

Introduction to Botany. Lecture 37

Alexey Shipunov

Minot State University

December 9, 2013



Outline

1 Questions and answers

2 Seed plants

- Life cycle of flowering plants
- Magnoliopsida, or Angiospermae



Outline

1 Questions and answers

2 Seed plants

- Life cycle of flowering plants
- Magnoliopsida, or Angiospermae



Previous final question: the answer

How to optimize the life cycle of seed plants? Name at least two possible optimizations.



Previous final question: the answer

How to optimize the life cycle of seed plants? Name at least two possible optimizations.

- Reduction of gametophytes
- Pollination
- Pollen tube
- Spermatia
- Endosperm after fertilization
- More ovules
- Ovules under cover



Seed plants

Life cycle of flowering plants



Flowering plants are “Spermatophyta 2.0”

- Reduction of gametophyte: 3-celled pollen and 7-celled embryo sac
- No archegonia and anteridia
- Spermatia, pollen tube
- Double fertilization
- New endosperm (second embryo)
- Cupule (pistil) and fruit
- In general, **angiosperms have accelerated life cycle** needed for fast-growing herbs

Note: angiosperms = flowering plants = class Magnoliopsida



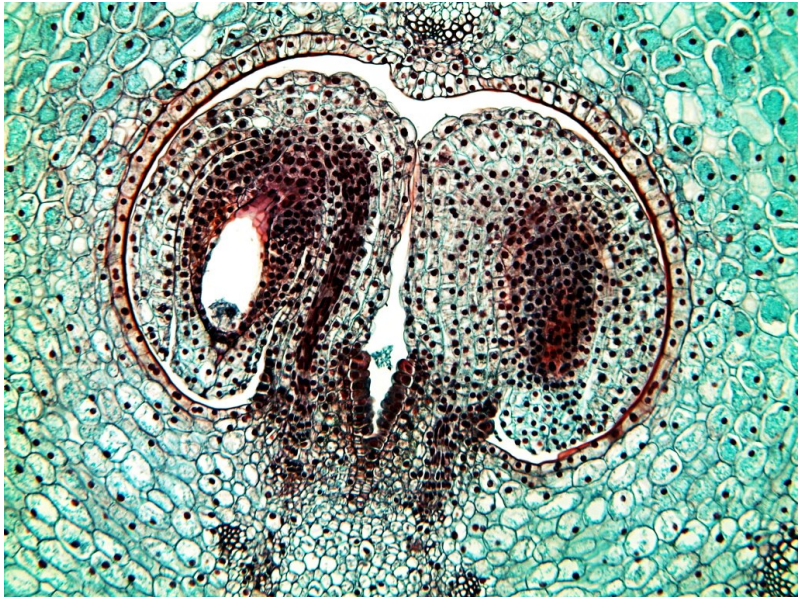
Life cycle of angiosperms

Terms covered:

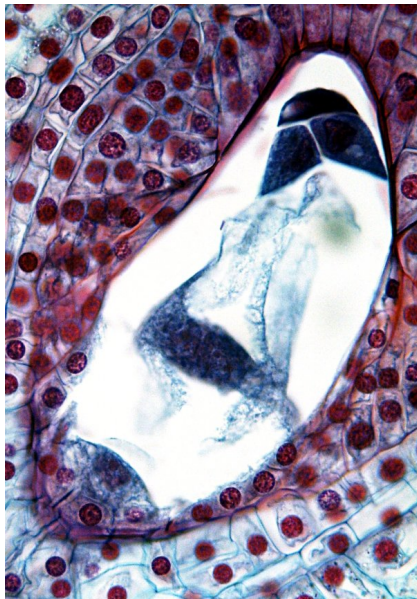
- Embryo sac, central cell
- Spermatia (sperms without flagella), pollen tube
- Double fertilization
- Pistil and ovule → fruit and seed



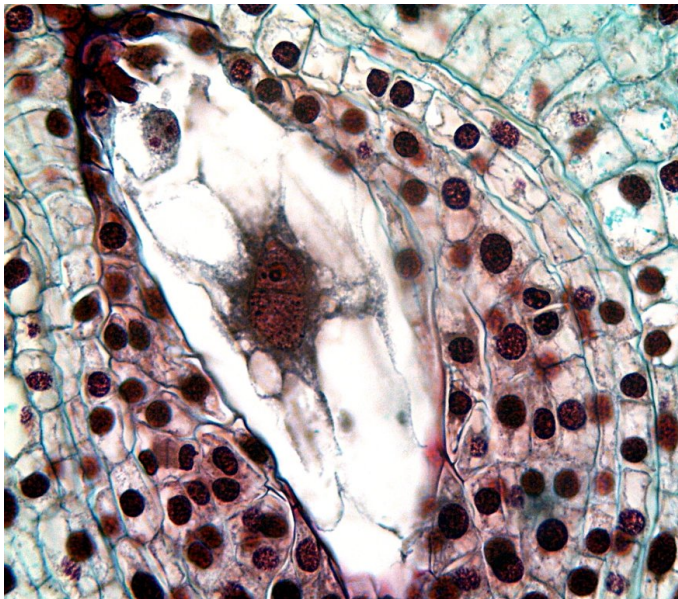
Ovules (*Lilium* sp., lily)



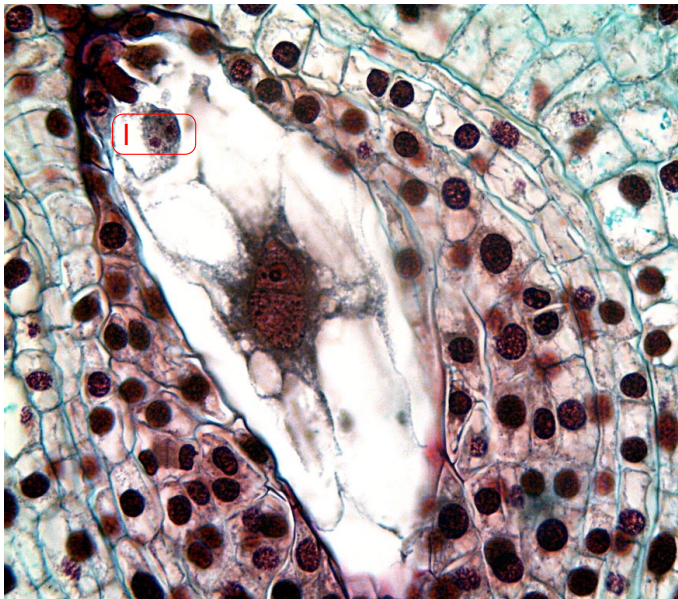
Embryo sac (*Lilium* sp., lily)



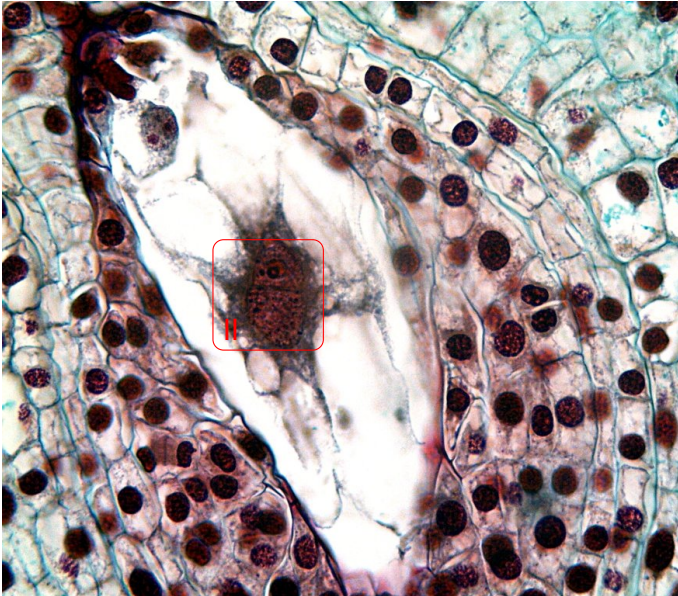
Double fertilization (*Lilium* sp., lily)



Double fertilization (*Lilium* sp., lily)



Double fertilization (*Lilium* sp., lily)

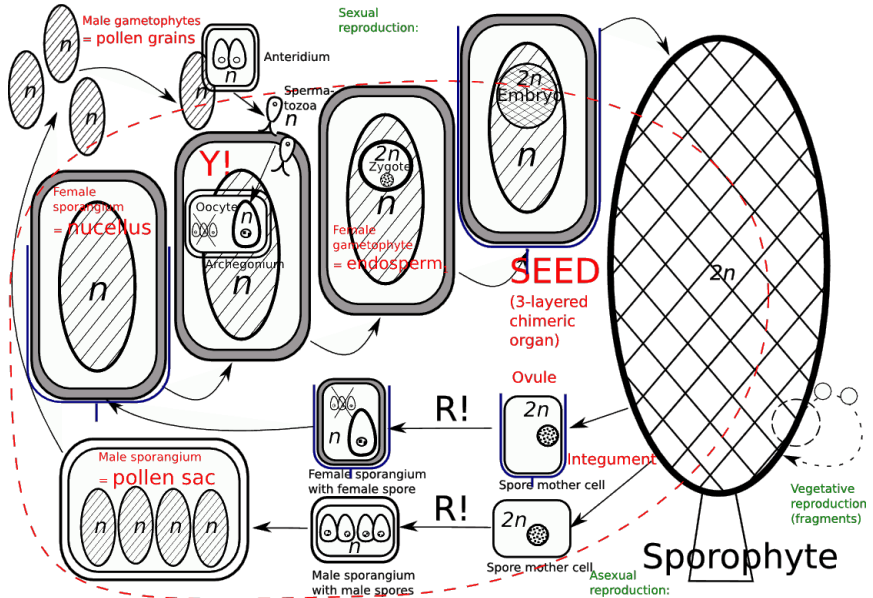


Life cycle of angiosperms: sources of optimization

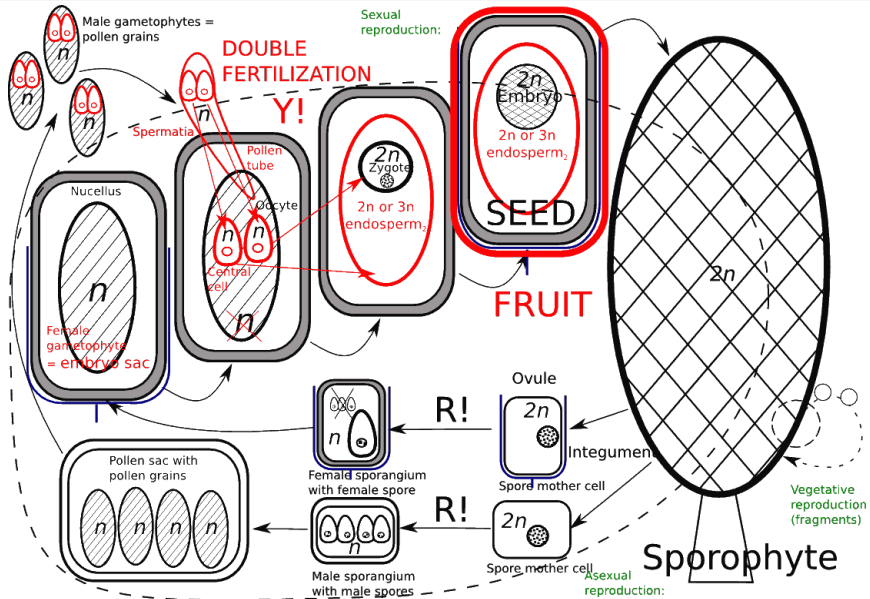
- Reduction of everything, especially of haploid stages
- Signal role of second embryo (source of endosperm₂)
- Well-developed pollination
- Pistil and fruit



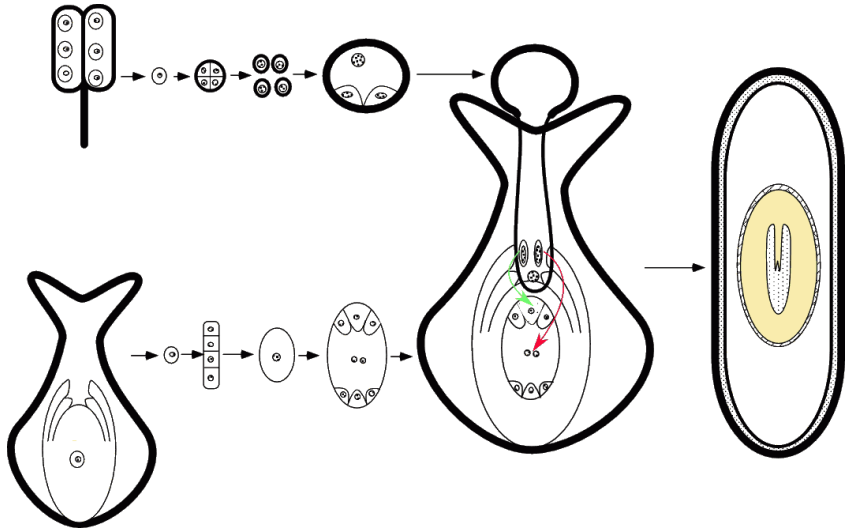
Life cycle of “gymnosperms”



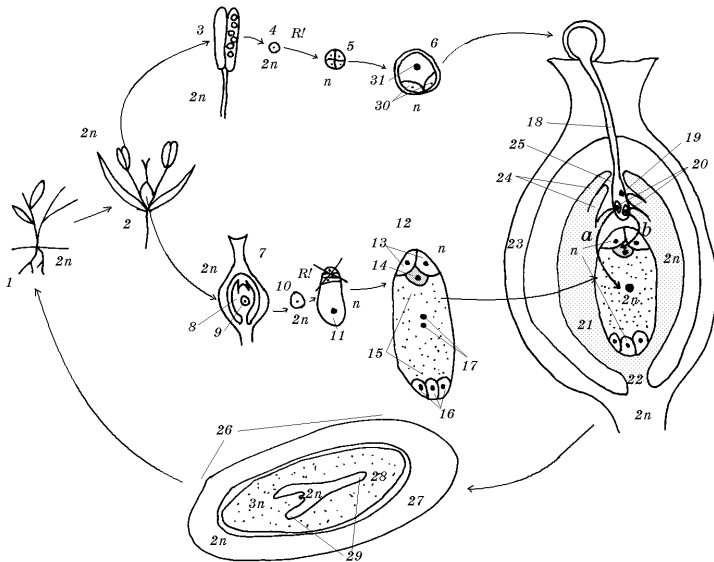
Life cycle of angiosperms: differences



Life cycle of angiosperms: relations between structures



Life cycle of angiosperms: another view



Seed plants

Magnoliopsida, or Angiospermae



Angiosperms in general

- Names: Magnoliopsida, Angiospermae (“angion” is a “bottle”), angiosperms, flowering plants
- 250,000 species, more than 90% of all plants diversity, the diversity is comparable with mollusks (200,000) and arthropods ($\approx 1,000,000$) and much more than fungi (75,000) and vertebrates (30,000)
- ≈ 300 families and ≈ 40 orders
- Grow everywhere except open ocean and central Antarctic



Diagnostic characters of angiosperms

- Flower
- Angiospermy
- Stigma
- Double fertilization
- Fruit
- Parcellation

In all, any of these characters taken alone is not unique, but together they delimit the group



Final question (2 points)



Final question (2 points)

What is a double fertilization?



Summary

- **Angiosperms** optimized their life cycle using (a) reduction, (b) signaling second embryo and (c) sophisticated pollination



For Further Reading



A. Shipunov.

Introduction to Botany [Electronic resource].

2010—onwards.

Mode of access:

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.

Chapters 24, 25.

