Laboratory 20: "Petaloid" Monocots

We are now finished examining the eudicots and we begin looking at the monocot families in detail, starting with the "petaloid" monocots. **Monocots as a whole are diagnosed by their typically parallel-veined leaves, embryo with one cotyledon, stems with ± scattered vascular bundles, and adventitious roots. Monocots also tend to have 3-merous flowers, an herbaceous habit, and monosulcate pollen.** In today's lab, we are requiring that you know the Liliales and Asparagales only to the order level, with the exception of Iridaceae and Orchidaceae (both of which are part of the Asparagales but will be learned separately in this class).

Araceae – Arum Family (including Lemnaceae); 112 genera, 2850 spp.

Herbs, lianas, rarely aquatic; leaves often well developed, sometimes deeply lobed, **with a membranous, sheathing base;** usually with milky sap; inflorescence a **spathe** (a bract, usually petaloid) which subtends a fleshy **spadix** that bears numerous small flowers, monoecious; flowers radial, lacking individual bracts, tepals 4-6 or lacking, stamens typically 1-6; carpels 2-3 fused; fruit is usually a **berry**.

Anthurium
Arum
Colocasia
Monstera
Zantedeschia

Order Liliales – 10 families (or so), 1300 spp.

Mostly herbs, often with bulbs, corms, or rhizomes; **no secondary growth**; leaves variable; flowers usually **regular and bisexual, 3-merous**; perianth generally composed of 6 tepals, **often spotted**; stamens **generally 6**; **nectaries present at base of tepals or stamens**; **anthers extrorse (opening away from axis)**; ovary composed **3 carpels, fused**; **stigmas 3 or 1 strongly 3-lobed**; fruit capsule or berry.

Prosartes (Liliaceae – Lily Family)
Smilax (Smilacaceae – Sarsaparilla Family)
Toxicoscordion, Trillium (Melanthiaceae – Death Camas Family)

Order Asparagales – 25 families (or so), ~26,800 spp. (mostly in Orchidaceae)

Herbaceous, some "woody", **sometimes succulent**; leaves variable; **sometimes limited secondary growth**; perianth composed of usually 6 tepals, **typically not spotted**, sometimes highly modified; stamens variable; **nectaries present on septa of ovary (usually not at the base of tepals or anthers)**; **stigmas usually one and simple to slightly lobed;** fruit variable, **seeds typically coated with a black phytomelan crust** (or completely lack an epidermis).

Allium (Alliaceae – Onion Family)
Agapanthus (Agapanthaceae – Lily of the Nile Family)
Asparagus, Convallaria, Ruscus (Asparagaceae s.l. – Asapargus Family)
Aloe, Asphodelis (Asphodelaceae – Aloe Family)
Scilla (Hyacinthaceae – Hyacinth Family)
Narcissus (Amaryllidaceae – Daffodil Family)
Hemerocallis (Hemerocallidaceae – Day-Lily Family)

Iridaceae – Iris Family; 78 genera, 1750 spp.

Generally perennial herbs with rhizomes, bulbs, or corms; **leaves alternate generally long and linear, sheathing at the base, equitant (oriented with their edges folded towards stem), often form a fan**; stipules lacking; inflorescence determinate, flowers solitary or in scorpioid cymes; flowers variable in shape but always bisexual, **subtended by 1 or 2 bracts**; perianth composed of **6 tepals**, inner tepals often differentiated from outer tepals, distinct or fused, petaloid and often spotted (unlike most of the Asparagales); **stamens 3** (2) **often adnate to the perianth**; **ovary typically inferior**; 3 fused carpels, style branches petaloid in *Iris*; fruit a capsule, seed brown (black crust lacking).

Babbiana
Ferraria
Iris
Sisyrinchium
Watsonia

Orchidaceae – Orchid Family; 775 genera, 19,500 spp.

Terrestrial, epiphytic, or rarely subterranean herbs, occasionally vines (as in *Vanilla*), with rhizomes, corms, or tubers; **often with velamen covered roots** (roots appear whitish due to absorbent layer of dead cells), roots nearly always mycorrhizal; leaves variable, sheathing at the base; stipules lacking; some with **psuedobulbs** at the base of leaves; inflorescence indeterminate; flowers generally bisexual with 6 tepals, **bilateral**; outer tepals 3, petaloid; inner tepals 3, often spotted, median petal strongly differentiated into a **labellum (lip)** often with fleshy bumps and a unique color pattern, **nectar produced in lip spurs**; **stamens generally 1 (2 or 3), fused to style forming a column;** pollen aggregated into **pollinia**; **ovary inferior, resupinate (twisted)**, carpels 3 fused; fruit is a **capsule; seeds extremely small**, up to 1000's in one fruit, little or no endosperm.

Lycaste
Stanhopia

figures from Lawrence 1951 Taxonomy of Vascular Plants

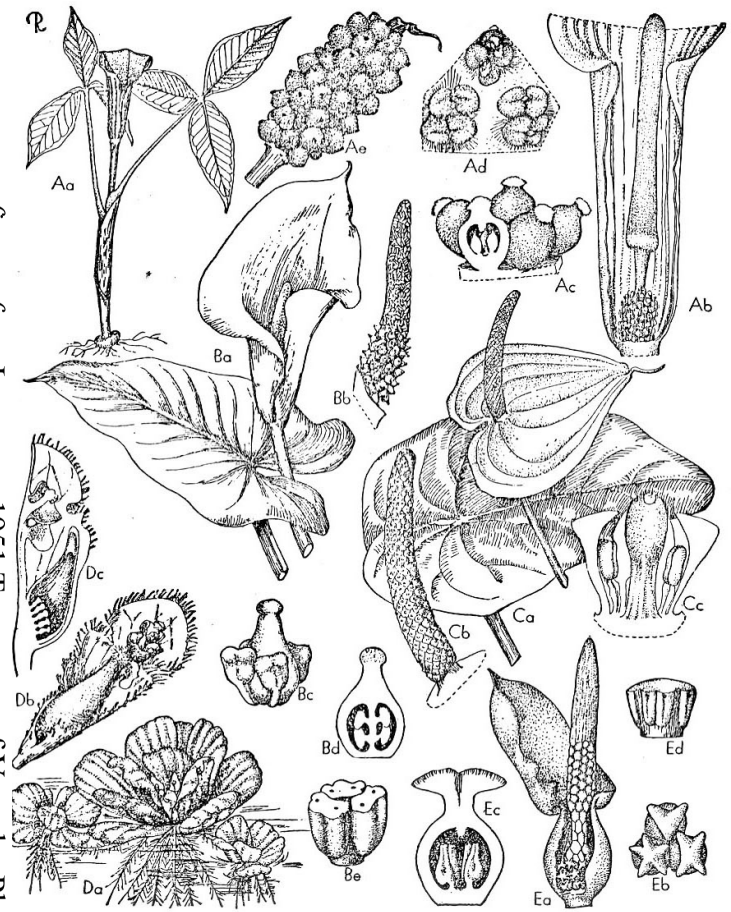

Fig. 79. ARACEAE. A, *Arisaema atrorubens*: Aa, plant in flower, × ⅙; Ab, spathe base showing spadix with pistillate flowers, × 1; Ac, fertile section of spadix with pistillate flowers, × 5; Ad, fertile section of spadix with staminate flowers, × 5; Ae, fruit-cluster, × ½. B, *Zantedeschia aethiopica*: Ba, leaf-blade and inflorescence, × ⅙; Bb, spadix, × ¼; Bc, pistillate flower with staminodia, × 8; Bd, same, vertical section, × 8; Be, staminate flower, × 8. C, *Anthurium Andraeanum*: Ca, leaf-blade and inflorescence, × ¼; Cb, spadix, × ½; Cc, flower, one perianth-segment and stamen removed, × 8. D, *Pistia Stratiotes*: Da, habit, × ½; Db, inflorescence, × 3; Dc, same, vertical section, × 3. E, *Alocasia Lowii*: Ea, inflorescence, spathe sectioned to show spadix, × ½; Eb, cluster of pistillate flowers, top view, × 3; Ec, pistillate flower, vertical section, × 6; Ed, staminate flower, × 4. (From L. H. Bailey, *Manual of cultivated plants*, The Macmillan Company, 1949. Copyright 1924 and 1949 by Liberty H. Bailey.)

NOTE: *Maianthemum* now in the Asparagales

Fig. 88. LILIACEAE. A, *Lilium canadense*: Aa, plant in flower, with bulb, much reduced; Ab, flower, habit, × ⅓; Ac, same, vertical section, × ⅓; Ad, anther and distal end of filament, × 1½; Ae, ovary, vertical section, × 5; Af, same, cross-section, × 15; Ag, style tip with 3-lobed stigma, × 10. B, *Clintonia borealis*: Ba, plant in flower, × ¼; Bb, flower, habit, × 1; Bc, same, vertical section, × 1; Bd, ovary, vertical section, × 4; Be, same, cross-section, × 6. C, *Maianthemum canadense*: Ca, plant in flower, × ¼; Cb, flower, face view, × 3; Cc, pistil, vertical section, × 8. D, *Polygonatum pubescens*: Da, plant in flower, much reduced; Db, flower, habit, × 2; Dc, same, vertical section, × 2; Dd, ovary, cross-section, × 6; De, style tip with 3-lobed stigma, × 10. E, *Camassia Quamash*: Ea, plant in flower, × ⅛; Eb, flower, habit, × ⅓; Ec, same, vertical section, × ½; Ed, ovary, cross-section, × 3; Ee, same, vertical section, × 2; Ef, style tip with 3-lobed stigma, × 5. F. *Erythronium americanum*: Fa, plant in flower, × ½; Fb, flower, vertical section, × ½; Fc, ovary, vertical section, × 3; Fd, same, cross section, × 3; Fe, stigma, × 5; Ff, anther, with distal end of filament, × 3.

Fig. 92. IRIDACEAE. A, *Gladiolus tristis*: Aa, inflorescence, × ¼; Ab, flower, × ¼; Ac, same, vertical section, × ¼. B, *Crocus susianus*: plant with flower, vertical section, × ½. C, *Freesia refracta*: Ca, inflorescence, × ½; Cb, flower, vertical section, × ½; Cc, ovary, cross-section, × 5. D, *Iris Xiphium*: inflorescence, × ½. E, *Iris germanica*: flower, × ¼ (b beard, f fall, p.t. perianth tube, sp spathe, std standard, stg stigma-branch.) F, *Iris sibirica*: capsule, × ½. (From L. H. Bailey, *Manual of cultivated plants,* The Macmillan Company, 1949. Copyright 1924 and 1949 by Liberty H. Bailey.)

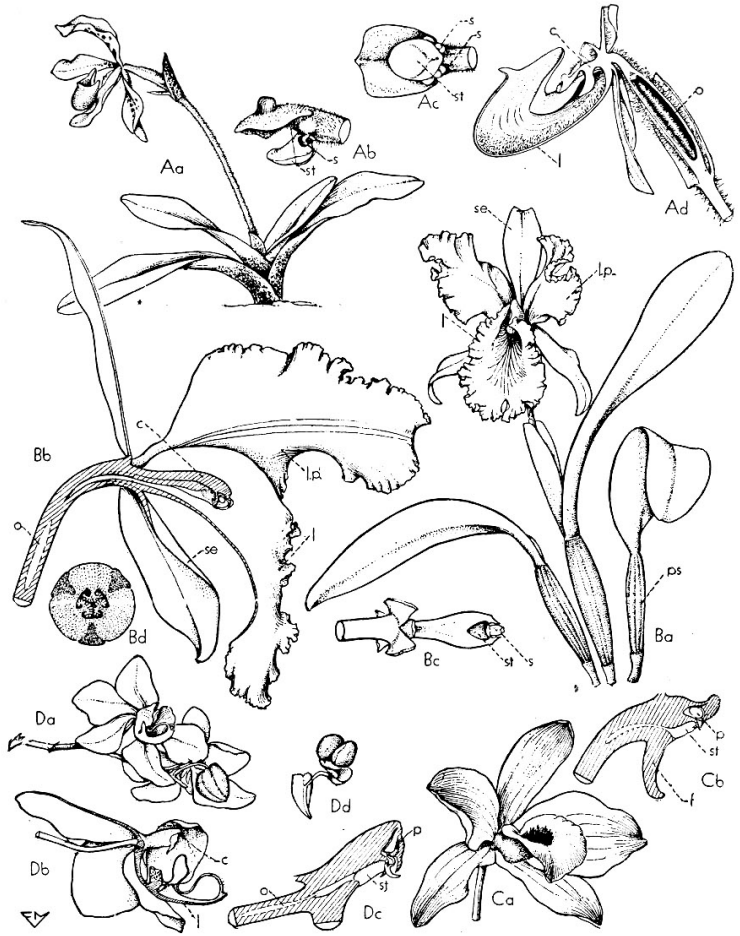

Fig. 98. ORCHIDACEAE. A, *Paphiopedilum insigne*: Aa, plant in flower, × ⅛; Ab, column, side view, × 1; Ac, same, from below, × 1; Ad, flower, vertical section, × ½. B, *Cattleya Lueddemanniana*: Ba, plant in flower, × ⅙; Bb, flower, vertical section, × ½; Bc, column from beneath, × ½; Bd, ovary, cross-section, × 2. C, Dendrobium nobile: Ca, flower, × ½; Cb, column, × 2. D, *Phalaenopsis amabilis*: Da, flowers, × ¼; Db, flower, vertical section, × ½; Dc, column, vertical section, × 1½; Dd, pollinia, × 3. (c column, f foot, l labellum, l.p. lateral petal, o ovary, ps pseudobulb, s stamen, se sepal, st stigma.) (From L. H. Bailey, *Manual of cultivated plants,* The Macmillan Company, 1949. Copyright 1924 and 1949 by Liberty H. Bailey.)