, or tubular-flowered groups. *Cornus* (49) in front of the Asterids indicates that some of the tubular flowered species have many petals, and the Cornaceae used to be classified among the polypetalae.
- The **Monocots** form the final evolutionary lineage on the far-left. They are arranged according to a modern evolutionary scheme. They share single-porate pollen with the Paleoherbs and Paleotrees.

PALEOTREES

- 1 MAGNOLIACEAE
- 2 WINTERACEAE
- 3 LAURACEAE
- 4 CALYCANTHACEAE

PALEOHERBS

- 5 NYMPHACEAE
- 6 ARISTOLOCHIACEAE
- 7 SAURURACEAE
- 8 ILLICIAEAE
- 8 SCHISANDRACEAE

EUDICOTS (ROSIDS & ASTERIDS)

All Eudicots have **3-porate pollen**, while the Paleo groups and Monocots all share **monocolpate pollen**.

- 9 PROTEACEAE
- 10 PLATANACEAE

ROSIDS (= POLYPETALAE)

The petals are each separate, and can be pulled off the flower one at a time. These are divided into 3 sections:

THALAMIFLORAE: *The Sepals, Petals and Stamens in these flowers are each separately attached to the receptacle.*

- 21 RANUNCULACEAE
- 22 LARDIZABALACEAE
- 23 BERBERIDACEAE
- 23 PAPAVERACEAE
- 24 CRUCIFERAE
- 24 CAPPARACEAE
- RESEDACEAE
- 25 CISTACEAE
- 25 VIOLACEAE
- POLYGALACEAE
- 27 HYPERICACEAE
- 27 MALVACEAE
- 28 TILIACEAE

CARYOPHYLLIDS *In these families the ovary is axile, or basal, and the seeds have a characteristic curved embryo. Because of their highly reduced flowers, which lack both sepals and petals, Bentham & Hooker*

classified many of these in their Monochlamydae.

- 11 CARYOPHYLLACEAE
- 12 PORTULACACEAE
- 12 AIZOACEAE
- 13 NYCTAGINACEAE
- 13 AMARANTHACEAE
- 14 CHENOPODIACEAE
- 14 PHYTOLACCACEAE
- 15 POLYGONACEAE

DISCIFLORAE: *In these flowers the ovary is superior, but is immersed, or sunken, into the disk of the flower.*

- 29 LINACEAE
- 29 LIMNANTHACEAE
- 30 GERANIACEAE
- 31 BALSAMINACEAE
- 31 OXALIDACEAE
- 31 VITACEAE
- 32 RUTACEAE
- 33 AQUIFOLIACEAE
- 34 RHAMNACEAE

CALYCIFLORAE: *The Stamens are fused to the Calyx*

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of the flower, often forming a hypanthium (a tube below the petals and sepals), the ovary may be superior or inferior.

- 35/36 LEGUMINOSAE
- 37/38 ROSACEAE
- 39 EUPHORBIACEAE
- 39 URTICACEAE
- 40 JUGLANDACEAE
- 41 BETULACEAE
- 42 SALICACEAE
- 43 MYRTACEAE
- 44 LYTHRACEAE
- 44 ONAGRACEAE
- 45 LOASACEAE
- 45 PASSIFLORACEAE

- 46 CUCURBITACEAE
- 46 BEGONIACEAE
- 47 UMBELLIFERAE
- 48 ARALIACEAE

SAXIFRAGALES *These were formerly classified as being close to Rosaceae and Leguminosae, but are a distinct and early lineage of Eudicots. They have partly-fused ovaries.*

- 16 SAXIFRAGACEAE
- 17 PAEONIACEAE
- 18 CRASSULACEAE
- 19 GROSSULARIACEAE
- 20 HAMAMELIDACEAE

ASTERIDS (=GAMOPETALAE)

The petals are fused to one another along their sides, forming a tubular flower. Divided into 3 groups.

- 49 CORNACEAE.

INFERRAE: *The Ovary is below the flower (inferior), and the number of stamens is equal to the number of petals.*

- 50 CAPRIFOLIACEAE
- 50 RUBIACEAE
- 51 VALERIANACEAE
- 52 DIPSACACEAE
- 53/54 COMPOSITAE
- 55 CAMPANULACEAE

HETEROMERAE: *The Ovary is within the flower (superior) and the number of stamens is either double the number of petals, or each stamen is aligned on the centre-line of the petal*

- 56 ERICACEAE
- 57 PLUMBAGINACEAE
- 58 PRIMULACEAE
- 59 EBENACEAE
- 60 STYRACACEAE

BICARPELLATAE: *The Ovary is within the flower (superior) and is divided into 2 carpels (n.b. these look like 4 in Boraginaceae and Lamiaceae)*

- 61 OLEACEAE
- 62 APOCYNACEAE
- 62 ASCLEPIADACEAE
- 63 GENTIANACEAE
- 64 POLEMONIACEAE
- 64 HYDROPHYLLACEAE
- 65 BORAGINACEAE
- 66 CONVULVACEAE
- 67 SOLANACEAE
- 68/69 SCROPHULARIACEAE
- 70 ACANTHACEAE
- 71 GLOBULARIACEAE
- 71 BIGNONIACEAE
- 72 VERBENACEAE
- 73/74 LABIATAE
- 74 PLANTAGINACEAE

MONOCOTYLEDONS

The family Liliaceae used to be classified as a single large family (78-86), today it is divided into some 20 separate families, each distinguished by simple structural differences. Bentham & Hooker's arrangement is long outdated, and the new arrangement relates to many morphological features of growth.

These families have separate carpels.

- 75 ARACEAE
- 76 ALISMACEAE
- 76 BUTOMACEAE

These are isolated and distinctive families.

- 77 ORCHIDACEAE
- 77 IRIDACEAE

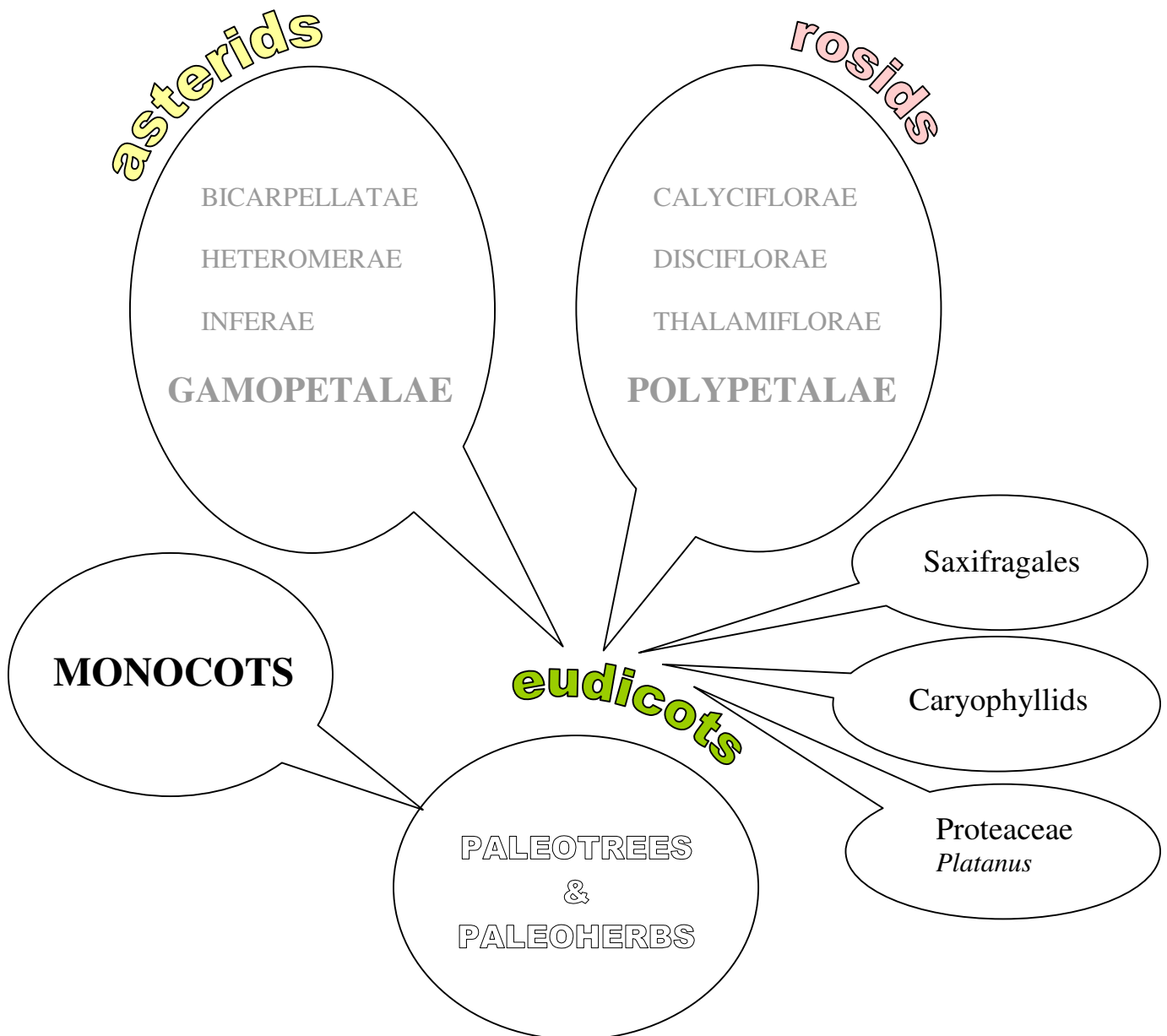
These families have essentially similar calyx & corolla lobes.

- 78 HEMEROCALLIDACEAE
- 78 PHORMIACEAE
- 79 HYACINTHACEAE
- 79 THEMIDACEAE
- 80 AGAPANTHACEAE
- 80 ALLIACEAE
- 80 AMARYLLIDACEAE
- 81 HOSTACEAE
- 81 AGAVACEAE

- 82 ASPARAGACEAE
- 82 ASPHODELLACEAE
- 83 ASTELIACEAE
- 83 CONVALLARIACEAE
- 83 RUSCACEAE
- 84/85 LILIACEAE
- 85 SMILACACEAE
- 86 ALSTROEMERIACEAE
- 86 COLCHICACEAE
- 86 MELANTHIACEAE

These families have calyx and corolla lobes that are not alike.

- 87 PALMAE
- 87 BROMELIACEAE
- 88 JUNCACEAE
- 88 CYPERACEAE
- 89 GRAMINEAE.
- 90 COMMELINACEAE
- 90 ZINGIBERACEAE



OVERVIEW OF THE TWO SYSTEMS. The new phylogeny as proposed by the *Angiosperm Phylogeny Group (APG)* and the groupings of **Bentham and Hooker**. Both systems recognise the Monocots, but the APG divides our old concept of Dicotyledons into the Paleotrees and Paleoherbs and the **Eu-dicots** (True-Dicots). Within the Eudicots there are a number of early divergences such as the Caryophyllids and Saxifragales, but the two major lineages: the Rosids and Asterids contain the bulk of families. The **Rosids** and **Asterids** still contain many of the families that the B&H system distinguished as **Poly-petalae** (many-petals) and **Gamo-petalae** (fused-petals) respectively.