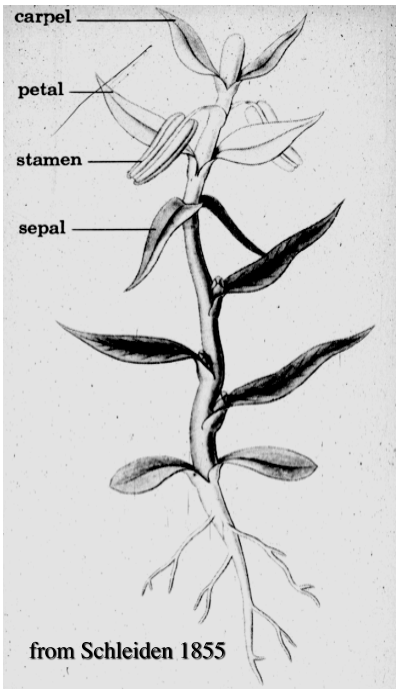
The Flower - What is it?

The Flower — What is it?

- "foliar theory" of flower - J.W. von Goethe in "*Attempt to Interpret the Metamorphosis of Plants*" (1790)



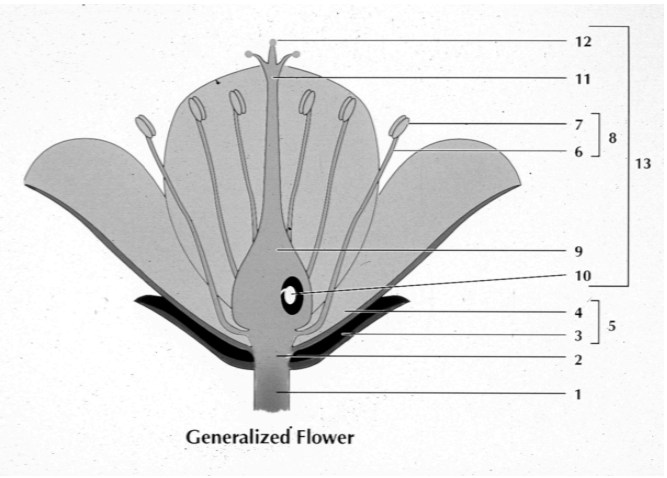
The Flower — What is it?

- thus, a flower is a specialized shoot that:

1. is determinate (vs. indeterminate)
2. has a modified stem with compressed internodes
3. possesses modified leaves with various functions, these determined by gene arrays (e.g., ABC model)
4. often clustered in an inflorescence (larger branch)

The Flower

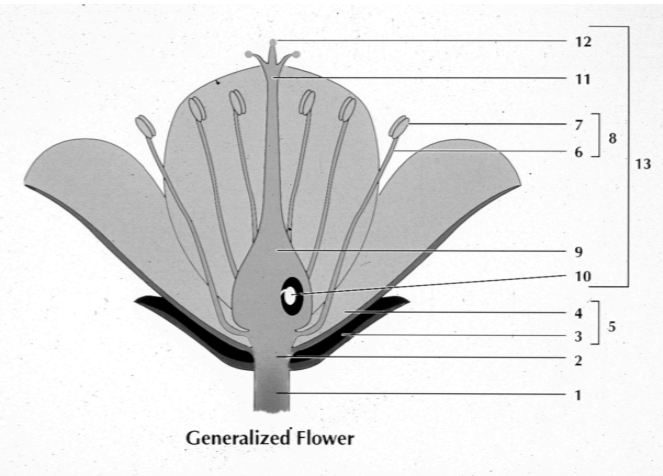
read chpt 9 in *Plant Systematics*!



Generalized Flower

1. Peduncle: floral stalk, the stem supporting the flower; sometimes referred to as the pedicel

The Flower



2. Receptacle: modified floral stem or axis from which arise the floral appendages or modified leaves

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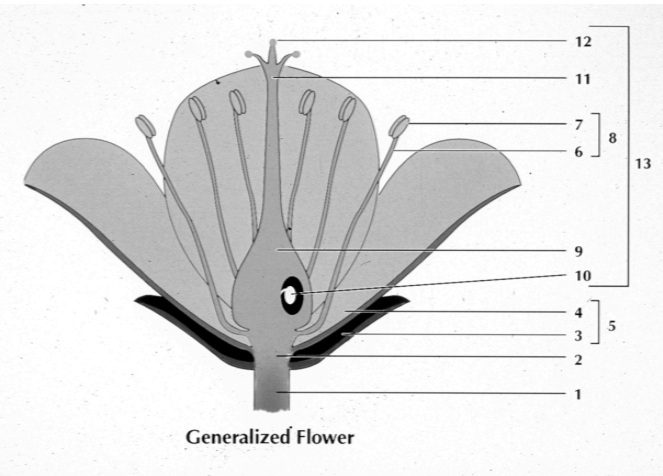
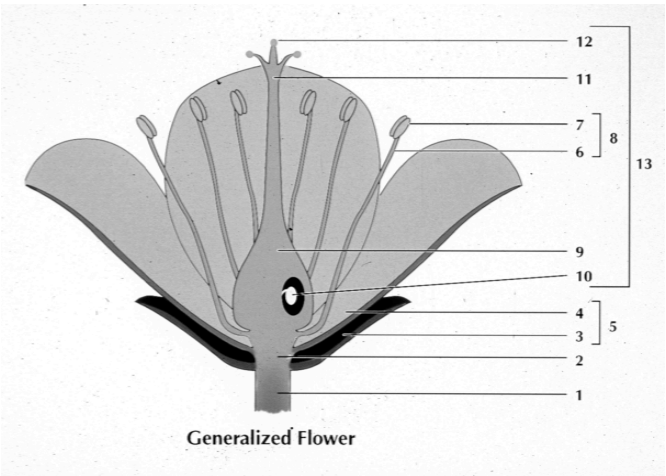


3. Sepal: the outer whorl of leaves, green and protection; collectively called the calyx

The Flower



4. Petal: the second whorl of leaves, typically brightly colored, attracting pollinators; collectively called the corolla

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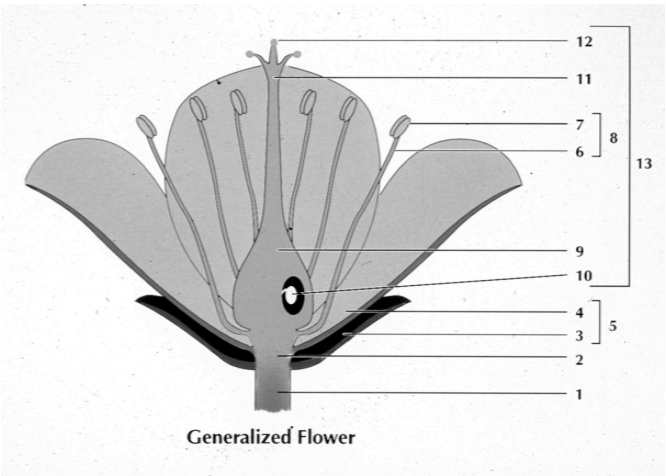
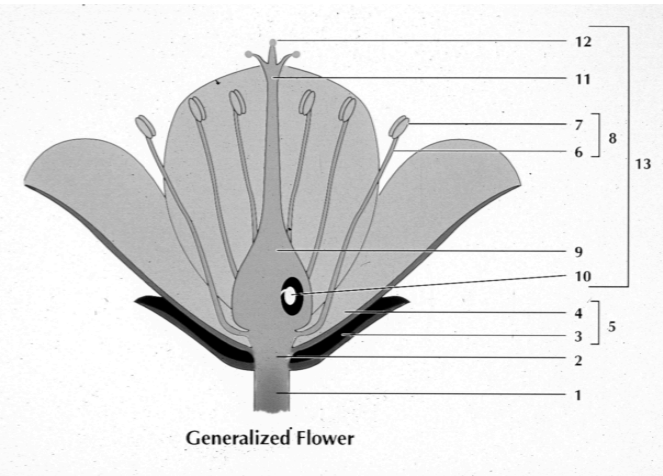


5. Perianth: collective term for sepals and petals

Tepals if both similar

The Flower

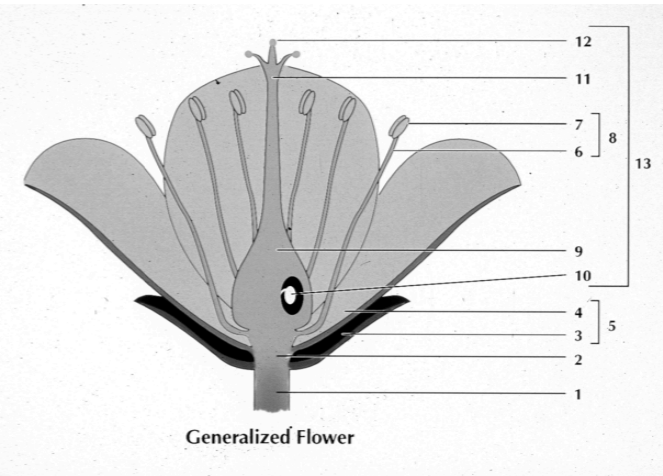


8. Stamen: the male structure of flower comprising filament and anther

- collectively, stamens are the androecium (= 'house of males')

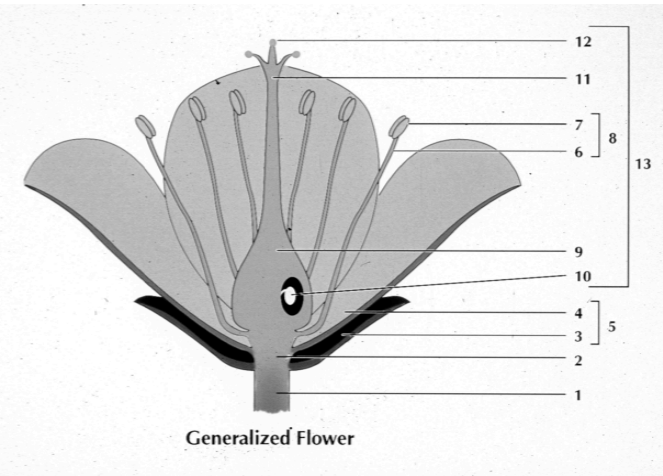
- can be leaf-like in primitive angiosperms

The Flower

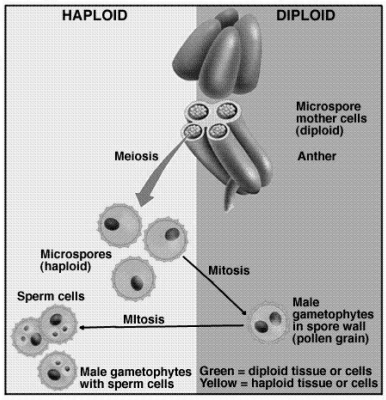


6. Filament: slender stalk of the stamen supporting the anther; permits exsertion of pollen out of flower

The Flower



7. Anther: fertile portion of stamen that dehisces to release pollen grains; composed of anther sacs



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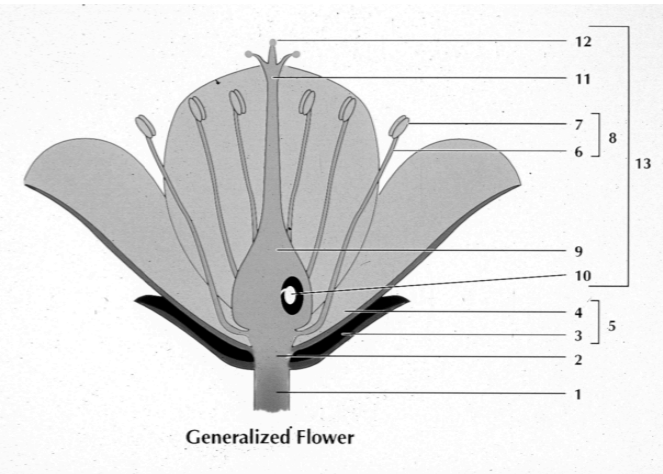
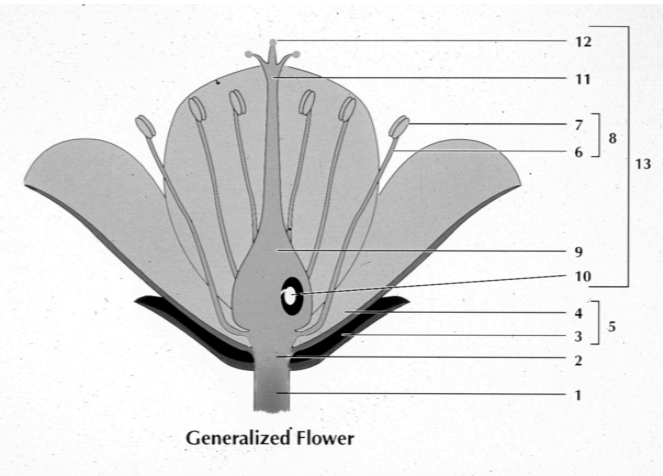


Nectaries often near base of stamens

- produce nectar reward for visitors who will move pollen ('pollinators')

e.g., grass-of-parnassus & fritillary

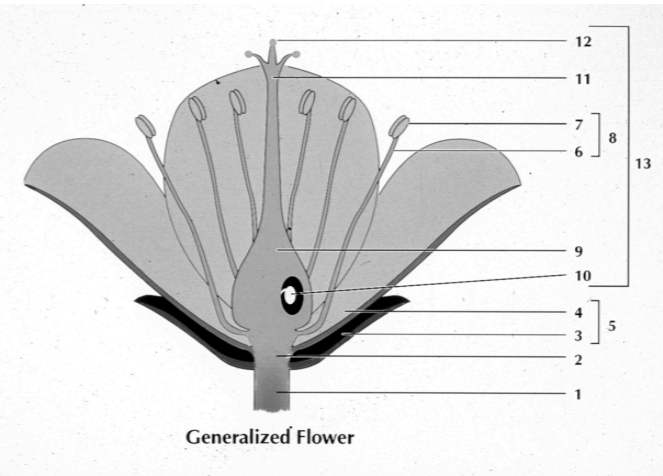
The Flower



13. Pistil: flask-shaped, female structure comprising three main parts

- often referred to as carpel(s)
- all pistils (1 or more) are referred to as the gynoecium (= 'house of females')

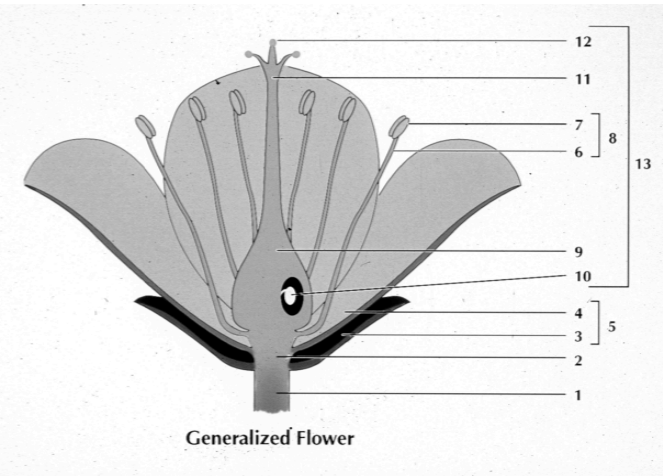
The Flower



9. Ovary: basal portion of pistil that contains ovules; at maturity becomes fruit with seeds

10. Ovules: fertile portions of pistil that contain a female gametophyte (embryo sac); develop into seeds after fertilization

The Flower

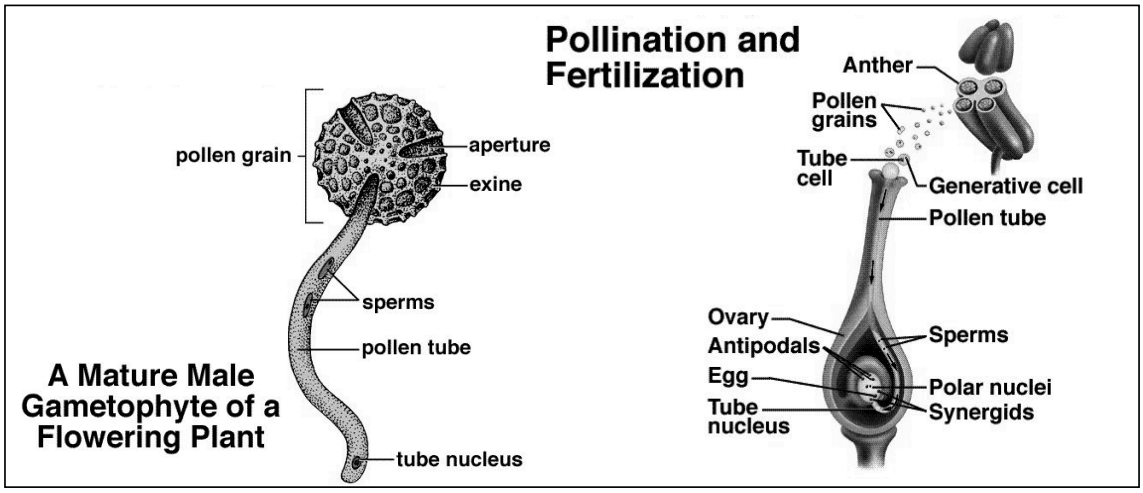


12. Stigma: receptive portion at top of style that receives and recognizes pollen

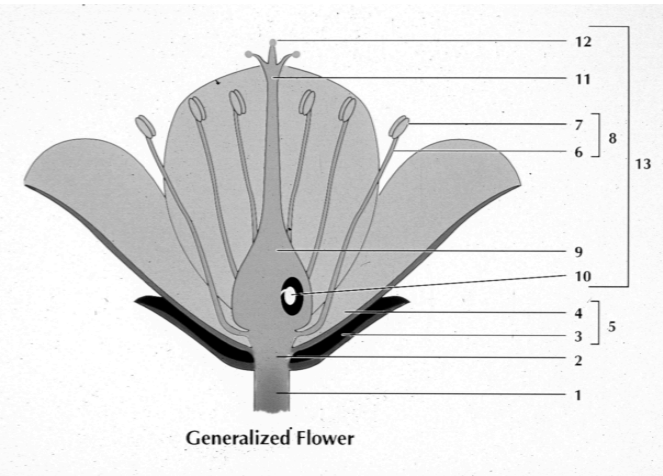
11. Style: slender stalk of pistil above ovary that the pollen tubes must pass through to reach eggs in ovules

The Flower

Pollination biology — Study of the pollen, its transfer, and movement down the style



The Flower



Generalized Flower

Pistil vs. carpel

How do you know?

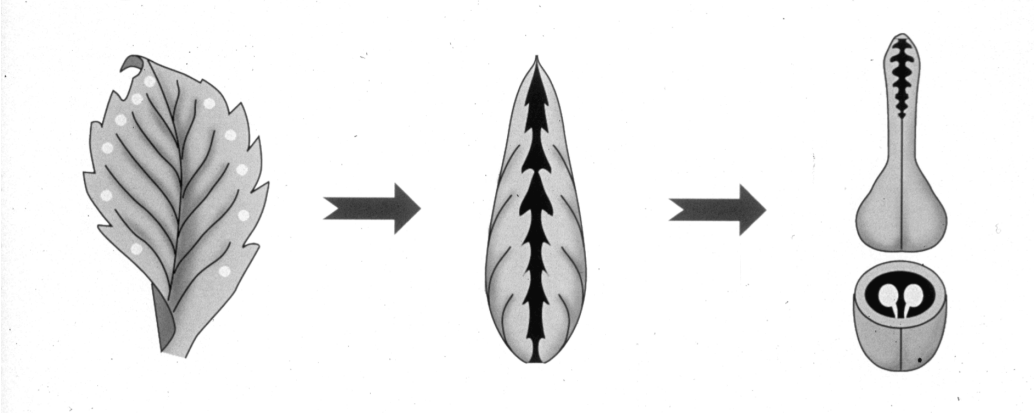
3 examples

Carpels not fused
1. Monocarpic
2. Apocarpic

Carpels fused
3. Syncarpic

The Flower

Monocarpic



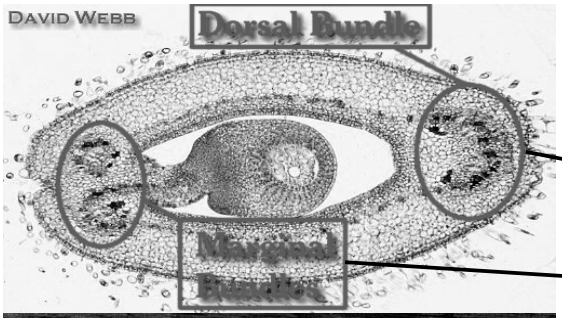
1 floral 'leaf' in gynoecium

Folded 'leaf'

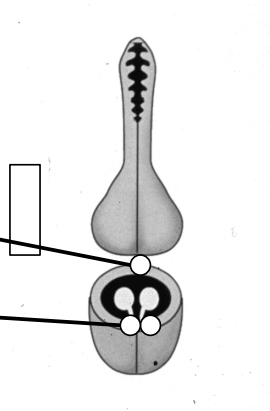
1 carpel = 1 pistil

This gynoecium is monocarpic (one carpel)

The Flower



legumes



1 carpel = 1 pistil

This gynoecium is monocarpic (one carpel)

The Flower

Apocarpic

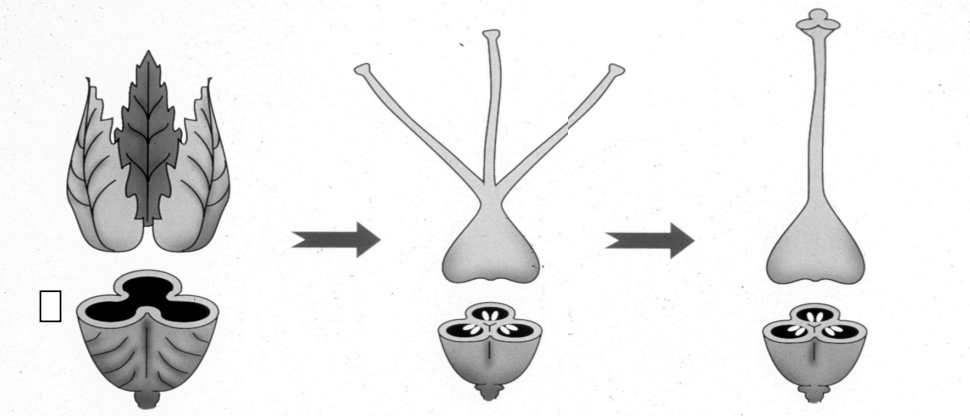
- If 9 'leaves' in one flower each separately forms carpels,
- then the flower has 9 carpels and 9 pistils,
- gynoecium is apocarpic (separate carpels)

Caltha palustris - Marsh marigold

9 fruits (pistils) from 1 flower
Gynoecium is apocarpic with 9 carpels or 9 pistils

The Flower

Syncarpic



3 floral ‘leaves’ in gynoecium fuse

3 carpels = 1 pistil
3 styles

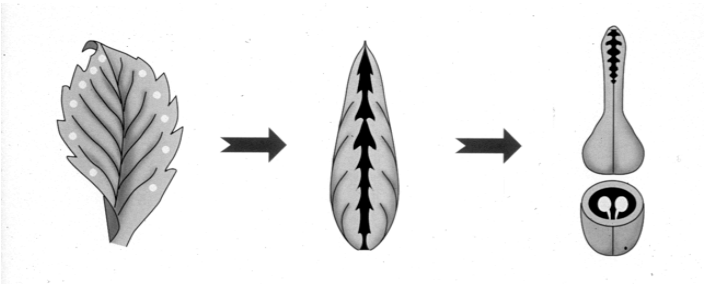
This gynoecium is syncarpic

3 carpels = 1 pistil
1 style

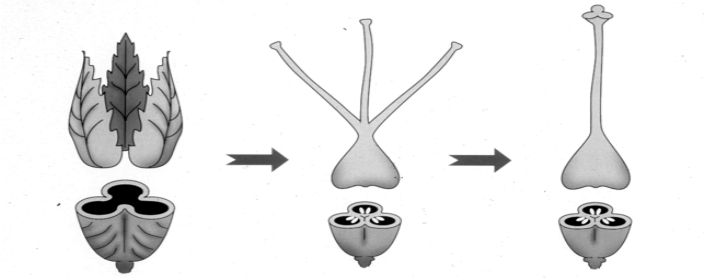
This gynoecium is syncarpic

The Flower

Placentation types - arrangement of ovules, provides hints to the number of carpels



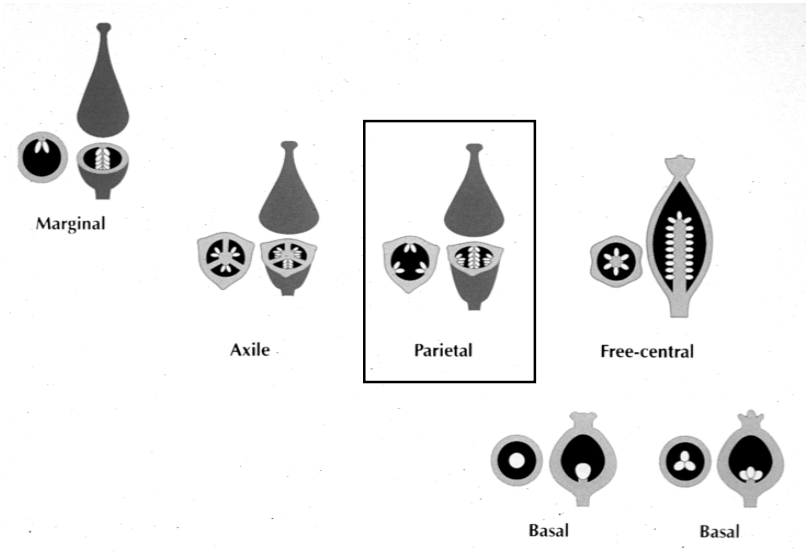
Marginal - found in all monocarpic or apocarpic pistils



Axile - found in some syncarpic pistils

The Flower

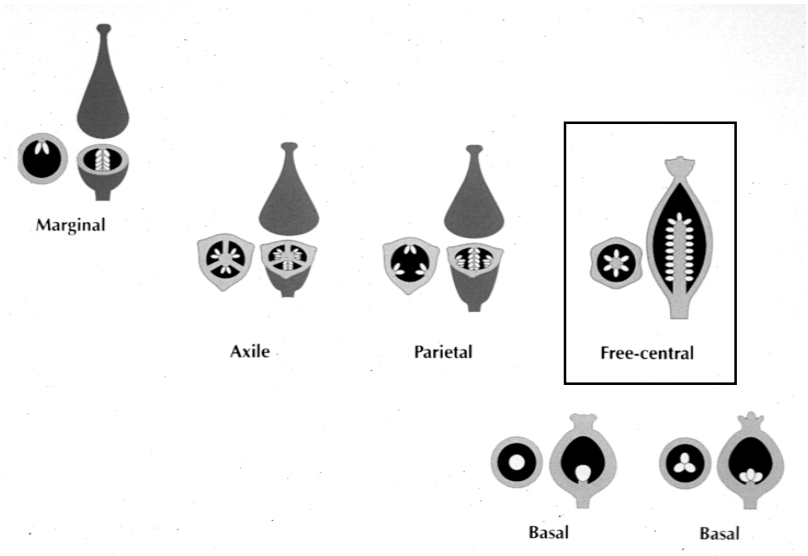
Placentation types - arrangement of ovules, provides hints to the number of carpels



Parietal - found in some syncarpic pistils

The Flower

Placentation types - arrangement of ovules, provides hints to the number of carpels

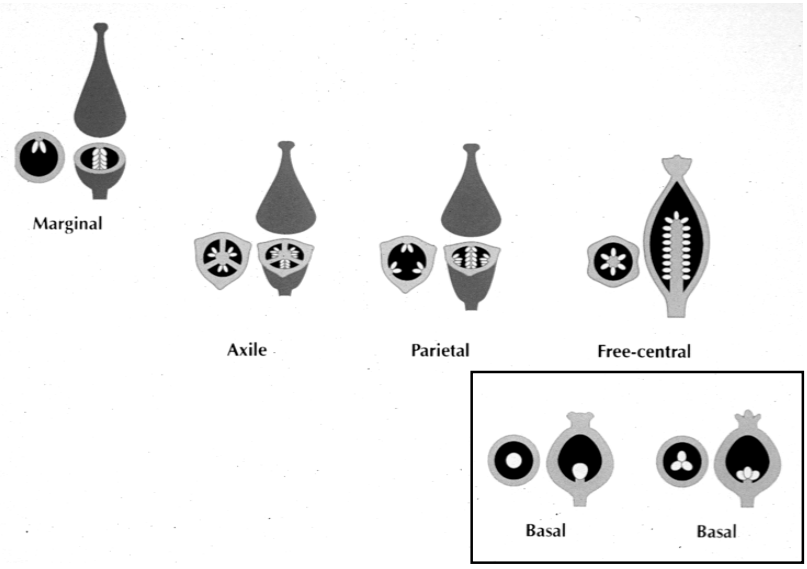


Parietal - found in some syncarpic pistils

Free-central - found in a few syncarpic pistils

The Flower

Placentation types - arrangement of ovules, provides hints to the number of carpels



Parietal - found in some syncarpic pistils

Free-central - found in a few syncarpic pistils

Basal - found in some monocarpic, apocarpic, or syncarpic pistils

The Flower

Symmetry plan - perianth arrangement important in pollination biology

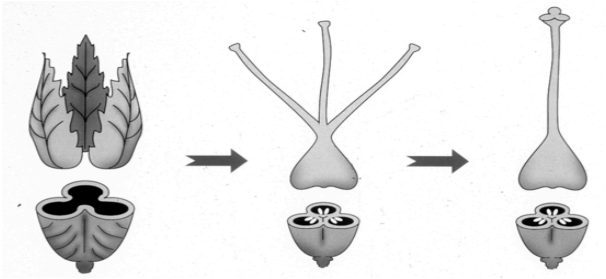
Flowers radially symmetrical

Flowers actinomorphic

Flowers bilaterally symmetrical

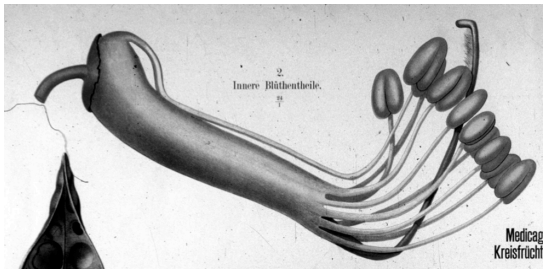
Flowers zygomorphic

The Flower



Fusion of carpels → Syncarpic pistil

Connation: fusion of floral parts from the same whorl

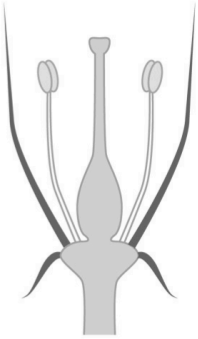


Fusion of stamens → Staminal tube

Fusion of petals → Corolla tube

The Flower

Adnation: fusion of floral parts from different whorls



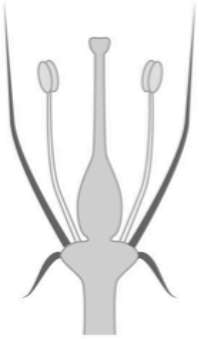
Ovary superior
Flower hypogynous
No hypanthium

No adnation!

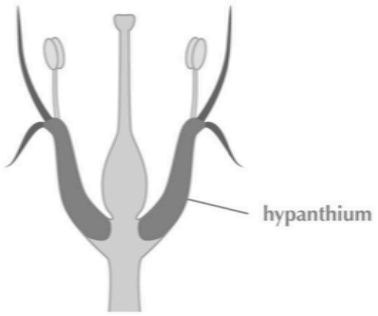
Connation (fusion of similar parts) may or may not occur

The Flower

Adnation: fusion of floral parts from different whorls



Ovary superior
Flower hypogynous
No hypanthium

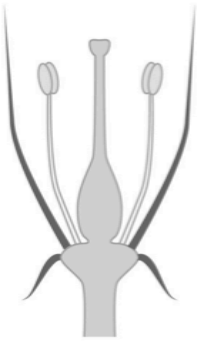


Ovary superior
Flower perigynous
Hypanthium present

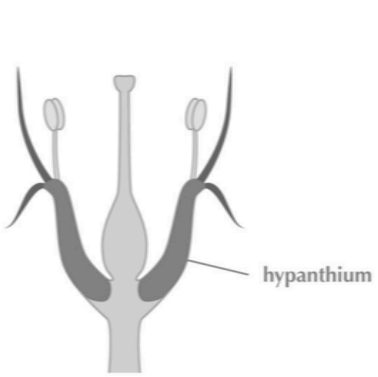
Adnation of calyx, corolla, & stamens = hypanthium

The Flower

Adnation: fusion of floral parts from different whorls



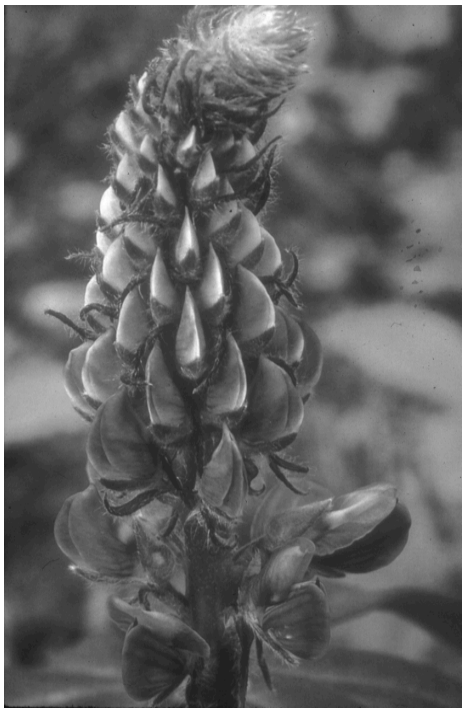
Ovary superior
Flower hypogynous
No hypanthium



Ovary superior
Flower perigynous
Hypanthium present

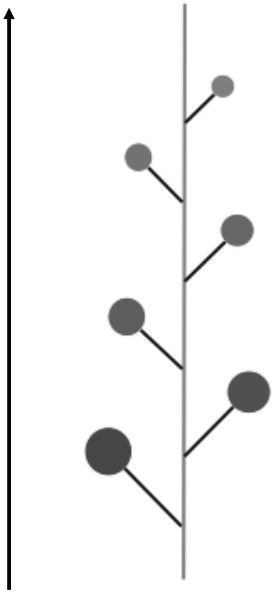
Ovary inferior
Flower epigynous
Hypanthium present

Inflorescences - Floral Displays



The vast majority of flowering plants possess flowers in clusters called an inflorescence.

These clusters facilitate pollination via a prominent visual display and more efficient pollen uptake and deposition.



Raceme

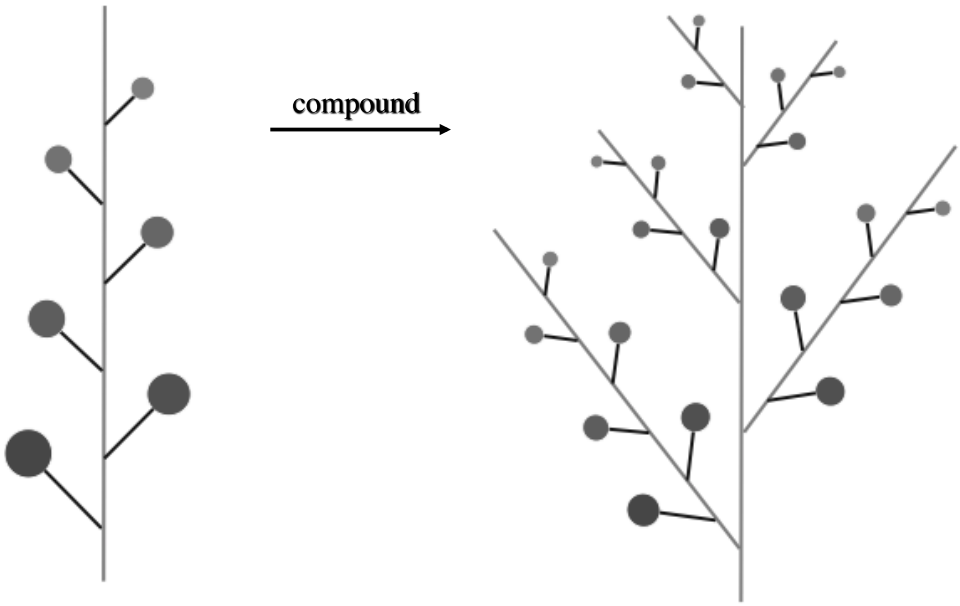
(*Prunus* or cherry)

A shift from widely spaced single flowers to an inflorescence required condensation of shoots and the loss of the intervening leaves.

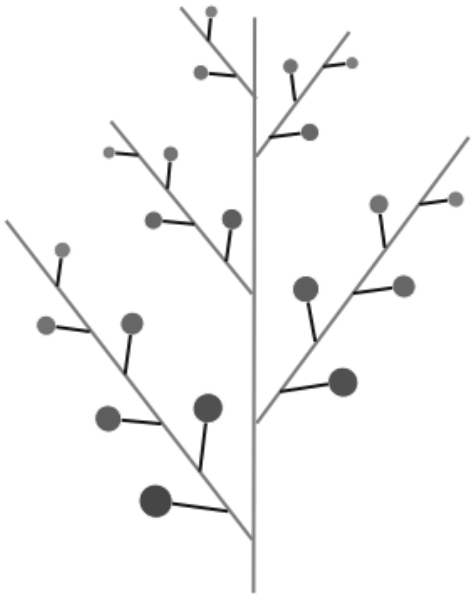
The simplest inflorescence type would thus be indeterminate with the oldest flowers at the base and the younger flowers progressively closer to the apical meristem of the shoot.

= a raceme

One modification of the basic raceme is to make it compound



Raceme **Panicle**

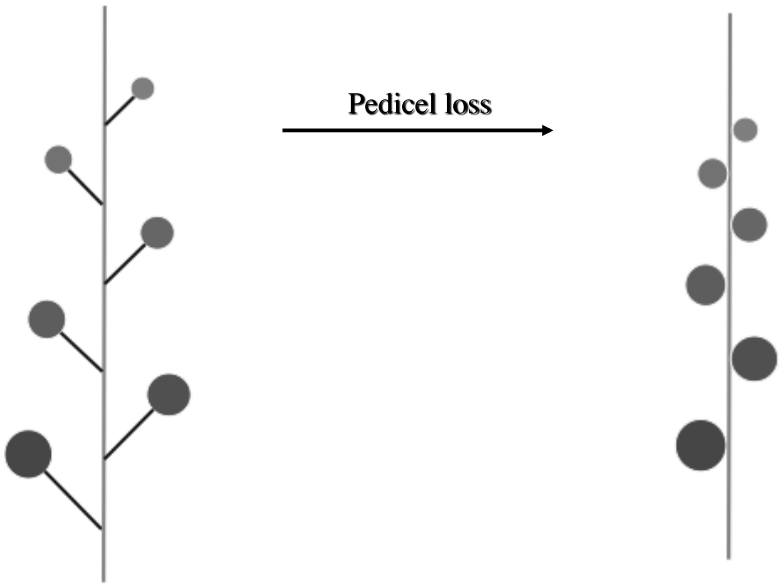


Panicle

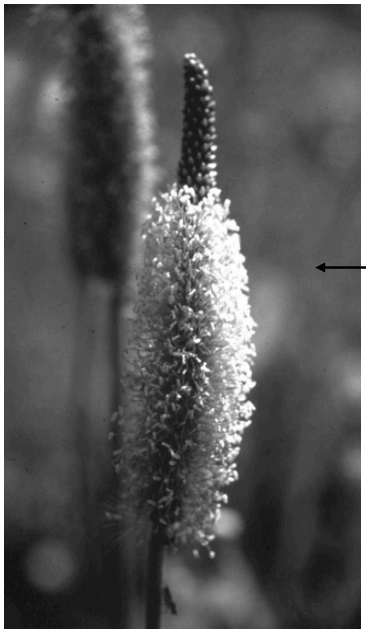
(*Zigadenus* or white camass)

The panicle is essentially a series of attached racemes with the oldest racemes at the base and the youngest at the apex of the inflorescence.

A second modification of the basic raceme is to lose its pedicels



Raceme **Spike**



The spike is usually associated with congested reduced flowers and often, but not always, with wind pollination.

wind pollinated

Spike (*Plantago* or plantain)

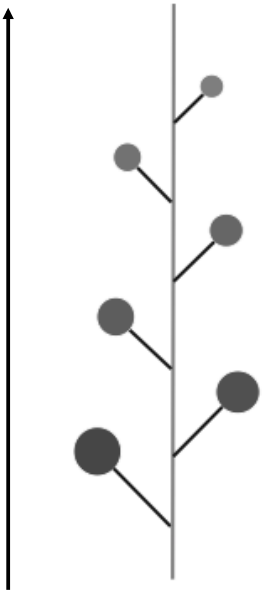
Spike

The spike is usually associated with congested reduced flowers and often, but not always, with wind pollination.

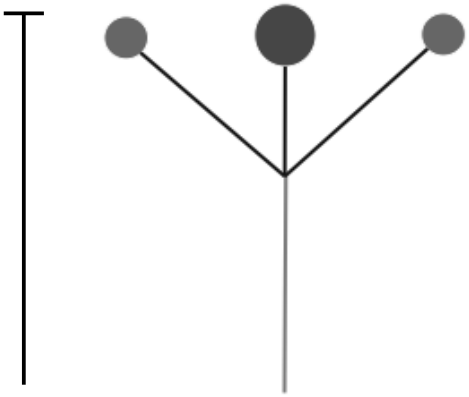
animal pollinated

(*Combretum* - Brent's plants)

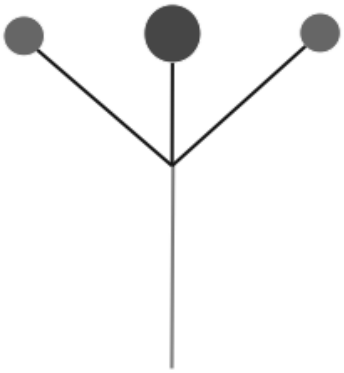
Besides these indeterminate inflorescences based on the raceme, there is a series of inflorescence types based on determinate shoots (shoot can not grow up indefinitely). The simplest is the dichasium.



Raceme

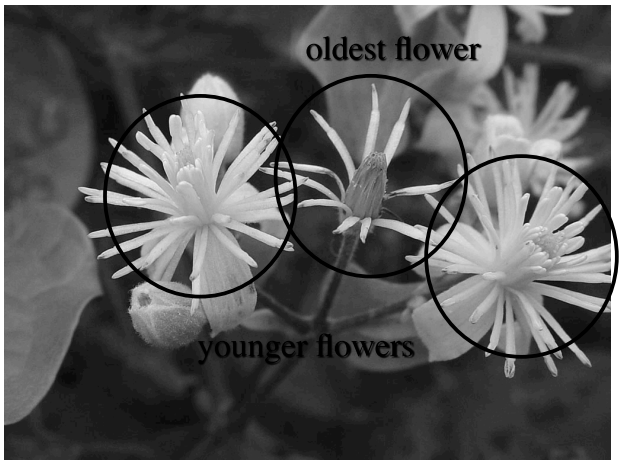


Dichasium



Dichasium

The dichasium inflorescence is terminated (i.e., determinate) by the oldest flower and flanked by two lateral younger flowers.



(*Clematis* or virgin's-bower)