Plant Taxonomy

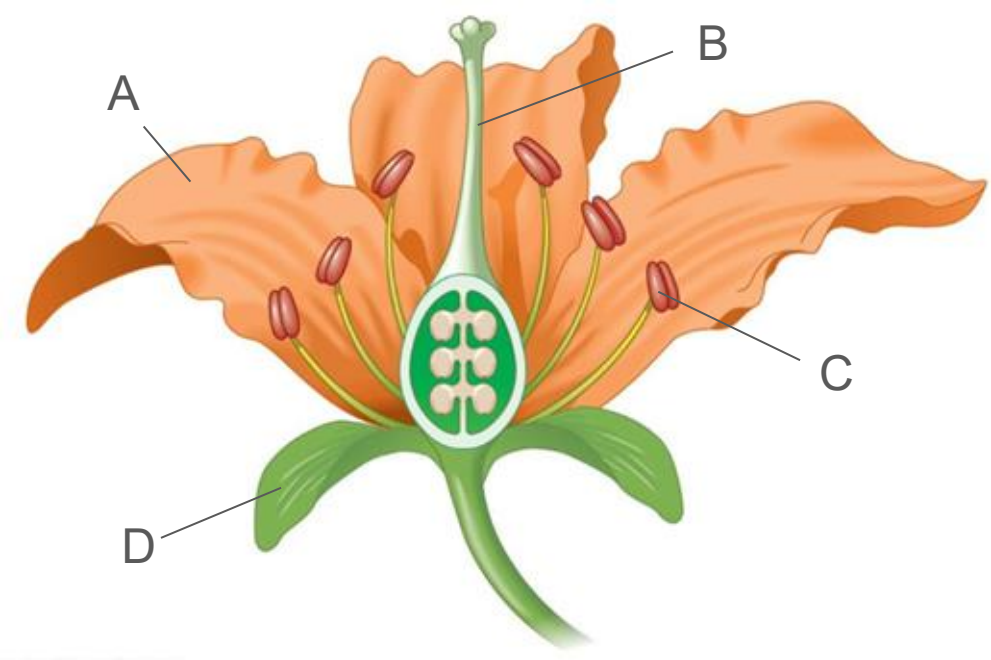
Flower Diversity 1

How many parts?

- Floral formula?

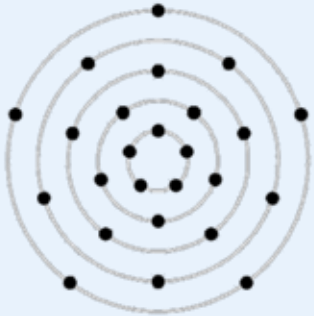
Floral organs

- Whorled or spiral?
- What names do we use for parts of each whorl?

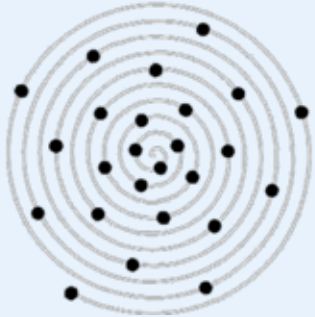


From whorls to spirals

Whorled:
(two whorls of stamens)



Spiral:



Top-down diagram of organs

Top-down diagram of organ positions

Side-view diagram of organs

https://doi.org/10.1038/nplants.2015.188

Magnoliaceae (magnolia family)

P ∞ A ∞ G ∞

- Spiral perianth, androecium, gynoecium
- Native to North America, not quite Wisconsin

Nymphaeaceae (water-lily family)

P ∞ A ∞ G ∞

- Spiral sepals, petals, androecium (gynoecium whorled/fused)

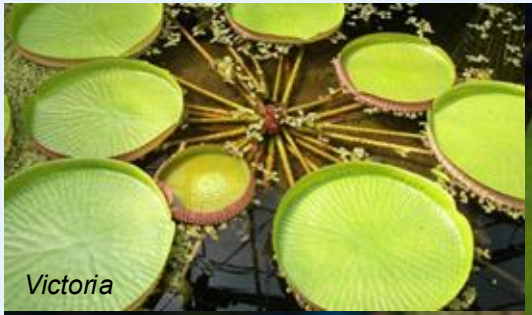

Water-lily
Nymphaea
Nymphaeaceae


[developing fruit]

Water-lily
Nymphaea
Nymphaeaceae

Nymphaeaceae (water-lily family)

- Leaves and flowers emerge separately from rhizome

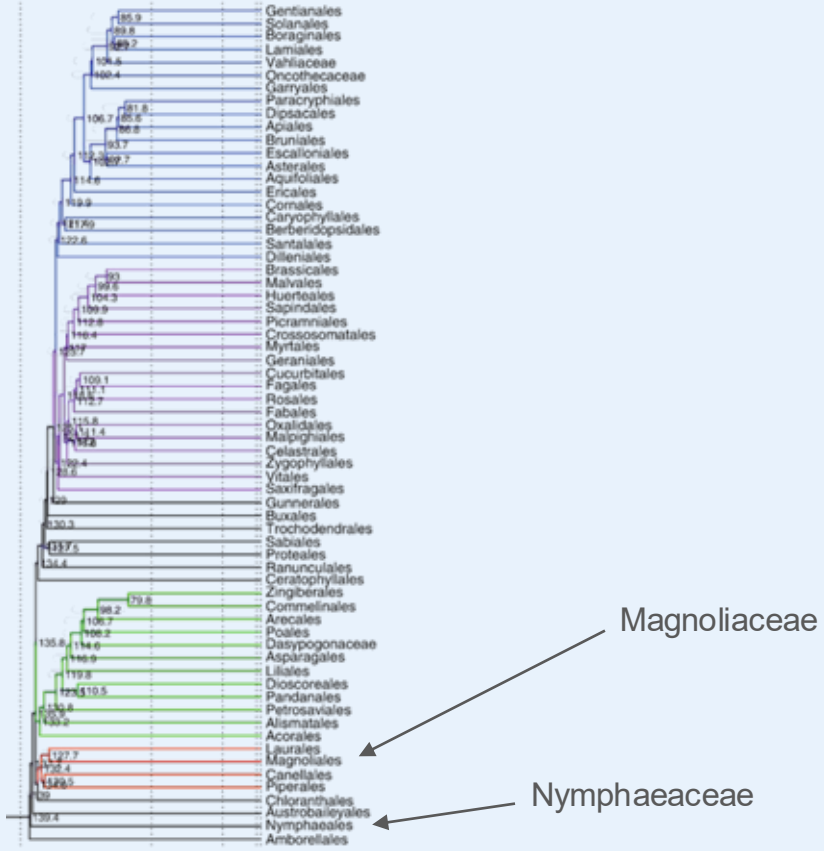

Victoria


Victoria


Nymphaea

Victoria

Spiral flowers in ancient plant lineages



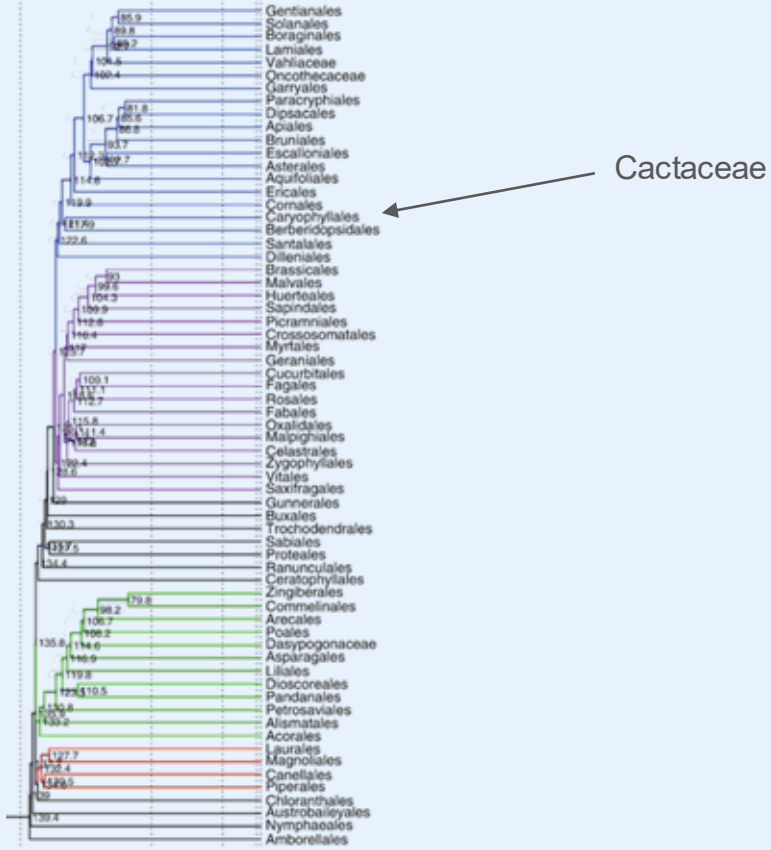
Cactaceae (cactus family)

- Spiral tepals, androecium, gynoecium

Cereus

Cereus

Spiral flowers in more recent plant lineages



Spiral cones (non-flowering plants)


Spruce (*Picea*) seed cones
Pinaceae


…and pollen cone


Lycopodium spore cones
Lycopodiaceae


Pine (*Pinus*) seed cone
Pinaceae


…and pollen cones

Flower variation

- Numbers of organs
- Positions of organs
- Fusion of organs
- Symmetry


Enchanter's nightshade
Circaea
Onagraceae


St. John's wort
Hypericum
Hypericaceae


Beardtongue
Penstemon
Plantaginaceae

Calyx (sepals)

- Often green and tougher than petals
- Often serve to protect the flower bud before it opens
- Often still present during fruiting phase

Corolla (petals)

- Typically showy to attract animal pollinators
- …may be reduced or absent in wind-pollinated flowers


Partridge-berry
Mitchella
Rubiaceae


Flower-of-an-hour
Hibiscus
Malvaceae


Wood-sorrel
Oxalis
Oxalidaceae

Perianth organ number

- One of the more useful traits for identifying families
- Sepal number usually equal to petal number

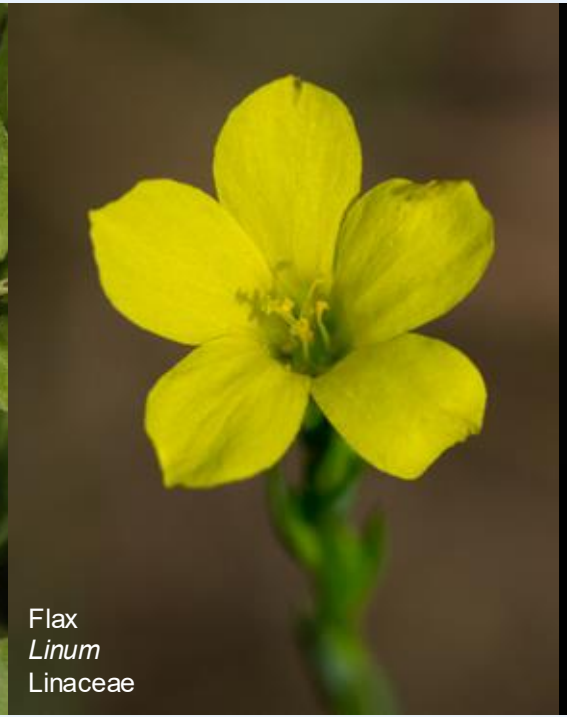
Monocots: perianth (if showy) in 3s

- Often 6 tepals instead of 3 sepals + 3 petals

Dicots: perianth in 4s or 5s

- Multiples of 5 are more common


Scarlet pimpernel
Primula
Primulaceae


Flax
Linum
Linaceae


Privet
Ligustrum
Oleaceae

Onagraceae (evening primrose family)

- Perianth in 4s


Willow-herb
Epilobium
Onagraceae


Beeblossom
Oenothera
Onagraceae


Evening-primrose
Oenothera
Onagraceae

Rubiaceae (coffee family)

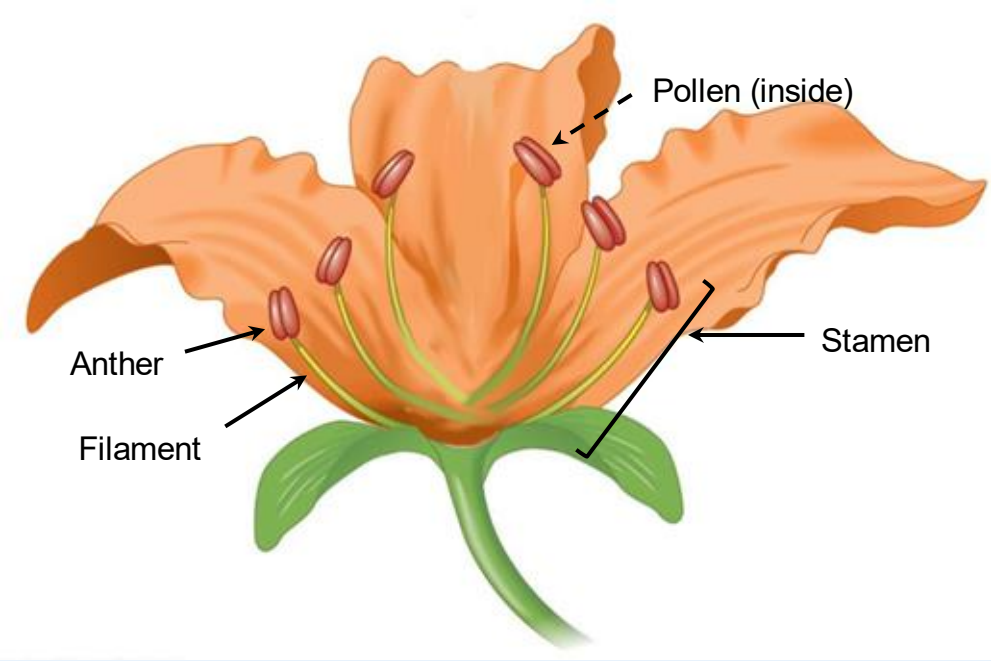
- WI plants frequently in 4s

Cornaceae (dogwood family)

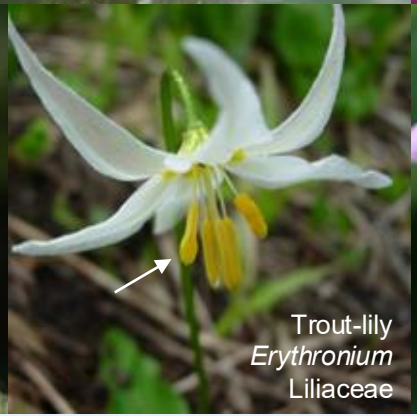
- Perianth in 4s

Androecium

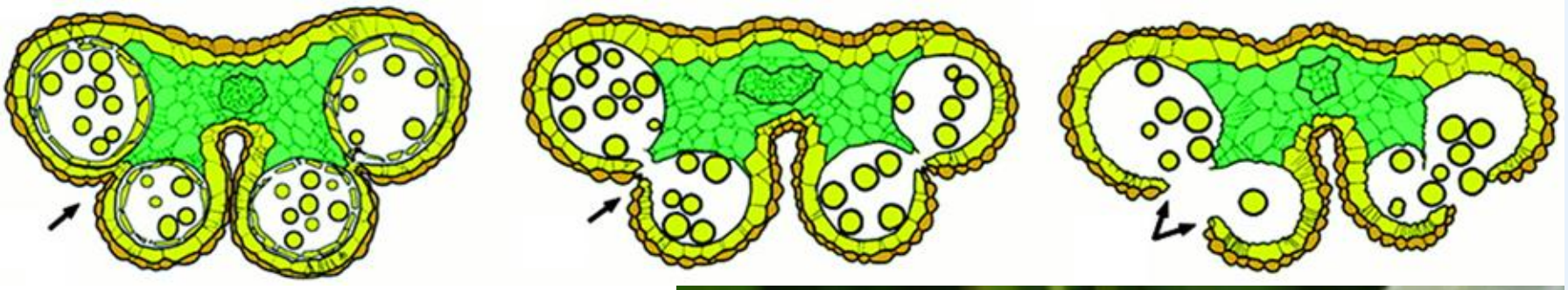
- …made up of stamens



Androecium (stamens)



Stamen anatomy

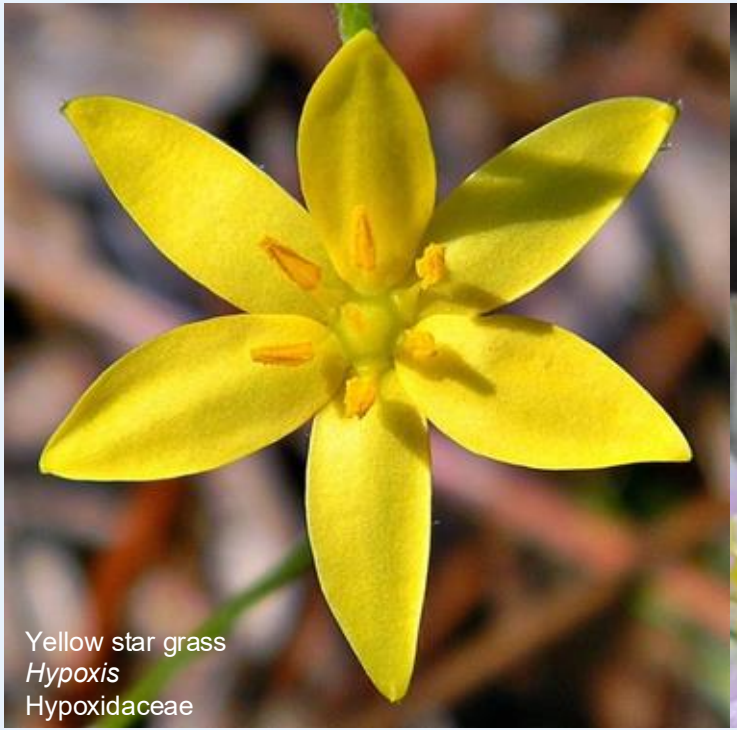


Anther cross-section

Jaltomata (Solanaceae)

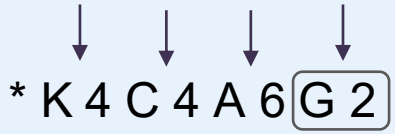
Stamen number

- Often a multiple of perianth number



Brassicaceae (mustard family)

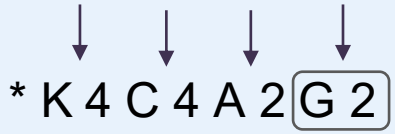
- Perianth in 4s but 6 stamens



Yellow rocket
Barbarea
Brassicaceae

Oleaceae (olive family)

- Perianth in 4s but 2 stamens



Privet
Ligustrum
Oleaceae

Forsythia
Oleaceae

Numerous stamens

- Previous families with ∞ stamens: Cactaceae, Nymphaeaceae, Magnoliaceae

Water-lily
Nymphaea
Nymphaeaceae

Tulip-tree
Liriodendron
Magnoliaceae

Rosaceae (rose family)

- Perianth in 5s, ∞ stamens
- Always K 5 C 5


Hawthorn
Crataegus
Rosaceae


Agrimony
Agrimonia
Rosaceae


Strawberry
Fragaria
Rosaceae

Ranunculaceae (buttercup family)

- Perianth in 5s (mostly), ∞ stamens
- Sometimes K 5 C 5, sometimes P ∞ tepals

Liver-leaf
Hepatica
Ranunculaceae

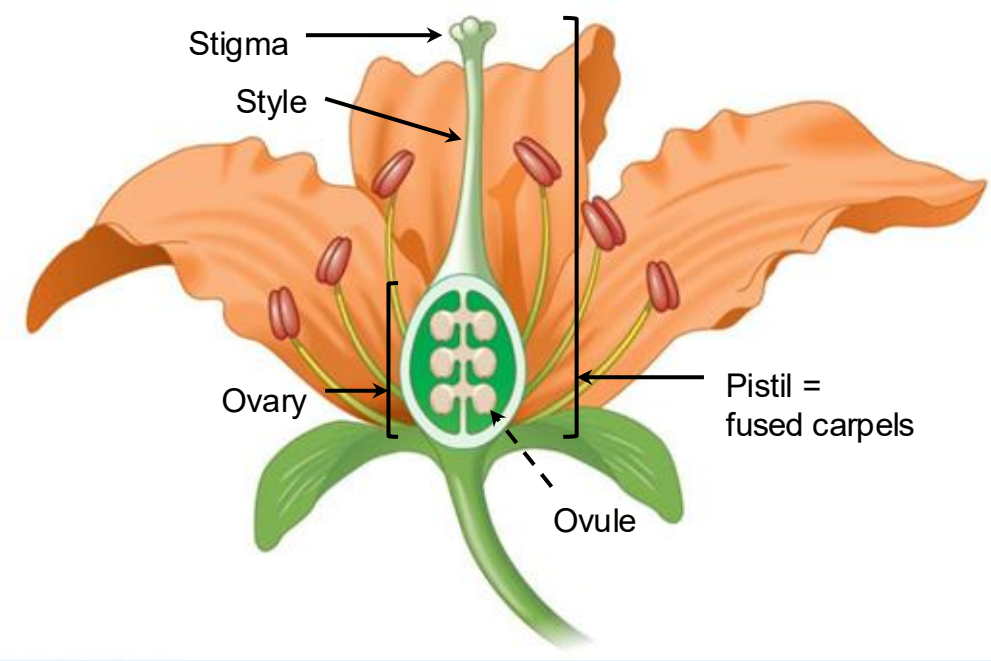
False rue-anemone
Enemion
Ranunculaceae

Hypericaceae (St. John's wort family)

- Perianth in 5s, ∞ stamens
- Capsule fruit, leaves opposite

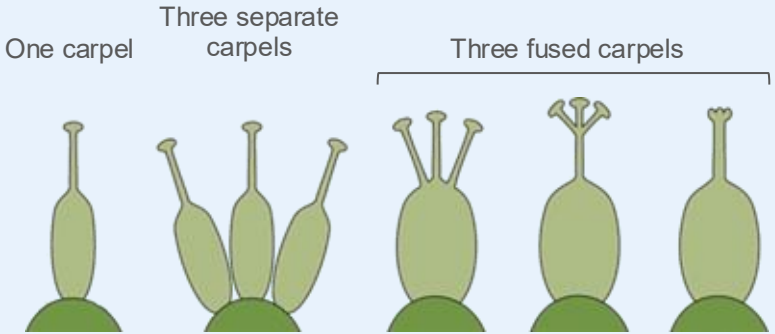
Gynoecium

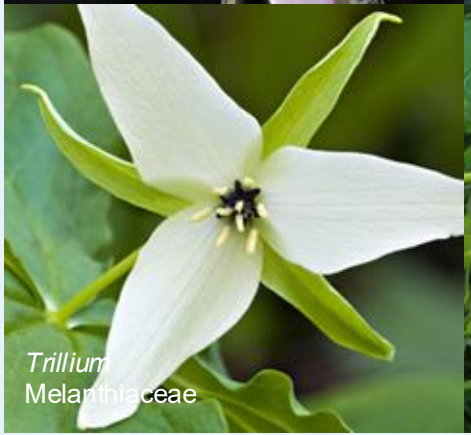
- …made up of carpels
- Multiple carpels often fused into ‘pistil’



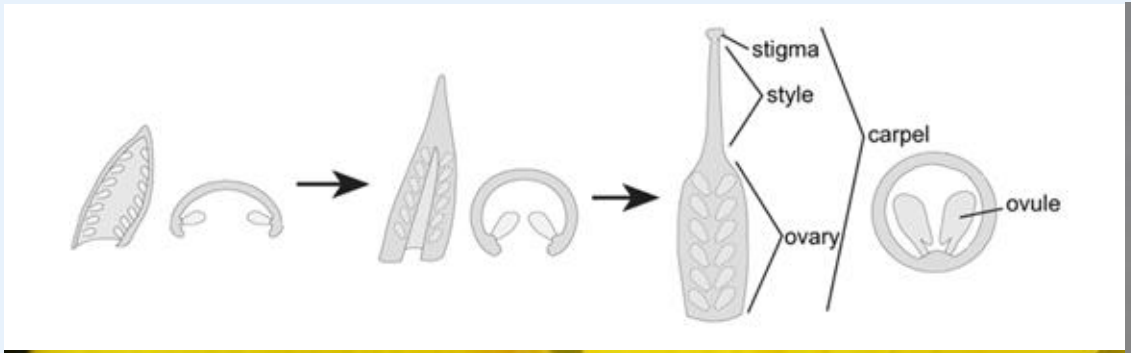
Carpel fusion

- One of the more useful identification features
- Number of stigma lobes often indicates carpel number





Carpel evolution

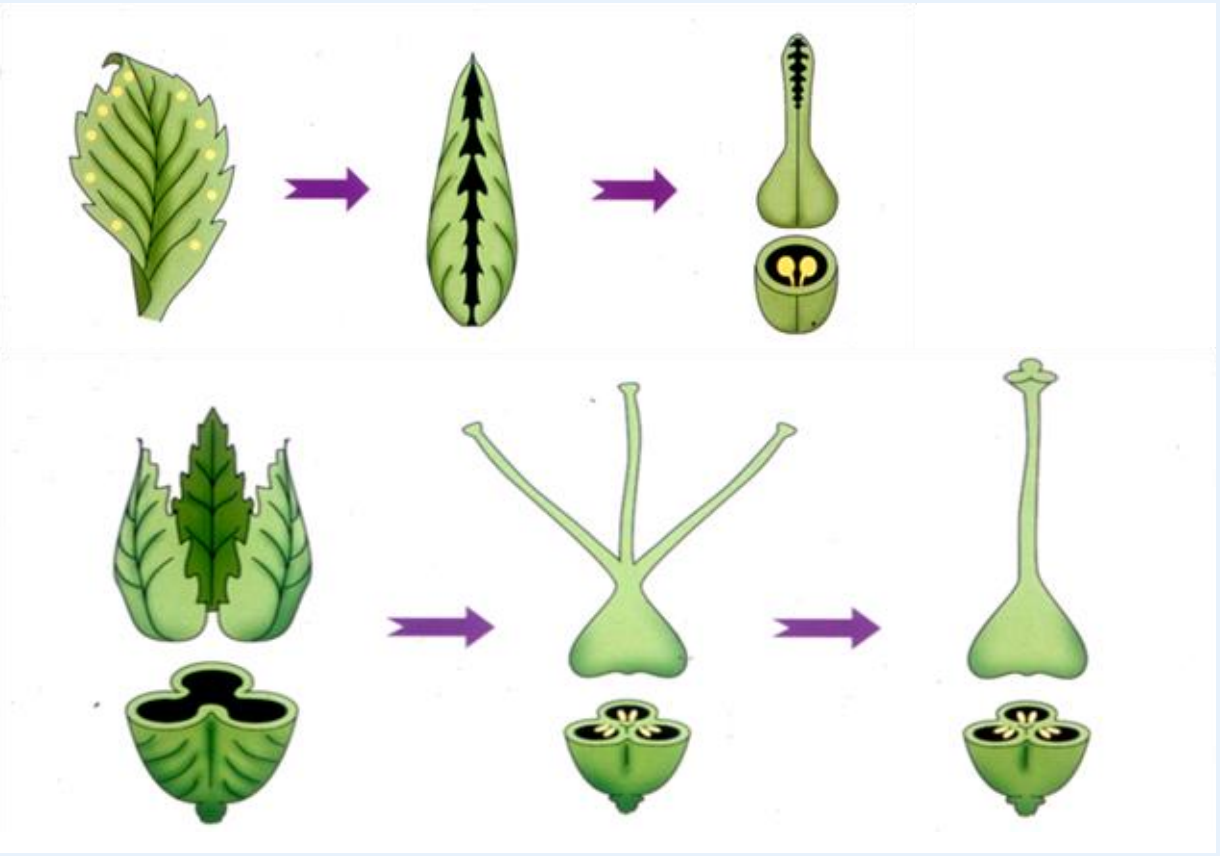


Caltha (Ranunculaceae)

Ranunculus achenes

Carpels and pistils


Geranium
(Geraniaceae)



Carpel fusion

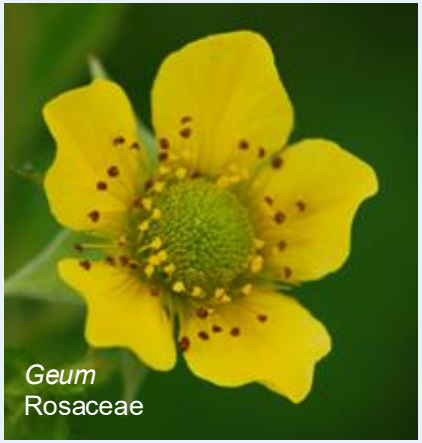
- Monocarpous (unicarpellate) / apocarpous / syncarpous

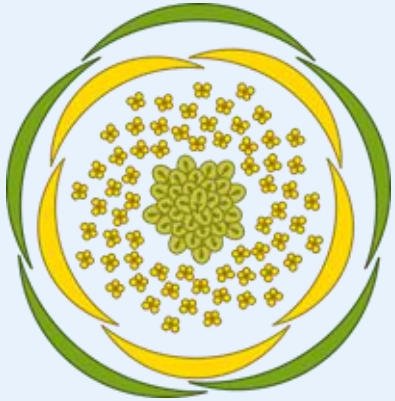
Most plants are syncarpous

- Stigma number can tell you how many carpels are fused together

Syncarpous / apocarpous floral formulas

- Circle around ‘G’ indicates fusion





K 5 C 5 A ∞ G ∞

P 6 A 6 G 3

Fabaceae with unicarpellate flowers

- Not easily seen in most flowers because carpels are concealed by petals
- …but fruit type is from a single carpel (more on this later)

Rosaceae with unicarpellate flowers

- Genus *Prunus*: cherries / plums / peaches
- Only one style, maybe hard to discern among stamens

Apocarpous: Magnoliaceae

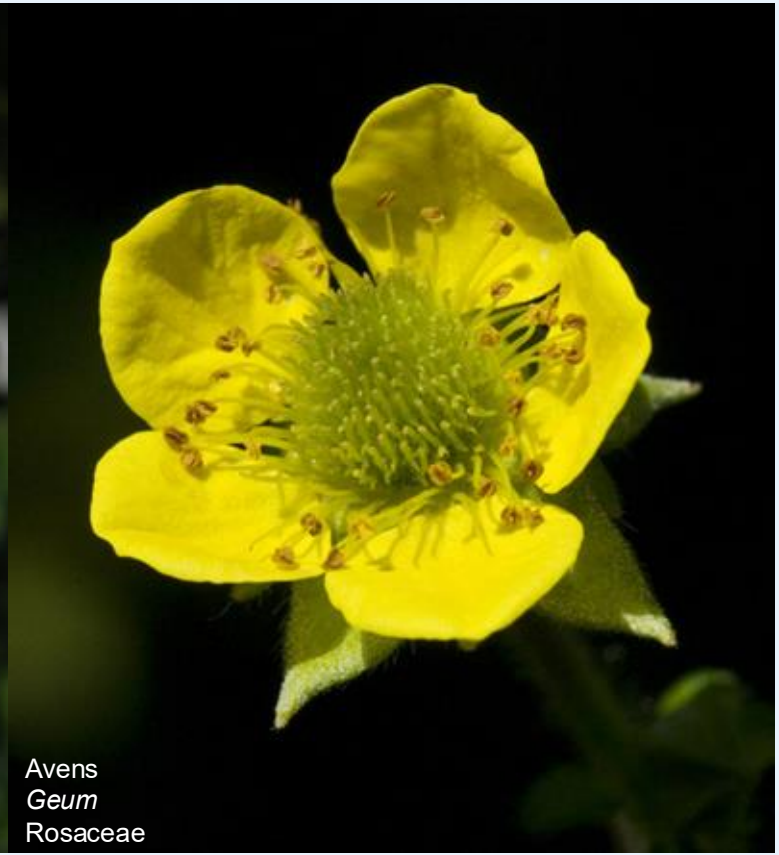
Apocarpous: Ranunculaceae

Bower
Clematis
Ranunculaceae

Buttercup
Ranunculus
Ranunculaceae

Apocarpous: Rosaceae

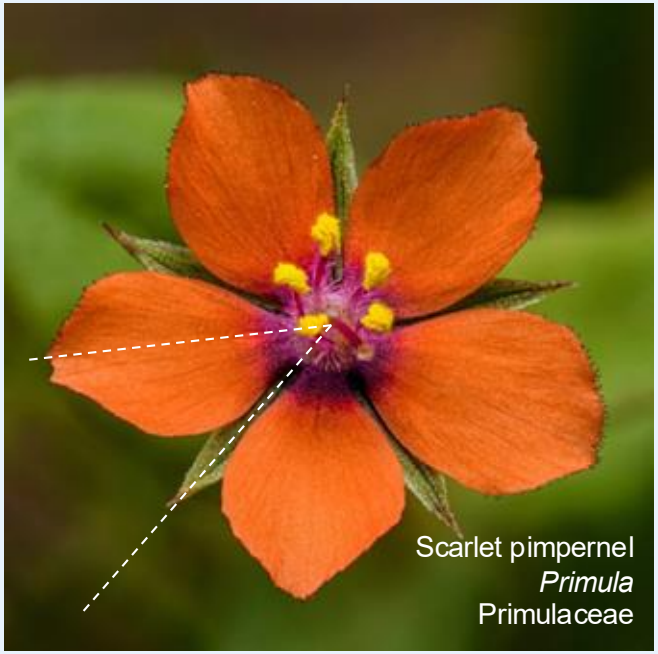
Blackberry
Rubus
Rosaceae



Avens
Geum
Rosaceae

Organs most often are alternate

- i.e., petals fall in between the sepals, stamens in between the petals
- In Primulaceae, stamens are opposite the petals



Stamens opposite petals: Primulaceae

Creeping Jenny
Lysimachia
Primulaceae

Water pimpernel
Samolus
Primulaceae