

Introduction to Botany. Lecture 10

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September 20th, 2010

Outline

- 1 Monday test
- 2 Leaf morphology
 - Terminal characters
 - Leaves in nature
- 3 Leaf anatomy
 - Typical leaf

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Monday test (5 points)

1 Name four basic plant organs

Monday test (5 points)

- 2 What is the difference between vegetative and generative shoot systems?

Monday test (5 points)

- 3 What is the next formula of spiral phyllotaxis after $\frac{3}{8}$ and $\frac{5}{13}$?

Monday test (5 points)

- 4 Which life form is prevalent in North Dakota—phanerophytes or cryptophytes?

Monday test (5 points)

5 What is the botanical name of organs like potato?

Hierarchy in leaf morphology

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

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: whole
- With teeth
 - Dentate
 - Serrate
 - Crenate
- Could be double-dentate, triple-serrate etc.

Terminal characters: leaf venation

Main vein Lateral veins	No	One	Several
No	Apodromous	Hypophyllous	Acro-
Several	Acrodromous	Pterophyllous	Actinophyllous

Heterophylly

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

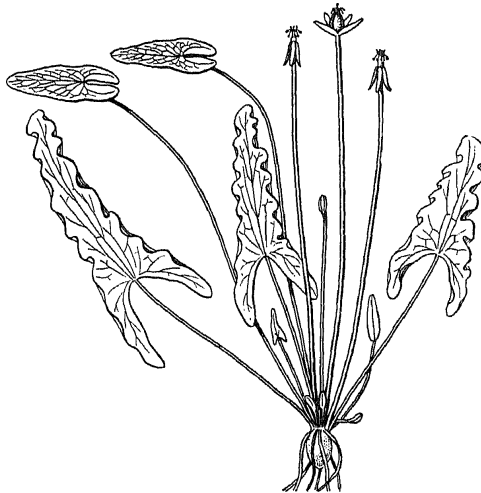
Juvenile leaves of *Juniperus* sp.



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

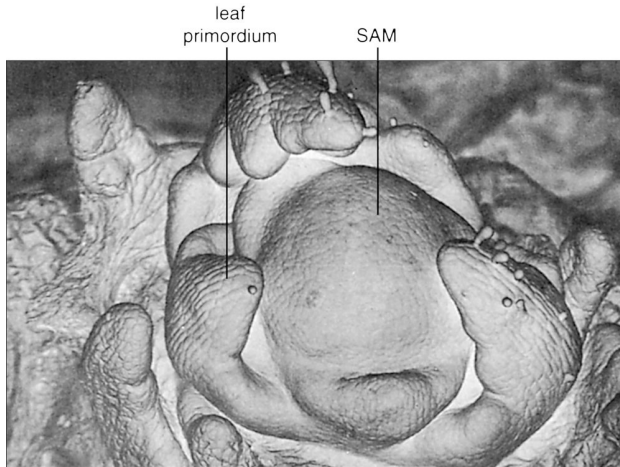
Leaf mosaic of red maple (*Acer rubrum*)



Seasonal life of leaves

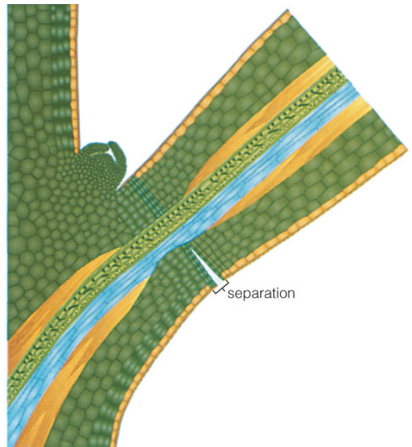
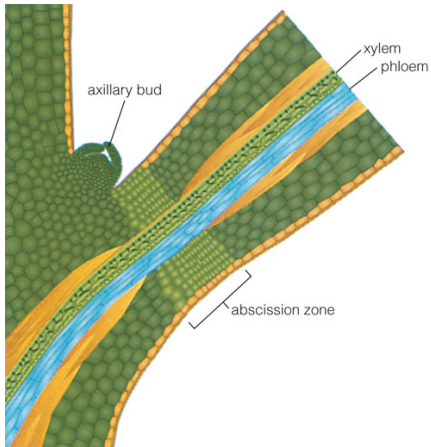
- Leaves arise from SAM through leaf primordia
- Old leaves separate from plant in a region called abscission zone

Leaf primordia



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Abscission zone



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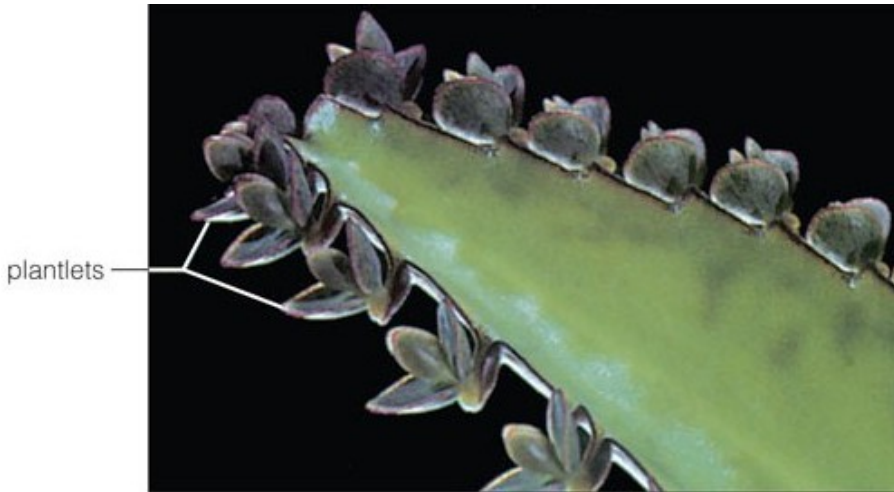
Leaf modifications 1

- Spines
- Tendrils
- Bulbs
- Plantlets

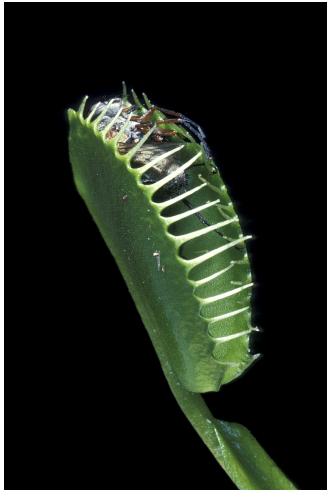
Tendrils of sweet pea (*Lathyrus odoratus*)



Plantlets on the leaf of *Kalanchoe pinnata*



Leaf of Venus flytrap (*Dionaea muscipula*)



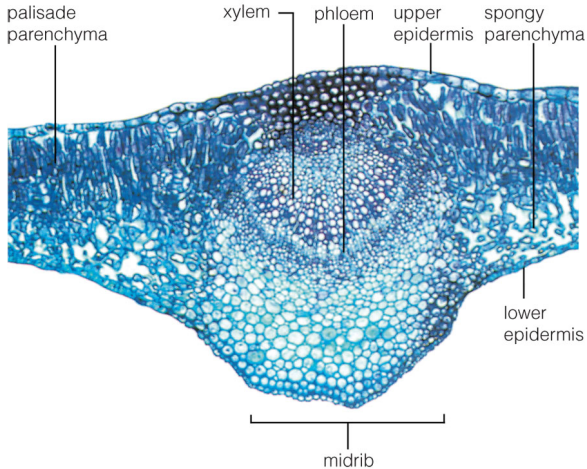
Leaf modifications 2

<i>Function</i>	Stem	Leaf	Root	FU
Expansion	Rhizomes, stolons	Plantlets		
Storage	Bulbs, corms, tubers	Bulbs		
Photosynthesis	Cladophylls	DEFAULT		
Defense	Thorns	Spines		
Support	DEFAULT	Tendrils		
Insect catching	Traps	Traps		

General leaf anatomy

- Epidermis with stomata
- Mesophyll
- Vascular bundles, or veins

Lilac (*Syringa vulgaris*) leaf in cross-section



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Epidermis and stomata

- Covered with cuticle
- Include stomata with guard cells and (often) subsidiary cells and trichomes
- Opening of stomata is a result of exchange of K^+ , osmosis and uneven cell wall
- Lower epidermis in most cases contain more stomata

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
- *Osmotic processes in guard cells* result in opening and closing of stomata

For Further Reading



Th. L. Rost, M. G. Barbour, C. R. Stocking, T. M. Murphy.
Plant Biology. 2nd edition.
Thomson Brooks/Cole, 2006.
6.1-6.4.