

Introduction to Botany

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Lecture 23

1

Leaf

- Leaf morphology
- Leaves in nature
- Modifications of leaf

Leaf

Leaf morphology

Plan of leaf description

- Ⓐ General characters (leaf as a whole):
 - A. stipules (present / absent, deciduous / not);
 - B. base (sheath / no sheath, ligule / no ligule, auricles / no auricles)
- Ⓑ First level of hierarchy: repetitive characters:
 - A. symmetry (symmetrical / asymmetrical);
 - B. shape;
 - C. dissection;
 - D. petiole (length)
- Ⓒ Second level of hierarchy
- Ⓓ Third level of hierarchy and so on
- Ⓔ Terminal characters (leaflets):
 - A. base [of leaf blade] (rounded, truncate, cuneate, cordate, sagittate);
 - B. apex (rounded, mucronate, acute, obtuse, acuminate, retuse);
 - C. margin (whole, dentate, serrate, crenate; degree of order);
 - D. surface (color, hairs etc.);
 - E. venation (apo-, hypho-, acro-, ptero-, actinodromous)

Leaf

Leaves in nature

Heterophyly

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

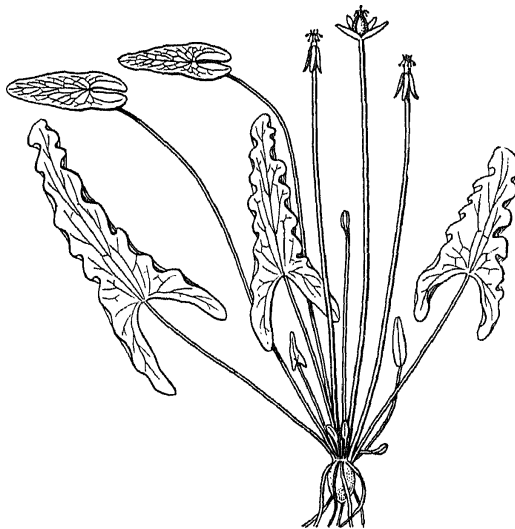
Juvenile leaves of *Juniperus* sp.



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

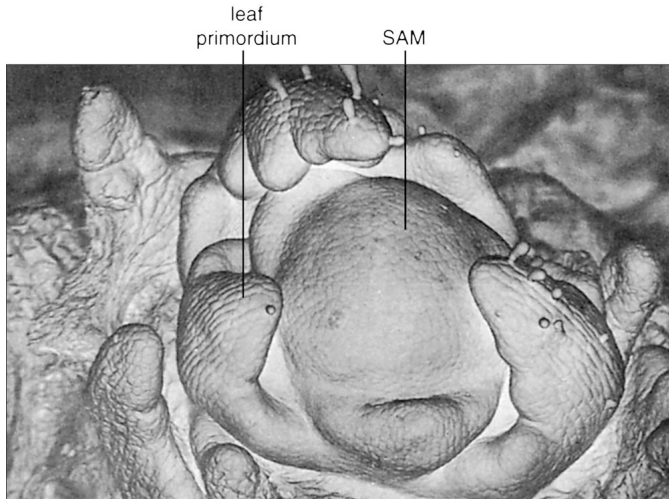
Leaf mosaic of red maple (*Acer rubrum*)



Seasonal life of leaves

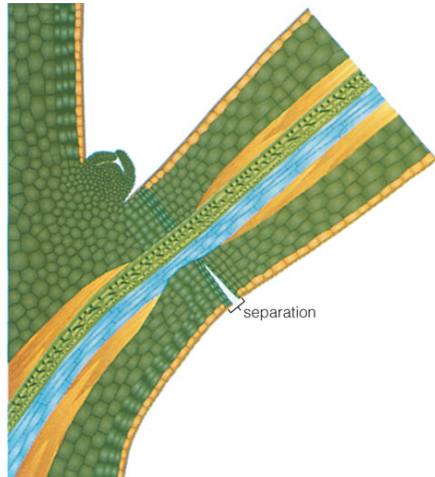
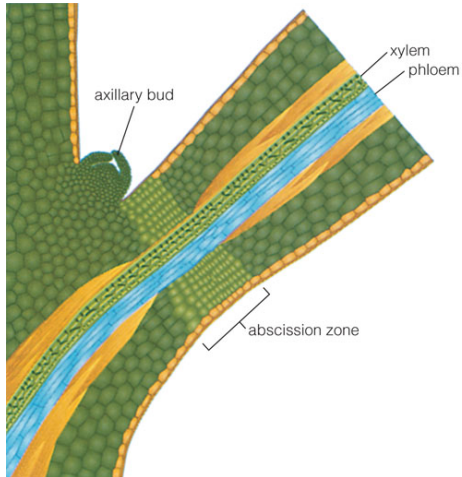
- Leaves arise from SAM through leaf primordia
- Old leaves separate from plant in a region called abscission zone

Leaf primordia



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Abscission zone



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Leaf

Modifications of leaf

Goethe's theory of modification



Famous German poet and writer Johann Wolfgang Goethe is also a founder of plant morphology. He invented an idea of “primary plant” (“Urpflanze”) where all organs were modifications of one primordial organ.

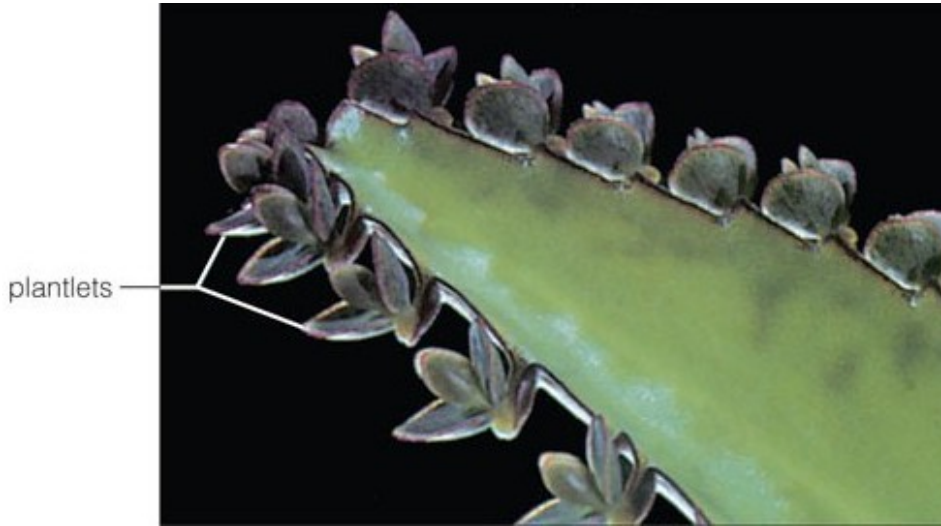
Leaf modifications

- Spines
- Tendrils
- Succulent leaves
- Traps
- Plantlets

Tendrils of sweet pea (*Lathyrus odoratus*)



Plantlets on the leaf of *Kalanchoe pinnata*



Leaf of Venus flytrap (*Dionaea muscipula*)



Everything is possible when plant needs nitrogen!

Venus flytrap in work

Urn leaf of yellow pitcher plant (*Sarracenia flava*)



Sarracenia flava on Buttercup Fields, Mississippi



Prey in the urn



Urn leaf of purple pitcher plant (*Sarracenia purpurea*)



Hairs prevent insects from climbing out of leaf

“Cobra Lily” (*Darlingtonia californica*)



Sticky tape leaf of butterwort (*Pinguicula* sp.)



Leaf margins are slowly rolling

Sticky tape/trap leaf of sundew (*Drosera intermedia*)



Leaves are constantly open and close and finally digest the glued insects

Table of modifications

<i>Function</i>	Stem / shoot	Leaf	Root
Expansion		Plantlets	
Storage		Succulent leaves	
Photosynthesis		DEFAULT	
Defense		Spines, scales	
Support		Leaf tendrils	
Interactions		Traps, “sticky tapes”, urns	

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

Quiz question (... points)

Quiz question (... points)

For Further Reading



A. Shipunov.

Introduction to Botany [Electronic resource].

Mode of access:

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