Ranunculaceae — Buttercup Family

Herbaceous perennials (rarely annuals, shrubs, or lianas), leaves compound or dissected (rarely simple in some herbs); *leaves sheathing* (at least at the very base)

Flowers bisexual (unisexual in *Thalictrum*), usually actinomorphic, but zygomorphic in *Aconitum* (monkshood) and *Delphinium* (larkspur), hypogynous

Perianth *distinct,* either with one whorl of *4–∞ petaloid sepals* (the corolla is considered absent) **or** with CA (4)–5–(∞) and CO (4)–5–(∞)

Stamens distinct, *usually ∞*

Gynoecium (1–)*5–∞ simple pistils*, each pistil unilocular with marginal placentation (i.e., each is a carpel)

Fruit achenes, less commonly follicles, rarely a berry

"Basal Eudicot"

Magnoliaceae — Magnolia Family

Shrubs or trees, deciduous or evergreen, leaves simple, entire, stipulate, *stipules caducous leaving a circular scar*.

Flowers bisexual, actinomorphic, hypogynous

Perianth distinct, usually not clearly differentiated into sepals and petals (= tepals), outer whorl usually 3 (sometimes of a different texture than the inner whorls), inner whorl 6–∞

Stamens distinct, ∞, *spirally arranged; often flattened* (especially the outer ones) *with indistinct filaments*

Gynoecium few to usually ∞ simple pistils (i.e., each a carpel), these partially fused along an *elongated, often woody, axis*

Fruits on an elongated, usually woody receptacle and an aggregation of woody follicles, samaras, or berries

Magnoliid

Berberidaceae — Barberry Family

Herbaceous or woody perennials; leaves simple to compound; *wood usually colored yellow*

Flowers usually bisexual, actinomorphic, hypogynous

Perianth distinct, usually 3-merous [unusual in Eudicots]; *sepals (4 or) 6, often petaloid,* (sometimes caducous)*; petals in two whorls, the outer of (4 or) 6, the inner* [probably petal-like staminodes] *of (4 or) 6 that may be showy, reduced to scales, or lacking*; perianth parts typically all alike and referred to as *tepals*

Stamens distinct, (4)–6–(∞), *the anthers opening by flaps that open from the base* (a few with longitudinal winged slits)

Gynoecium of 1 pistil with 1 locule, placentation marginal or basal

Fruit usually a berry

"Basal Eudicot"

Nymphaeaceae — Waterlily Family

Plants aquatic, perennial herbs, leaves *large, simple, typically peltate or cordate, floating*

Flowers large, solitary, bisexual, actinomorphic, hypogynous to epigynous

Perianth distinct, usually not clearly differentiated into sepals and petals (= *tepals*), outer whorl 3–∞, inner 3–∞

Stamens distinct, ∞, spirally arranged, *filaments flattened and often petaloid*, especially the outer ones

Gynoecium carpels united into 1 pistil with few to ∞ locules

Fruit a spongy berry

"Basal Angiosperm"

Papaveraceae — Poppy Family
(including **Fumariaceae**)

Papaveraceae subfamily Papaveroideae

Herbaceous annuals or perennials; leaves *alternate, deeply divided or dissected*; *sap opaque*

Flowers actinomorphic, bisexual, hypogynous, solitary

Perianth distinct, *CA 2 or 3 caducous*; CO 4 or 6 (8), *petals often wrinkled* (because they were wadded-up in bud)

Stamens distinct, ∞

Gynoecium of 1 pistil, 1 locule, 2 to several parietal placentae, *placentae often intrusive*

Fruit a capsule

" Basal Eudicot"

Papaveraceae subfamily Fumarioideae
(Fumariaceae, Fumitory Family)

Herbaceous perennials (a few annuals); *leaves deeply dissected to divided or compound*; sap watery.

Flowers *zygomorphic*, bisexual, hypogynous

Perianth distinct; *CA 2 minute, caducous or not*; CO 4 *petals in 2 dissimilar sets* of 2, the outer 2 with a basal spur or sac; the inner 2 connivent or connate at the tip

Stamens *6, usually diadelphous* in 2 sets of 3, fused or somewhat fused in each set

Gynoecium 1 pistil, usually 1 locule with 2 parietal placentae

Fruit a capsule

"Basal Eudicot"

Equisetaceae Scouring Rush or Horsetail Family

Usually rhizomatous, erect, surface often *longitudinally ridged*, rough from silica deposits

Leaves at nodal joints in whorls, scale–like and forming a tubular sheath; branches, when present, whorled at nodes; stems hollow except at nodes

Sporangia borne in terminal, sessile or stalked strobili, eusporangiate

Some species have dimorphic stems where the spore-producing and sterile stems are different

MONILOPHYTE

Polypodiaceae Polypody Family

Herbaceous, creeping from short to long scaly rhizomes; *petioles with 3 vascular bundles, leaves simple, entire to pinnatifid or pinnatisect* (rarely once, twice, or several times pinnately compound), glabrous to pubescent to scaly, leaf veins free or anastomozing, areoles sometimes with free included veinlets

Sporangia organized into *round* (commonly)*, oblong, or elongate sori*, (sometimes sporangia covering large areas), leptosporangiate

Indusium absent

MONILOPHYTE

Pinaceae Pine Family

Shrubs or trees; leaves alternate or in fascicles on short shoots, simple and linear to needle-like

Plants monoecious

Pollen cones small and ephemeral

Ovulate cones small to large and more or less woody, consisting of ovuliferous scales and *bracts spirally arranged* around a woody axis; *bract free from ovuliferous scale*; *ovules inverted*

Ovuliferous scales with two ovules on the upper surface

Seeds usually *winged* except in a few (e.g., the nut pines)

Important genera: *Abies* (fir)*, Larix* (larch)*, Pinus* (pine)*, Picea* (spruce)*, Pseudotsuga* (Douglas-fir)*,* and *Tsuga* (hemlock)

GYMNOSPERM

Cupressaceae Cypress Family
(including **Taxodiaceae**)

Shrubs or trees; leaves variously arranged, simple, *usually scale-like but often awl-shaped, or linear*; wood and foliage typically *aromatic*

Plants monoecious or dioecious

Pollen cones small

Ovulate cones woody (but cones becoming fleshy and berry-like in *Juniperus*); *ovuliferous scales fused to subtending bract* nearly the length of the scale; 2–∞ ovules per scale, *erect* and *scales often opposite*

GYMNOSPERM

Fabaceae (**Leguminosae**) Legume Family

Herbs, shrubs and trees, usually with alternate, stipulate, *compound leaves*

Flowers actinomorphic to usually *zygomorphic*, bisexual, hypogynous

Perianth CA 5 basally connate sepals; CO 5 or “4" (3 free + 2 fused) distinct petals

Stamens either 10 connate in 1 (monadelphous) or 2 (diadelphous) sets (and then usually 9 + 1) or 10–∞ and distinct

Gynoecium 1 simple pistil (= carpel) with marginal placentation

Fruit *a legume* = from a simple pistil and splitting along 2 sutures

ROSID (FABID)

Fabaceae continued

Subfamilies (Families):

Mimosoideae (Mimosaceae)
leaves *bipinnate*; flowers *regular* and often in dense clusters; petals valvate, distinct or connate, valvate and *very reduced*; stamens 10–∞, distinct, showy

Caesalpinioideae (Caesalpiniaceae)
leaves pinnate to bipinnate; flowers imbricate, zygomorphic (occasionally actinomorphic); petals *distinct*, imbricate with the *upper inserted inside the others*; stamens ≤10, *usually distinct*

Papilionoideae (Fabaceae)
leaves simple, pinnate, or palmate but *never bipinnate*; flowers imbricate, zygomorphic (papilionaceous); petals imbricate, *lower 2 fused into a keel*, *upper petal outside the others*; stamens 10, *monadelphous or diadelphous* (9 + 1)

ROSID (FABID)

Saxifragaceae Saxifrage Family

Herbaceous perennials, leaves alternate or more commonly basal, with *palmate venation* (a few pinnate), usually simple; *plants often scapose*

Flowers bisexual, actinomorphic, hypogynous to epigynous (ovary often half-inferior), with a hypanthium (usu. short)

Perianth hypanthium technically present but typically very short; CA (4–) 5, free or connate; CO (4–) 5, *clawed*, many species with *dissected petals*

Stamens (4) 5 or 10, equal to or twice the number of petals

Gynoecium of 2 (–5) connate carpels that are usually *fused basally with distinct upper ovaries,* styles and stigmas (together forming *beaks*); locules 2 (–5) with parietal or axile placentation (marginal in the upper free portion of ovary)

Fruit a capsule (or a cluster of follicles)

BASAL ROSID

Apiaceae (**Umbelliferae**) Carrot Family

Perennial, *aromatic*, herbaceous (a few lianas, shrubs, and trees); leaves alternate or basal, *sheathing*, *blades deeply dissected or compound; internodes often hollow*; usually estipulate

Flowers small, bisexual, actinomorphic, epigynous; *inflorescence a simple or compound umbel* often subtended (either the entire umbel and/or the secondary umbels) by an involucre of bracteoles

Perianth CA 5, distinct, often *very small and essentially absent*; CO 5, distinct (but arising from a nectary disk)

Stamens 5, alternate the petals, inserted on a nectary disk

Gynoecium 1 pistil with 2 locules; 1 (really 2, but one aborts) apical-axile ovule per locule; styles 2 often basally swollen forming a *stylopodium*

Fruit a schizocarp of 2 mericarps attached to a carpophore and the fruit often ribbed and/or ornamented, fruit with oil ducts visible on the surface or in cross section

ASTERID (CAMPANULID)

Euphorbiaceae Spurge Family

Habit various (herbaceous, woody, succulent, annual or perennial), usually with alternate, simple, stipulate leaves; plants with *milky or colored sap*

Flowers hypogenous, *unisexual* (monoecious or dioecious), often aggregated into a flower-like structure called a *cyathium* (an involucre of modified leaves); styles usually 3, these usually bifid or divided

Perianth CA 0 or (3)–5–(6), distinct or slightly connate; CO typically 5 but often absent

Fruit usually a schizocarp

***Euphorbia*-type** flowers: ♂ and ♀ flowers in a *cyathium*; glands on cyathium often with petaloid appendages; perianth lacking or of reduced sepals; ♂ flowers consist of a single stamen; ♀ flowers have 1 pistil with 3 locules on an elongating pedicel ("gynophore")

Non-*Euphorbia*-type flowers: ♂ and ♀ flowers well separated on the plant; perianth none or of (3)–5–(6) sepals and 0 or 5 petals; ♂ flowers usually with (1)5–10(∞) stamens; ♀ flowers have 1 pistil with 3 locules

ROSID (FABID)

Solanaceae Potato or Nightshade Family

Usually herbaceous, annuals or perennials with alternate, estipulate leaves. *Leaves in the inflorescence often appear in pairs on the same side of the stem*.

Flowers usually bisexual, actinomorphic, hypogynous

Perianth CA 5, connate (sometimes only basally), sometimes becoming accrescent; CO 5, connate, *plicate*

Stamens usually 5, *epipetalous*, sometimes *connivent* by the anthers, occasionally opening by terminal pores, often attached to a membranous projection of the corolla

Gynoecium 1 pistil, usually with 2 locules and axile placentation, the *placenta often swollen*, 1 style and stigma

Fruit a berry or capsule

ASTERID (LAMIID)

Lamiaceae (**Labiatae**) Mint Family

Herbaceous to woody plants with *square stems* and *decussate*, usually simple leaves; plants usually *aromatic*; *trichomes multicellular,* glandular trichomes often present. As recognized here, includes some woody genera formerly in Verbenaceae.

Flowers bisexual (or polygamous), zygomorphic, hypogynous; inflorescence often *verticillate* but technically with an indeterminate main axis and *cymose* lateral axes (a thryse)

Perianth CA 5, strongly fused; CO 5 (rarely appearing 4-lobed), strongly fused and forming a *bilabiate* corolla of various shapes

Stamens 2 or 4, *epipetalous;* usually *didynamous if 4*, *exserted* (often) *or not*

Gynoecium 1 pistil usually with a *4-lobed ovary*, 2 locules with 1 basal-axile ovule in each of four apparent locules, *style almost always gynobasic, 2-branched at apex*

Fruit schizocarp of 4 nutlets or rarely a berry

ASTERID (LAMIID)

Polemoniaceae Phlox Family

Usually herbaceous with alternate or less commonly opposite, leaves; leaves simple, divided or compound; often foul-smelling

Flowers usually bisexual actinomorphic, hypogynous

Perianth CA 5, connate, lobes usually green with *hyaline margins*, calyx tube typically *hyaline between sepals*; CO 5, connate, often with a *slender tube* and salverform

Stamens 5, *epipetalous*, often inserted at *different levels on the corolla tube* when salverform

Gynoecium 1 pistil with *3 locules*, axile placentation, and a single style with *3 style branches*

Fruit capsule

ASTERID (BASAL)

Plantaginaceae Snapdragon Family
(Includes much of traditional **Scrophulariaceae**)

Usually herbaceous perennials, leaves alternate or opposite, simple, usu. entire; autotrophic (unlike the segregated Orobancaceae, which are hemiparasites or parasites)

Flowers bisexual, usually zygomorphic, hypogynous (actinomorphic in *Plantago* and a few others)

Perianth CA (4) 5, usually connate; CO (4) 5, connate, *bilabiate*, and tending to have *2 upper lobes and 3 lower lobes*

Stamens *epipetalous;* (2 or) *4 and didynamous*, but sometimes including a 5th sterile stamen (a staminode)

Gynoecium 1 pistil with *2 locules* (1 in a few members of *Plantago*) and axile placentation; stigma entire or 2-lobed

Fruit usually a septicidal capsule

ASTERID (LAMIID)

Brassicaceae (**Cruciferae)** Mustard Family

Herbs and shrubs, leaves alternate, simple to dissected; plants often smell of mustard-oils (glucosinolates)

Flowers usually bisexual, actinomorphic, hypogynous

Perianth *CA 4,* distinct; *CO 4*, distinct

Stamens 6, almost always *tetradynamous* (4 long + 2 short)

Gynoecium 1 pistil with 2 locules with *parietal placentation*

Fruit a specialized capsule, called a *silique* when > 3 times longer than broad or a *silicle* when < 3 times longer than broad; valves splitting leaving the *replum* attached to the receptacle and spanned by a septum

ROSID (MALVID)

Salicaceae Willow Family

Shrubs or trees, leaves alternate, simple, stipulate with deciduous stipules; dioecious

Flowers unisexual, *essentially actinomorphic without an evident perianth*; flowers in *catkins* (aments), often each flower subtended by a small bract (called a scale)

Perianth uniseriate, CA 1–2 (3) modified into enlarged basal glands (*Salix* – willows) or a small cup-shaped disk (*Populus* – cottonwoods)

Stamens (1) 2 – ∞, distinct

Gynoecium 1 pistil with 1 locule and a few parietal placentae and many ovules

Fruit a capsule containing many *comose seeds*

ROSID (FABID)

Asteraceae Sunflower or Composite Family
(**Compositae**)

Habit and leaves extremely variable

Flower bisexual or, in ray flowers, pistillate or sterile; actinomorphic (disk flowers) and zygomorphic (ray and ligulate flowers); epigynous; *flowers in a head* (*capitulum*) surrounded by phyllaries. One tribe (Lactuceae) has milky sap.

Perianth CA highly modified into a *pappus* or absent; CO 5, connate, actinomorphic and/or zygomorphic

Stamens 5, epipetalous, fused by anthers around style

Gynoecium 1 pistil, style 2-lobed **Fruit** cypsela ("achene")

Flower Types: (1) *disk* (tubular): bisexual, in heads with or without ray flowers. (2) *ray* (sometimes referred to as ligulate): flowers pistillate (or sterile), always in heads with disk flowers. (3) *ligulate*: bisexual, in heads with no disk flowers

ASTERID (CAMPANULID)

Ericaceae Heather Family
(including Empetraceae, Monotropaceae, & Pyrolaceae)

Shrubs, sometimes low to the ground (rarely trees or herbs), evergreen or deciduous, often in acidic soils; leaves alternate, simple, estipulate, *often leathery*. Includes some achlorophyllous parasites.

Flowers usually bisexual, usually actinomorphic, hypogynous (epigynous in tribe Vaccineae)

Perianth CA (4)–5, connate; CO (4)–5, connate, *often urceolate*

Stamens anthers inverted at maturity, distinct, equal to or twice the number of petals, typically *free from the corolla* [unusual in Asterids] (basally epipetalous in a few); typically *dehisce by "apical" pores or slits* and *sometimes with 2 appendages*; often with modifications; pollen in large tetrads

Gynoecium 1 pistil, usually with 5 (2–10) locules, axile placentation, style 1, undivided

Fruit capsule, berry or drupe

ASTERID (BASAL)

Caryophyllaceae Pink or Carnation Family

Herbaceous, *leaves opposite*, simple, estipulate or stipulate; the *nodes are often swollen*

Flowers bisexual or unisexual, actinomorphic, hypogynous

Perianth CA 5, distinct or connate; CO 5, distinct or fused, petals often bilobed, usually clawed. True petals lacking, the "petals" are really modified stamens.

Stamens 5 or 10

Gynoecium 1 pistil, 1 locule, styles 2–5 (typically 3 or 5), *free-central placentation*,

Fruit capsule (infrequently an achene)

CARYOPHYLLID

Cactaceae — Cactus Family

Small to large *stem-succulents* sometimes large enough to be shrubs or trees; leaves very reduced or absent, when present usually quickly deciduous

Flower bisexual, actinomorphic, *epigynous*

Perianth tepals ∞, spirally arranged, distinct, the outer sepaloid, the inner petaloid

Stamens ∞, distinct, basally adnate to innermost tepals

Gynoecium 1 pistil, 1 locule, parietal placentation, many seeds, style with 2–∞ stigma lobes

Fruit berry (rarely a fleshy capsule, or indehiscent spiny bur)

Terms: *areole* = a short shoot with leaves modified to a collection of spines (and also *glochids* in *Opuntia* and *Cylindropuntia*)

CARYOPHYLLID

Betulaceae — Birch or Alder Family

Shrubs and trees. Leaves alternate, simple, serrate (usually doubly so), stipulate. Bark often with *lenticels*.

Flowers unisexual in *catkins*; plants monoecious; epigynous (but perianth parts not or very rarely visible)

Perianth and Gynoecium

Perianth reduced or absent (0 or 4). Staminate catkins with many flowers, made up of *firm to woody bracts,* each subtending 3 flowers, each usually with 4 stamens. Pistillate catkins with many flowers, made up of *firm to woody bracts* subtending 2–3 pistils, each pistil usually with 2 styles and 1–2 locules

Fruit achene, nut, or samara

ROSID (FABID)

Juncaceae — Rush Family

Herbaceous, *grass-like*; usually in mesic, aquatic or semiaquatic sites; leaves usually basal or in lower portion of the stem, linear, *3-ranked*, with *open or closed sheaths*

Flowers bisexual, actinomorphic, hypogynous

Perianth scale-like; CA 3, distinct; CO 3, distinct; *like a miniature lily flower*, prophyllate (flower subtended by 2 bracteoles) or not

Stamens 3 or 6

Gynoecium 1 pistil with 3 styles, the ovary either with 1 locule and 3 parietal placentae or with 3 locules and axile placentation

Fruit capsule; seeds with or without tails on 1 or 2 ends

MONOCOT

Fagaceae — Oak or Beech Family

Shrubs or trees; leaves alternate, stipulate but stipules usually quickly deciduous

Flowers epigynous, *unisexual in catkins*; plants monoecious

Perianth, Androecium, and Gynoecium

Perianth reduced and inconspicuous, usually of 6 segments. *Staminate catkins with many flowers*, each with 4–∞ stamens. *Pistillate catkins with 1–3 flowers*, each with 1 pistil, 3–7 styles and 1 locule at maturity (all but one abort), and subtended by an involucre of bracts or a scaly cupule

Fruit nut

ROSID (FABID)

Commelinaceae — Spiderwort Family

Herbaceous; leaves alternate, *sheathing, nodes swollen;* often *succulent*; plants surfaces usually with 3-(rarely 4-)celled, glandular microhairs

Flowers bisexual, actinomorphic to more infrequently zygomorphic, hypogynous, subtended by a folded *spathe*

Perianth CA 3, *greenish*, distinct or connate; CO 3, *colorful*, usually distinct

Stamens 6, often with *hairy filaments*, often (1–)3 stamens are reduced to staminodes with modified anthers

Gynoecium 1 pistil, 1 stigma, 3 locules, axile placentation

Fruit capsule

MONOCOT

Cyperaceae — Sedge Family

Herbs (usually *grass-like*), leaves *3-ranked*, linear, sheathing with *closed sheaths,* stems usually *triangular in cross section*

Flowers bisexual or unisexual, very reduced, actinomorphic, hypogynous, subtended by a bract; flowers arranged into *spikelets*

Bisexual: perianth of bristles, scales, hairs, or absent; stamens 3; gynoecium of 1 pistil with 1 locule and 2–3 styles

Unisexual: **staminate flowers** *without a perianth*, stamens 3; **pistillate flowers** with a perianth (a *perigynium*) that closely envelops the gynoecium of 1 pistil with 1 locule and 2–3 styles. Spikelets may be all of one sex or may be gynaecandrous (♀ above ♂) or androgynous (♂ above ♀)

Fruit achene

MONOCOT

Poaceae (**Gramineae**) Grass Family

Herbaceous (a few woody like bamboo), leaves linear, entire, *2–ranked, sheaths open or closed*

Flowers highly reduced and aggregated into *spikelets*. Spikelets usually bisexual, sometimes unisexual or. A spikelet consists of the following:

2 outer (lower) bracts (*glumes*)
1–∞ *florets* each consisting of the following:
- 2 bracts (*lemma* and *palea*)
- a perianth reduced to 2(3) microscopic lodicules
- 3 stamens
- 1 pistil with 2 styles and 2 plumose stigmas

Fruit a caryopsis

Terms: auricle, awn, collar, floret, glume, lemma, ligule, lodicule, palea, rachilla, spikelet

MONOCOT

Ephedraceae Mormon-tea or Joint-Fir Family

Mostly *shrubs* (rarely vines), spreading by rhizomes and having jointed stems. *Leaves opposite or whorled*, simple and scale-like, often quickly deciduous.

Plants dioecious. Pollen and ovules borne in flower-like structures arranged in a *strobilus* of opposite or whorled bracts. Bracts subtending each "flower", "flowers" at the apex of the strobilus, the lower bracts sterile.

Pollen strobili with stamen-like structures (stalk) with 2–10 microsporangia. Ovulate strobili with 1–3 "flowers". Seeds encased in a fused pair of bracts.

Has double fertilization, like the angiosperms!

GYMNOSPERM

Onagraceae Evening-Primrose Family

Usually herbaceous annuals or perennials, leaves simple and usually alternate or basal, but rarely opposite

Flowers bisexual, actinomorphic (usually), and epiprigynous

Perianth *hypanthium* present and usually obvious (but may be so short as to be inconspicuous in a few genera); *CA 4* (rarely 2 or 5)*; CO 4* (rarely 2 or 5)

Stamens (2, 4) *8* (10)

Gynoecium of 1 pistil with *4 locules*; stigmas unbranched or more commonly branched with 4 lobes

Fruit usually a capsule

ROSID (FABID)

Crassulaceae Stone Crop Family

Perennials (usually) with *succulent* stems and simple leaves that are *succulent or fleshy*

Flowers bisexual, actinomorphic, hypogynous

Perianth CA 4–5 distinct; CO 4–5 distinct or basally connate, a short hypanthium may be visible

Stamens *equal or twice the number of petals* (4, 5, 8, or 10); free or basally adnate to corolla (often when twice the number of the petals the opposite stamens are adnate to the petals); distinct to slightly connate at base

Gynoecium *4–5 distinct simple pistils*, (i.e., each a carpel) usually the same number as the petals

Fruit a cluster of follicles

BASAL ROSID

Rosaceae Rose Family

Herbs, shrubs, or trees, usually with alternate, simple or compound, *stipulate* leaves that are *serrate*

Flowers actinomorphic, bisexual, *perigynous or epiperigynous*

Perianth *hypanthium present* (occasionally very short and hard to observe); CA 5, partially connate, often alternating with *epicalyx* lobes; CO 5 (0, 3–10), distinct, *clawed*, around the rim of the *cup-like hypanthium*

Stamens *10–∞*, rarely fewer than twice the number of petals

Gynoecium variable, pistils 1–∞; when 1, pistil compound, when 2–∞, the pistils each a carpel (simple pistils)

Fruit variable: drupe, achene, follicle, pome, or an aggregate of achenes, drupelets, or follicles, some with fleshy tissues derived from the receptacle (accessory fruit) or hypanthium (pome and hip)

ROSID (FABID)

Hydrangeaceae Hydrangea Family

Woody shrubs (or trees), leaves *opposite with pinnate veins*

Flowers bisexual, actinomorphic, *half to fully epigynous*, rarely hypogynous

Perianth forming a short or nearly obsolete *hypanthium* [unusual in Asterids]; CA 4–5 connate; CO 4–5 attached to hypanthium rim [unusual in Asterids]

Stamens *twice the number of petals or more* [unusual in Asterids]

Gynoecium 1 pistil, half to fully inferior; (2–) 3–5 (–12) locules with axile placentation or 1 locule with parietal placentation

Fruit a capsule

ASTERID (BASAL)

Geraniaceae Geranium Family

Usually herbaceous, annuals or perennials; leaves pinnately or *palmately compound or lobed*, usually stipulate, herbage usu. *aromatic* and with *glandular hairs*

Flowers actinomorphic, bisexual, hypogynous

Perianth CA 5 distinct or basally connate; CO 5 distinct

Stamens usually 5 or 10 (15), *somewhat fused at the base*

Gynoecium 1 pistil, usually *5-lobed* and with 5 locules, axile placentation, elongated style with 5 distinct stigmas

Fruit *schizocarp* splitting into mericarps

MALVID

Hydrophyllaceae Waterleaf Family
(= Boraginaceae subfamily Hydrophylloideae)

Usually herbaceous, annuals or perennials, leaves alternate (more rarely opposite) and usually *dissected or compound*; *herbage often rough-hairy or with glandular hairs*. (Sometimes included in a broader Boraginaceae)

Flowers bisexual, actinomorphic, hypogynous; inflorescence usually a *scorpioid cyme* or flowers solitary

Perianth CA 5 distinct or basally connate; CO 5, connate

Stamens 5, *epipetalous*, often with a *pair of scales* where the filament joins the corolla, stamens often exserted

Gynoecium 1 pistil with *1 locule and parietal placentation* (rarely with 2 locules and axile placentation); style with 1 (2) style branches; ovary *not* 4-lobed (as in Boraginaceae)

Fruit *many-seeded capsule*

ASTERID (LAMIID)

Boraginaceae Borage Family

Herbs or shrubs; leaves alternate, simple and ± *entire*; *foliage very often hirsute* with swollen-based hairs (with important exceptions)

Flowers bisexual, actinomorphic (rarely zygomorphic), hypogynous; inflorescence usually a *scorpioid cyme*

Perianth CA 5 distinct or connate, sometimes fused in groups; CO 5 connate, frequently with *scales or appendages (fornices)* at mouth of corolla tube

Stamens 5, *epipetalous*

Gynoecium 1 pistil, with usu. *2 locules, axile placentation*, style with 2 branches or stigma lobes (rarely unlobed), gynobasic or from summit of ovary. Each locule divided into 2 lobes and thus the ovary appears to have 4 locules and is *4-lobed*.

Fruit usually a *schizocarp dehiscing into 4 one-seeded nutlets*

ASTERID (LAMIID)

Caprifoliaceae Honeysuckle Family

Herbs, shrubs, and woody vines; leaves *opposite* and simple

Flowers bisexual, zygomorphic (sometimes barely so), *half to fully epigynous*

Perianth CA (4) 5, connate; CO (4) 5 connate, *bilateral and often bilabiate* with 2 upper lobes and 3 lower or 4 upper and 1 lower

Stamens (4) 5, *epipetalous*

Gynoecium 1 pistil usually with an elongated style; 2–5 locules and axile or apical placentation or with 1 locule and 1–few parietal or apical ovules; *stigma capitate*

Fruit a berry, drupe, capsule, or achene

ASTERID (CAMPANULID)

Campanulaceae Bellflower/Lobelia Family
(includes **Lobeliaceae**)

Usually herbaceous, often with *milky sap*; leaves alternate, simple

Flowers bisexual, *actinomorphic or zygomorphic*, *epigynous* or *partly epigynous* (ovary inferior or half-inferior)

Perianth CA usually 5, distinct or basally connate; CO usually 5, connate, actinomorphic or zygomorphic

Stamens 5, alternate with CO, *distinct, connivent or connate by filaments* (monadelphous), free or adnate to base of corolla; in some the anthers are connate around the style (see segregate families below)

Gynoecium 2–5 (10) locules and axile placentation or 1 locule and parietal placentation; style 1, entire or 2–5–lobed
Fruit capsule or berry

Campanulaceae *sensu stricto*: flowers actinomorphic, stamens distinct
Lobeliaceae: flowers zygomorphic, anthers connate in a tube around style

ASTERID (CAMPANULID)

Apocynaceae Milkweed Family
(includes **Asclepiadaceae**)

Usually herbaceous but also woody vines, stem-succulents, or trees; usually with *milky sap*; leaves *opposite* (rarely whorled or alternate), simple, entire

Flowers bisexual, actinomorphic, hypogynous

Perianth CA 5, connate or nearly distinct; CO 5, *connate* (often highly modified with 5 reflexed lobes and 5 erect lobes comprising a hood and horn [together the corona] in Asclepiadaceae *sensu stricto*)

Stamens 5, epipetalous or fused to gynoecium.

Gynoecium *2 carpels connate by their styles or stigmas*, *apical part of style expanded and highly modified.* In taxa with pollinia, the **Androecium and Gynoecium** are fused into a single structure with the 5 stamens adnate to the gynoecium (= the *gynostegium)*

Fruit a pair of follicles

Terms: corpusculum, translator, pollinium, horn, hood, corona

ASTERID (LAMIID)

Malvaceae Mallow Family

Mostly herbaceous perennials and shrubs, leaves simple, alternate, usually *palmate*, usu. with *stellate or peltate hairs*, stipulate, *these often prominent*

Flowers bisexual, actinomorphic, hypogynous

Perianth CA 5, usually fused, often with an *epicalyx*; CO 5, distinct but may be adnate to filament tube

Stamens ∞, *monadelphous* in a tube around the style

Gynoecium 1 pistil, 5–∞ locules, style branches as many as locules, axile placentation

Fruit usually a schizocarp but often a capsule

ROSID (MALVID)

Amaranthaceae Amaranth/Goosefoot Family
(includes **Chenopodiaceae**)

Herbs and shrubs; often halophytic; leaves alternate, often *farinose or glaucous*, bract-like in some, usually *somewhat succulent*

Flowers small, usually bisexual (some unisexual), actinomorphic, hypogynous, associated with fleshy to papery bracts

Perianth *uniseriate*, usually *reduced, herbaceous and green, papery (greenish) or otherwise colored*, of (2)–5 distinct or basally connate segments, surrounding the fruit

Stamens (3)–5, distinct, *opposite* the sepals, distinct (or fused at the very base)

Gynoecium 1 pistil, 1 locule, 1 basal ovule, carpels 2 or 3 as stigmas are (1) 2 or 3

Fruit achene or utricle, often surrounded by adnate or adherent calyx or bracts; *seed with spirally coiled embryo*

CARYOPHYLLID

Polygonaceae Buckwheat Family

Herbs to shrubs, *stems with swollen nodes* and usually stipulate with fused stipules (*ocrea*), less frequently estipulate (e.g., the large genus *Eriogonum*)

Flowers usually bisexual, actinomorphic, hypogynous

Perianth either biseriate with *2 whorls of 3 each* or *uniseriate with 1 whorl of 5 (6) segments*; perianth parts distinct or basally connate, *typically all petaloid*

Stamens 3, (5), *6*, or (9), distinct

Gynoecium 1 pistil, 1 locule, 2–3 styles, 1 basal ovule

Fruit lenticular or trigonous achene, sometimes associated with enlarged (fleshy or dry) perianth parts

CARYOPHYLLID

Montiaceae Purslane Family
(segregated from Portulacaceae *s.l.*)

Herbs, leaves simple, entire, *spirally arranged*, estipulate, *commonly succulent*

Flowers bisexual, actinomorphic, hypogynous

Perianth *sepaloids 2* (3–9), distinct; petaloids (4)–5–(19), usually distinct (sometimes basally connate). The 2 "sepals" originated as bracts, therefore, the "petals" are actually petaloid sepals

Stamens *opposite petaloids*, equal the number of petaloids (infrequently ∞), distinct (rarely adnate to the base of the petaloids)

Gynoecium 1 pistil, 1 locule with 2–∞ *basal or free-central ovules*; styles 2–9 or 1 and lobed

Fruit usually a 2–3 valved capsule

Portulacaceae *s.s.*: leaves alternate or rarely opposite, often stipulate; ovary half-inferior; fruit a circumscissile capsule, the cap falling with the dry perianth remains

CARYOPHYLLID

Iridaceae Iris Family

Herbs (a few shrubs) from rhizomes, bulbs, or corms; leaves *equitant,* basal or alternate

Flowers bisexual, usually actinomorphic, *epigynous*, subtended by a spathe (bract)

Perianth petaloid, distinct or connate (and appearing like a hypanthium); CA usually 3 and *petaloid*; CO usually 3; CA and CO differentiated or not

Stamens 3, filaments distinct or connate

Gynoecium 1 pistil, 3 locules, style 1 or 3-lobed; stigmas sometimes petaloid

Fruit capsule

MONOCOT

Alismataceae Water-Plantain Family

Herbaceous, aquatic, perennial with *milky sap*; unusual monocot in some species have palmate venation; leaves basal, simple, often *hastate or sagittate*

Flowers bisexual or unisexual (monoecious), actinomorphic, hypogynous

Perianth CA 3, distinct, usually *green*; CO 3, distinct

Stamens 6–∞, distinct

Gynoecium 6–∞ *distinct carpels*

Fruit achenes in a cluster

MONOCOT

Araceae — Arum Family

Perennial herbs, leaves large, unlike most monocots in having *palmate or pinnate venation*, simple, often *mucilaginous*

Flowers minute, unisexual or bisexual, usually actinomorphic, ovary position variable; inflorescence consisting of a fleshy spike (= *spadix*) and a showy subtending bract (= *spathe*)

Perianth 0, 4 or 6 tepals, *very reduced*

Stamens 1, 2, 4, or 8, distinct or connate

Gynoecium individual flowers with 1 pistil of (1) 2–3 carpels with 1–3 locules, style 1; ovary typically sunken into axis of spadix

Fruit berry

MONOCOT

Agavaceae — Agave or Yucca Family

Perennial or monocarpic, *woody to some degree* (some trees), with thickened stems and *fibrous*, often spiny, persistent leaves in whorls or rosettes

Flowers bisexual, actinomorphic, hypogynous or epigynous

Perianth tepals 6, usually *entirely petaloid*, distinct or connate

Stamens 6, distinct, free or adnate to the perianth

Gynoecium 1 pistil with 3; style 1 or stigma sessile

Fruit usually a capsule but sometimes berry-like

MONOCOT

Liliaceae — Lily Family

(including Calochortaceae)

Herbs, perennial from a bulb; leaves simple, entire, usu. sheathing, alternate, whorled, or usu. basal; lacking an onion-like odor.

Flowers bisexual, actinomorphic (rarely slightly bilateral), *hypogynous*, large; inflorescence a *raceme or solitary* (very rarely an umbel), each flower usually subtended by a bract

Perianth showy, biseriate, of 6 petaloid tepals or of 3 sepals and 3 petals of different texture, *distinct*, *often with spots, lines, showy glands, or other ornaments.*

Stamens 6, distinct

Gynoecium 1 pistil, 3 locules, axile placentation, stigma 1, 3-lobed, or 3
Fruit capsule, loculicidal (Liliaceae *sensu stricto*) or septicidal (traditional Calochortaceae)

MONOCOT

Orchidaceae — Orchid Family

Herbaceous perennials with alternate or basal, simple leaves; epiphytic or less frequently terrestrial

Flowers bisexual, *zygomorphic*, epigynous, mostly resupinate

Perianth ornate; CA 3 (2 of the petals fused in some), usually distinct but sometimes connate, usually actinomorphic; CO 3, zygomorphic with 2 similar lateral petals and a 3rd median petal forming the *labellum*

Stamens 1 or 2 (3), fused to the gynoecium; pollen in *pollinia*, these attached by "threads" to a *viscidium*, together, this structure called a *pollinarium*; operculum (anther cap) sometimes present

Gynoecium 1 pistil, unilocular, fused to androecium and together forming the *column* (gynostemium or gynostegium); ovary inferior, usually *resupinate* (twisted)
Fruit a capsule

MONOCOT

Violaceae — Violet Family

Herbaceous in temperate zones, but some shrubs, vines, and even small trees in the tropics; usually perennial, plants relatively small; leaves simple, stipulate, alternate or basal

Flowers bisexual, *zygomorphic* (less frequently actinomorphic), hypogynous; cleistogamous flowers often present

Perianth distinct; CA 5, CO 5 with *lower-most petal often saccate or spurred*

Stamens 5, often *connivent* or connate; anthers appressed to the ovary

Gynoecium 1 pistil with 1 locule and 3 parietal placentae

Fruit a capsule in temperate species

ROSID (FABID)

Alliaceae — Onion Family

Herbaceous, from a bulb; leaves alternate and usually basal, simple, sheathing, often *grass-like or terete*; plants often *strong-smelling of onion*; from *bulbs*

Flowers bisexual, actinomorphic (rarely bilateral), hypogynous; inflorescence an *umbel* subtended by a bract (spathe); individual flowers not subtended by a bract

Perianth tepals 6, distinct to connate, petaloid, not spotted, when connate, tubular to campanulate

Stamens 6, filaments distinct to connate, sometimes adnate to tepals

Gynoecium 1 pistil, 3 locules, axile placentation, stigma 1, capitate to 3-lobed

Fruit loculicidal capsule

MONOCOT

Ruscaceae Butcher's Broom Family
(includes Convallariaceae)

Herbs (usually) to *shrubs and trees*; leaves simple, entire, usually alternate and cauline, but often basal.

Flowers bisexual, actinomorphic, *hypogynous*, small

Perianth tepals 6, usually *connate* (sometimes only at the very base or rarely distinct), petaloid, *not spotted*

Stamens 6, filaments usually distinct, *often adnate to tepals*

Gynoecium 1 pistil, (2) 3 locules with axile placentation, stigma 1, capitate to 3-lobed

Fruit usually a *berry* or sometimes 3-angled and nut-like

MONOCOT

Lycopodiaceae Club–moss Family

Herbaceous; densely leafy with *1–nerved leaves*; stems *dichotomously branched*

Sporangia borne in axils of fertile leaves, these often aggregated into *cone–like strobili* projected above the often trailing stems; eusporangiate

LYCOPOD

Grossulariaceae Gooseberry or Current Family

Woody *shrubs, leaves alternate with palmate venation*, often with glandular hairs

Flowers bisexual, actinomorphic, epigynous

Perianth well developed *hypanthium* present; CA (4)–5, connate; CO (4)–5 attached to hypanthium rim

Stamens (4)–5

Gynoecium 1 pistil, 1 locule and 2 parietal placentae

Fruit berry

BASAL ROSID

Aspleniaceae Spleenwort Family

Herbaceous, rhizome ascending to nearly erect or creeping, scaly at the apex; petioles with 2 vascular bundles, leaves simple to 4-pinnate, *scaley,* veins free or anastomosing, areoles without free included veinlets, veins reaching the leaf margin or not, vein endings undifferentiated or forming hydathodes

Sporangia in *elongate sori along the veins*, *the sorus along one side of veins*, *not crossing leaf veins*, leptosporangiate

Indusium linear and laterally attached

MONILOPHYTE

Dryopteridaceae Wood Fern Family

Herbaceous, rhizomes creeping, ascending or erect, scaly at the apex; *petioles with numerous vascular bundles in a ring*, leaves 1–5-pinnate or more divided (rarely simple), glabrous to sometimes scaly or glandular, leaf veins free or anastomozing, areoles with or without free included veinlets

Sporangia in ± *round* (usually) *sori*, leptosporangiate

Indusium superior and peltate or ± *lateral and kidney-shaped* (very rarely absent), *not growing along veins if lateral* (crossing veins), if kidney-shaped (or even a little longer), the sorus crosses a leaf vein

MONILOPHYTE

Pteridaceae Maidenhair Fern Family

Herbaceous, creeping from short to long scaly rhizomes; petioles with 1–2–several vaxcular bundles, leaves1–6-pinnate (rarely simple), glabrous to pubescent, glandular or scaly, leaf veins free or anastomozing, areoles without free included veinlets

Sporangia in *elongate sori along the leaf veins* or in *bands along the leaf margin*, leptosporangiate

Indusium absent but the reflexed margin of the leaf often forms a *false indusium*

MONILOPHYTE

Athyriaceae — Ladyfern Family

Herbaceous, from short- to long-creeping to erect rhizomes, these scaly, sometimes with golden hairs; plants frequently have *trophopods* (thickened petiole base that is starch-filled and persistent upon the rhizome); petioles with 2 vascular bundles, leaves simple to 3-pinnate-pinnatifid, veins free or sometimes anastomosing, the areoles without free included veins, veins usually terminating before the leaf margin, vein endings slightly raised and expanded, or forming hydathodes, or not differentiated

Sporangia in *somewhat elongate, sometimes round sori, on the vein or along one side,single or paired across the vein, then crossing over the vein in a J- or U-shape*, leptosporangiate

Indusium lateral

MONILOPHYTE

Cystopteridaceae — Bladder Fern Family

Herbaceous, from short-to more often long-creeping rhizomes; petiole bases narrow or with *trophopods* (thickened petiole base that is starch-filled and persistent upon the rhizome); petioles with 2 vascular bundles, leaves 2–3-pinnate-pinnatifid, leaf veins free and terminating at the leaf margin, the vein endings not differentiated

Sporangia in *round or slightly elongate sori*, these usually on a distinctly raised and hardened receptacle, leptosporangiate

Indusium inferior (basal) and curving like a hood around the sorus (indusium lacking in *Gymnocarpium*)

MONILOPHYTE

Woodsiaceae — Cliff Fern Family

Herbaceous, from short-creeping, horizontal to suberect rhizomes; petioles with 2 vascular bundles, leaves 1-pinnate to 2-pinnate-pinnatifid, leaf veins free and terminating before the leaf margin, vein endings expanded and forming hydathodes

Sporangia in *round sori*, leptosporangiate

Indusium inferior (basal) and composed of a series of scale-like or filamentous segments (rarely sac-like and globose)

MONILOPHYTE

Verbenaceae — Verbena Family

Herbaceous to woody plants, often with *square stems*, leaves *decussate* and simple, these nearly always toothed; plants not typically aromatic; *trichomes unicellular*, glandular trichomes often present

Flowers bisexual, zygomorphic (a few nearly actinomorphic), hypogynous; *inflorescence racemose*

Perianth CA 5, strongly fused; CO 5 (rarely appearing 4-lobed), strongly fused, zygomorphic, usually trumpet-shaped, usually with short lobes

Stamens usually 4, *epipetalous*; often didynamous *never exserted*

Gynoecium 1 pistil (*unlobed*), 2 locules (but appearing 4 locular) with 1 or 2 ovules per locule, *style terminal, entire or 2-lobed*

Fruit schizocarp of 4 nutlets (usually) or drupaceous

ASTERID (LAMIID)