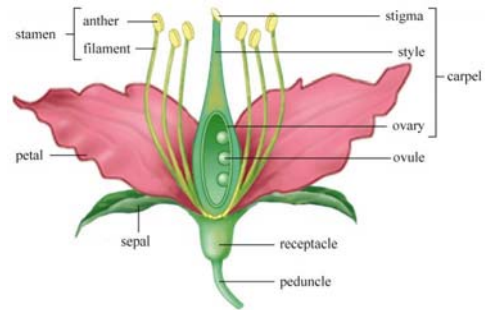


Lecture 24.

Flowers (cont'd)

Anatomy of a Flower – most flowers have four types of structures, all of which are modified leaves

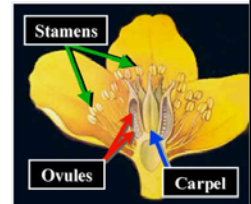


Topics

- 1. Male part: Androecium
- 2. Female part: Gynoecium
- 3. Coalescence VS Adnation
- 4. Types of flowers
 - Insertion of floral structure
 - Superior: hypogynous and perigynous
 - Inferior: epigynous
 - Flower Symmetry
 - Complete/Perfect Flowers
 - Monoecious/Dioecious Flowers

Androecium = collection of stamens

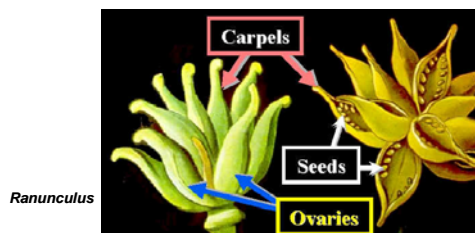
- stamen = anther + filament.
- Anther produces Pollen (Microgametophyte)



Long section through a mature *Ranunculus* flower.

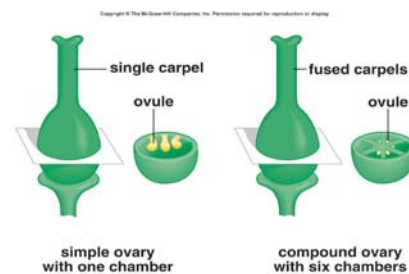
Gynoecium = collection of carpels

- Carpel = stigma + style + ovary (containing ovules)
- Ovule → seed
- Carpel → fruit



Ranunculus

How ovules are attached in carpel – concept of placentation

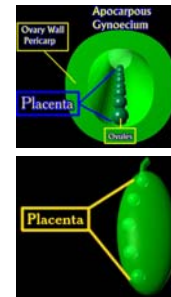


Types of Placentation

- The Placenta is the area of the Carpel to which Ovules are attached.
 - Marginal Placentation
 - Parietal Placentation
 - Axile Placentation
 - Central Placentation

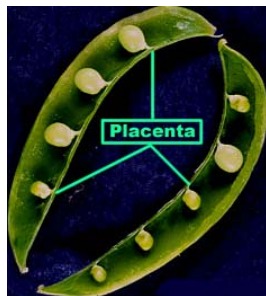
Marginal Placentation

- This Diagram is similar to the single Carpel of a Legume Gynoecium.
- Transparent Model of a Legume Carpel with Marginal Placentation



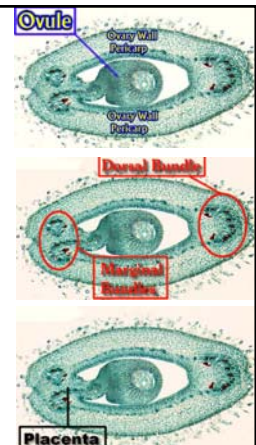
Marginal Placentation

- Legume Fruits have their Ovules attached along the area where the Marginal Traces occur.



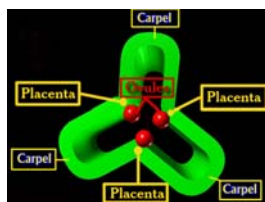
Marginal Placentation

- Cross Section of a Legume Carpel showing the Ovule and Pericarp
- Cross Section of a Legume Carpel showing the Vascular Bundles
- Cross Section of a Legume Carpel showing the location of the Placenta



Parietal Placentation

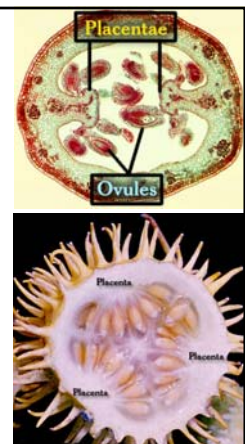
- Two or more Carpels are fused at their Margins such that a Single Locule is created, the Placentae are generally located at the Sutures. This is called Parietal.



Model of A Syncarpous Gynoecium with Parietal Placentation.

Parietal Placentation

- Cross Section through an Ovary with Parietal Placentation
- Wild Cucumber with Parietal Placentation: The Placental areas have enlarged and create the illusion of a partitioned locule.



Parietal Placentation

- Passion Flower *Passiflora* sp.
- Passion Fruit
- Cross Section of an Immature Passion fruit
- Cross Section of an older Passion fruit

Axile Placentation

- Axile Placentation occurs when the Ovules of a Syncarpous Gynoecium are attached to a Central Axial Structure and the Ovary is divided into two or more chambers (Locules).

Cross Section of a Lily Ovary which has Axial Placentation with 3 Carpels & 3 Locules.

Axile Placentation

Central Placentation

- Central Placentation is similar to Axile except that there is only One Locule. The Ovules are attached to a central pillar of tissue but there is only one Locule.

Central Placentation

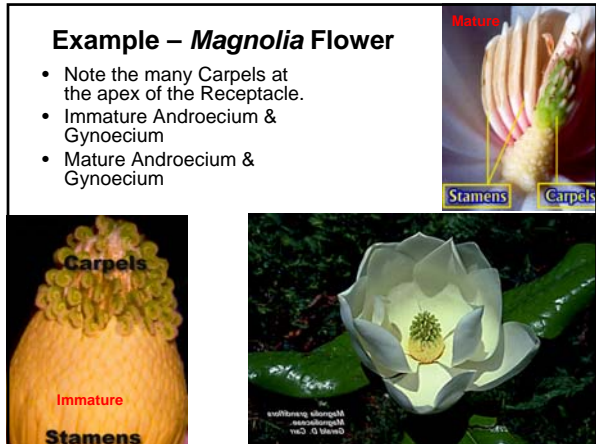
- Cross Sections of an Ovary with Central Placentation

Example - *Magnolia*

- Species of *Magnolia* can have many Petals, Stamens & Carpels. The Gynoecium is Apocarpous like *Ranunculus*.

Example – *Magnolia* Flower

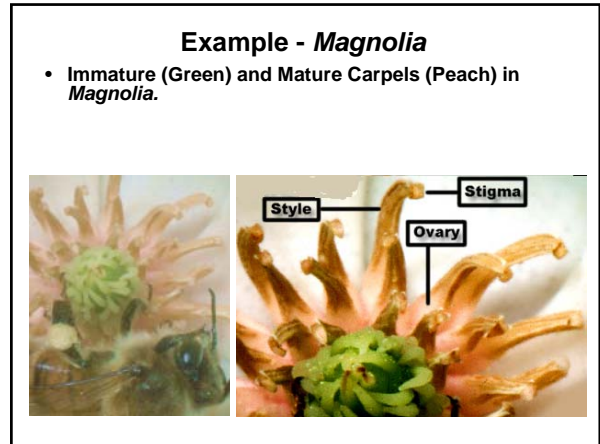
- Note the many Carpels at the apex of the Receptacle.
- Immature Androecium & Gynoecium
- Mature Androecium & Gynoecium



The image shows three photographs of Magnolia flower parts. The top right shows a close-up of mature stamens and carpels. The bottom left shows immature stamens and carpels. The bottom right shows a full Magnolia flower with its characteristic large, white petals.

Example - *Magnolia*

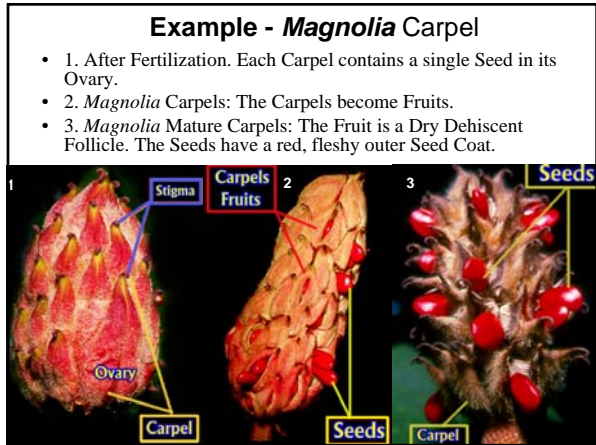
- Immature (Green) and Mature Carpels (Peach) in *Magnolia*.



The image shows two photographs of Magnolia carpels. The left photograph shows immature, green carpels. The right photograph shows mature, peach-colored carpels with labels for the style, stigma, and ovary.

Example - *Magnolia* Carpel

- After Fertilization. Each Carpel contains a single Seed in its Ovary.
- Magnolia* Carpels: The Carpels become Fruits.
- Magnolia* Mature Carpels: The Fruit is a Dry Dehiscent Follicle. The Seeds have a red, fleshy outer Seed Coat.

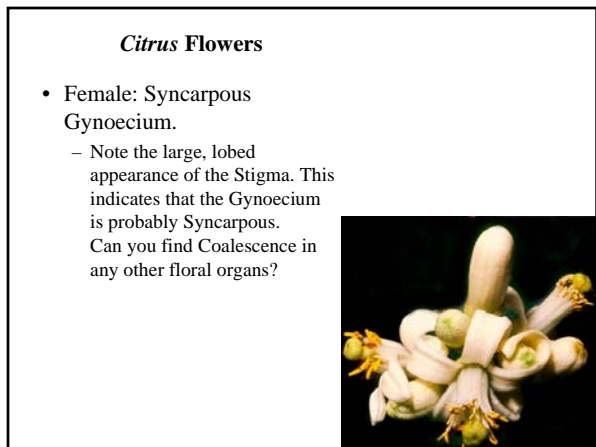


The image shows three stages of Magnolia carpel development. Stage 1 shows a carpel with a stigma and ovary containing a seed. Stage 2 shows carpels becoming fruits. Stage 3 shows mature carpels with seeds. Labels include Stigma, Carpels Fruits, Seeds, Ovary, and Carpel.

Anatomy of Male/Female flowers

Citrus Flowers

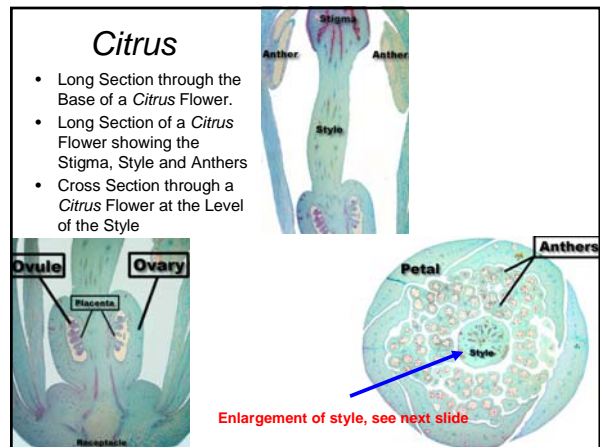
- Female: Syncarpous Gynoecium.
 - Note the large, lobed appearance of the Stigma. This indicates that the Gynoecium is probably Syncarpous. Can you find Coalescence in any other floral organs?



The image shows a photograph of a citrus flower with a syncarpous gynoecium, characterized by a large, lobed stigma.

Citrus

- Long Section through the Base of a *Citrus* Flower.
- Long Section of a *Citrus* Flower showing the Stigma, Style and Anthers
- Cross Section through a *Citrus* Flower at the Level of the Style



The image shows two diagrams of a citrus flower. The top diagram is a long section showing the stigma, style, and anthers. The bottom diagram is a cross section showing the ovule, ovary, placenta, petal, and anthers. A blue arrow points to the style, with a red caption: "Enlargement of style, see next slide".

Citrus

- 1. Enlargement of the Style from the previous slide. Note the 10-11 Vascular Bundles!!!
- 2. Cross Section of a *Citrus* Flower at the Level of the Ovary
- 3. Cross Section of the Ovary showing the Ovules and the locules (L). Count the Number of Locules!!!!

Citrus

- Cross Section of the Ovary with Lines defining the Carpels. Count the Number of Carpels!!!!
- Cross Section of a Citrus Fruit with the Carpels labeled. Count the Number of Carpels!!
- the number of Vascular Bundles in the Style equalled the number of Carpels in the Ovary which equalled the number of Carpels in the Fruit.
- Consequently, the Gynoecium contained 10 Carpels and was Syncarpous!!!!

The number of Stigmatic Lobes can signify the number of Carpels.

- Note the number of Stigmas on this *Hibiscus*.
- The Stigmas are fused at a lower level. How many carpels are involved?

Cross Sections from a lily flower which is Syncarpous

- The yellow lines indicate the boundaries of each carpel & the numbers signify the individual carpels.

Seed Development

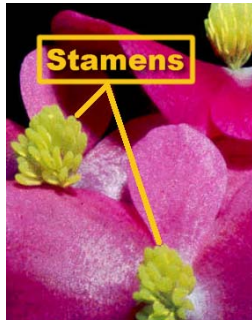
- Seed:** Mature ovule that contains an embryo, with stored food enclosed in a protective coat.
- Seed development:**
 - After double fertilization, endosperm nucleus begins to divide asymmetrically, forming endosperm tissue.
 - Zygote divides
 - Small cell is destined to become the embryo.
 - Larger cell divides repeatedly to become a suspensor.

Complete & Perfect Flowers

- Complete** - Has all four floral Organs
- Incomplete** - One or more floral organs missing
- Perfect** - Flower with Androecium & Gynoecium
- Imperfect** - Missing Androecium or Gynoecium
- Carpellate Flower** - Imperfect flower that has only Carpels
- Staminate Flower** - Imperfect flower that has only Stamens

Begonia Flowers

- *Begonia* with Staminate Flowers
- *Begonia* with Carpellate Flowers



Monoecious vs. Dioecious

- Monoecious (*One House*) -One plant has BOTH Carpellate & Staminate Flowers.
- Dioecious (*Two Houses*) -One plant has only Staminate Flowers & another plant has only Carpellate Flowers

