

# Introduction to Botany. Lecture 33

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## 1 Questions and answers

## 2 Branching and seed

- Life forms
- Modifications of stem / shoot



## 1 Questions and answers

## 2 Branching and seed

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# Previous final question: the answer

What is a ray?



# Previous final question: the answer

What is a ray?

- Parenchyma cells which provide horizontal transport and compensate radial growth



# Branching 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



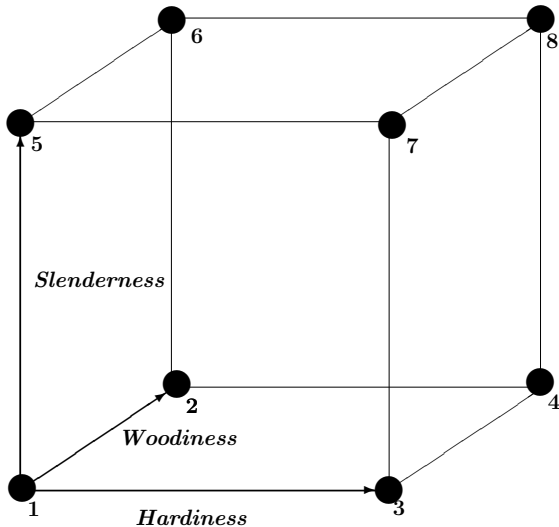
# Life forms: dynamic approach

- **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



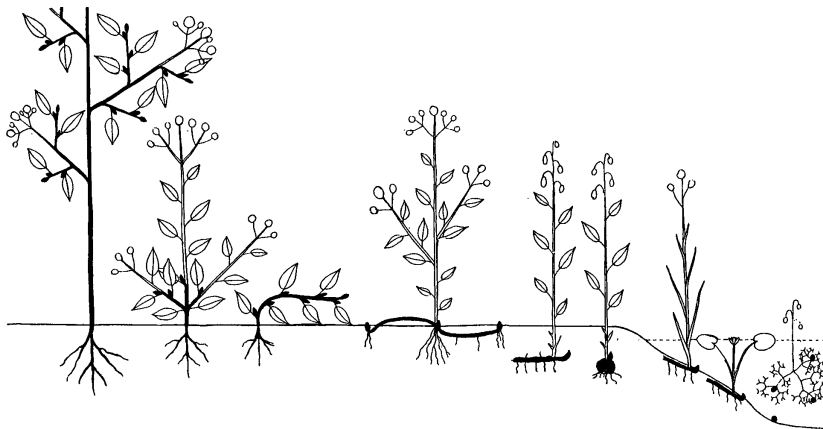
# Life forms: Raunkiaer's approach

- **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

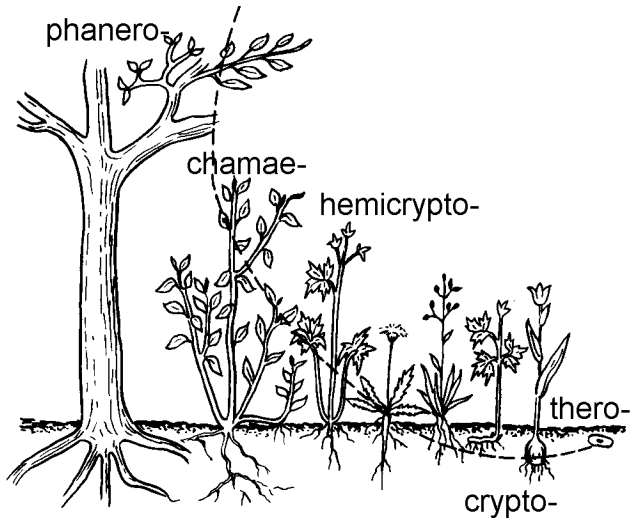
The Raunkiaer system is very useful to characterize the whole *floras*, especially temperate floras



# Raunkiaer classification (after Raunkiaer, 1937)



# Raunkiaer classification again

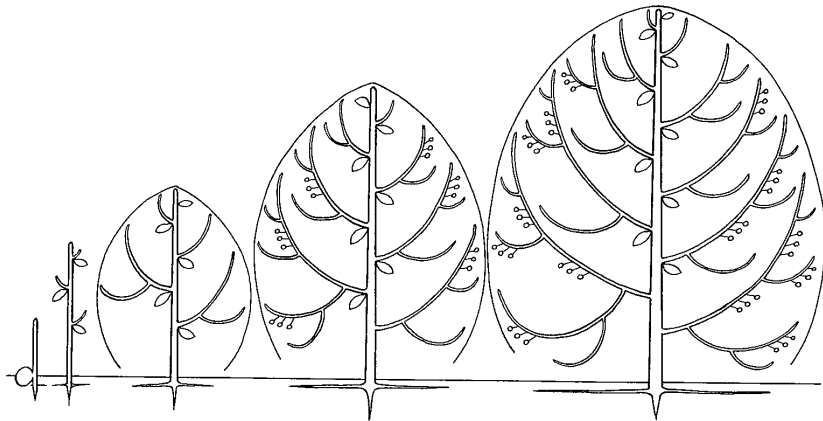


# Life forms: architectural models

- 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 and seed

## Modifications of stem / shoot



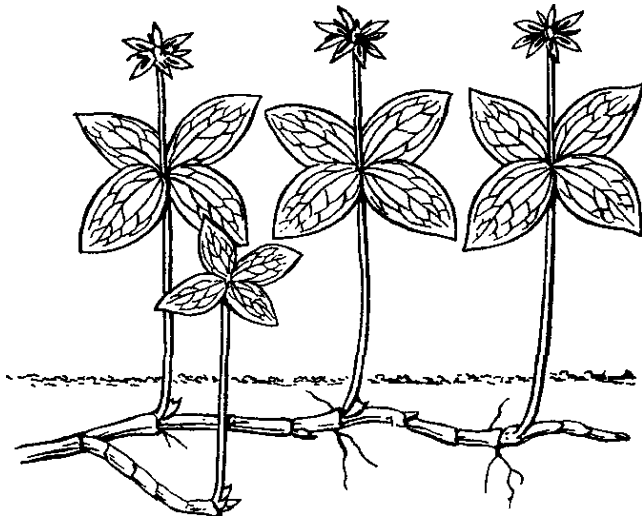
# Modifications of shoots and stems

- **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

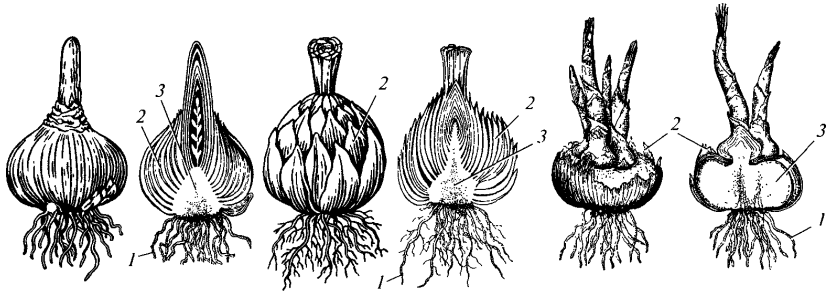




# Rhizome

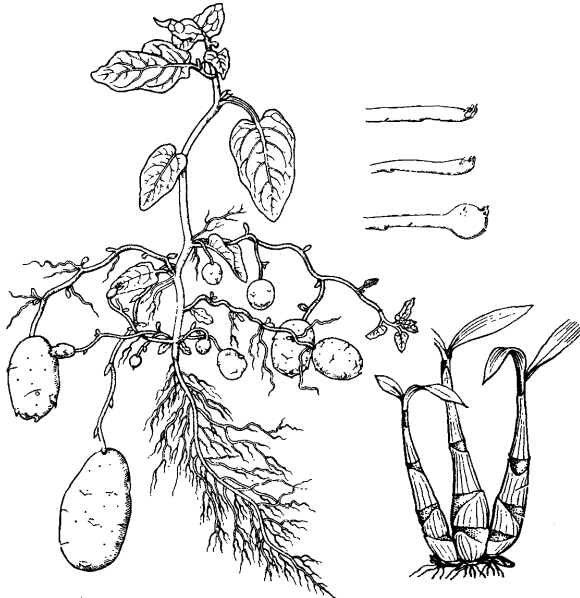


# Bulbs and corms



(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	Haustoria, 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.



# For Further Reading



A. Shipunov.

*Introduction to Botany* [Electronic resource].

2015.

Mode of access:

[http://ashipunov.info/shipunov/school/biol\\_154](http://ashipunov.info/shipunov/school/biol_154)

