# Introduction to Botany. Lecture 21

Alexey Shipunov

Minot State University

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# Outline

1. Life cycles
   - Life cycle of land plants
   - Evolution of life cycles
   - Heterosporic life cycle
   - Origin of seed

# Life cycle of land plants***

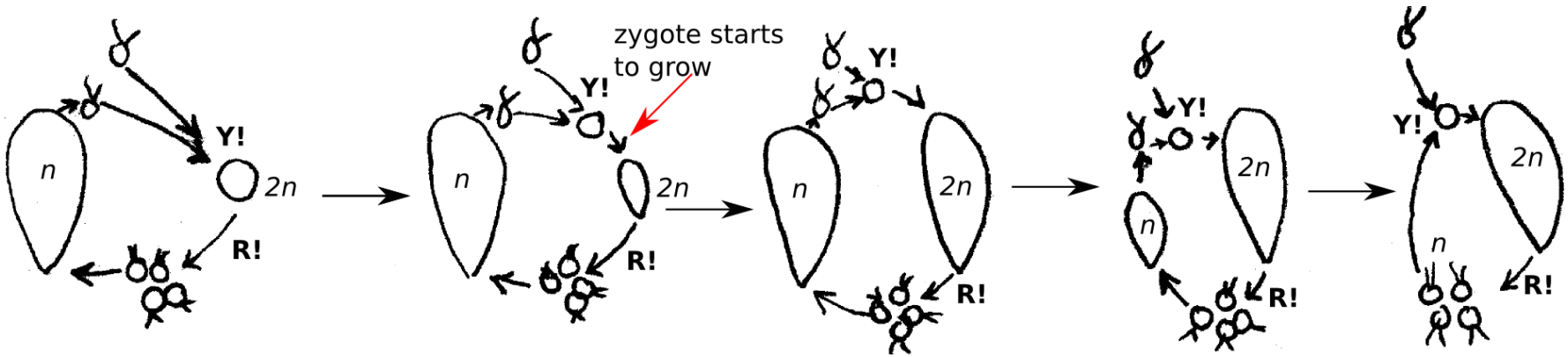
Terms covered:

- Sporophyte and gametophyte
- Archegonium and antheridium
- Spermatozoa and oocyte (egg cell)
- Embryo
- Predominance of sporophyte and/or gametophyte
- Homosporic and heterosporic

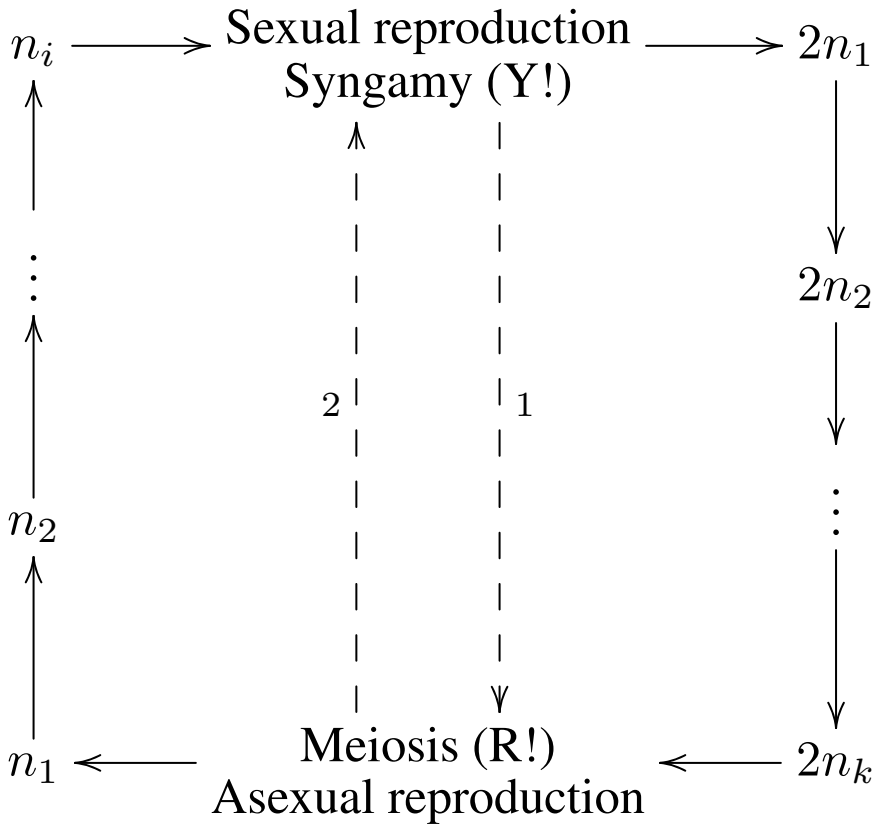
# Directions of life cycle evolution

- The simplest life cycle of unicellular organism is the alternation of syngamy (cell fusion) and meiosis
- Next stage is a zygotic cycle of many algae and fungi
- When zygote starts to divide without changing genotype, sporic life cycle arises
- Initial sporic cycle was probably with haplont dominance (mosses), then with equal generations
- Advanced sporic cycle is with diplont predominance (ferns and seed plants)
- Finally, gametic cycle of animals and some algae in the final step of life cycle evolution

# Stages of life cycle evolution

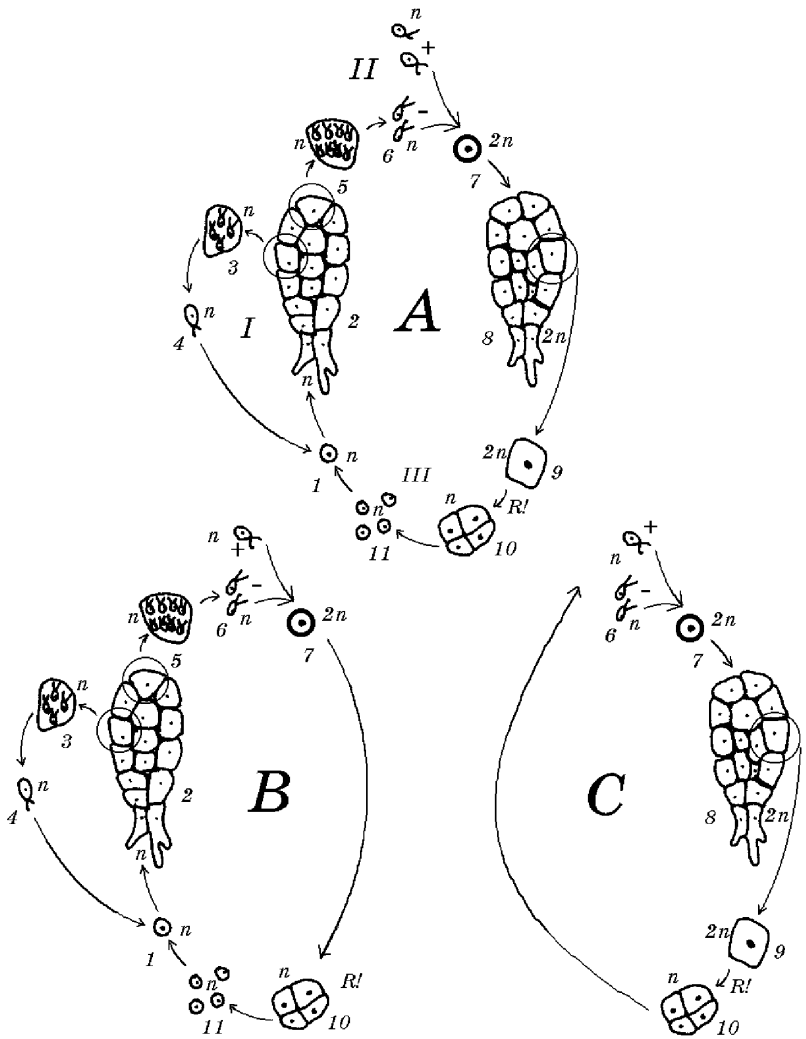


# Sporic cycle with equal generations




1 — zygotic cycle (Y!→R!);
2 — gametic cycle (R!→Y!).

# Three main variants of life cycle



# Heterosporic life cycle***

Terms covered:

- Male gametophyte, female gametophyte
- Male spore (microspore), female spore (megaspore)
- Male sporangium (microsporangium), female sporangium (megasporangium)

# Origin of seed

- **Seed is the result of enforced control of sporophyte over gametophyte**
- **Dinosaur problem:** without control on the r-strategic gametophyte, K-strategic tree sporophyte cannot guarantee its reproduction
- Growing of gametophytes, syngamy (fertilization) and growing of daughter sporophyte—everything happens **right on mother sporophyte**

# Summary

- *Sporophyte* is a diplont of plants; *gametophyte* is a haplont
- Land plants have: (1) multicellular sporangia and gametangia, (2) vegetative reproduction via fragments, (3) oogamy and also (4) embryo—young sporophyte growing on gametophyte
- Mosses have sporic cycle with gametophyte predominance whereas ferns and seed plants—with sporophyte predominance
- Heterosporic plants have two kinds of spores: female (megaspores) and male (microspores)
- Seed plants have compact life cycle where almost all stages happen on mother sporophyte

# For Further Reading

Th. L. Rost, M. G. Barbour, C. R. Stocking, T. M. Murphy.
*Plant Biology*. 2nd edition.
Thomson Brooks/Cole, 2006.
**Chapter 12.1–12.2 (skip angiosperm life cycle!).**