

Introduction to Botany. Lecture 11

Alexey Shipunov

Minot State University

September 22th, 2010

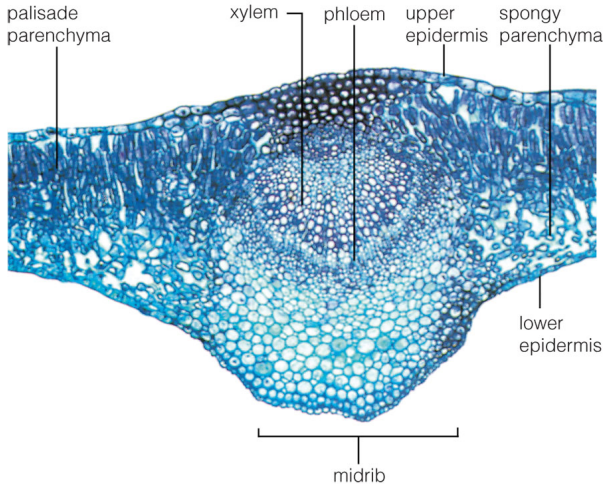
Outline

- 1 Leaf anatomy
 - Typical leaf
 - Ecological adaptations of leaves

General leaf anatomy

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

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

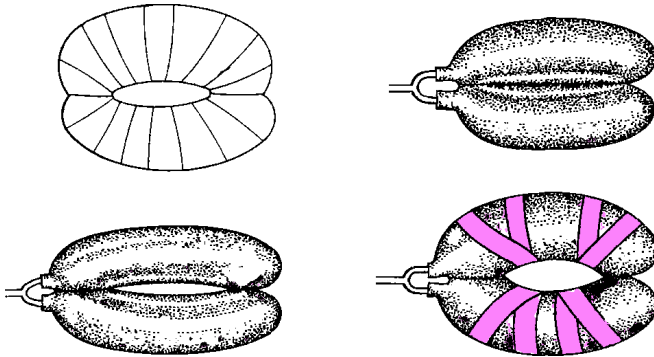


© 2006 Brooks/Cole - Thomson

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

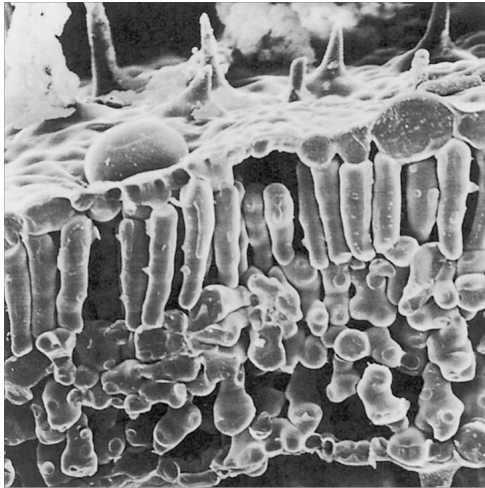
Stomata as balloons



Mesophyll

- Palisade mesophyll consists of tightly arranged elongated cells with less chloroplasts*
- Spongy mesophyll consists of loosely attached cells rich of chloroplasts*

Palisade and spongy cells



© 2006 Brooks/Cole - Thomson

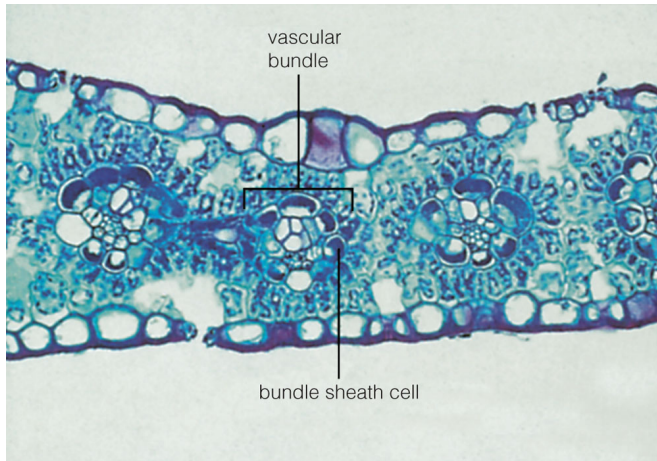
palisade
mesophyll

spongy
mesophyll

Veins/vascular bundles

- Phloem typically faces downwards, xylem—upwards
- Bundles of C_4 -plants have additional bundle sheath cells

Bundle sheath cells



© 2006 Brooks/Cole - Thomson

Plants and water

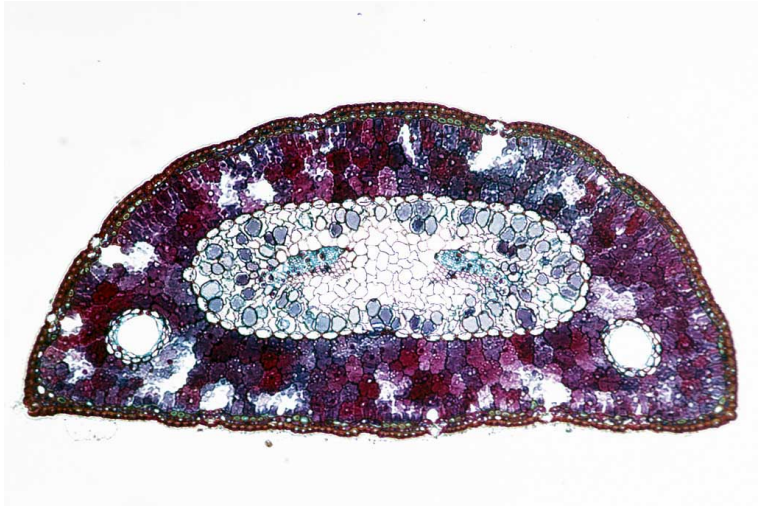
- Xerophytes: sclerophytes and succulents (stem and leaf)
- Mesophytes
- Hygrophytes
- Hydrophytes

Leaf succulent (*Crassula argentea*)



mesophyll
cells

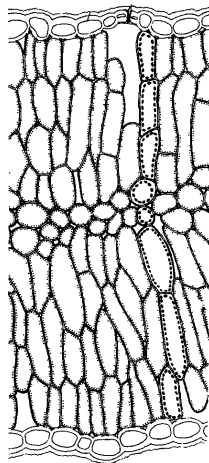
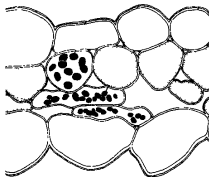
Xerophyte leaf—needle of pine (*Pinus contorta*)



Plants and light

- Sciophytes
- Heliophytes

Sciophyte and heliophyte

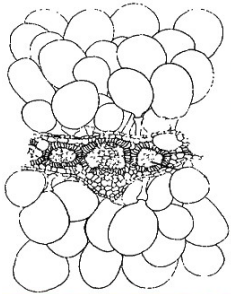


Oxalis acetosella and *Sylphium laciniatum*

Plants and soil

- Halophytes (accumulate, excrete or avoid NaCl)
- Nitrate halophytes (grow on soils rich of NaNO_3)
- Oxylophytes (grow on acidic soils)
- Calciphytes (grow on chalk soils rich of CaCO_3)

Leaf of salt-accumulating halophyte



Atriplex prostrata

Plants and substrate

- Psammophytes (grow on sand)
- Petrophytes (grow on rocks)
- Rheophytes (grow in fast springs)

Rheophyte



Rhyncholacis penicillata from Venezuela

Plants and methabolism

- Mycoparasites
- Hemiparasites
- Phytoparasites (root and stem)

Mycoparasite



Triuris hyalina from South America

Hemiparasite



Krameria parvifolia from southern Texas

Root parasite



Hydnora africana from South Africa

Stem parasite 1



Cuscuta europaea from Germany

Stem parasite 2



Pilostyles thurberi from southern California

Summary

- *Osmotic processes in guard cells* result in opening and closing of stomata
- The differentiation of mesophyll to **palisade** and **spongy** cells helps to acquire different types of light rays

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.