Introduction to Botany. Lecture 35

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Outline

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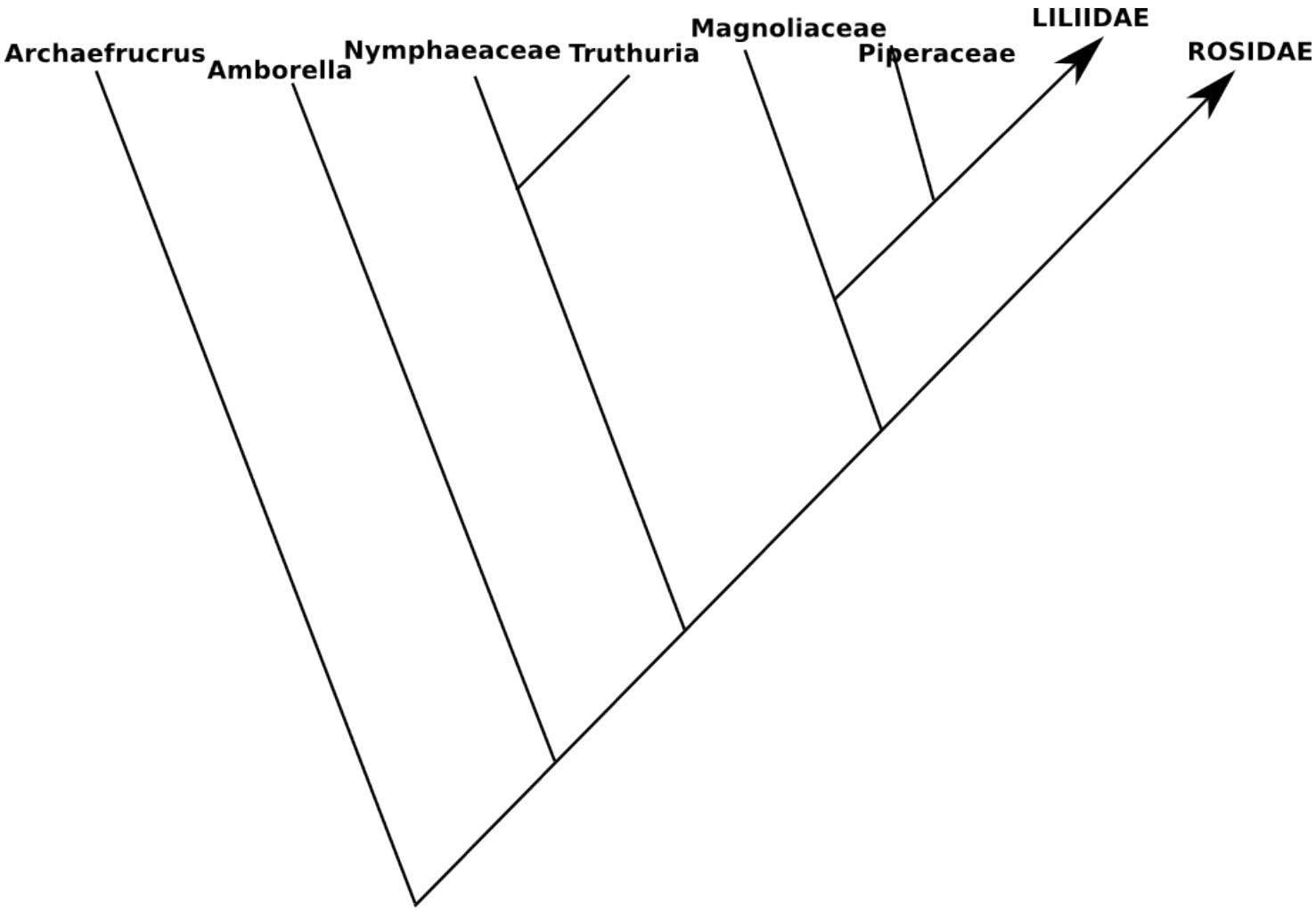
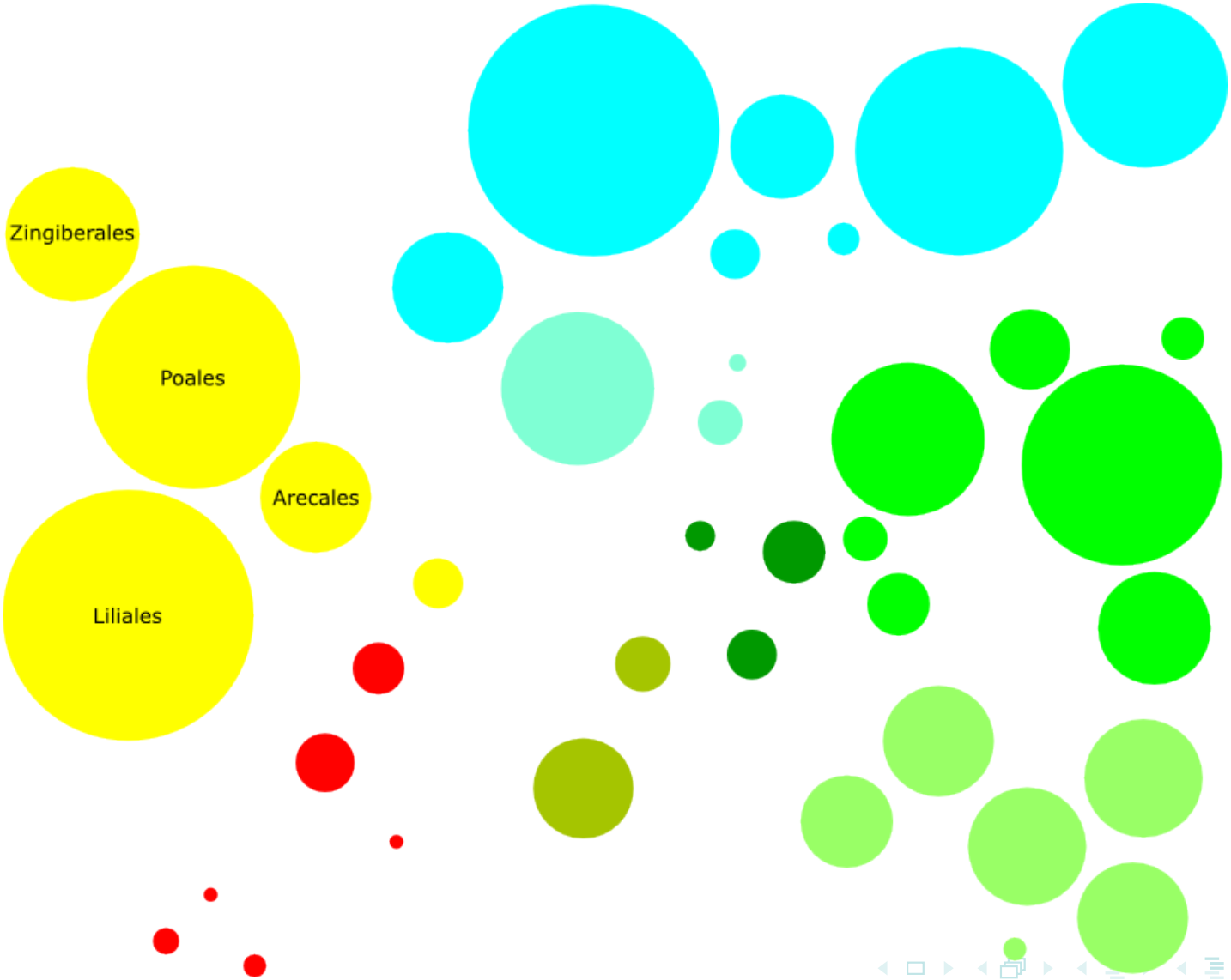
Phylogeny of basal angiosperms



Overview of liliids



Main features of monocots

- One cotyledon
- Linear leaves with acrodromous venation
- Root system without main root
- No cambium
- Trimerous flower with non-differentiated perianth

General features of orchids

- $\approx 30,000$ species
- Mostly tropical groups with amazingly complex flowers and pollination systems
- Depend on mycorrhizal fungi

Morphology of orchids

- Epiphytes or vines, with aerial roots; roots with velamen. Terrestrial forms also have thick roots.
- Often have bulbs originated from stems or even leaves
- Thick leaves, usually with no visible veins
- Flowers in pending racemes
- Flowers bilaterally symmetric, with big lip which goes downwards in epiphytic species
- One stamen fuses with pistil
- Pollen in pollinia
- Seeds are dust-like, millions per flower

Dactylorhiza flower

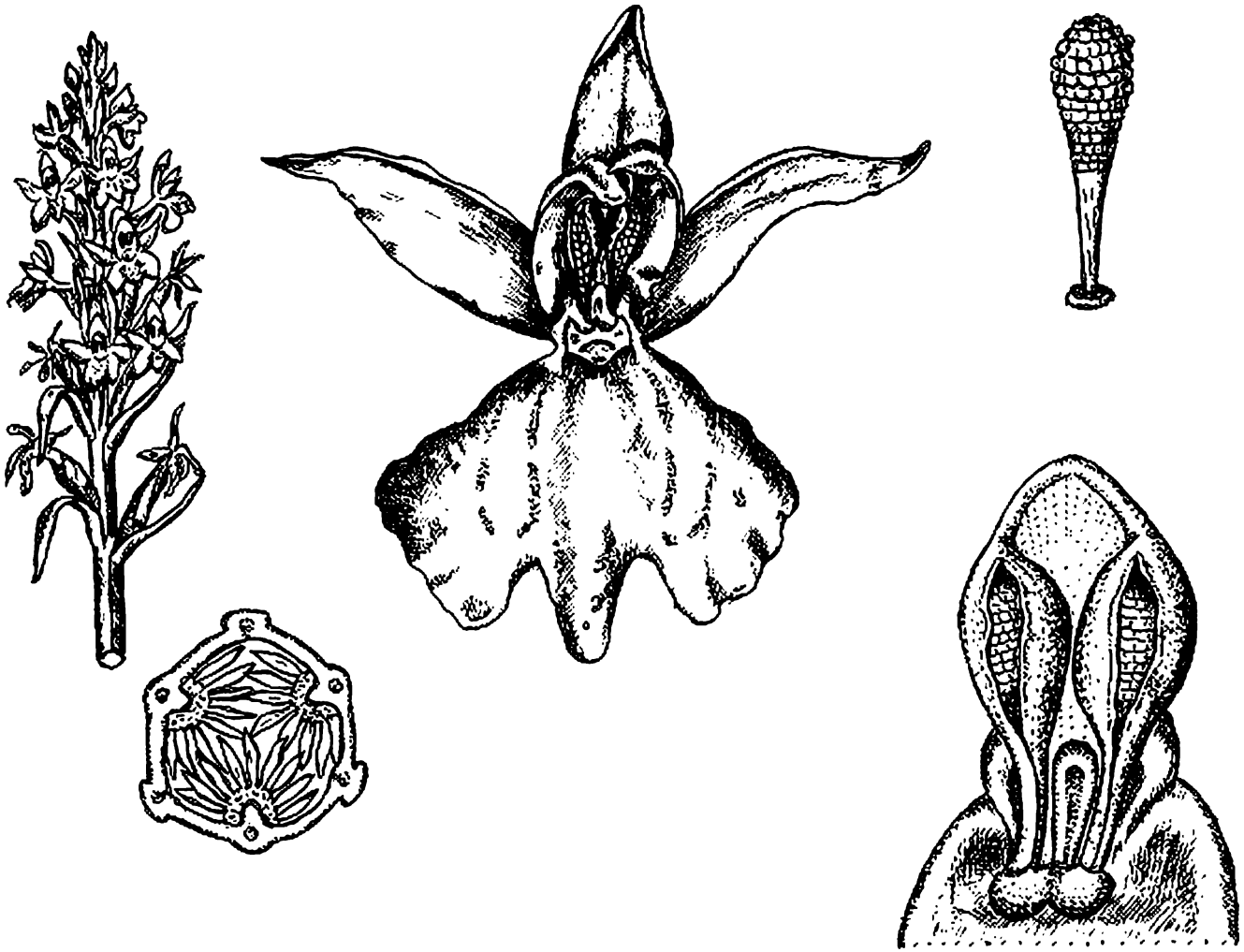
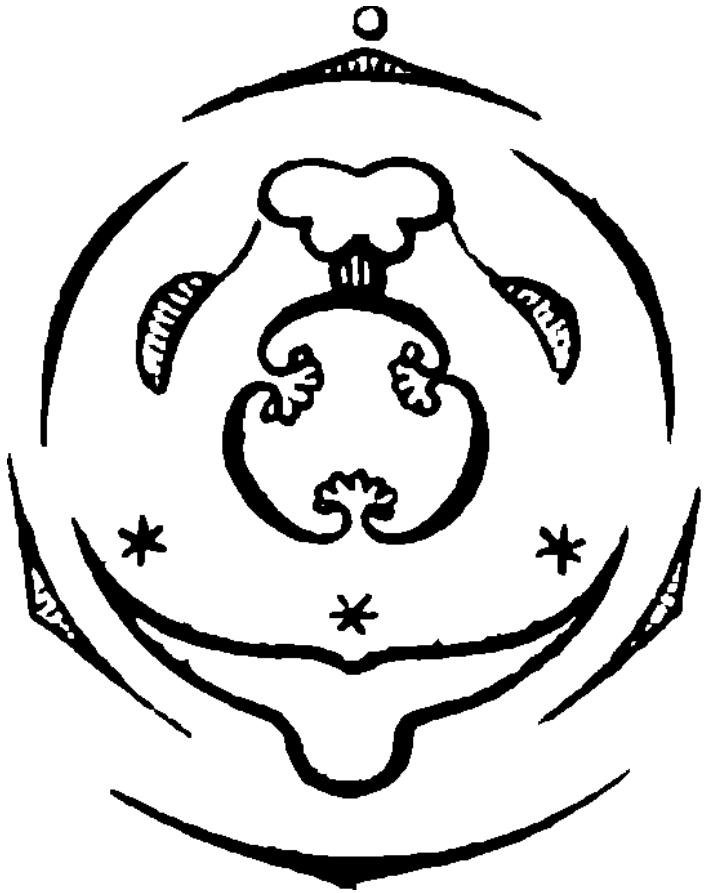


Diagram of Orchidaceae flower



$$\uparrow P_{3+2,1}[A_1 G_{\overline{(3)}}]$$

Representatives of orchids

- One economically important, *Vanilla* produces famous spices
- Lots of very popular ornamentals
- In temperate regions of America, *Habenaria* is the most species-rich group; in Eurasia—*Dactylorhiza*

Vanilla sp. (Mexico)

Dactylorhiza sp. (Eurasia)

Epipogium aphyllum (Eurasia)

Habenaria dilatata, North American temperate orchid

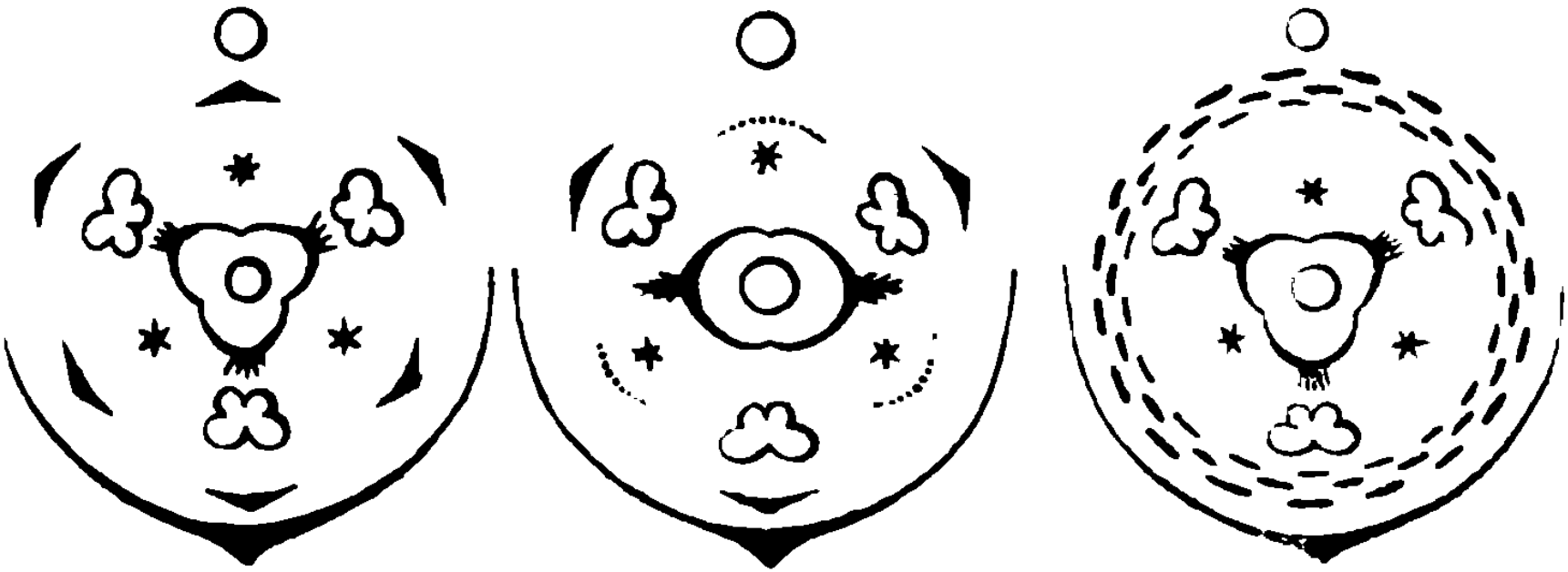
Main features of Cyperaceae

- $4,000$ species, $\approx 1,000$ belongs to sedges, *Carex*
- Grasslike plants, distributed mostly in temperate and Arctic regions
- Prefer wet places

Morphology of Cyperaceae

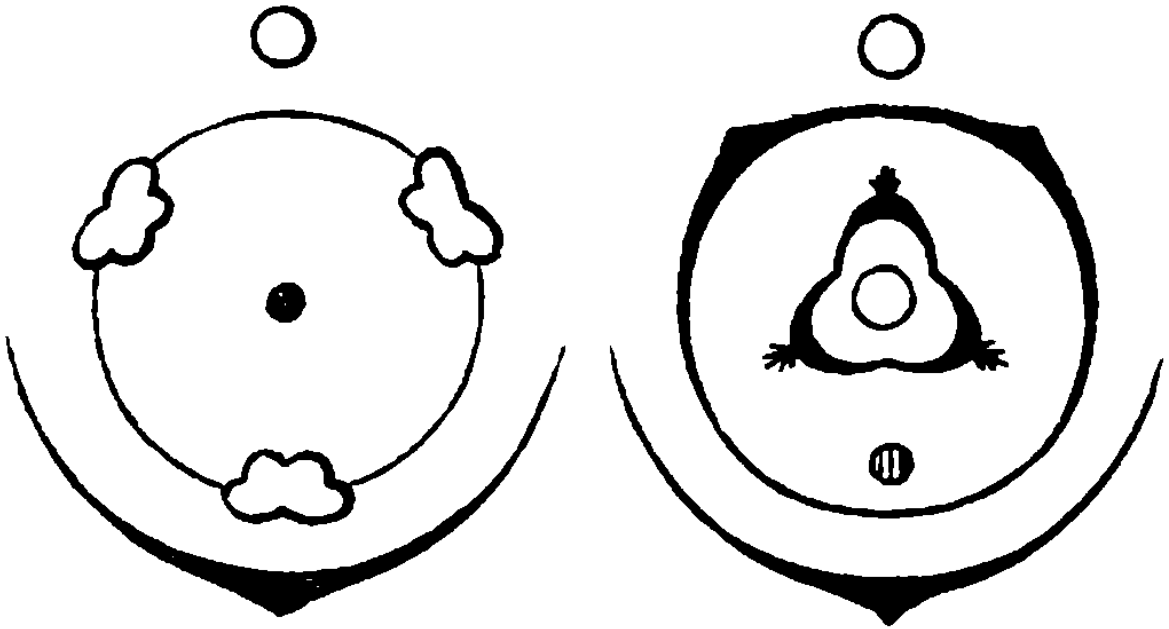
- Accumilate silica
- Leaves often in 3 ranks, stem is also a triangle on the cross-section
- Flowers small, wind-pollinated, unattractive, often unisexual, form spikes or spikelets and more complicated inflorescences
- Pollen grains in monads (from four microspores, only one survives)
- Perianth often reduced, stamens three, one pistil with one ovule but three carpels
- *Carex* flowers have specific bag-like periginium
- Fruit is an achene

Cyperaceae flower diagram



$$*\mathrm{P}_{3+3} \text{ or } {}_0\mathrm{A}_3\mathrm{G}_{\underline{(2-3)}}$$

Diagram of *Carex* flower



$$\ast \mathrm{P}_0\mathrm{A}_3 \text{ or } \uparrow \mathrm{P}_0\mathrm{G}_{\underline{(2-3)}}$$

Representatives of Cyperaceae

- *Carex* cover almost half of wet places in Arctic and northern temperate region
- *Eriophorum*, cottongrass was used as fiber source
- *Cyperus papyrus* was used for famous Egyptian papyrus

Carex sp.

Carex sp.

Eriophorum sp.

Cyperus papyrus

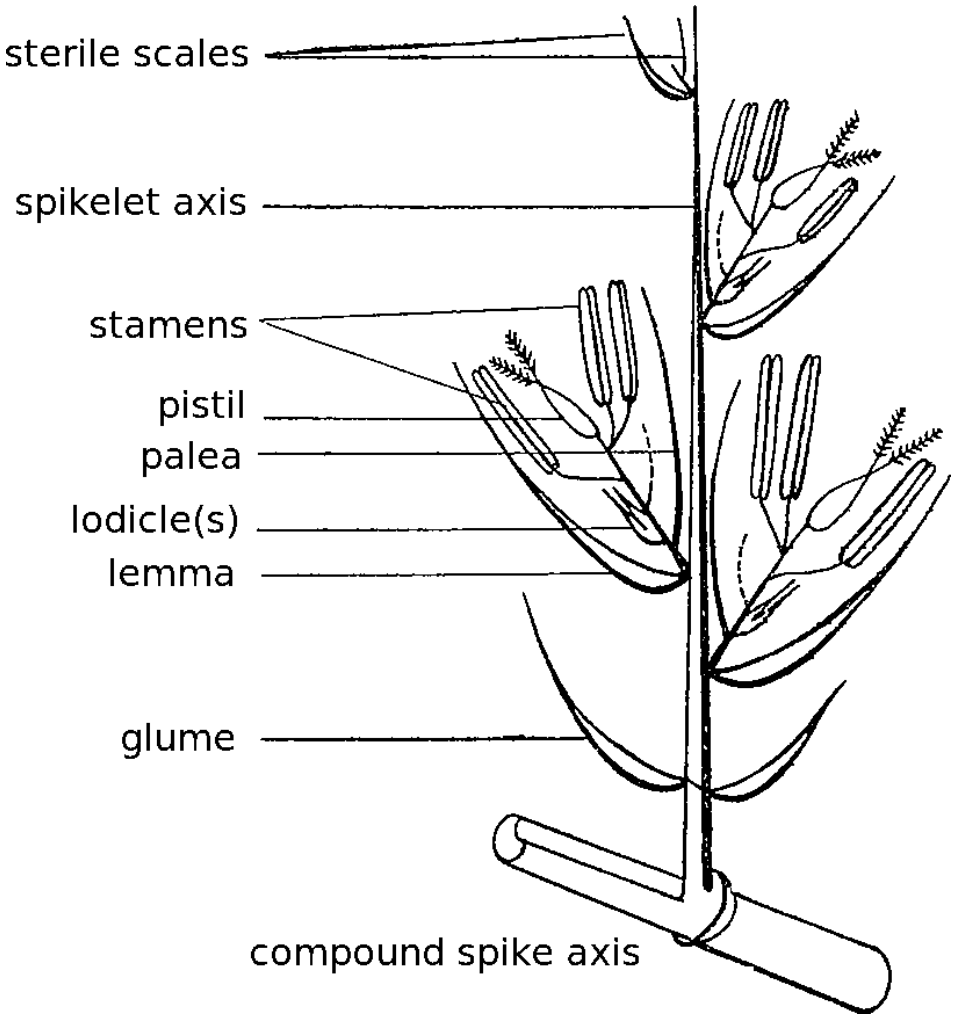
Main features of grasses

- $\approx 8,000$ species distributed thorough all the world, but most genera concentrate in tropics
- Prefer dry, sunny places
- Ofren form tussocks—compact structures where old grass stems, rhizomes and roots are intermixed
- Grasses form grasslands—specific ecological communities widely represented on Earth. North Dakota prairies are grasslands.

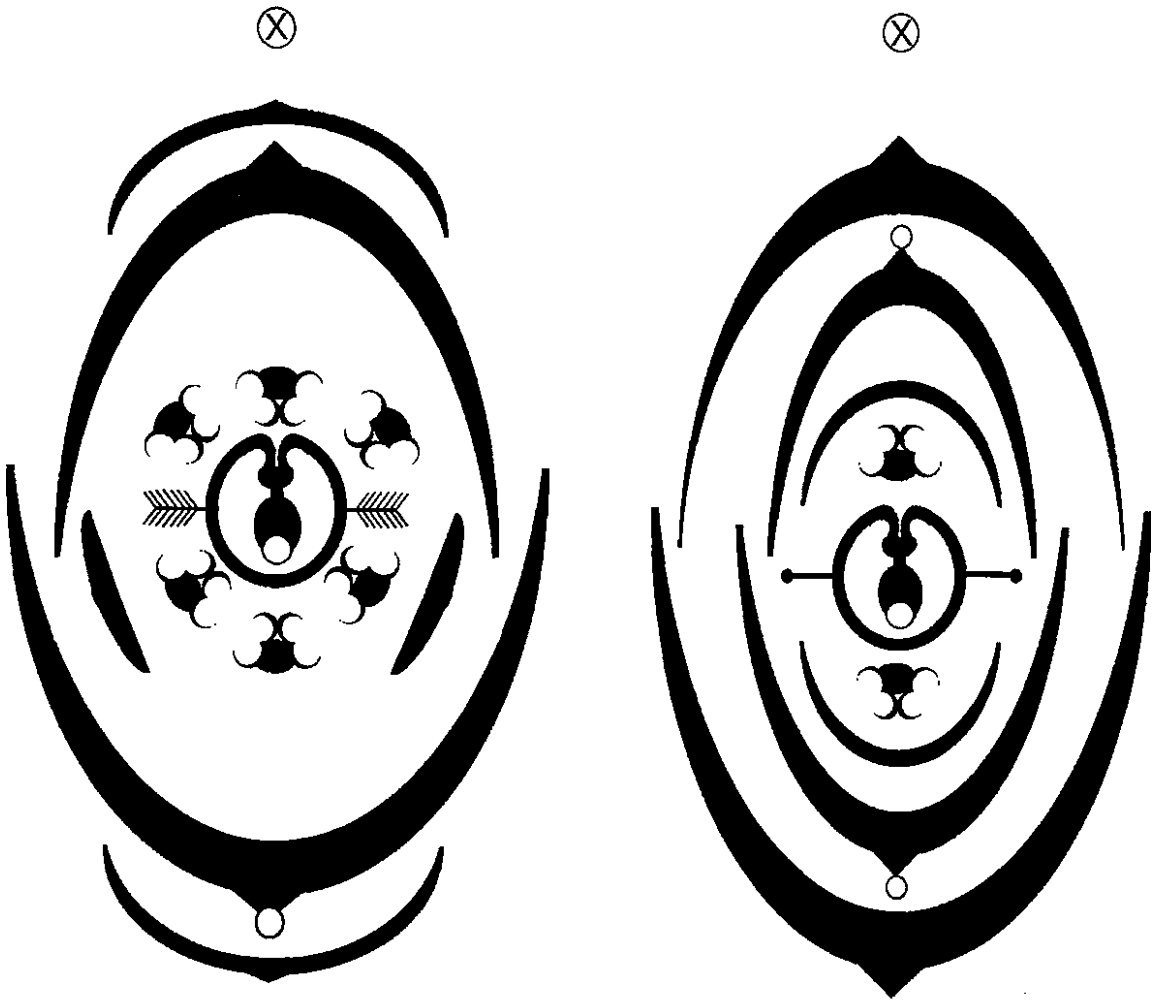
Morphology of grasses

- Stems usually hollow and round
- Leaves flat, in two ranks
- Flowers reduced, wind-pollinates, usually bisexual, form complicated spikelets*
- Each spikelet bear two glumes; each flower has lemma and palea scales
- Perianth is reduced to lodicules
- Stamens from 6 to 1 (most often 3), with large anthers
- Fruit is a caryopsis, it includes flower scales
- Seed has a specific structure—embryo with coleoptile, coleorhiza and scutellum

Scheme of grass spikelet



Grasses: *Oryza* and *Anthoxanthum* diagrams



$$\uparrow P_{0-3} A_{0-3+2-3} \underline{G_{(2)}}$$

Representatives of grass family

- Most primitive grasses are bamboos (Bambusoideae subfamily)
- Pooid grasses usually are C_3 plants, wheat (*Triticum*), rice (*Oryza*), barley (*Hordeum*) and rye (*Secale*) belong to this group
- Panicoid grasses are mostly C_4 plants, corn (*Zea*) and sugarcane (*Saccharum*) belong here

Rare event: bamboo (*Schizostachyum* sp.) is flowering!

Festuca sp.

Rice (*Oryza sativa*), the most important world crop

Corn (*Zea mays*), the most productive world crop (up to 10 MT/ha)

Summary

- Three monocot families, Orchidaceae (Liliales) and Cyperaceae plus Gramineae (Poales) have general monocot characters but their flower structure deviated from “typical” structure due to pollination adaptations: insects in first case, and wind in two last cases.

For Further Reading

Th. L. Rost, M. G. Barbour, C. R. Stocking, T. M. Murphy.
Plant Biology. 2nd edition.
Thomson Brooks/Cole, 2006.
Chapter 25.