

Introduction to Botany. Lecture 22

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October 24, 2016



Outline

1 Questions and answers

- Quiz

2 Tissues

- Step five: pumps. Absorption tissues
- In addition: secretory tissues

3 Leaf

- Leaf in general
- Leaf morphology
- General characters
- Repetitive characters



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Questions and answers

Quiz



Final question (1 point)

What is a difference between tracheids and vessels?



Final question (1 point)

What is a difference between tracheids and vessels?

- Pores vs. perforations
- Slow vs. fast

and so on.



Movie

David Attenborough. Private Life of Plants. Episode 2: Growing.

`https:`

`//en.wikipedia.org/wiki/The_Private_Life_of_Plants`



Tissues

Step five: pumps. Absorption tissues



Poikilo- and homoiohydraulicity

- **Poikilohydric** plants do not save water, they survive even complete desiccation
- **Homoiohydric** plants save water, they always have similar water content and do not survive after desiccation
- Compare with poikilo- and homoiothermic animals (reptiles vs. mammals)



Absorption tissues

- Always primary, simple tissues
- **Rhizodermis**, or root hairs, originates from protoderm, but life span is much shorter than of epidermis
- **Velamen**, originates from root cortex



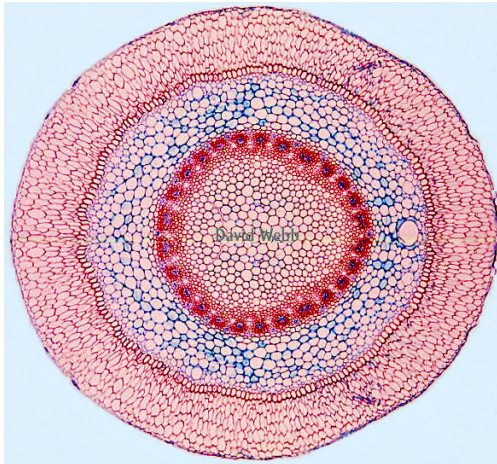
Rhizodermis



Root hairs of grass seedlings (LM)



Velamen



Outer cylinder is a velamen tissue of orchid root (LM)



Tissues

In addition: secretory tissues

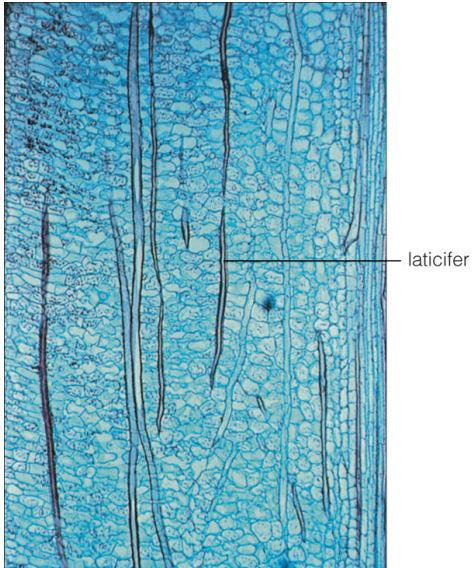


Secretory tissues

- Primary, simple or complex tissues
- Spreading across plant body, concentrating in leaves and young stems
- May secrete latex, volatile oils, mucus and other chemicals
- Functions vary: attraction or dis-attraction, communication, defense etc.



Laticifers



© 2006 Brooks/Cole - Thomson



Leaf

Leaf in general



Definition, functions and features

- Lateral flattened organ of shoot with restricted growth
- Functions:
 - Photosynthesis
 - Respiration
 - Transpiration
 - Synthesis of secondary chemicals
- Features:
 - Have bud in the axil (remember compound leaves)
 - Do not grow by apex
 - Do not produce new leaves
 - Have hierarchical morphology



Leaf

Leaf morphology



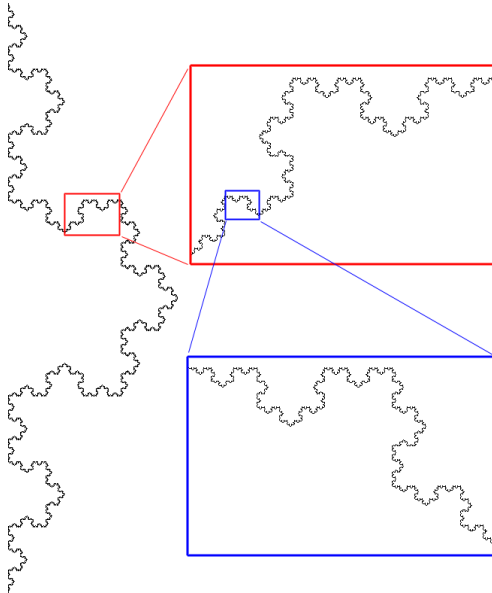
Hierarchy



Fractals are hierarchical, with levels

 $n = 0$  $n = 1$  $n = 2$  $n = 3$  $n = 4$ 

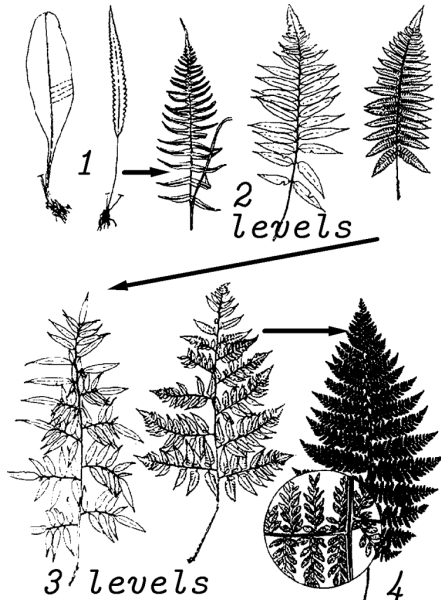
Fractals are self-similar



Fractals could be just like plants



And leaves could be just like fractals, with levels



Types of leaf characters

- General: applicable only to the whole leaf
- Terminal: applicable only to the terminals (e.g., terminal leaflets)
- Repetitive: repeating on each level of hierarchy



Hierarchy in leaf morphology

- **General** and **terminal** characters do not depend on hierarchy
- **Repetitive** characters may be different on each step of hierarchy
- Therefore, leaf description should state that “on first level of hierarchy, the shape is ..., on the second level, the shape is ...”
- It is possible that each level has different repetitive characters



Leaf

General characters



General characters

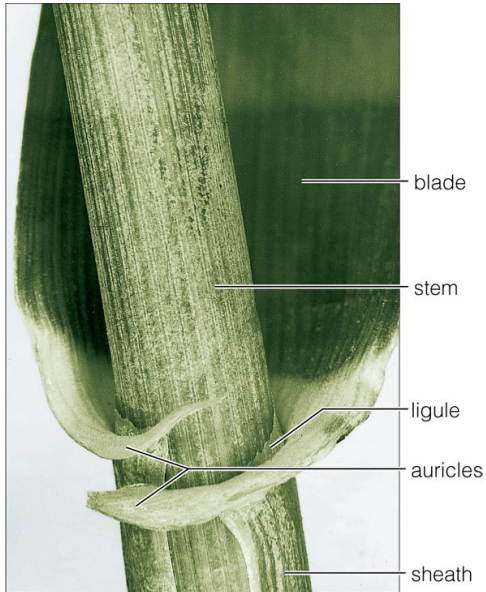
- General characters apply to the whole leaf
- Stipules (present or not, how many etc.)
- Other leaf base organs (sheath, ocrea, ligules etc.)



Stipules



Leaf base



Leaf

Repetitive characters



Repetitive characters

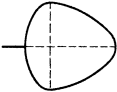
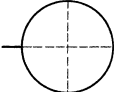
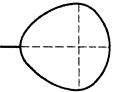
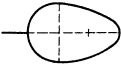
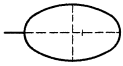
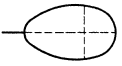

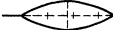
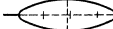

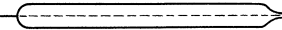
Repetitive characters are the same on each level of leaf hierarchy:

- Shape
- Dissection
- Petiole (stalked/non-stalked etc.)






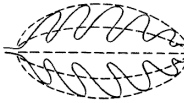


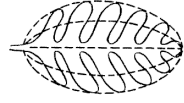
Repetitive characters of same type may combine



Shape

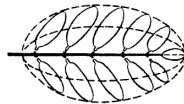
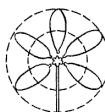
	Maximum width closer to leaf base	Maximum width in the middle	Maximum width closer to the apex
Length = width or slightly more	 Deltate	 Circular	 Cuneate
Length > 1-1.5 x width	 Ovate	 Elliptic	 Obovate
Length > 3-4 x width	 Narrowly ovate	 Lanceolate  Oblong	 Narrowly obovate
Length > 5 x width	 Linear		

Dissection

		Tri-	Palmately	Pinnately
Simple leaves	Lobed (from 1/4 to 3/4)			
				
	Dissected (from 3/4 to midrib)			

Compound leaves

(leaflets stalked, with joints)



Summary

- Leaves have **general**, **repetitive** and **terminal** characters



Final question (2 points)



Final question (2 points)

What are difference(s) between homoiohydric and poikilohydric plants?



For Further Reading



A. Shipunov.

Introduction to Botany [Electronic resource].

2016.

Mode of access:

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

