Plant Taxonomy

Flower Diversity

Organ fusion

- Connation (prefix ‘syn-’ or ‘sym-’): organs of the same kind
- Adnation (prefix ‘epi-’): organs of different kinds
- How to know if organs are fused?

Epipetalous stamens:
Lonicera
Caprifoliaceae

Sympetalous corolla:
Ipomopsis
Polemoniaceae)

Staminal column:
Hibiscus
Malvaceae

Many examples of sympetalous flowers

- Evolutionary advantages?

Horse-gentian
Triosteum
Caprifoliaceae

Wild-basil
Clinopodium
Lamiaceae

Sympetalous: Ericales

Blueberry
Vaccinium
Ericaceae

Jacob's ladder
Polemonium
Ericaceae

Sympetalous: Gentianales

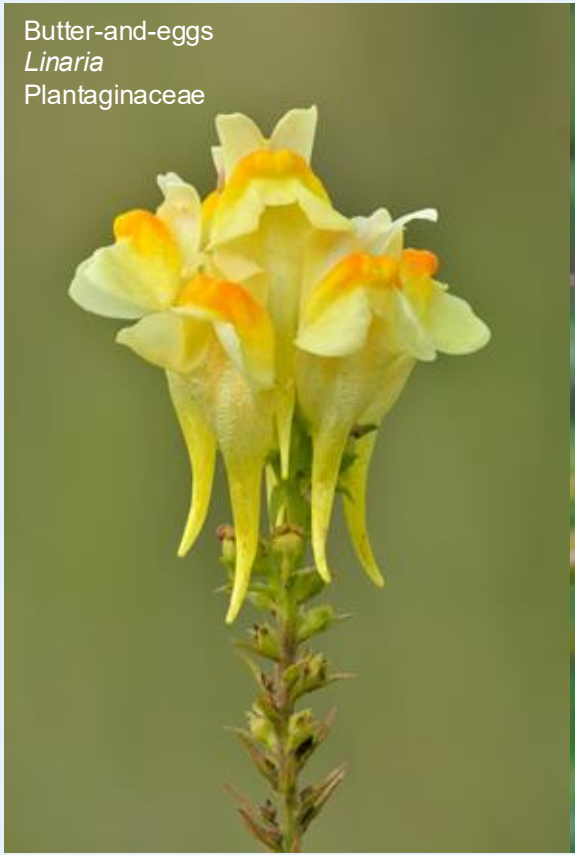
Partridgeberry
Mitchella
Rubiaceae

Dogbane
Apocynum
Apocynaceae

Sympetalous: Solanales

Sympetalous: Asterales

Sympetalous: Lamiales



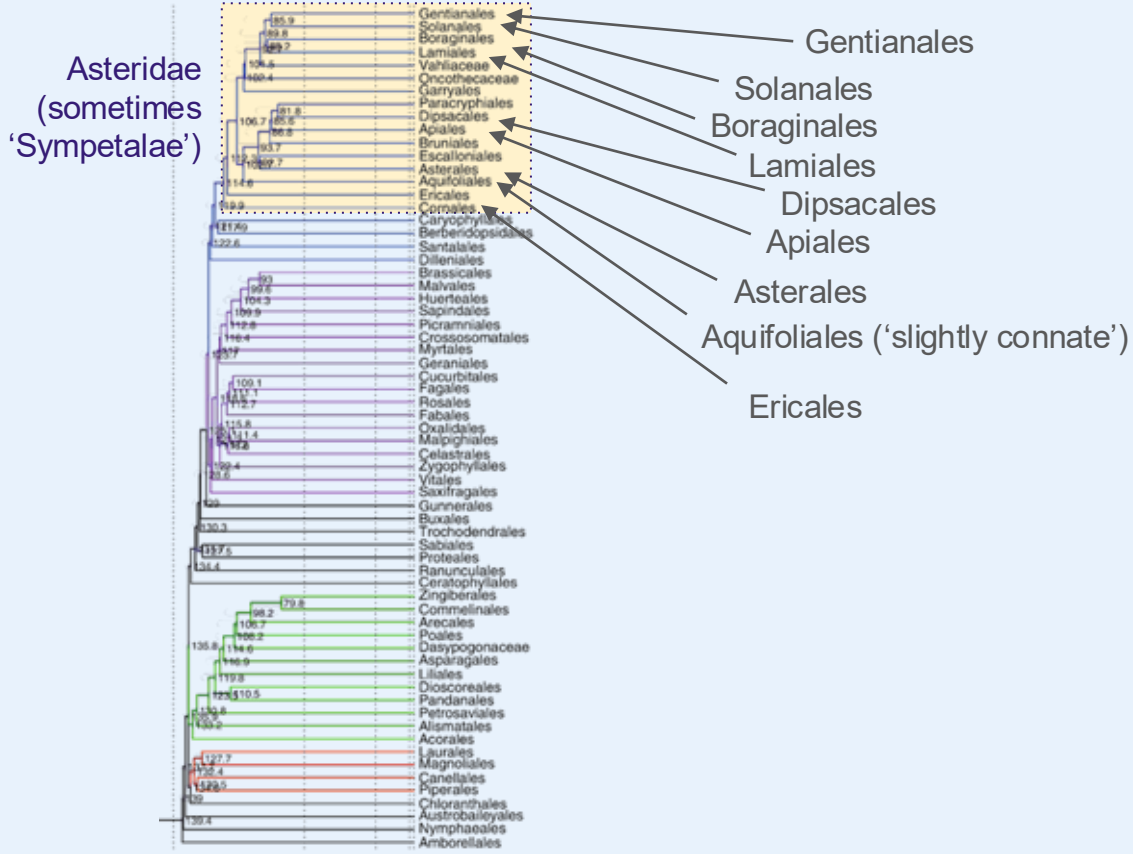
Sympetalous: Dipsacales

Honeysuckle
Lonicera
Caprifoliaceae

Moschatel
Adoxa
Adoxaceae

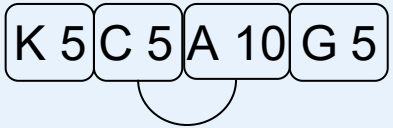
Valerian
Valeriana
Caprifoliaceae

Sympetalous



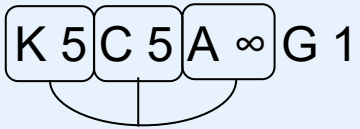
Organ fusion: floral formulas

- Recall circle for fusion of same organ kind (e.g., syncarpous)
- Line below connects fused organs of different kinds



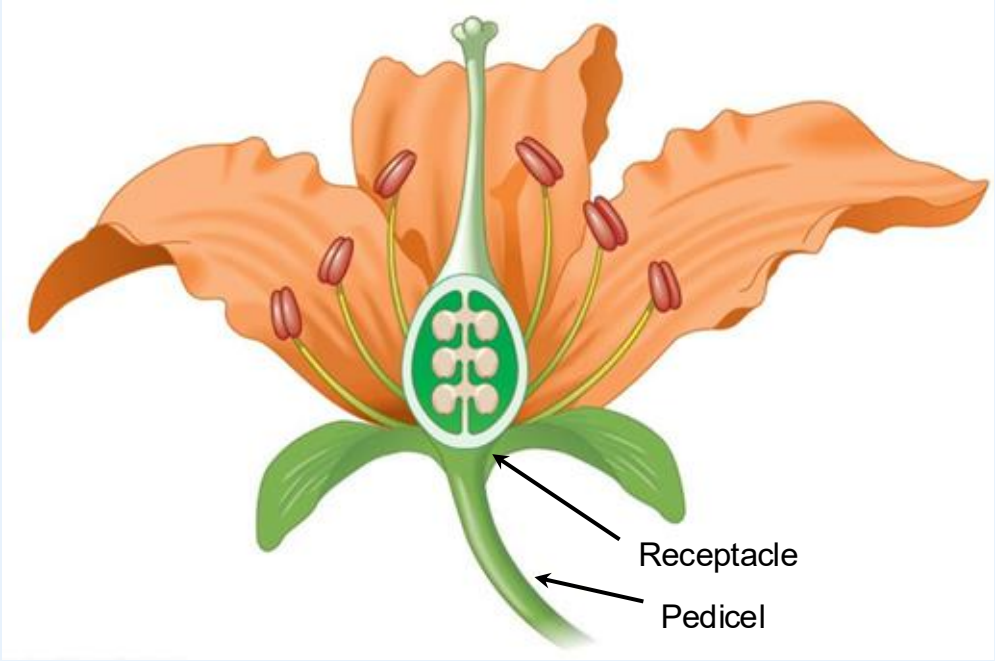
Hypanthium

- *Hypanthium*: perianth and stamens fused together
- May or may not also be fused to ovary



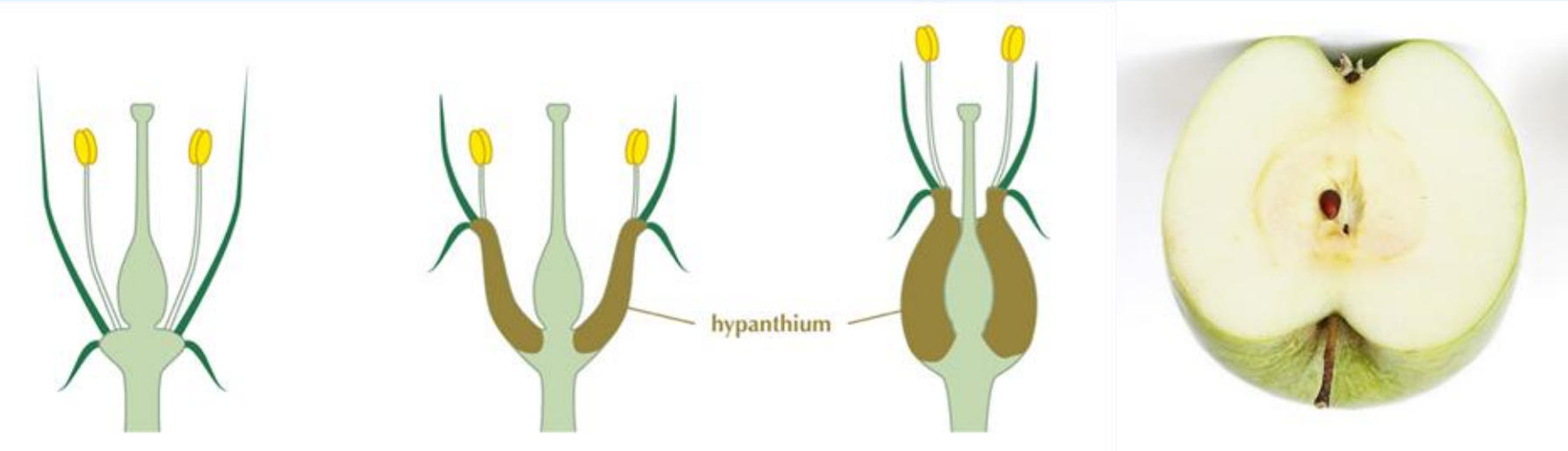
Supporting roles

- *Receptacle*: base of flower
- *Pedicel*: stalk leading to flower (flowers without pedicels are *sessile*)



Ovary position

- Ovary superior (flower hypogynous or perigynous)
- Ovary inferior (flower epigynous)
- *Hypanthium*: fused perianth+androecium



Flower longitudinal sections

Inferior ovaries are syncarpous

Fuchsia
Onagraceae

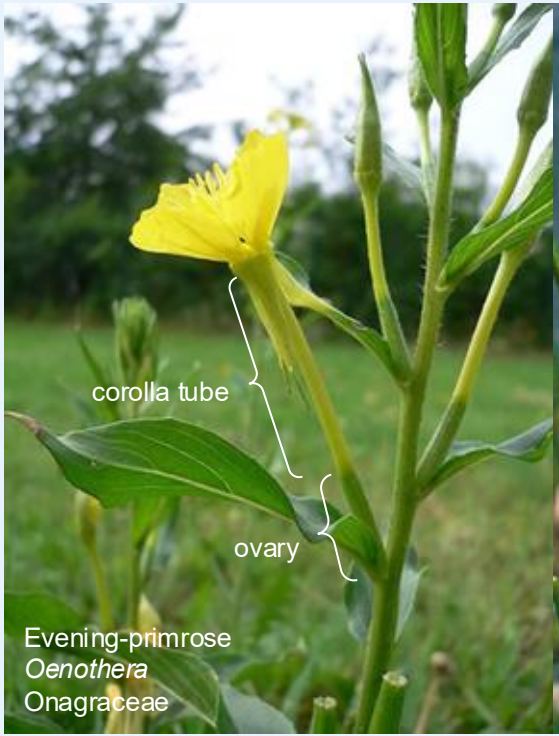
…because the receptacle is located below the ovary, all flower organs must be fused together in this region

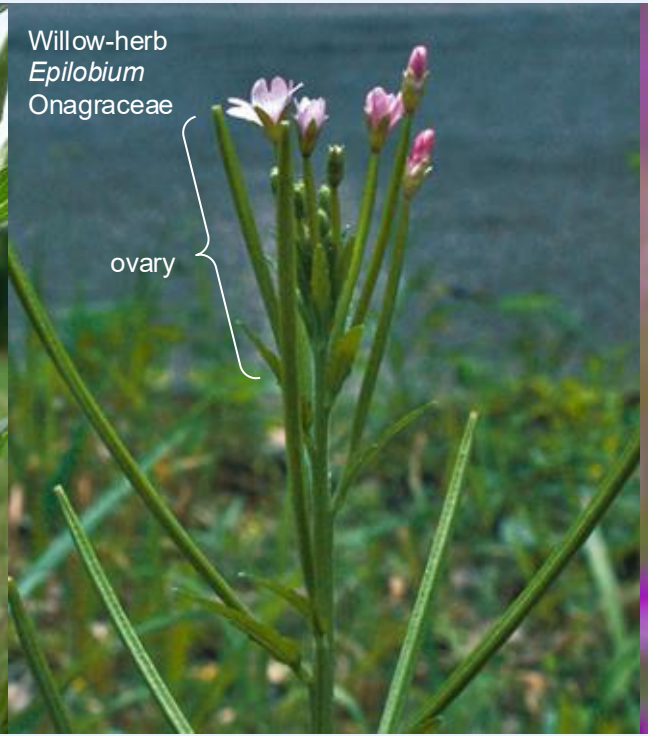
Inferior ovaries

- Often visible from outside the flower

Onagraceae (evening primrose family)

- Inferior ovary





Rubiaceae (coffee family)

- Inferior ovary

Cactaceae (cactus family)

- Inferior ovary basically sunk into stem, thus able to have spines

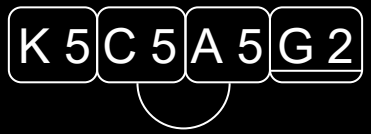
Prickly-pear
Opuntia
Cactaceae

Ovary position: floral formula

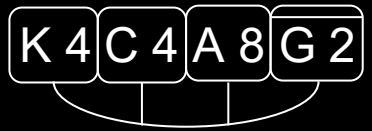
- Line above or below ‘G’ reflects the attachment point of other organs
- Notice that sympetalous flowers can have superior or inferior ovary

Petunia
Solanaceae

… corolla/androecium fused together around the ovary, but not fused *to* the ovary



Fuchsia
Onagraceae



… recall that all organs are fused together by definition because of the inferior ovary

Flower symmetry

- Radial symmetry
- Bilateral symmetry
- Advantages of each?

Beardtongue
Penstemon
Plantaginaceae

Liver-leaf
Hepatica
Ranunculaceae

Flower symmetry floral formulas

* = radial / × = bilateral

Monkshood
Aconitum
Ranunculaceae

* P 9 A ∞ G ∞

× K 5 C 2 A ∞ G 3

Meadow-rue
Thalictrum
Ranunculaceae

Radial symmetry with unfused petals

Grove-sandwort
Moehringia
Caryophyllaceae

Bloodroot
Sanguinaria
Papaveraceae

Radial symmetry with fused petals

Bilateral symmetry unfused petals

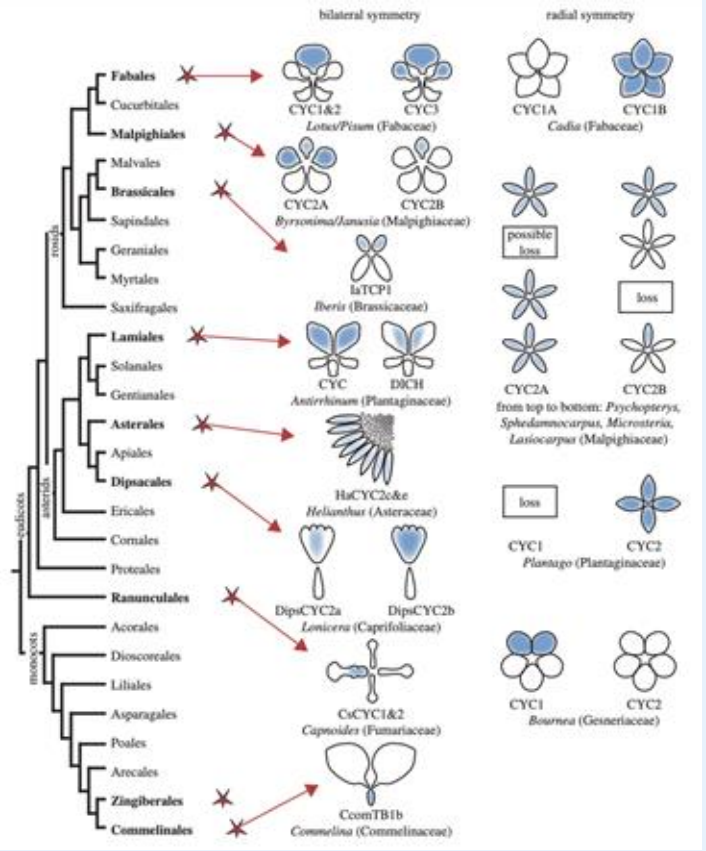
Monkshood
Aconitum
Ranunculaceae

Violet
Viola
Violaceae

Bilateral symmetry fused petals

CYCLOIDEA gene strongly influences symmetry

- Multiple independent origins of bilateral symmetry



https://doi.org/10.1098/rstb.2013.0348

Floral formula summary

* = radial / × = bilateral

P = perianth (undifferentiated)

K = calyx

C = corolla

A = androecium

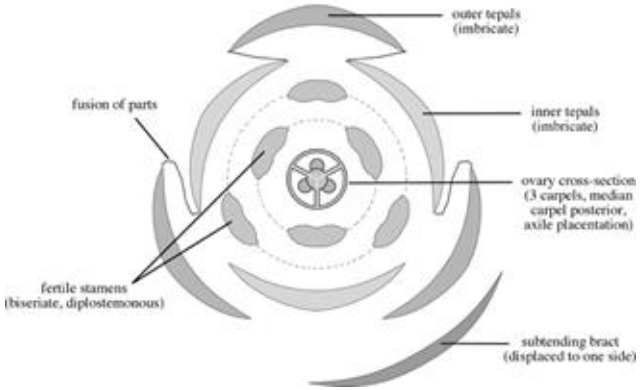
G = gynoecium (line indicates receptacle position)

▢ or ⬚ = connation

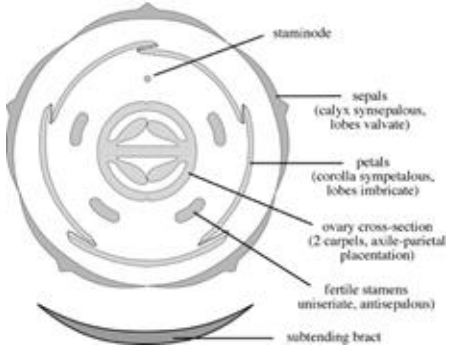
Curved line = adnation

*/× K 5 C 5 A 5-15 G 3-5

* P 6 A 6 G 3



* K 5 C 5 A 4 G 2



Flower sexuality

- Bisexual (‘perfect’) flowers were ancestral
- Unisexual flowers result from losing male or female function

Pistillate and staminate

- ‘Male’ flowers also known as ‘staminate’ (stamens)
- ‘Female’ flowers also known as ‘pistillate’ (pistils)
- Both kinds are required for sexual reproduction

Functionally unisexual

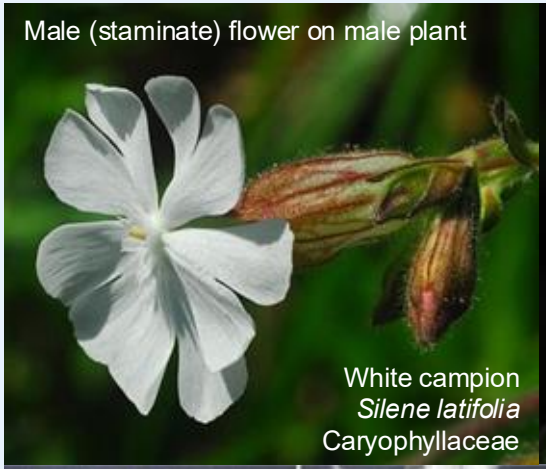
- Unisexual flowers often have vestigial organs of the non-functional sex

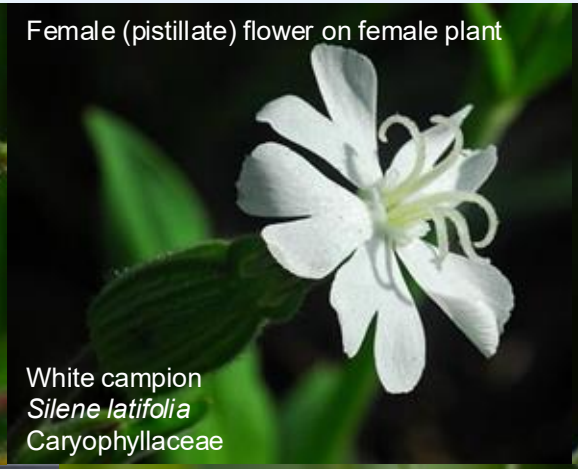
Plant sexuality

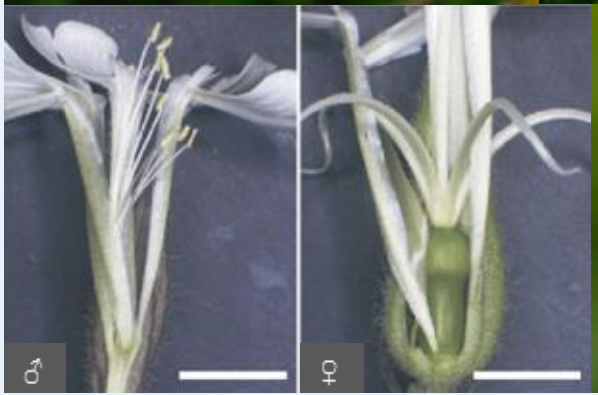
- Unisexual flowers
  - Monoecious plant
  - Dioecious plant
- Bisexual flowers
  - Bisexual plant

Bisexual flowers are the most common

Mixed bisexual and unisexual in the same family

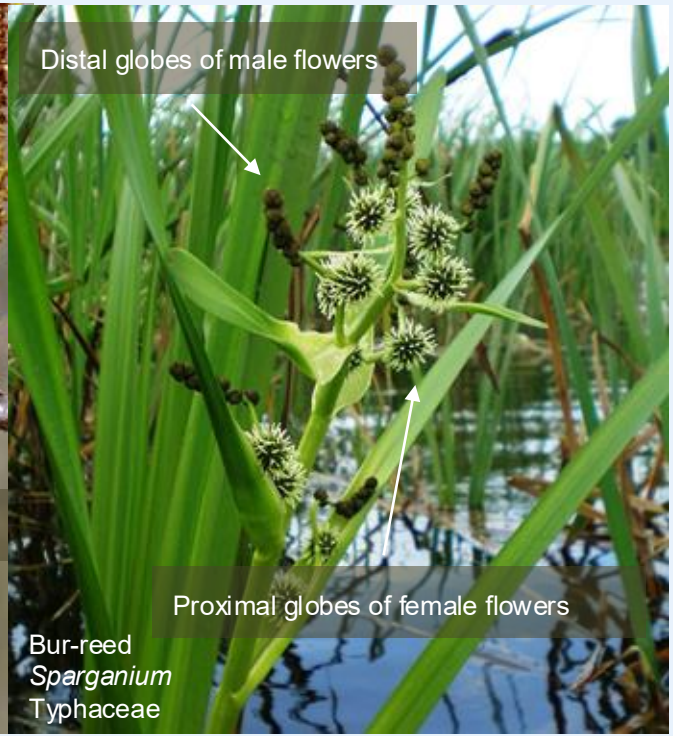






Entirely monoecious

- Uncommon for a family to be entirely monoecious



Entirely dioecious: Salicaceae (willow)

Entirely dioecious: Smilacaceae (greenbrier)

Entirely dioecious: Dioscoreaceae (yam)

Entirely dioecious: Moraceae (mulberry)

Mulberry ♀
Morus
Moraceae

Mulberry ♂
Morus
Moraceae

Missing parts

- Besides sexual organs, flowers may lack other parts