Introduction to Botany. Lecture 32

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Outline

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Previous final question: the answer

What is the difference between fusiform initials and ray initials?

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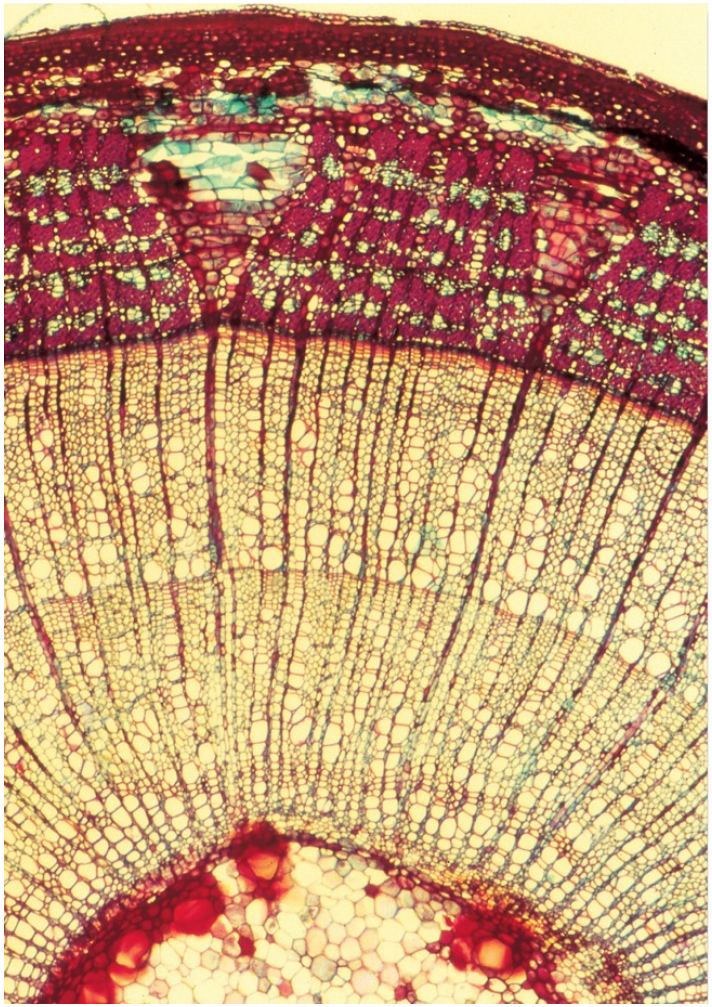
What is the difference between fusiform initials and ray initials?

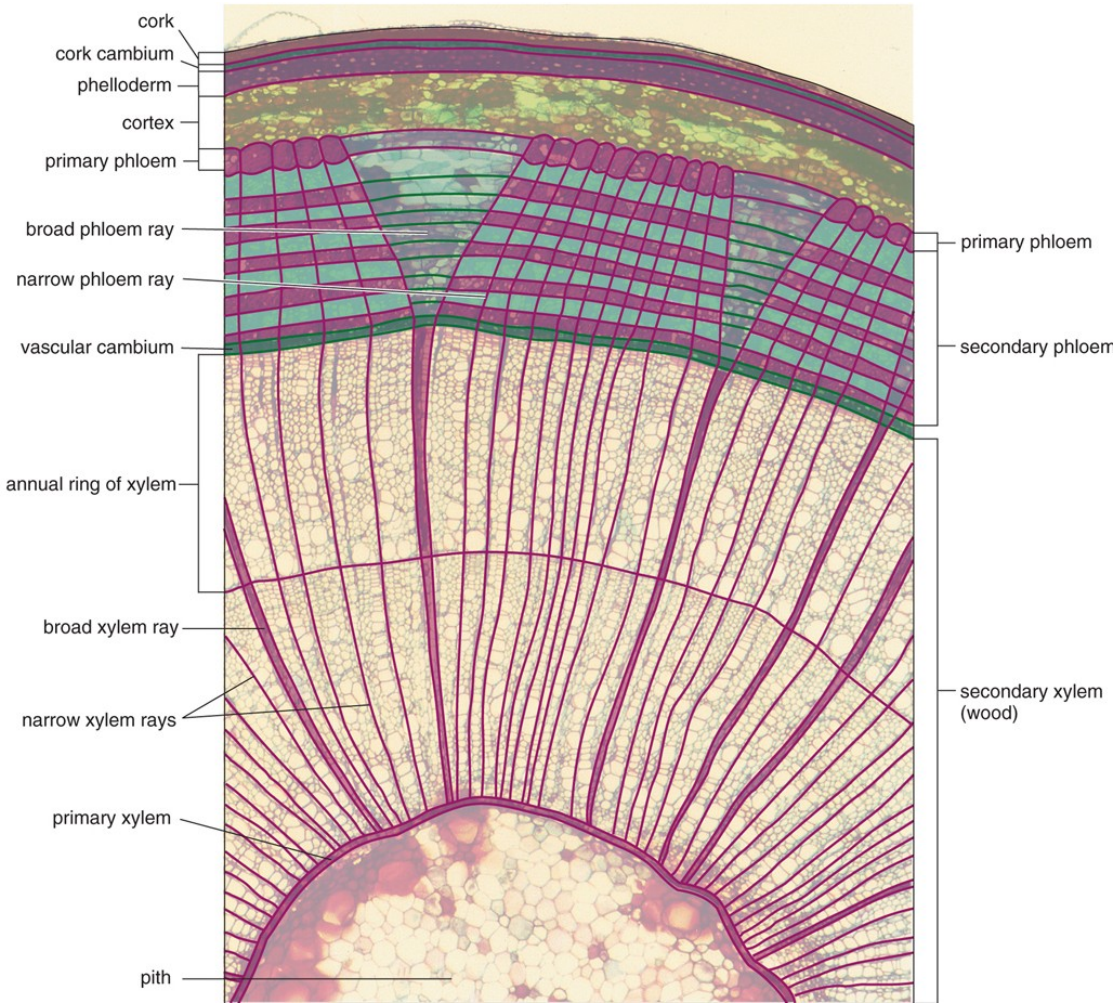
- Ray initials make parenchyma ray cells whereas fusiform initials make other cells of xylem and phloem

Growing stem

Secondary stem

Secondary structure of stem (photo and explanations)





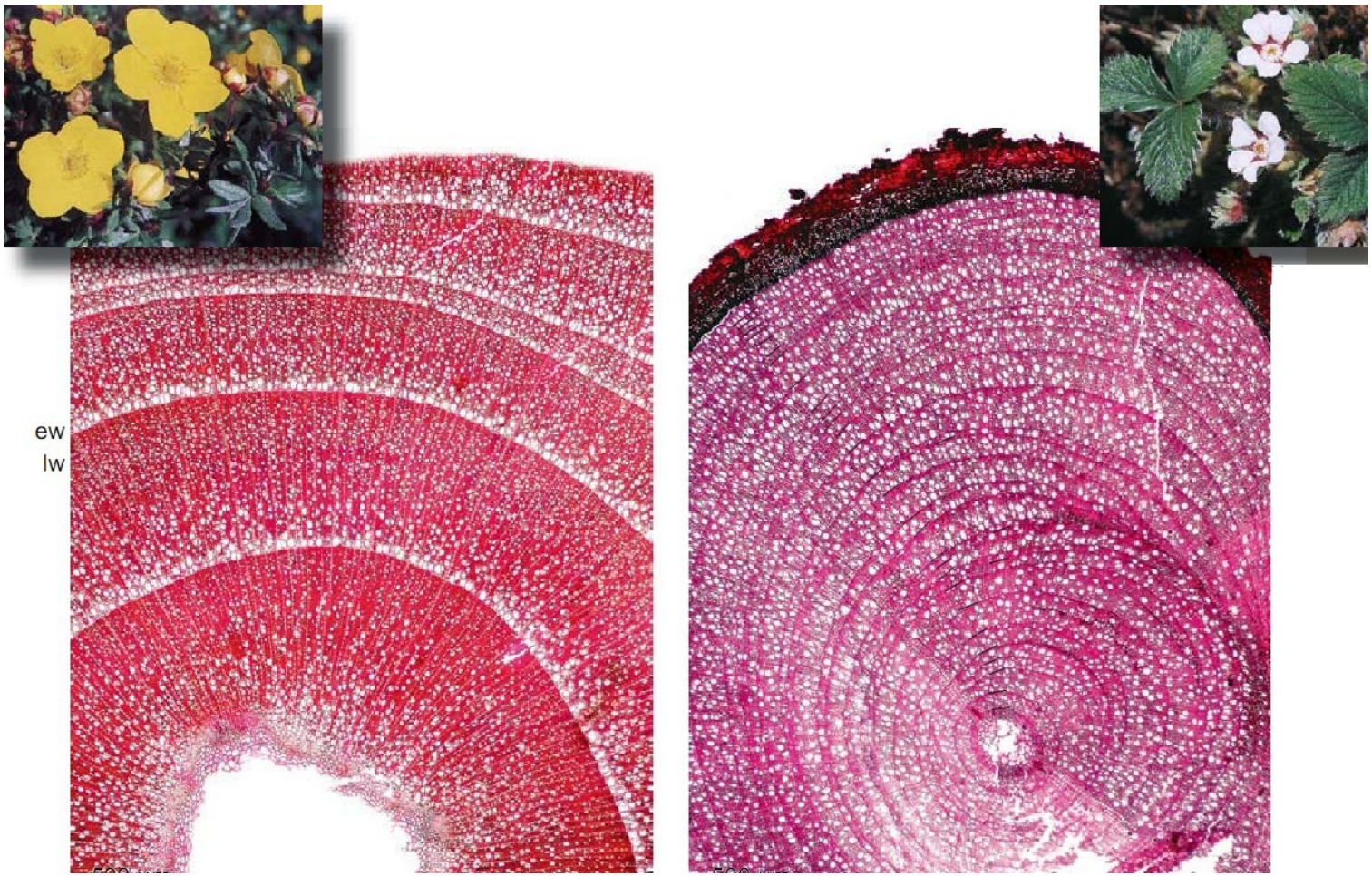
Earlywood and latewood

- **Earlywood** (springwood) contains more parenchyma and often have larger vessel elements
- **Latewood** (summerwood) often have small vessel elements and looks darker

Diffuse and ring porous wood

- In **ring porous** wood (like in red oak) bigger vessel elements concentrate in earlywood
- In **diffuse porous** wood larger vessel elements spread across early- and latewood (American elm)

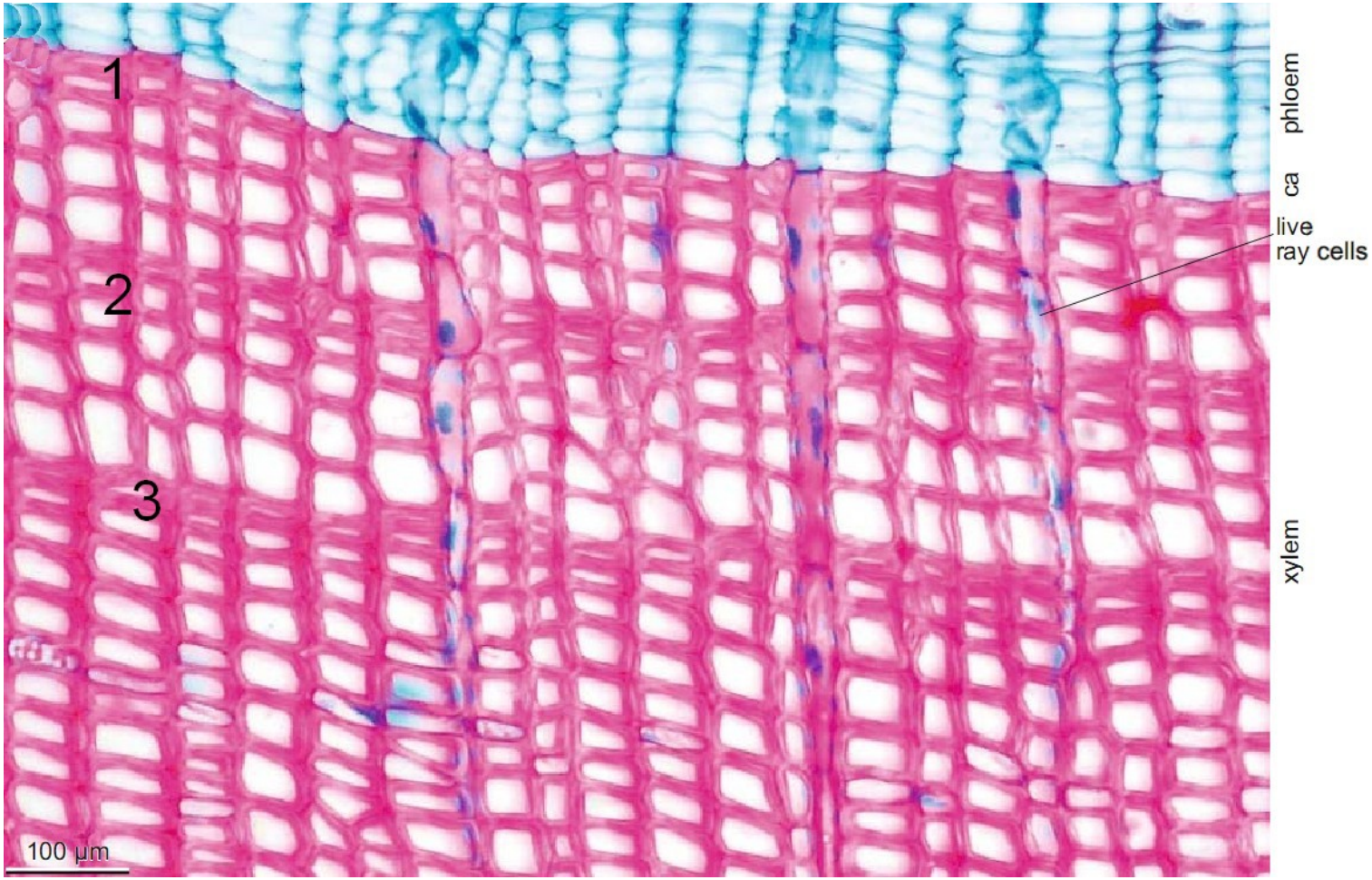
Diffuse and ring porous wood in two species of cinquefoil (*Potentilla* spp.)



Annual rings

- Interleaving early- and latewood from to sequential years form an impression of annual ring
- “Ring” is just a layer of darker (i.e., smaller) cells
- Tropical trees do not form annual rings

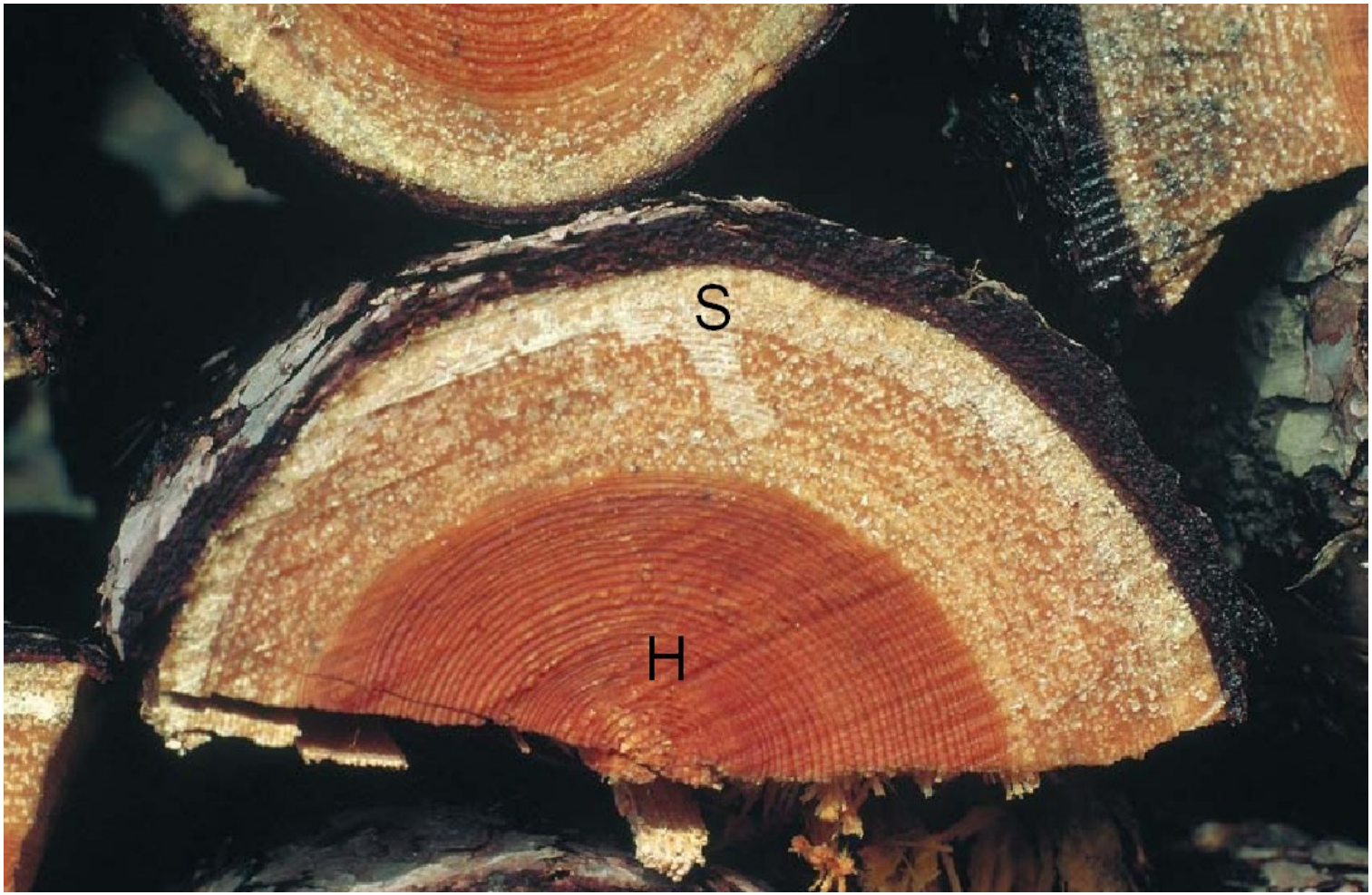
Annual rings in juniper (*Juniperus* sp.)



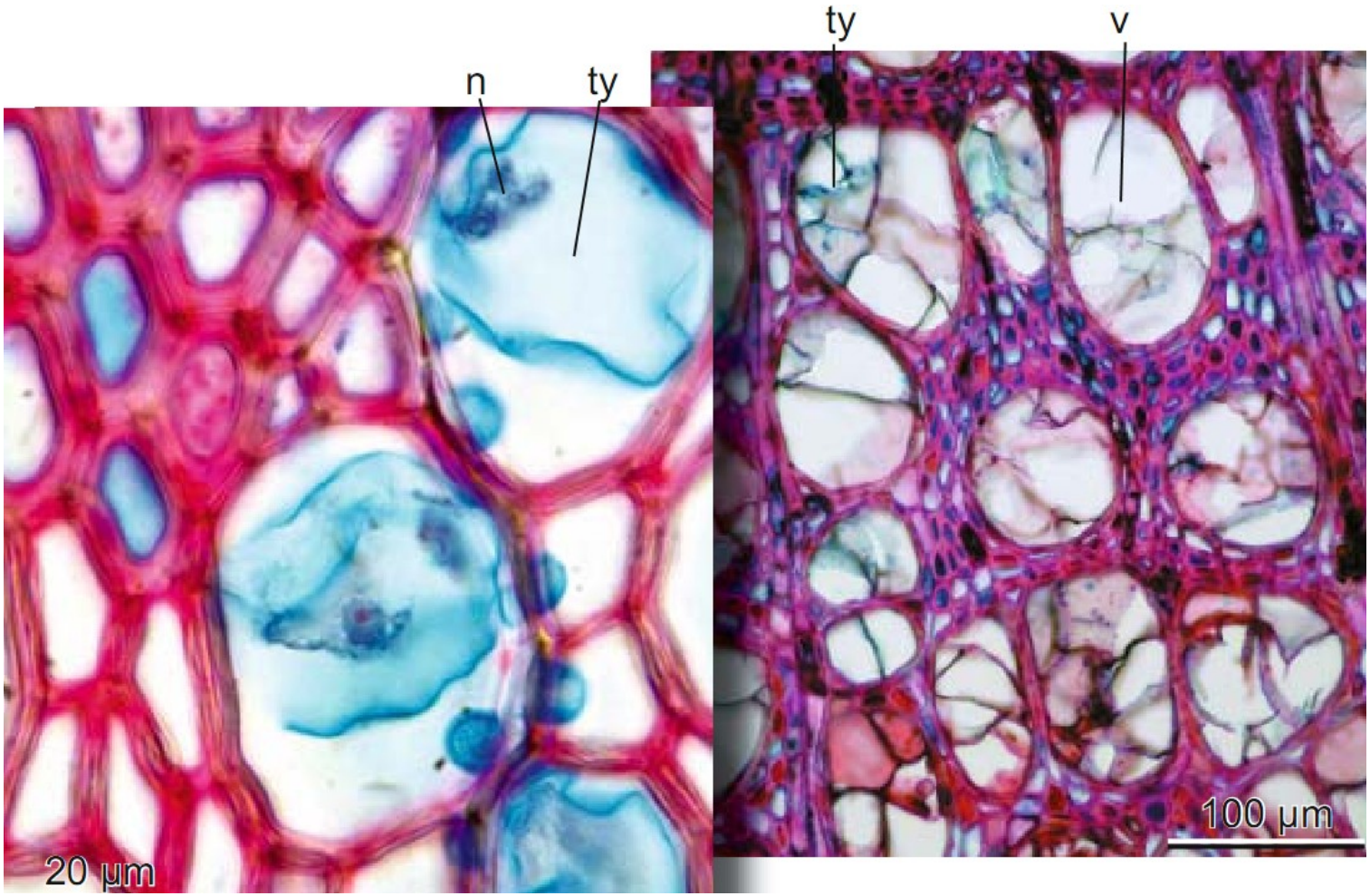
Sapwood and heartwood

- **Sapwood** is a peripheral layer of working xylem, it usually has relatively light color
- **Heartwood** is a central, non-functional, old, dark-colored xylem

Sapwood and heartwood of European pine (*Pinus sylvestris*)



Tyloses



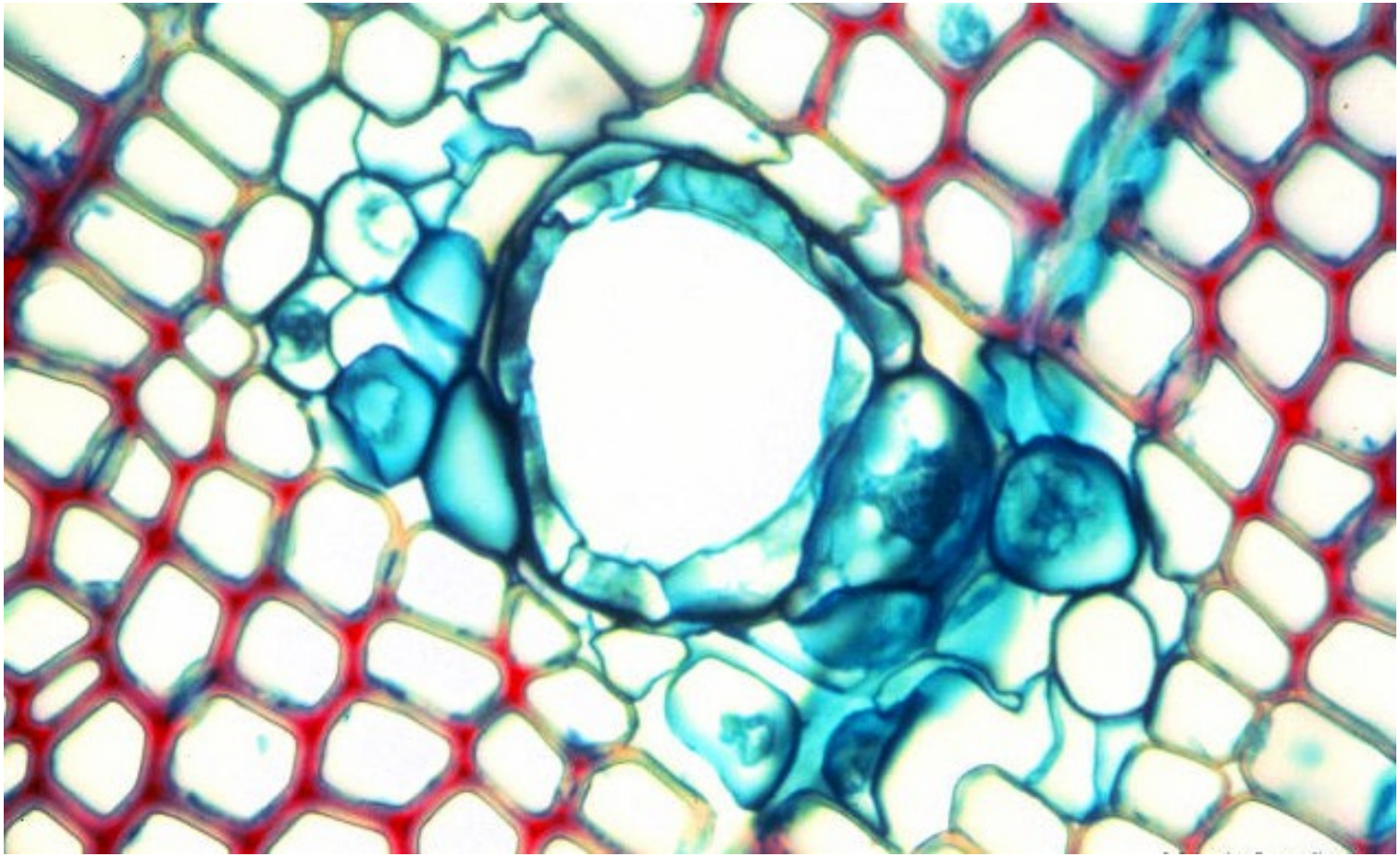
Tyloses control the winter functioning of vessels

Conifer wood

- Simpler structure, few cell types
- Simple rays
- Sometimes have **resin ducts**; resin secreted by epithelial cells

Ginkgo (*Ginkgo biloba*) wood (not a conifer, but gymnosperm)

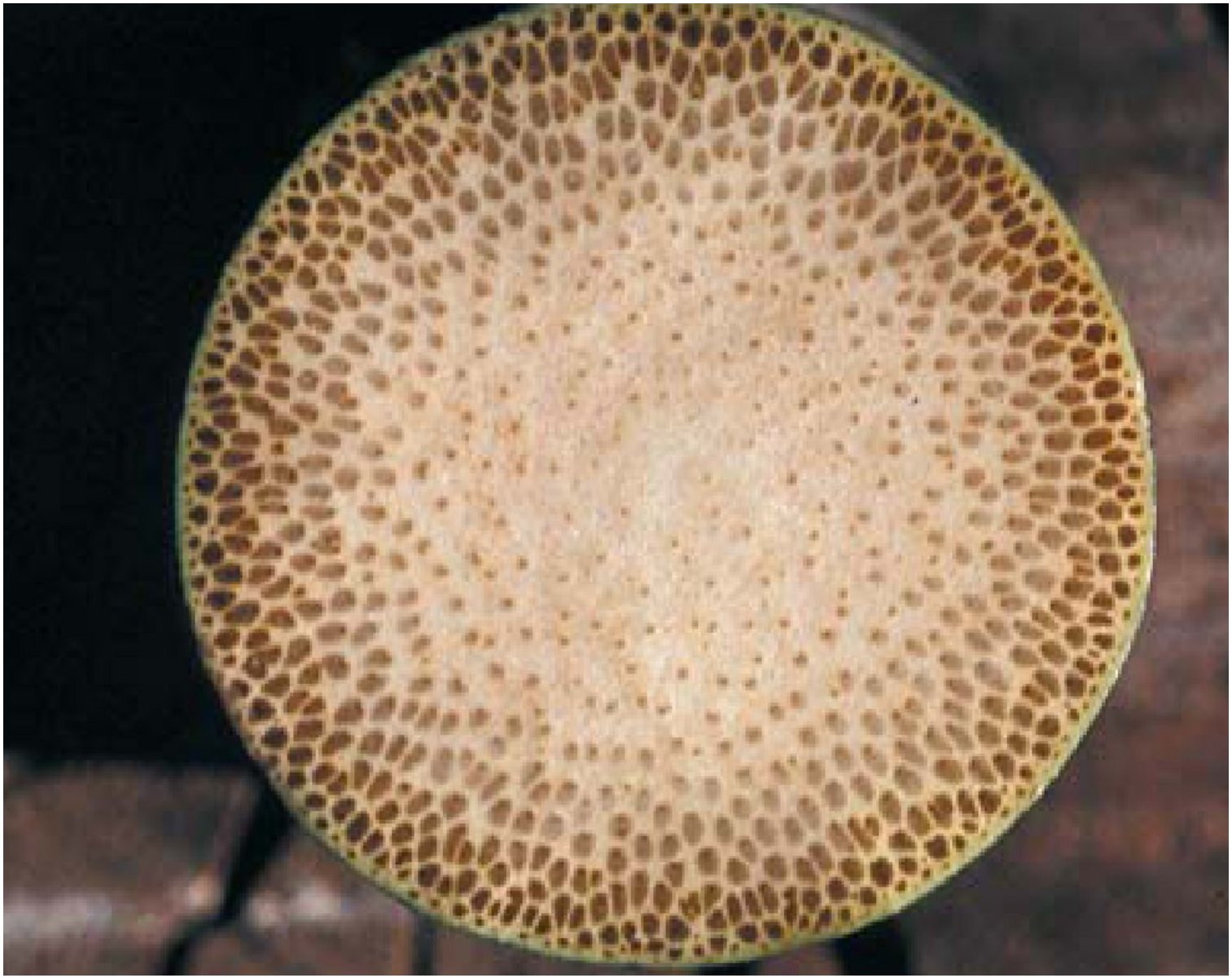
Resin duct in pine wood (©BSA)



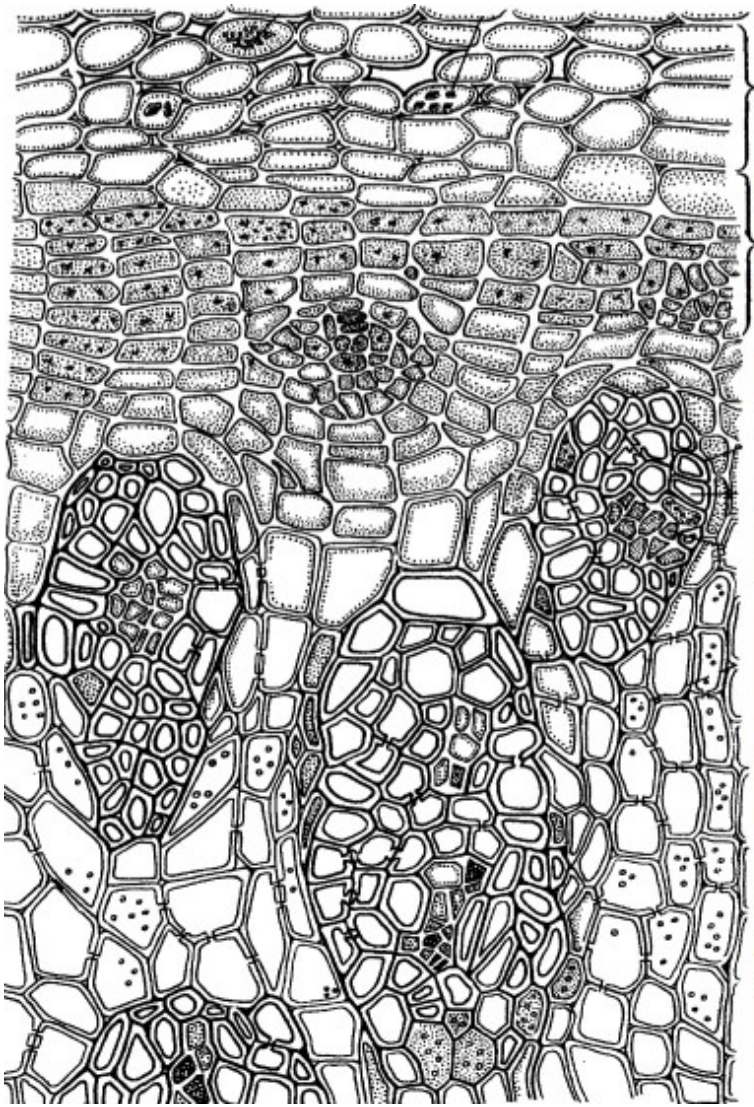
Monocot “wood”

- Most of monocots do not have lateral meristems and therefore have no true wood
- Palms have only primary tissues; their trunk widens from bottom to top
- Some monocots (dragon trees) have **anomalous secondary growth**

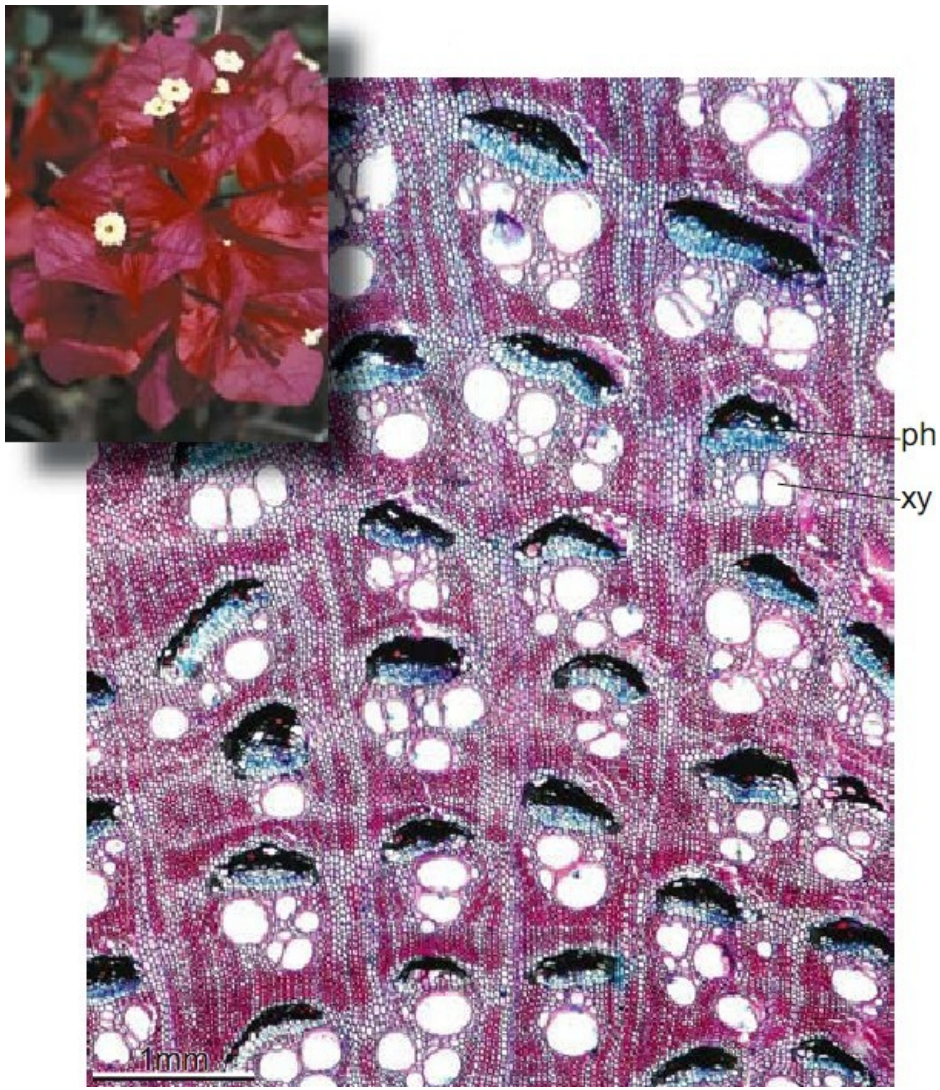
Cross section of palm (*Phoenix canariensis*) trunk



Dragon tree (*Dracaena draco*) and its anomalous cambium



Anomalous secondary growth in Bougainvillea (*Bougainvillea spectabilis*)



Growing stem

Life forms

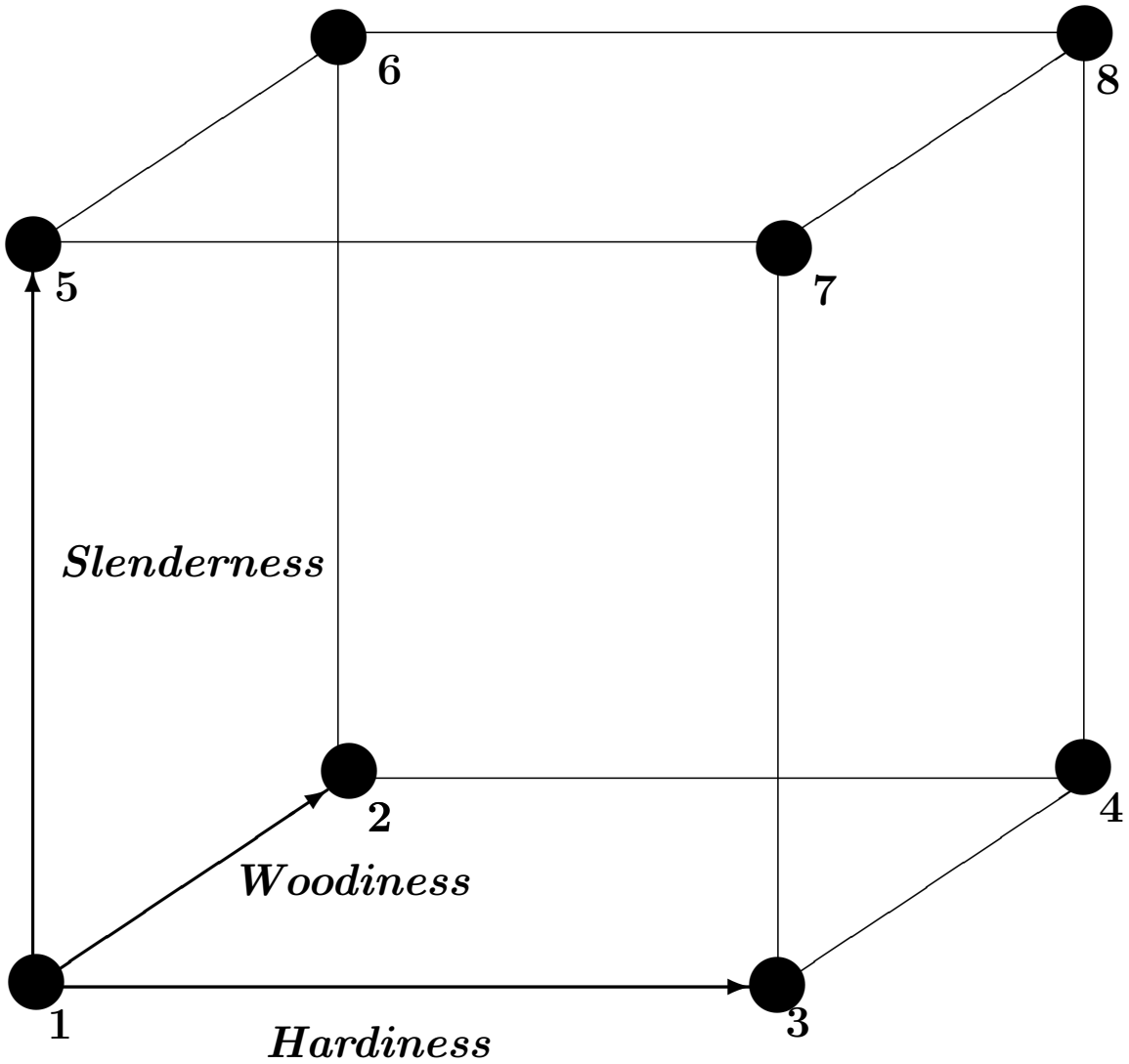
Life forms

- It is a different view on the plant diversity
- Life forms represent different lifestyles
- For example, trees, shrubs, vines, annual and perennial herbs are life forms

Life forms: dynamic approach

- **Hardiness**: sensitivity to all negative influence
- **Woodiness**: % of cells with secondary walls
- **Slenderness**: proportion of linearly ordered stems

Life form cube



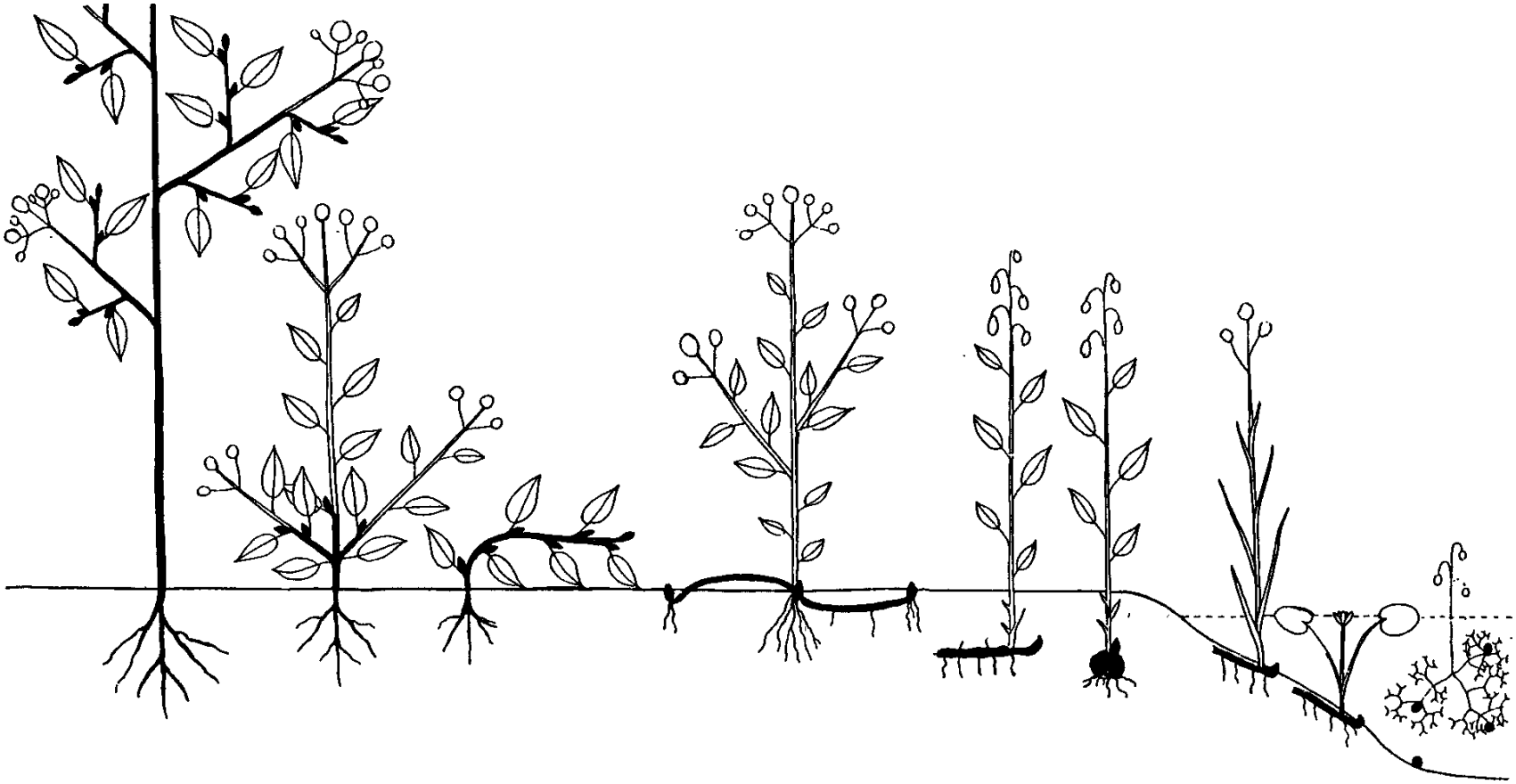
#1 could be similar to duckweed, #8—to sequoia

Life forms: Raunkiaer's approach

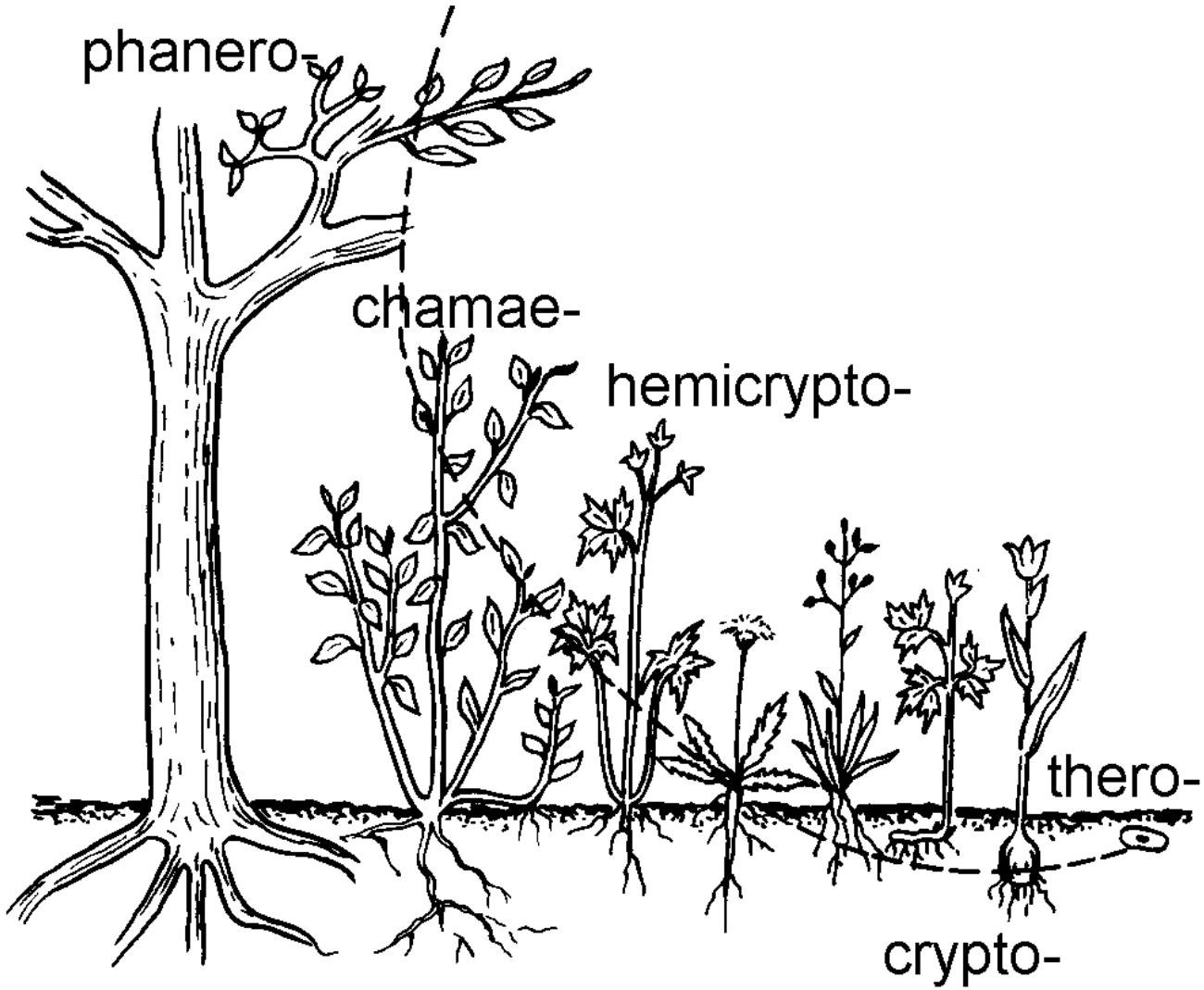
- **Epiphytes**: aboveground plants
- **Phanerophytes**: winter buds openly exposed
- **Chamaephytes**: winter buds under snow
- **Hemicryptophytes**: winter buds on soil surface
- **Cryptophytes**: winter buds in the soil
- **Therophytes**: no winter buds, only seeds

The Raunkiaer system is very useful to characterize the whole *floras*, especially temperate floras

Raunkiaer classification (after Raunkiaer, 1937)



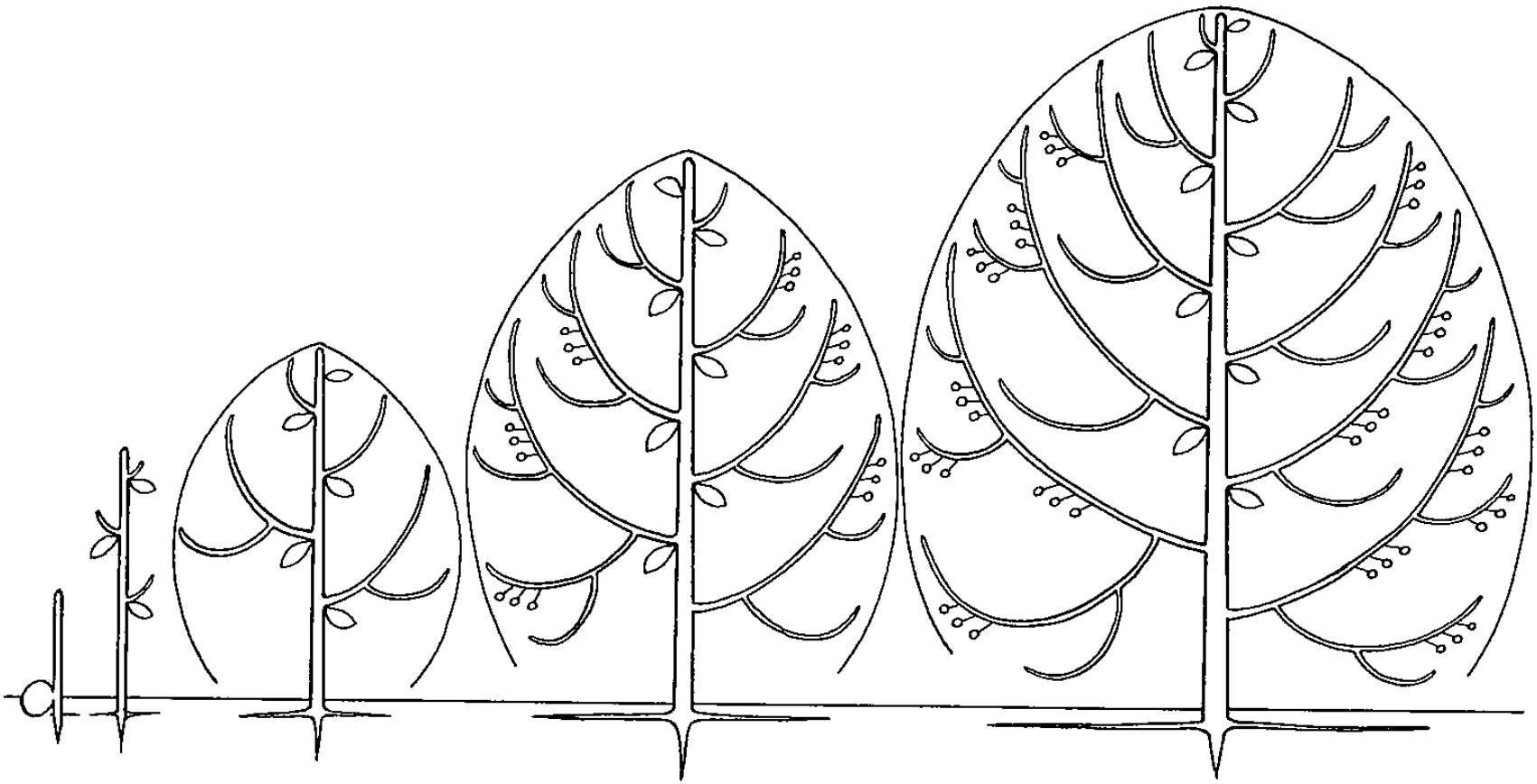
Raunkiaer classification again



Life forms: architectural models

- Developed for tropical trees, but also cover temperate forms which are less diverse
- Each model has a name of famous botanist, e.g. Thomlinson, Cook, Attims
- Based on the character of branching, development of generative shoots, directions of growing

Example of architectural model: Attims



Many temperate trees are growing according to this model

Final question (2 points)

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How is conifer wood different from other types of wood?

Summary

- **Bark** consists of secondary phloem and cork
- **Wood** is a secondary xylem
- Life forms represent different “life styles” of plant

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.
Chapter 5.