

Introduction to Botany. Lecture 21

Alexey Shipunov

Minot State University

October 23, 2017



1 Questions and answers

- Quiz
 - Phloem
- Secondary cover: periderm
- Step five: pumps. Absorption tissues
- In addition: secretory tissues



Questions and answers

Quiz



Final question (2 points)

What are secondary tissues?



Final question (2 points)

What are secondary tissues?

- Tissues originated from lateral meristems.

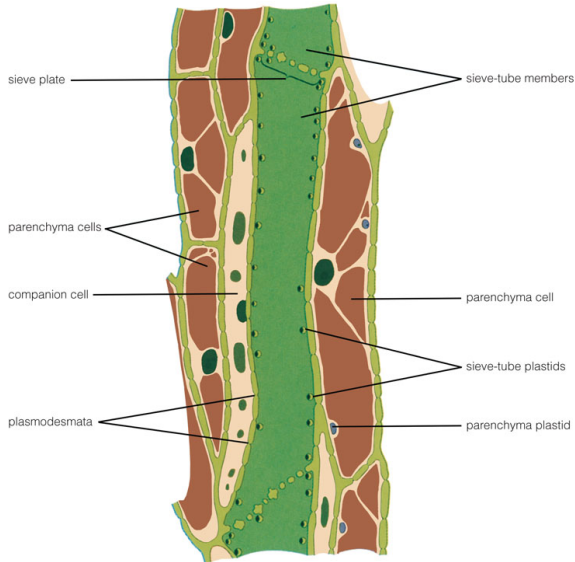


Phloem

- Usually occurs adjacent to a xylem
- Types of cells: **sieve tube cells**, **companion cells**, **fibers** and **parenchyma**
- Sieve tube cells have plastids and perforation (sieve) plates between cells but no nuclei, companion cells have nuclei
- However, in gymnosperms there are *no* companion cells and sieve tube cells *have* nuclei
- Secondary phloem usually has more fibers than primary phloem
- Main functions: sugar transport and mechanical support



Phloem cell types



© 2006 Brooks/Cole - Thomson



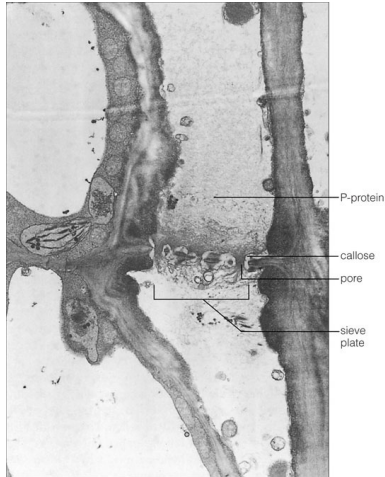
Sieve tubes and phloem parenchyma



© 2006 Brooks/Cole - Thomson



Perforation (sieve) plate

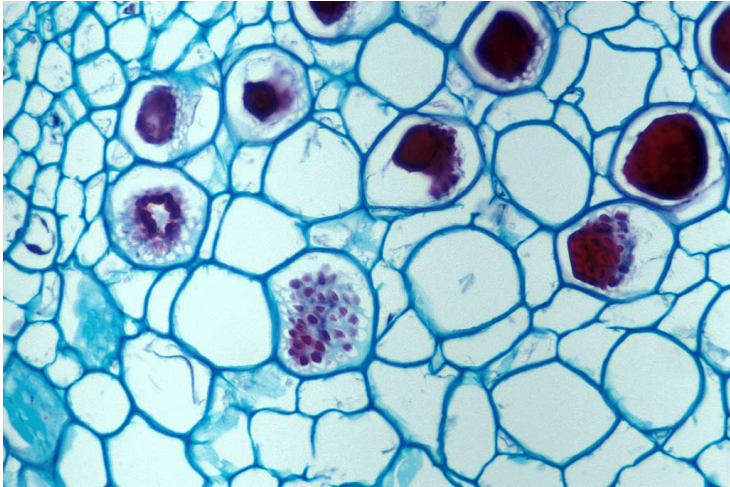


© 2006 Brooks/Cole - Thomson

Cross-section (TEM)



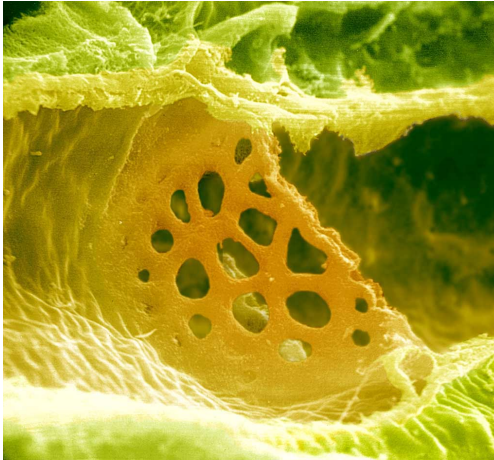
Perforation plates: frontal view



Frontal view (LM)



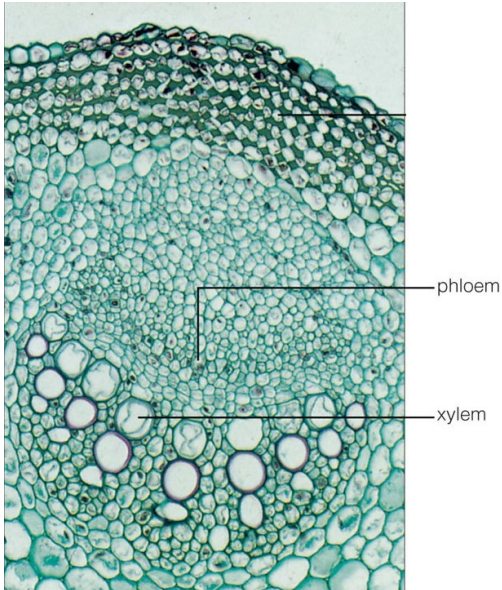
Plates: pores



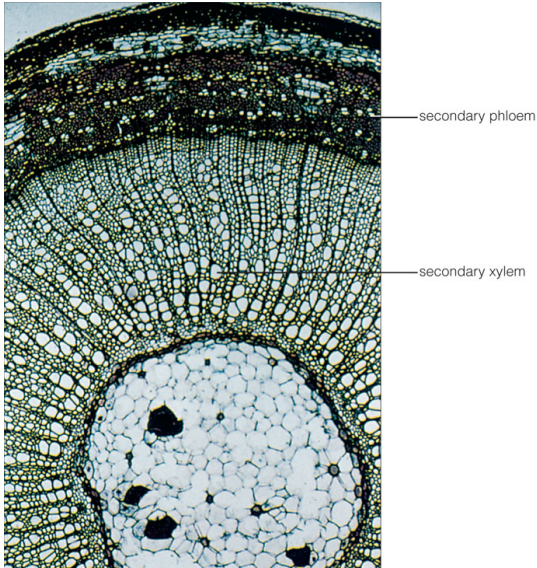
Sieve plate, a pore in the end wall of a sieve-tube member, through which phloem sap flows (SEM $\times 4800$)



Primary vascular tissues



Secondary vascular tissues



© 2006 Brooks/Cole - Thomson



Questions and answers

Secondary cover: periderm

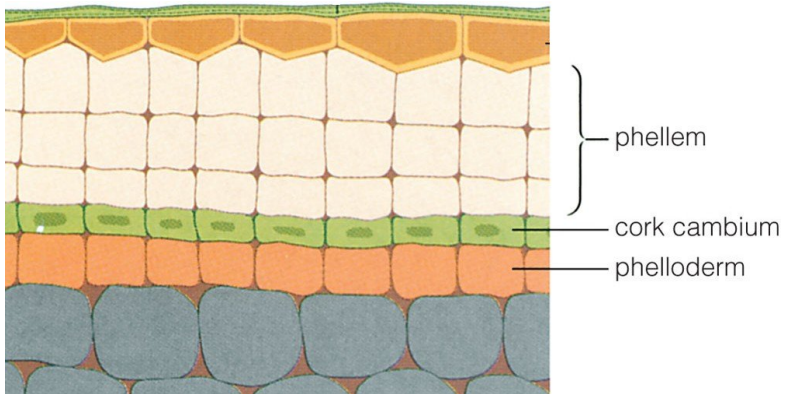


Secondary dermal tissue: Periderm

- Secondary dermal tissue
- Arises inside the stem ground tissue (cortex), closer to surface
- Complex tissue: includes phellem (cork in the strict sense), cork cambium (phellogen), and phelloderm
- Old periderm includes some other tissues and becomes a bark
- Cells of phellem are dead cells rich of suberin
- Main function is defense



Three cell types of periderm



Cork cambium is another lateral meristem; *phellem* and *phelloderm* are main components of periderm



Questions and answers

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



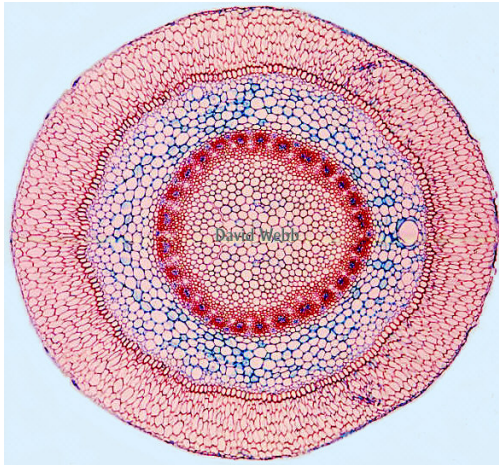
Rhizodermis



Root hairs of grass seedlings (LM)



Velamen



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



Questions and answers

In addition: secretory tissues

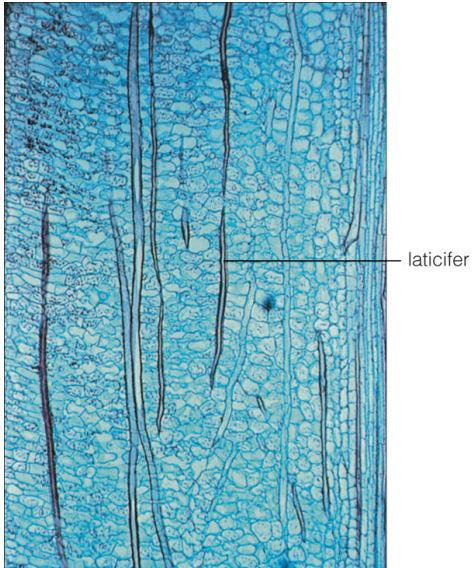


Secretory tissues

- 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



Summary

- **Epidermis** is a complex tissue which includes stomata
- **Collenchyma** and **sclerenchyma** are simple supportive tissues
- **Secondary tissues** originate from lateral meristems (i.e., cambium)
- **Xylem vs. phloem:**
 - **State:** dead vs. living cells
 - **Transport:** water vs. sugar
 - **Direction:** up vs. down
 - **Biomass:** big vs. small



Final question (3 points)



Final question (3 points)

Name 3 differences between xylem and phloem.



For Further Reading



A. Shipunov.

Introduction to Botany [Electronic resource].

Mode of access:

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

