

Introduction to Botany. Lecture 27

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Outline

- 1 Questions and answers
- 2 Life cycles and diversity
 - Basics
 - Evolution of life cycles



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Previous final question: the answer

In most organisms, cells participating in syngamy are unequal (male and female). Why?



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In most organisms, cells participating in syngamy are unequal (male and female). Why?

- This is a way of saving resources. They are concentrated in one place (“female”) whereas the other gender (“male”) may increase in number to make fertilization more likely.
- It is easier to recognize different genotypes if they have phenotypic differences.



Life cycles and diversity

Basics

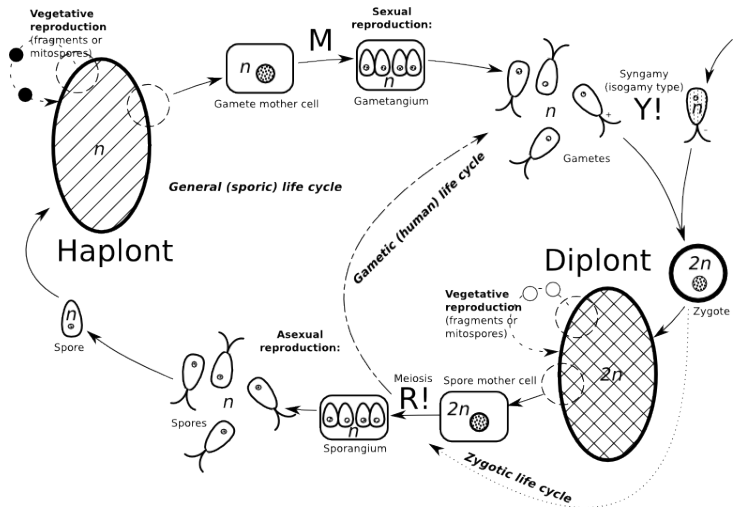


Life cycles of unicellular and multicellular organisms

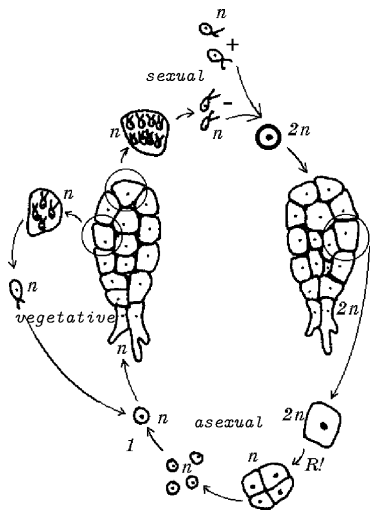
- Simple life cycle: unicellular organism. Associated terms: mitosis, meiosis (R!), syngamy (Y!), reproduction, sexual reproduction, asexual reproduction, vegetative reproduction, isogamy, heterogamy, oogamy, zygote, gamete, male, female, spermatozoon, oocyte
- General life cycle: multicellular organism. Associated terms: haplont, diplont, **gametangium**, **sporangium**, spores, mitospores, **sporic life cycle**, **gametic life cycle**, **zygotic life cycle**



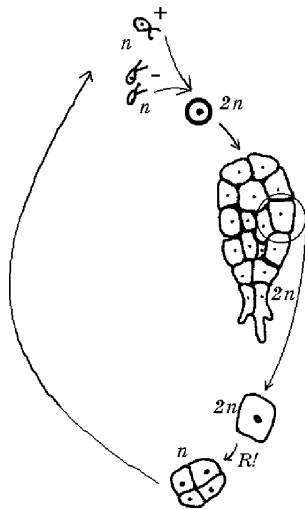
General life cycle



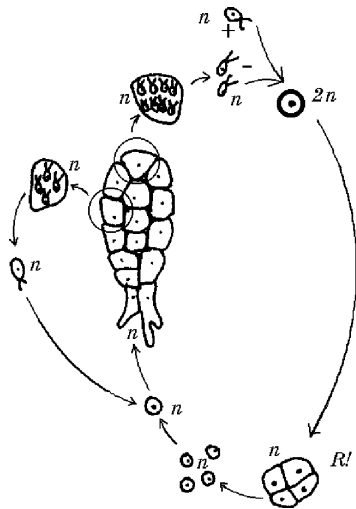
Sporic life cycle: plants



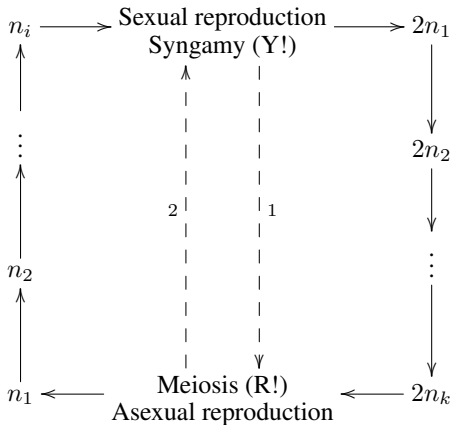
Gametic life cycle: animals



Zygotic life cycle: protists



Sexual and asexual reproduction



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



Life cycles and diversity

Evolution of life cycles



Directions of life cycle evolution

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



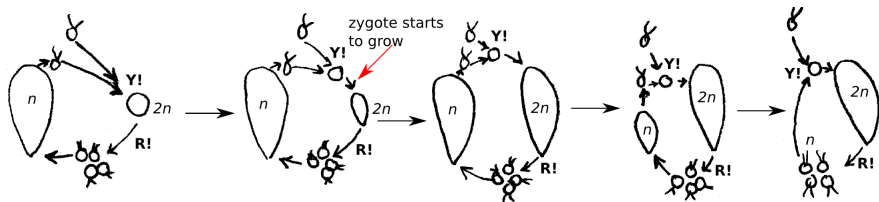
Why diplonts are better?

They have two variants of each gene!

- 1 **Dominance:** if one gene is deadly mutated, there is the second working variant
- 2 **Protein production:** two genes will give more protein
- 3 **Diversity:** if one gene is producing protein adapted to +5...+30°C and other—to +10...+35°C, the organism may live under +5...+35°C



Stages of life cycle evolution



Final question (2 points)



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What is the difference between zygotic and gametic life cycles?



Summary

- **Zygotic** life cycle has no *diplont*, **gametic** life cycle has no *haplont*, **sporic** life cycle has both *haplont* and *diplont*
- The evolution of life cycles goes from zygotic to sporic and then to gametic because diplonts are preferred in the evolution



For Further Reading



J. E. Bidlack, Sh. H. Jansky.
Stern's introductory plant biology. 12th edition.
McGraw-Hill, 2011.
Chapter 12.



Th. L. Rost, M. G. Barbour, C. R. Stocking, T. M. Murphy.
Plant Biology. 2nd edition.
Thomson Brooks/Cole, 2006.
Chapter 12 (skip angiosperm life cycle!).

