

Introduction to Botany. Lecture 21

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1 Questions and answers

2 Leaf

- Leaf morphology
 - General characters
 - Repetitive characters
 - Terminal characters
- Leaves in nature



1 Questions and answers

2 Leaf

- Leaf morphology
 - General characters
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Previous final question: the answer

Please give an example of the complex secondary tissue.



Previous final question: the answer

Please give an example of the complex secondary tissue.

- Periderm
- Phloem or xylem



Leaf

Leaf morphology



Definition, functions and features

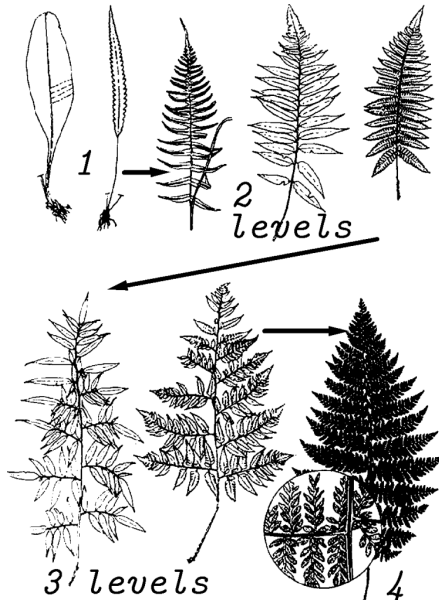
- Lateral flattened organ of shoot with restricted growth
- Functions:
 - Photosynthesis
 - Respiration
 - Transpiration
 - Synthesis of secondary chemicals
- Features:
 - Have bud in the axil
 - Do not grow by apex
 - Do not produce new leaves
 - Have hierarchical morphology



Hierarchy



Hierarchical levels in leaf morphology



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



General characters

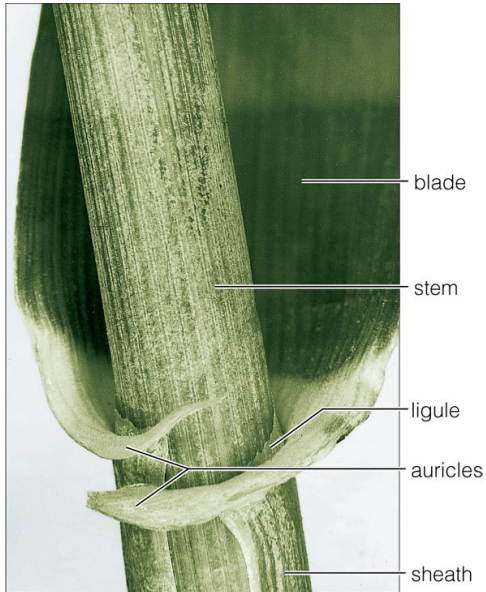
- General characters apply to the whole leaf
- Stipules (present or not, how many etc.)
- Other leaf base organs (sheath, ocrea, ligules etc.)



Stipules



Leaf base



Repetitive characters

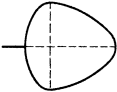
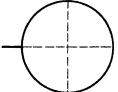
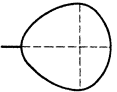
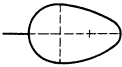
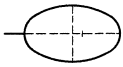
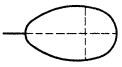

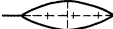
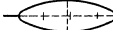

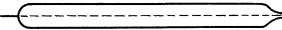
Repetitive characters are the same on each level of leaf hierarchy:

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


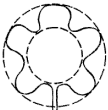






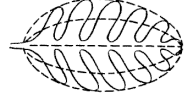
Repetitive characters of same type may combine



Shape

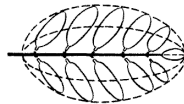
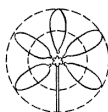
	Maximum width closer to leaf base	Maximum width in the middle	Maximum width closer to the apex
Length = width or slightly more	 Deltate	 Circular	 Cuneate
Length > 1-1.5 x width	 Ovate	 Elliptic	 Obovate
Length > 3-4 x width	 Narrowly ovate	 Lanceolate  Oblong	 Narrowly obovate
Length > 5 x width	 Linear		

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)



Terminal characters

Terminal (leaflet) characters are applicable only to terminal parts (normally, leaflets) of leaves:

- Form of base
- Form of tip
- Type of margin
- Surface
- Venation



Terminal characters: base of leaf blade

- Rounded
- Truncate (straight)
- Cuneate
- Cordate
- Sagittate



Terminal characters: leaf apex

- Rounded
- Mucronate
- Acute
- Obtuse
- Acuminate
- Retuse



Terminal characters: leaf margin

- Without teeth: smooth
- With teeth
 - Dentate
 - Serrate
 - Crenate
- Could be double-dentate, triple-serrate etc.



Terminal characters: leaf venation

Main vein Lateral veins	No	One	Several
	Apodromous	Hypho-	Acro-
Several	Acrodromous	Ptero-	Actino-



Leaf

Leaves in nature



Heterophyly

- Juvenile and adult leaves
- Water and air leaves
- Sun leaves and shade leaves



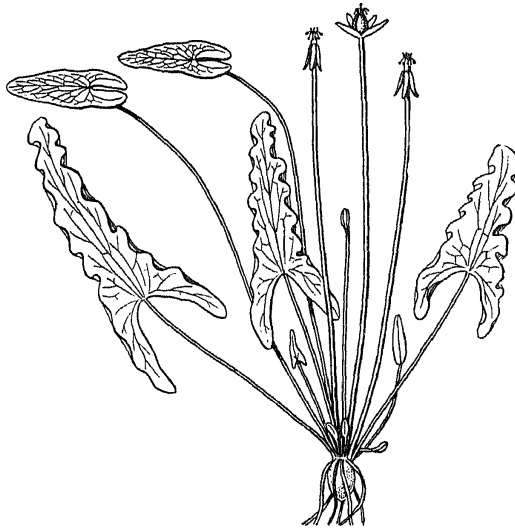
Juvenile leaves of *Juniperus* sp.



Juvenile leaves of *Eucalyptus* sp.



Submerged and floated leaves of *Ondinea*



Leaf mosaic

- Distribution of leaves of plants in a single plane, usually perpendicular to light rays
- Provides the least shading of leaves by one another



Leaf mosaic of red maple (*Acer rubrum*)

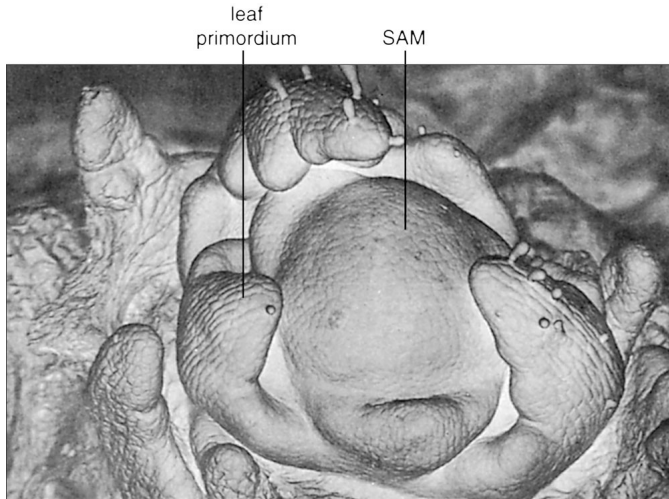


Seasonal life of leaves

- Leaves arise from SAM through leaf primordia
- Old leaves separate from plant in a region called abscission zone



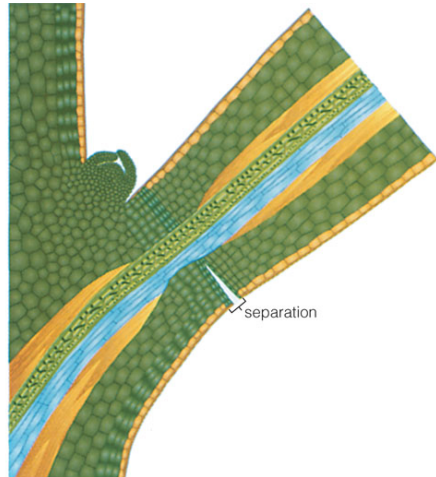
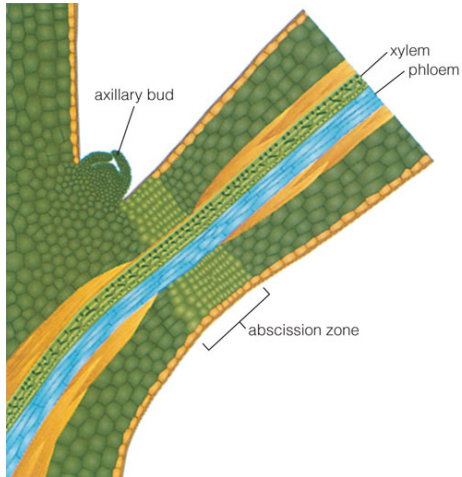
Leaf primordia



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Abscission zone



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Final question (2 points)



Final question (2 points)

How many levels of hierarchy has this leaf?



Summary

- Leaves have **general**, **repetitive** and **terminal** characters
- **Heterophylly** is a co-existence of different types of leaves on the same plant
- **Abscission zone** helps the separation of leaf at the end of season



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 6.

