

Systematic Botany. Lecture 33

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Outline

Questions and answers

Spermatophyta, seed plants

Class Angiospermae

Classification of angiosperms

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Previous final question: the answer

Who is the most primitive seed plant? Why?

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Who is the most primitive seed plant? Why?

- ▶ *Ginkgo*, or cycads: open ovules, spermatozoa, no pollen tube, fern-like features

Spermatophyta, seed plants

Class Angiospermae

Angiosperms in general

- ▶ Names: Angiospermae (“angion” is a “bottle”), Magnoliopsida, 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

Origin of angiosperms

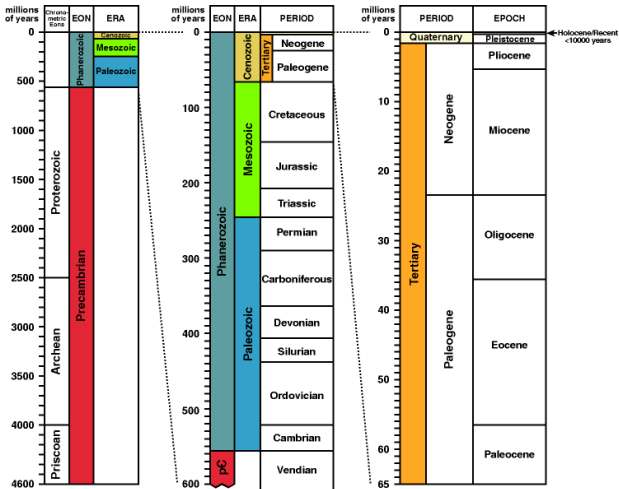
- ▶ Morphologically, angiosperms are similar to Gnetales but molecular data deny this similarity and place angiosperms as outstanding branch of all seed plants
- ▶ Transitional forms are still not discovered; candidates are either too close to angiosperms or too far from them
- ▶ True angiosperm-like structures appear from late Jurassic, shortly (10–20 mya) after they become dominant
- ▶ Several theories are trying to explain the origin of angiosperms and (separately) origin of flower and angiospermy:

Origin of angiosperms: hypotheses

- ▶ **Pseudanthial** theories state that flowers are result of integration of unisexual structures similar to *Ephedra*
- ▶ **Euanthial** theory insists on flower origin from more complicated bisexual generative shoots
- ▶ **Herbaceous** theory explains the rapid evolution of angiosperms and main factors of their transition from gymnosperms
- ▶ **Angiospermisation** theory states that many characters of angiosperms appeared independently in multiple lineages of gymnosperms, but only one group was successful

- └ Spermatophyta, seed plants
- └ Class Angiospermae

Geological time scale



Spermatophyta, seed plants

Classification of angiosperms

Milestones of angiosperm classification

- ▶ **Carolus Linnaeus** (XVIII century) gathered all available information, established species and genera
- ▶ **Michel Adanson** and **Antoine Jussieu** (end of XVIII) established plant families
- ▶ **John Lindley** (middle of XIX) invented plant orders
- ▶ **Alfred Engler** and **Charles Bessey** (XIX-XX) started evolutionary classifications
- ▶ **Arthur Cronquist**, **Rolf Dahlgren**, **Armen Takhtajan** and **Robert Thorne** (XX-XXI) developed different well-argued contemporary classifications based on morphology
- ▶ From 1993, **Angiosperm Phylogeny Group** (APG) as well as several individuals started to employ molecular characters. Luckily, one of the most accessible chloroplast DNA genes, *rbcL*, appeared to be extremely useful for tracing changes on family and order levels

Final question (3 points)

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Why angiosperms conquered the land?

- └ Spermatophyta, seed plants
- └ Classification of angiosperms

For Further Reading



Margulis and Chapman. 2009.

Kingdoms and domains: an illustrated guide to the phyla of life on Earth. 4th edition.