Introduction to Botany. Lecture 39

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Outline

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1. Questions and answers

2. Seed plants
   - Inflorescences
   - Seeds
   - Fruits

Previous final question: the answer

What is *Amborella*?

Previous final question: the answer

What is *Amborella*?

- The most ancestral (avoid the word “primitive”) living flowering plant
- New Caledonian shrub with irregular flowers, pistil with stylar canal and 5-celled embryo sac

Seed plants

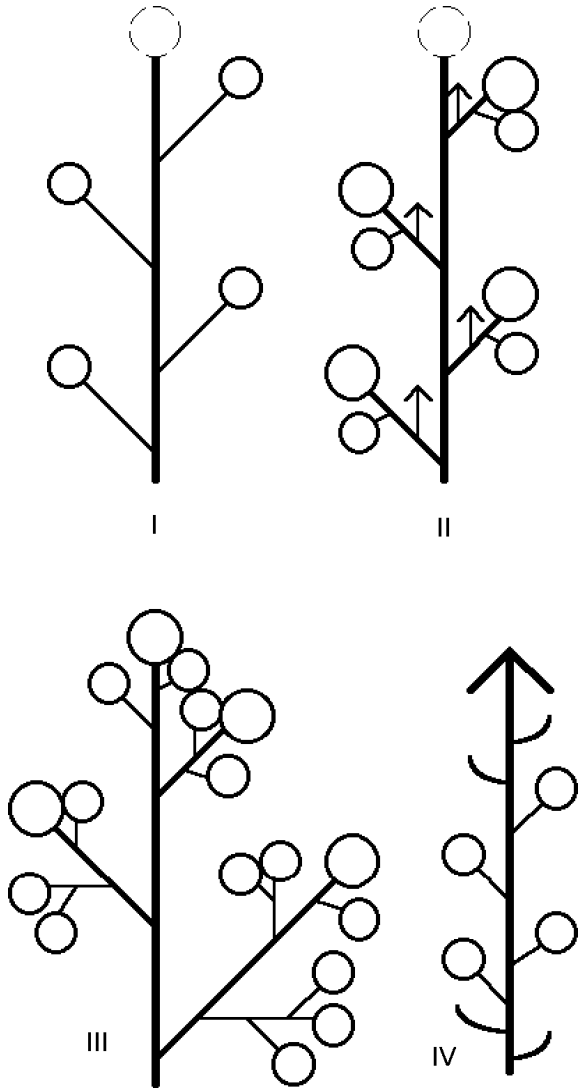
Inflorescences

Types of inflorescences

Inflorescence is an isolated generative shoot bearing flowers

- Model I. Raceme and its derivates
  - Simple: raceme (developed man axis, developed lateral axes: 11), spike/catkin (developed main axes, reduced lateral axes: 10), umbel (01), head (00)
  - Compound: compound raceme (11/11), compound umbel (01/01) etc.
- Model II. Thyrsus and its derivates
  - Reduced (cymes): dichasium, cincinnus (scorpioid inflorescence) etc.
  - Thyrses in a strict sense
- Model III. Closed panicle (also umbel-like panicles)
- Model IV. Intercalary inflorescences

Models of inflorescences



Seed plants

Seeds

Definition

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

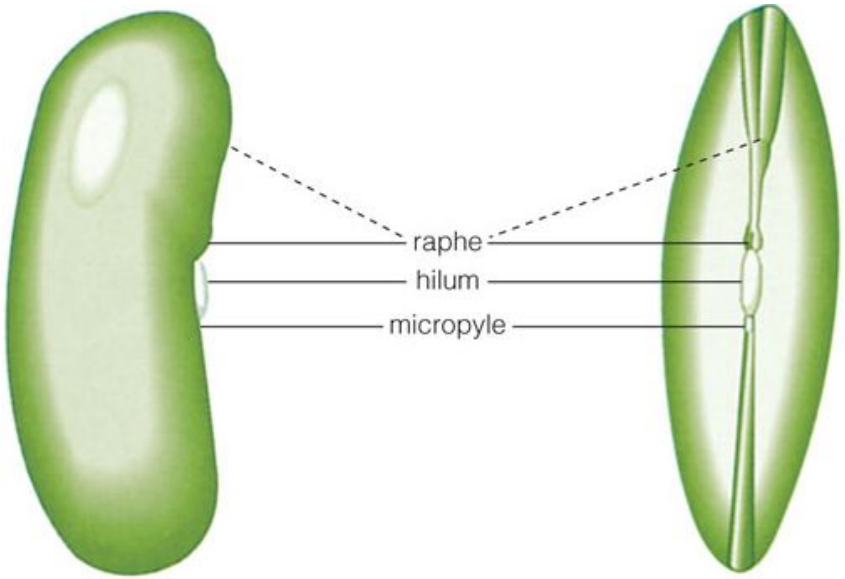
Origin of seed layers

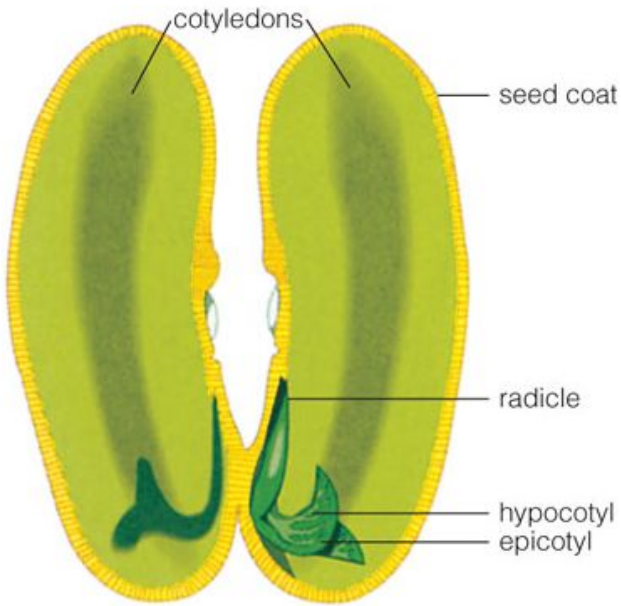
Layer	Ploidy	Origin
Seed coat	$2n$	Integument of ovule
Endosperm_2	$3n$, sometimes $2n$	Fertilized central cell of embryo sac
Embryo	$2n$	Fertilized egg
Endosperm_1	n	Female gametophyte (gymnosperms!)
Perisperm	$2n$	Nucellus of ovule

Seed structure variations

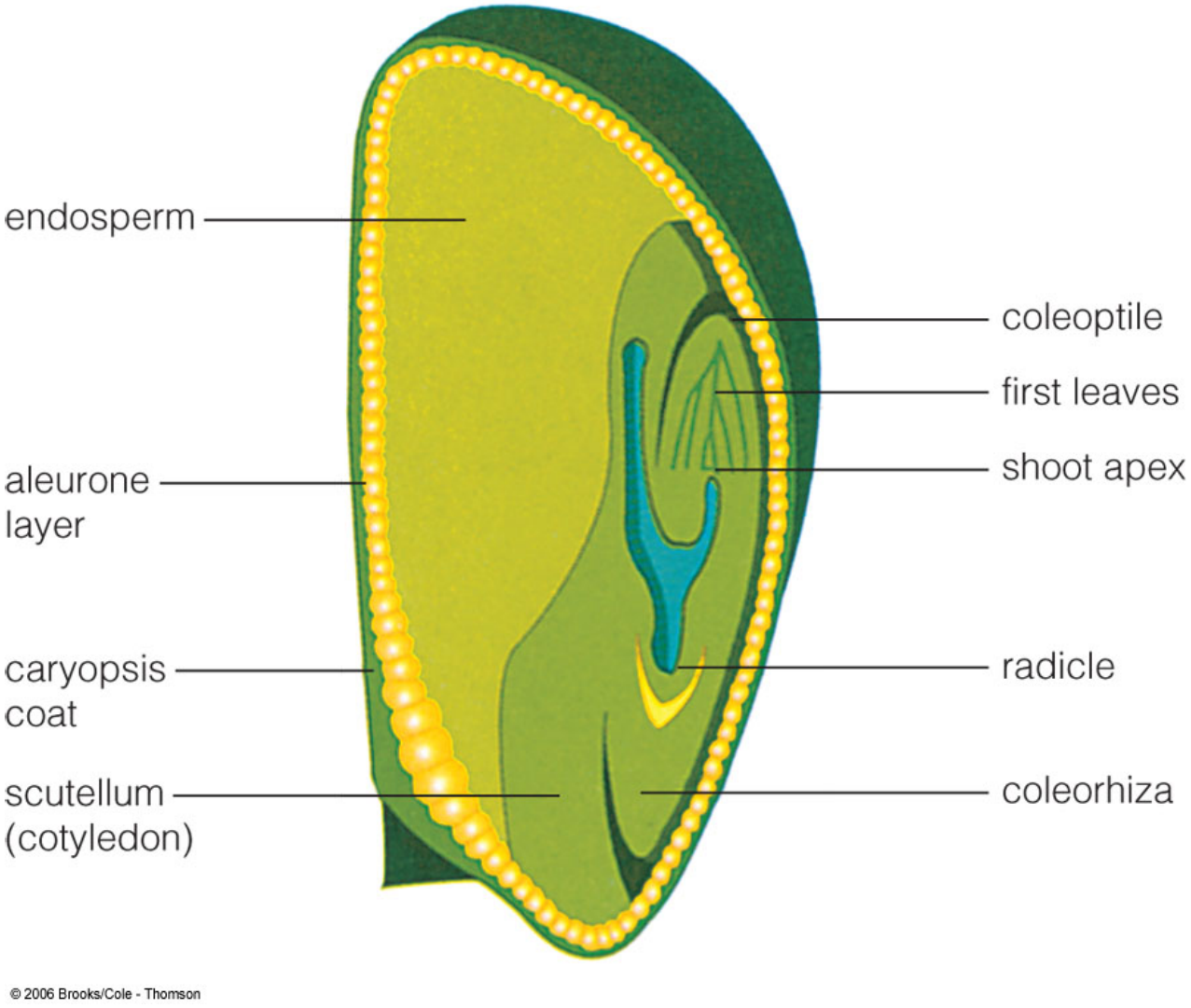
- Seed with endosperm (onion): cotyledon(s): embryonic leaves, radicle: embryonic root, apex: embryonic bud
- Seed without endosperm (beans and other Leguminosae): cotyledons, radicle, hilum, raphe
- Grass (Gramineae) seeds: coleoptile, coleorhiza, scutellum

Bean seed


raphe
hilum
micropyle


cotyledons
seed coat
radicle
hypocotyl
epicotyl

Grass seeds


endosperm
aleurone layer
caryopsis coat
scutellum (cotyledon)
coleoptile
first leaves
shoot apex
radicle
coleorhiza
© 2006 Brooks/Cole - Thomson

Cotyledons

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

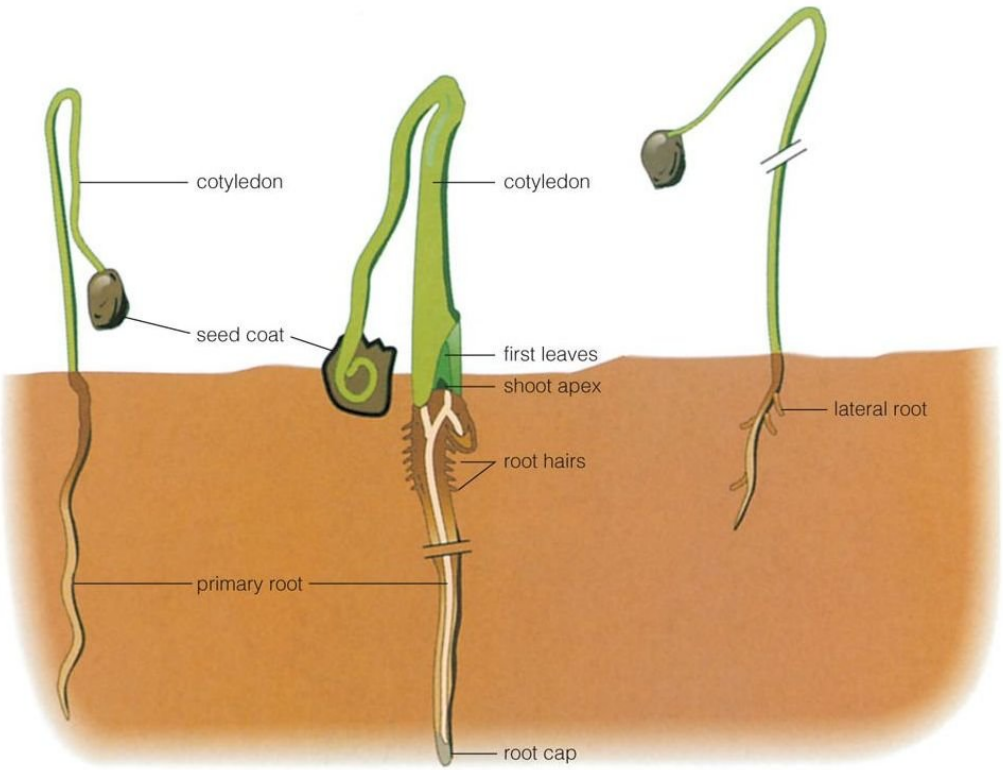
Pinus sp.: multiple cotyledons

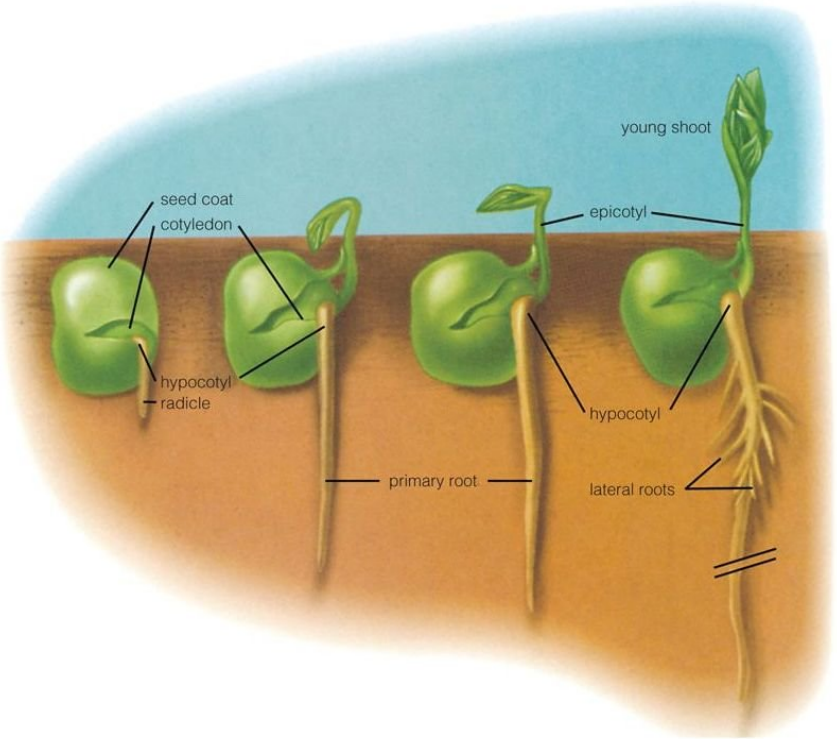
Germination

- 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

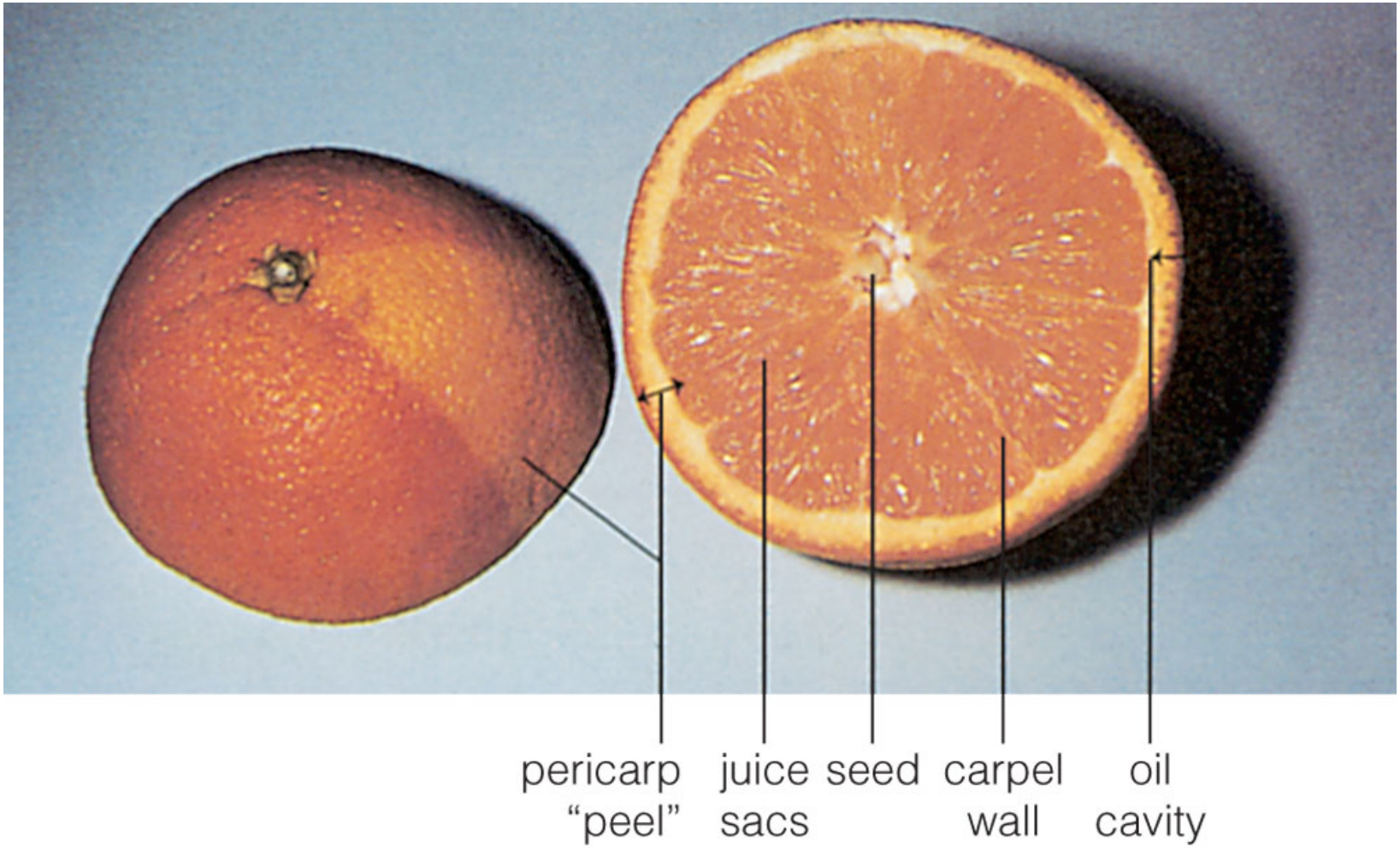
Trivial classification: criteria

- **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

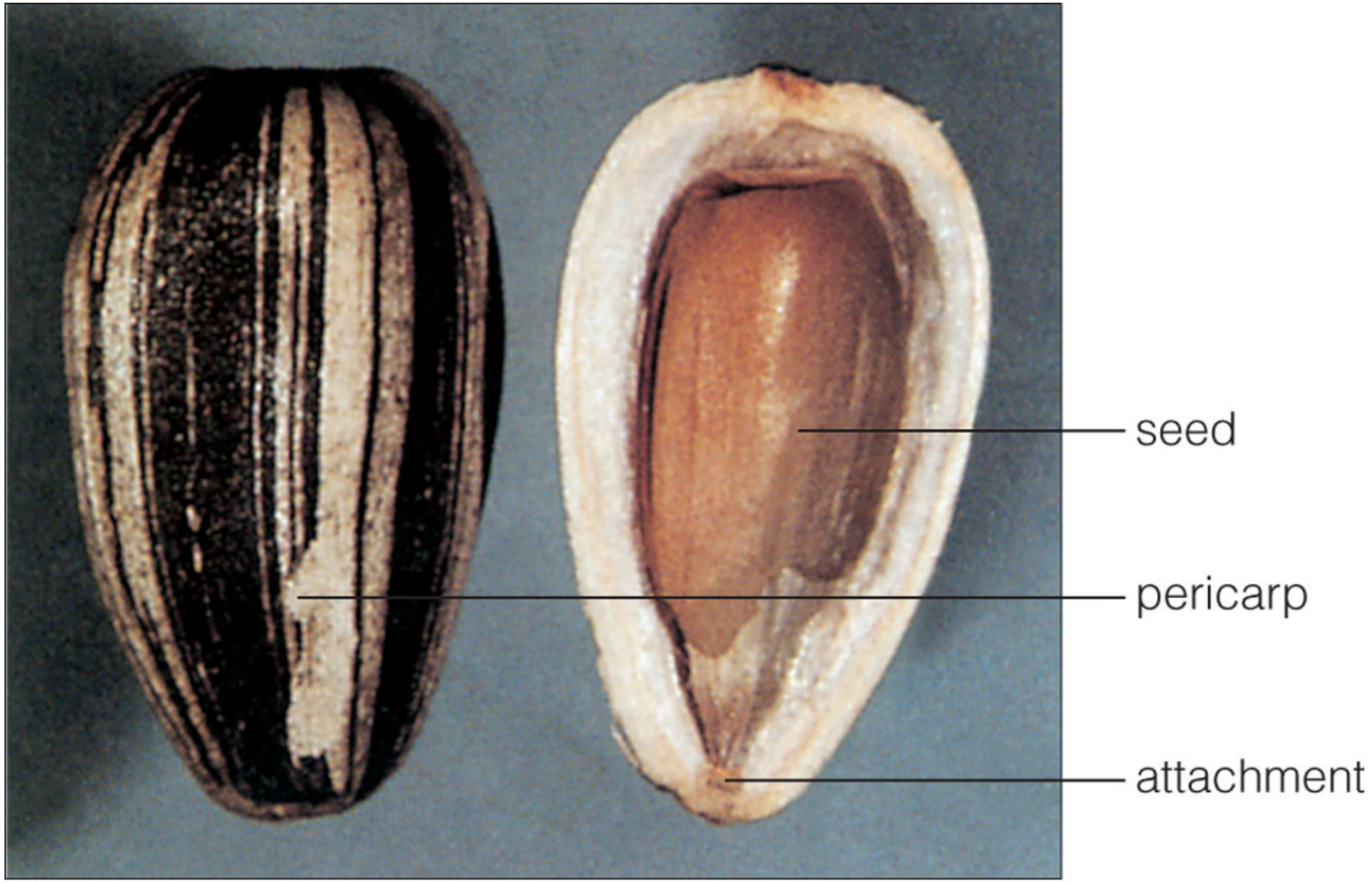
Type	Consistency	Opening	Example
Simple	Fleshy	Indehiscent	Drupe (one seed), Berry (multiple seeds), Hesperidium (citruses), Pome (apple, pear: from inferior ovary)
Simple	Dry	Dehiscent	Legume (pod), Capsule, Silique (fruit of cabbage family)
Simple	Dry	Schizocarpic	Regma (spurge), Samara (maple), Schizocarp (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*



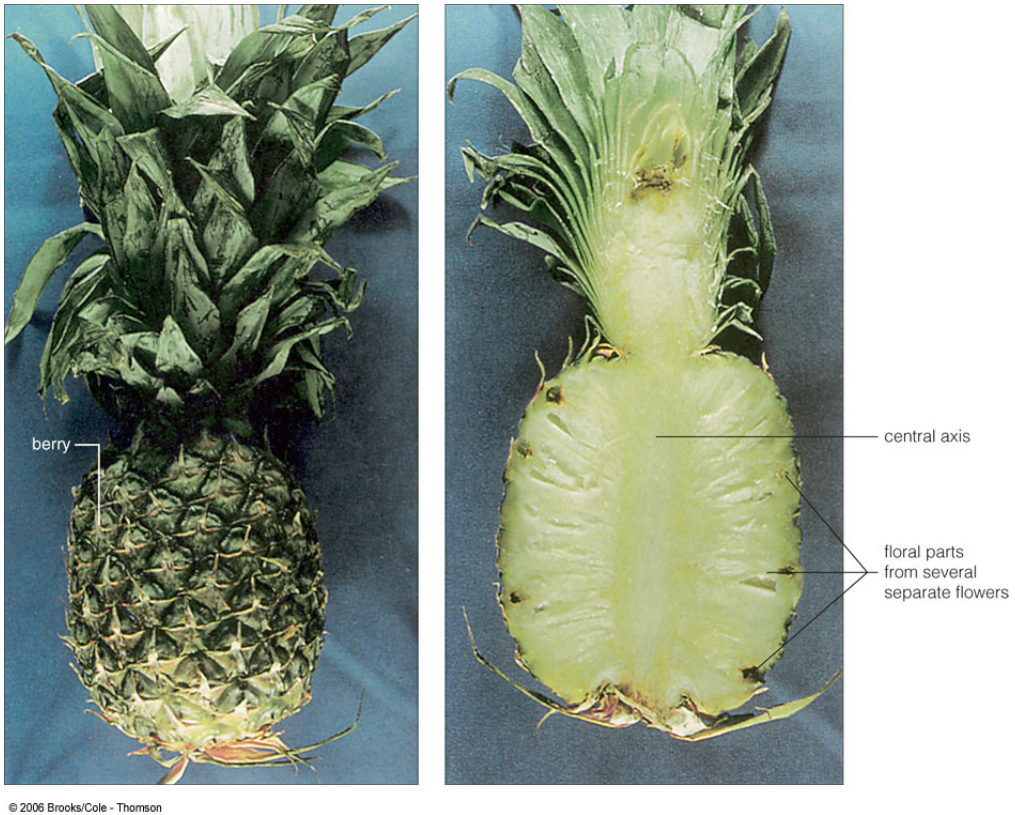
Samara of *Acer*

Schizocarp of *Zizia*

Multiple nut of *Fragaria* sp. (strawberry)

Multiple drupe of *Rubus* sp. (raspberry)

Compound berry of *Ananas comosus* (pineapple)



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
5. How to improve the textbook?

Summary

- **Inflorescence** is an isolated generative shoot bearing flowers
- **Seed** is a chimeric organ consists of seed coat, endosperm and embryo
- **Fruit** is a ripened ovary, flower or inflorescence
- BOTANY IS COOL!

For Further Reading

A. Shipunov.
Introduction to Botany [Electronic resource].
2015.
Mode of access:
http://ashipunov.info/shipunov/school/biol_154