

- 1a: Pollen shed in clumps (tetrads/polyads); grains generally triangular, with an annulus subtending the porate apertures (go 34)
- 1b: Pollen generally dispersed as single units (monads); grains seldom if ever with annulus.
- 2a: Apertures porate, always lacking colpi
- 3a: grain outline from equatorial view circular
- 4a: Pores distributed along the equator.
 - 5a: Pores > 5 (stephanoporate)
 - 6a: Ornamentation homobrochate (~ *MENTZELIA*)
 - 6b: Ornamentation otherwise (~ *POLYGALA*)
 - 5b: Pores < 5 (*CURRENTLY OPEN*)
- 4b: Pores +/- distributed across grain (pantoporate)
 - 7a: Ornamentation with striate ornamentation (~ *POLEMONIUM*)
 - 7b: Ornamentation otherwise
 - 8a: Ornamentation, slightly irregular - without regularly repeating features (scabrate) (~ *STELLARIA*)
 - 8b: Ornamentation forming regularly repeating (reticulate) cells of varying shapes.
 - 9a: spacing between the grid cells large (lophate), the walls of the cells with another set of projecting ornamentation (~ *OPUNTIA*)
 - 9b: spacing between cells small, the wall of the cells without projecting features.
 - 10a: Pores extending beyond the reticulate grids (~ *ARENARIA*)
 - 10b: Pores extending beyond the reticulate grids (~ *PHLOX*)
- 3b: Outline from equatorial view otherwise (usually slightly triangular)
 - 11a: Outline elliptic (*CURRENTLY EMPTY*)
 - 11b: Outline not elliptic, grains often with acute, if rounded, angles along sides (e.g., triangular, polygonal) (*EMPTY*)
- 2b: Apertures with colpi, occasionally also with pores in addition (colporate)
 - 12a: Grains with bristles tapering to points (echinate), and tri-colporate.
 - 13a: Grains uniformly echinate, less the apertures. (Asteraceae 1)
 - 13b: Grains with echinate bristles on ridges of lophae (Asteraceae 2)
 - 12b: Grains without echinate ornamentation - this lead includes projections with ornamentation with round tips.
 - 14a: Grains with either less than 3 apertures, or with two distinct ornamentation types (generally ½ psilate, ½ reticulate).
 - 15a. Grains apparently lacking any apertures. (~ *IRIS*)
 - 15b. Grains aperturate
 - 16a. Ornamentation on one face of grain psilate, the other homobrochate (~ *ZIGADENUS* + *ANTICLEA*)
 - 16b. Ornamentation psilate across both faces of grain (~ *ERYTHONIUM*)
 - 14b. Grains with either 3 or more apertures, or with an elongated spiral like aperture
 - 17a. Grain with spiral like colpi
 - 18a. Spiral with deep well-defined furrows (~ *ERYTHRANTHE GUTTATA*, syn. obsolete. *MIMULUS*)
 - 18b. Spirals without well-defined grooves, ornamentation evidently perforate (~ *RANUNCULUS ALISMIFOLIUS*)
 - 17b. Grains with colpi these not forming irregular spiral motifs.
 - 19a. Grains elliptic, essentially perfectly cylindrical along longest axis, except for minor inundations along equatorial region. Apertures, of two types (heteroaperturate). (~ *BORAGINACEAE*)
 - 19b Grains shaped similar or not, but never heteroaperturate.
 - 20a. From a polar view, grains notably polygonal (hexagonal), also evident when seldom seen from a equatorial view. (~ *PHACELIA*/ maybe *Hydrophyllaceae*, *Hydrophyllum* not sampled)
 - 20b. From a polar view, grains not with 6 convex apices

- 21a. Grains elliptic, with a short colporate aperture on each psilate face, the edges of each face and the apices with a distinct (homobrochate) textured ornamentation. (~ POLYGONUM)
- 21b. Grains otherwise, not featuring a mix of ornamentations independent of the apertures.
- 22a. Ornamentation perforate, the three colpi very short, their longest axis parallel to the equator rather than perpendicular. These colpi often times almost appearing to be slightly raised on an annulus like feature (~ LONICERA)
- 22b. Grains not as described in all aspects of the above.
- 23a. Apertures colporate
- 24a. Outline of grain in equatorial view circular, ornamentation smooth. (~MORPHOTYPE A).
- 24b. Grains otherwise
- 25a Grains distinctly triangular from polar view (go 26)
- 25b Grains elliptic (go 27)
- 26a Grains very large, clearly strongly triangular in cross section. (~ GERANIUM)
- 26b Grains smaller (SIZE), weakly triangular in cross section (~ POTENTILLA/DASIPHORA in part)
- 27a Grains elliptic to weakly circular (~MORPHOTYPE B)
- 27b Grains elliptic, much longer pole to pole than across equator.
- 28a Grains with evident protrusions of the pore, colpi short, scarcely noticeable (~ APIACEAE)
- 23b. Apertures colpate
- 30a Ornamentation psilate (~MORPHOTYPE C).
- 30b Ornamentation otherwise
- 31a Ornamentation homobrochate (~ MORPHOTYPE D)
- 31b Ornamentation otherwise
- 32a. Ornamentation bacculate, grains large, (~LINUM)
- 32b. Ornamentation otherwise
- 33a. Ornamentation of minor cross-corrugated grooves (fossulate) (~CORYDALIS)
- 33b. Ornamentation of scarcely perceptible irregular features (scabrate) (~RANUNCULUS IN PART)

34a: Annula subtending the apertures – making grains appear more or less triangular; Pollen often with viscin threads (ONAGRACEAE)

34b: Apertures not annulate – grains appear more or less circular (~ERICACEAE)

Morphotype A: Trifolium, Lupinus, Glycyrrhiza, Mitella, Geum

Morphotype B: Lupinus, Lathyrus, Potentilla, Androsace, Bistorta, Vicia

Morphotype C: Jeffersonia, Micranthes, Prunus, Delphinium, Androsace, Penstemon, Orthocarpus, Scutellaria, Aquilegia, Castilleja, Draba)

Morphotype D: Salix, Boechera