

Introduction to Botany. Lecture 33

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1 Questions and answers

- Quiz

2 Branching, thickening and seed

- Diversity of wood
- Life forms
- Modifications of stem / shoot



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 - Quiz

- 2 Branching, thickening and seed
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Questions and answers

Quiz



Final question (2 points)

Define the bark.

- **Bark** = secondary phloem + periderm (optionally, also primary phloem, cortex and epidermis)
- **Bark** is everything outside vascular cambium



Branching, thickening and seed

Diversity of wood



Conifer wood

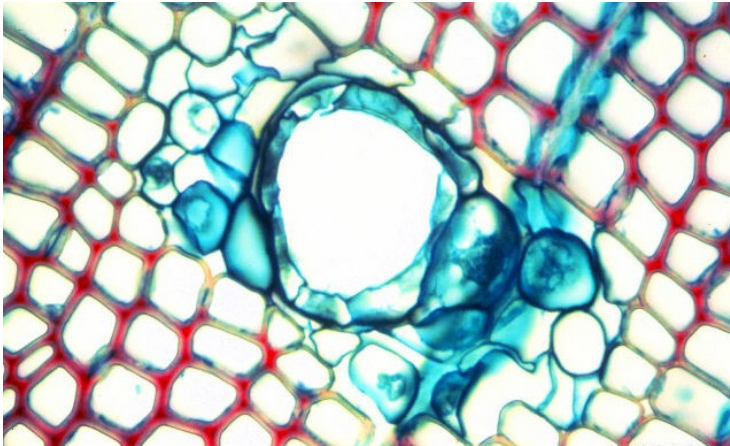
- Simpler structure, few cell types
- Simple rays
- Sometimes have **resin ducts**; resin secreted by epithelial cells



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



Resin duct in pine wood (©BSA)

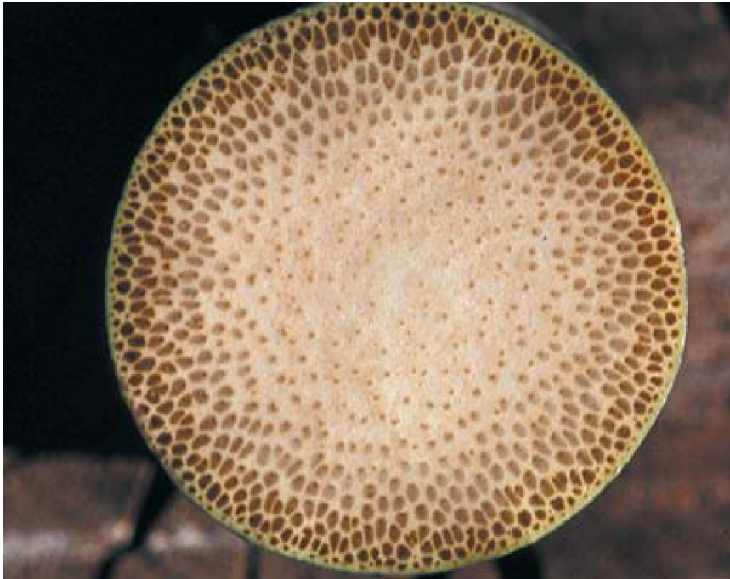


Monocot “wood”

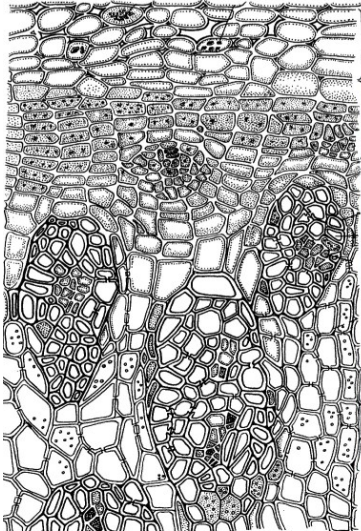
- Most of monocots do not have lateral meristems and therefore have no true wood
- Palms have only primary tissues; their trunk widens from bottom to top
- Some monocots (dragon trees) have **anomalous secondary growth**



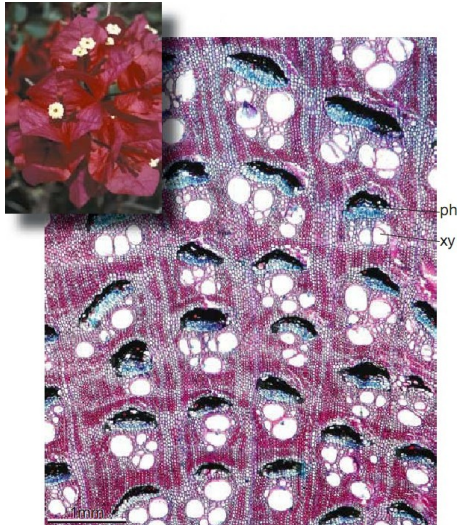
Cross section of palm (*Phoenix canariensis*) trunk



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



Anomalous secondary growth in *Bougainvillea* (*Bougainvillea spectabilis*)



Branching, thickening and seed 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

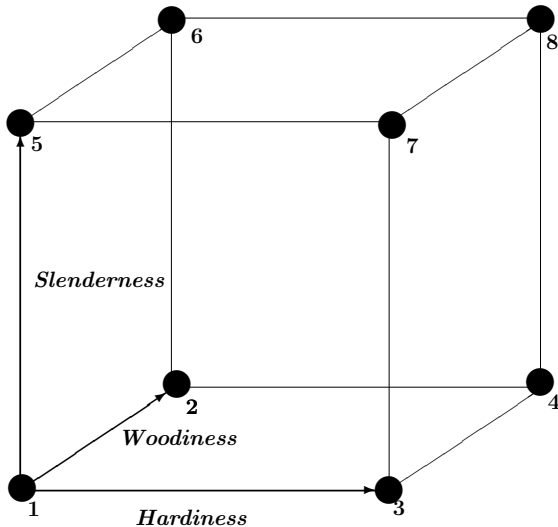


Life forms: dynamic approach

- **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



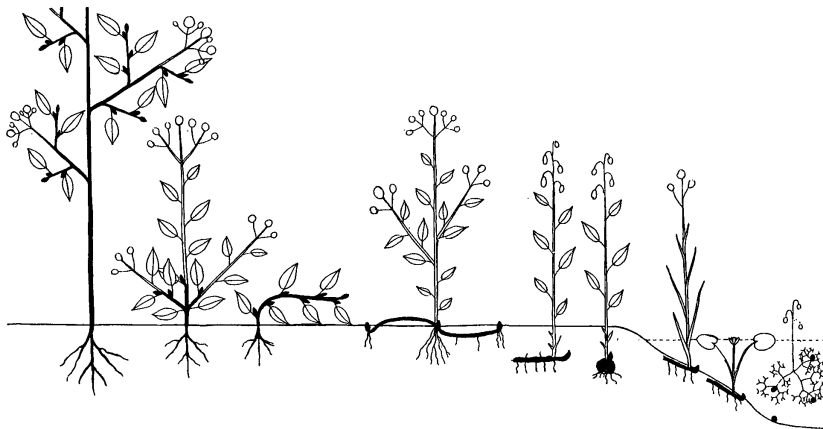
Life forms: Raunkiaer's approach

- **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

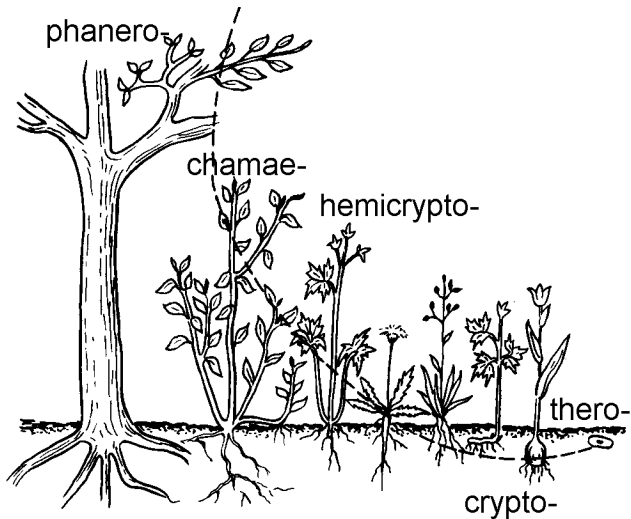
The Raunkiaer system is very useful to characterize the whole *floras*, especially temperate floras



Raunkiaer classification (after Raunkiaer, 1937)



Raunkiaer classification again

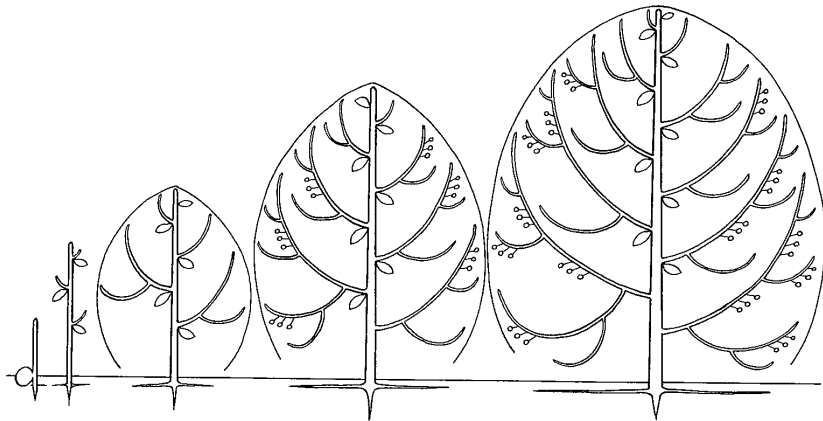


Life forms: architectural models

- 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: Attimis



Many temperate trees are growing according to this model



Branching, thickening and seed

Modifications of stem / shoot

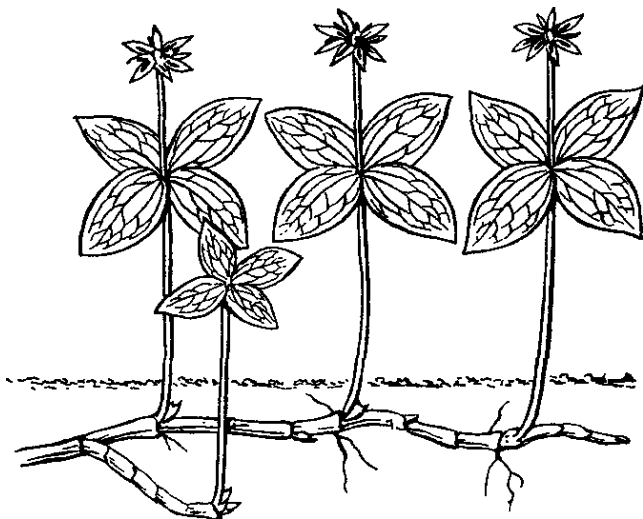


Modifications of shoots and stems

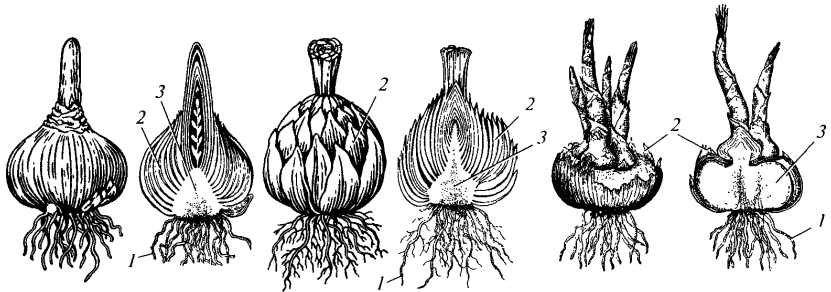
- **Rhizomes**: underground stems
- **Stolons** (runners): aboveground horizontal shoots
- **Tubers**: enlarged portions of rhizomes
- **Bulbs**: storage shoots, leaves $> 50\%$ of volume
- **Corms**: storage shoots, leaves $< 50\%$ of volume
- **Thorns**: defense shoots
- **Spines**: defensive emergencies of stem surface
- **Cladophylls**: leaf-like shoots
- **Stem traps**: catch animals for some carnivorous plants



Rhizome

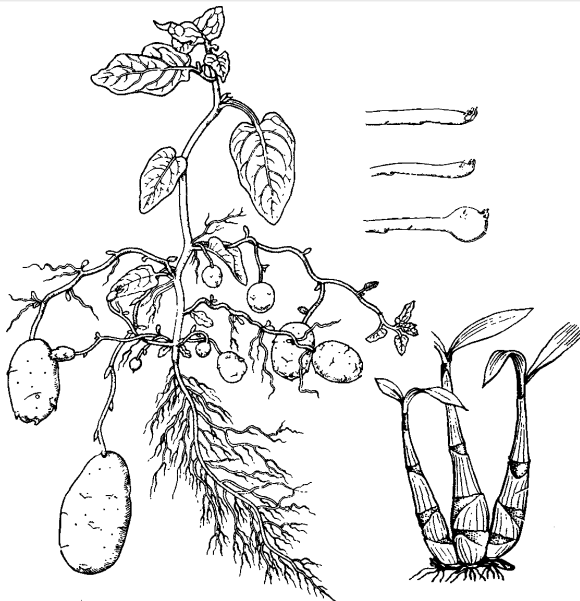


Bulbs and corms



(1) roots, (2) leaves, (3) stems

Tubers: potato and orchids



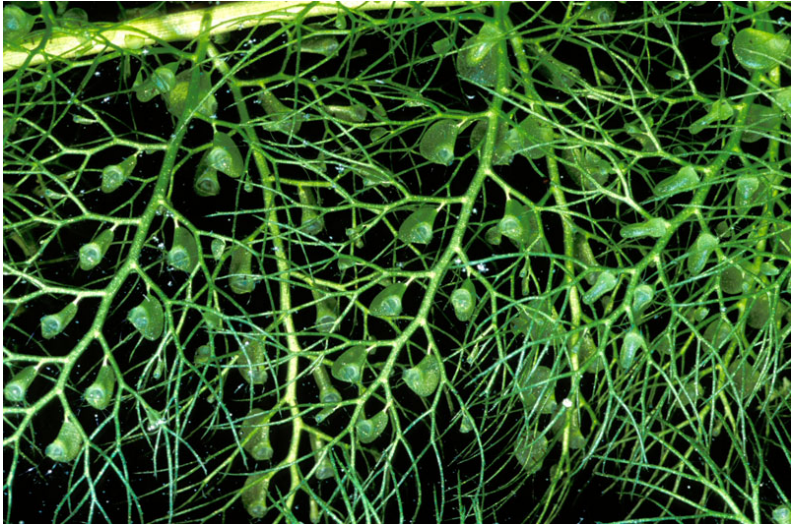
Thorns



Cladophylls: leafy stems



Traps of bladderwort (*Utricularia*)



External function and modifications

Function	Leaf	Stem/shoot	Root
Absorption	Absorption leaves (bromeliads)	Rhizoids	<i>Default</i>
Defense	Spines, scales	Thorns, prickles	Spines
Expansion	Plantlets	Rhizomes, stolons, runners	Adventive buds
Interactions	Traps, sticky epidermis, urns, colored leaves	Traps, insect nests	Hauatoria, mycorrhizae, root nodules, nematode traps, insect nests
Photosynthesis	<i>Default</i> , phyllodes	Cladophylls	Green roots (orchids)
Storage	Succulent leaves, pitchers	Bulbs, corms, tubers	Storage roots
Support	Tendrils, false stems, floats, suckers	<i>Default</i> , tendrils	Buttress, aerial and contractile roots, suckers

Each external function requires a specific modification of organ.



Summary

- Sympodial growth and secondary thickening are both evolutionary advantages.



Final question (2 points)



Final question (2 points)

What is botanical difference(s) between potato vegetable and sweet potato vegetable?



For Further Reading



A. Shipunov.

Introduction to Botany [Electronic resource].

2016.

Mode of access:

http://ashipunov.info/shipunov/school/biol_154

