

# Introduction to Botany. Lecture 40

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December 12, 2014



# Outline

## 1 Questions and answers

## 2 Seed plants

- Seeds
- Fruits



# Outline

## 1 Questions and answers

## 2 Seed plants

- Seeds
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# Previous final question: the answer

What is a flower?



# Previous final question: the answer

What is a flower?

- Compact reproductive shoot (FU) with sterile, male and female zones



# Seed plants

## Seeds



# Definition

- “Mature ovule”
- Chimeric organ consists of seed coat, endosperm and embryo



# Origin of seed layers

Layer	Ploidy	Origin
Seed coat	$2n$	Integument of ovule
Endosperm <sub>2</sub>	$3n$ , sometimes $2n$	Fertilized central cell of embryo sac
Embryo	$2n$	Fertilized egg
Endosperm <sub>1</sub>	$n$	Female gametophyte (gymnosperms!)
Perisperm	$2n$	Nucellus of ovule





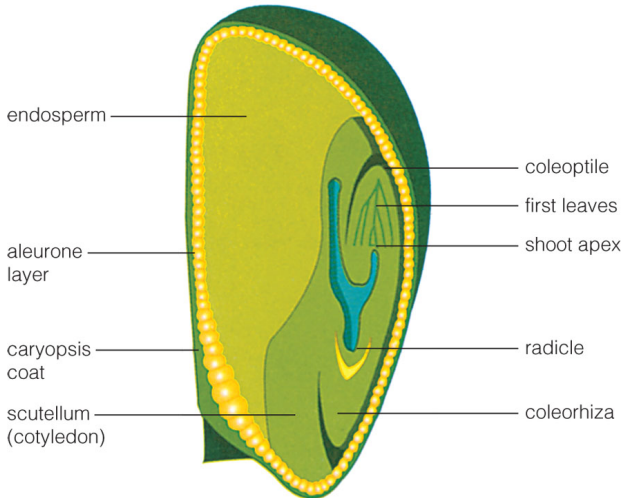
# Seed structure variations

- Seed with endosperm (onion): cotyledon(s): embryonic leaves, radicle: embryonic root, apex: embryonic bud
- Seed without endosperm (beans and other Leguminosae): cotyledons, radicle, hilum, raphe
- Grass (Gramineae) seeds: coleoptile, coleorhiza, scutellum





# Grass seeds



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# Cotyledons

- Monocots have lateral bud and terminal primary leaf (cotyledon)
- Other seed plants have terminal bud and multiple (2 to many) primary leaves (cotyledons)



# *Pinus* sp.: multiple cotyledons



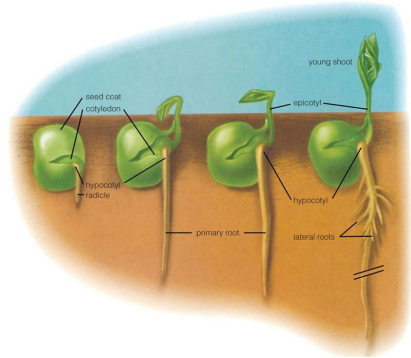
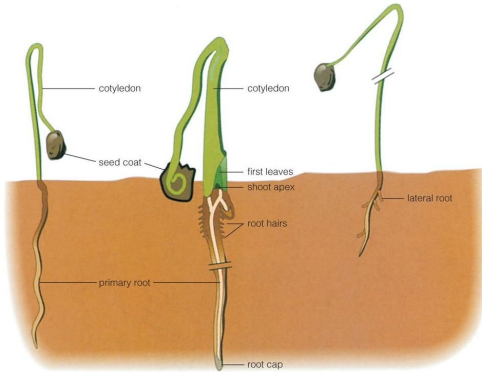
# Germination

- Epigeal (e.g., onion, pea). They expose cotyledons and both hypo- and epicotyl.
- Hypogeal (e.g., bean, grasses, palms). They expose only epicotyl (first internode), cotyledons and hypocotyl (root/stem transition) is underground.

Both variants have advantages and disadvantages.



# Epigeal *versus* hypogeal germination



# Seed plants

## Fruits





# Definition and origin

- **Fruit** is a ripened ovary, flower or inflorescence
- Fruit coat and pericarp (exocarp + mesocarp + endocarp) origin mostly from pistil wall



# Trivial classification: criteria

- **Simple, multiple** (aggregate) or **compound**. Simple fruits are from one pistil (cherry), multiple from many pistils of one flower (raspberry), compound—from multiple flowers (pineapple).
- **Dry** or **fleshy**. Fleshy fruits are adapted to animal dispersion through their digestive tract.
- **Dehiscent, indehiscent** or **schizocarpic**. Dehiscent (opening) fruit will delegate dispersal function to individual seeds; indehiscent (closed) fruit will take these functions but will require less seeds per fruit to avoid competition between seedlings. Schizocarp has multiple seeds but will be fragmented to many one-seeded parts.

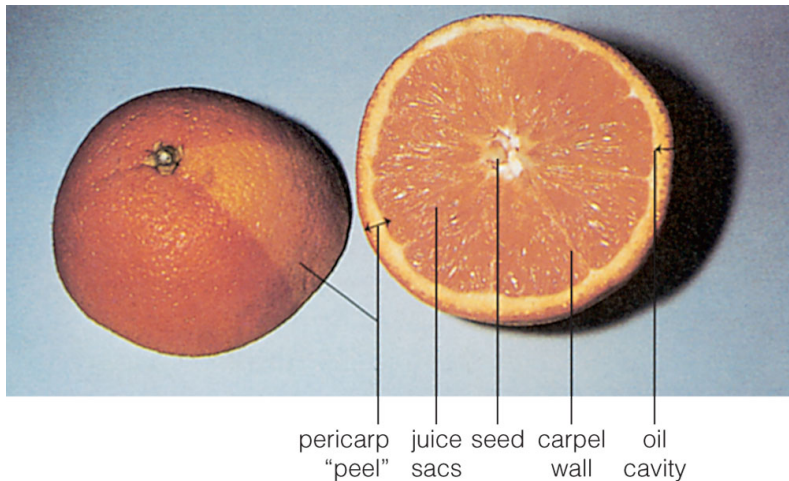


# Trivial classification: examples

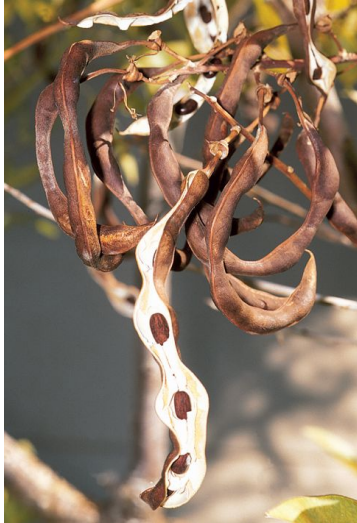
Type	Consistency	Opening	Example
Simple	Fleshy	Indehiscent	Drupe (one seed), Berry (multiple seeds), Hesperidium (citruses), Pome (apple, pear: from inferior ovary)
Simple	Dry	Dehiscent	Legume (pod), Capsule, Silique (fruit of cabbage family)
Simple	Dry	Schizocarpic	Regma (spurge), Samara (maple), Shizocarp (umbel family)
Simple	Dry	Indehiscent	Caryopsis (grain, fruit of grasses), Nut (incl. acorn), Achene (fruit of aster family)
Multiple	Fleshy	Indehiscent	Multiple drupe (raspberry)
Multiple	Dry	Dehiscent	Follicle (many pods together)
Multiple	[Dry]	Indehiscent	Multiple nut (strawberry)
Compound	Fleshy	Indehiscent	Compound berry (pineapple)
Compound	[Dry]	Indehiscent	Compound nut (fig)



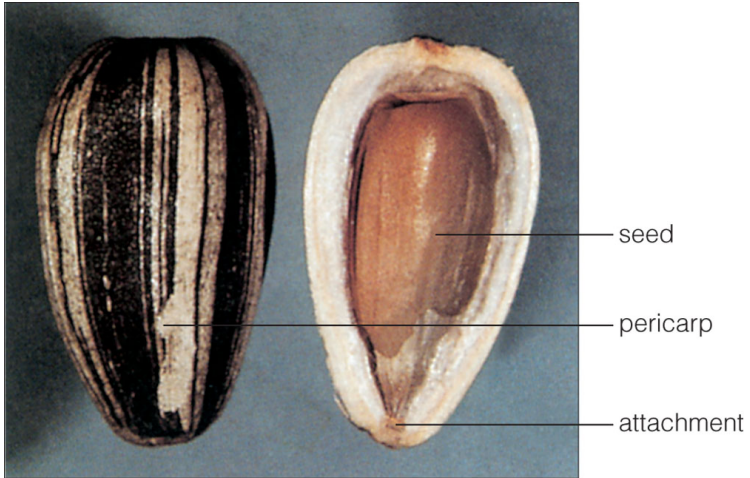
Simple, fleshy, indehiscent: **hesperidium** (or berry if you like it simpler) of *Citrus*



# Simple, dry, dehiscent: **pod** of *Erythrina* legume



# Simple, dry, indehiscent: **achene** (not “seed”!!!) of *Helianthus*



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# Samara of *Acer*



# Schizocarp of *Zizia*





# Multiple nut of *Fragaria* sp. (strawberry)



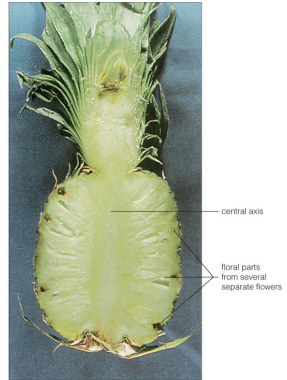
# Multiple drupe of *Rubus* sp. (raspberry)



# Compound berry of *Ananas comosus* (pineapple)



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# Compound fruit of *Ficus carica* (fig tree)



# Short anonymous absolutely voluntary survey

- 1 What do you **like** most in Biology 154?
- 2 What do you **dislike** most in Biology 154?
- 3 **Which lab** do you remember most of all?
- 4 Please grade (1—bad, 5—excellent):
  - A. Lectures
  - B. Labs
  - C. Final questions
  - D. Exams



# Summary

- **Seed** is a chimeric organ consists of seed coat, endosperm and embryo
- **Fruit** is a ripened ovary, flower or inflorescence



# For Further Reading



A. Shipunov.

*Introduction to Botany* [Electronic resource].

2010—onwards.

Mode of access:

[http://ashipunov.info/shipunov/school/biol\\_154](http://ashipunov.info/shipunov/school/biol_154)



Th. L. Rost, M. G. Barbour, C. R. Stocking, T. M. Murphy.

*Plant Biology*. 2nd edition.

Thomson Brooks/Cole, 2006.

*Chapter 14.*

