

Introduction to Botany. Lecture 17

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1 Questions and answers

2 Tissues

- Origin of tissues
- Step two: skeleton. Supportive tissues
- Step three: construction sites. Meristems



1 Questions and answers

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Results of Exam 2: statistic summary

Summary:

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.	NA's
24.00	45.00	59.00	60.38	78.00	104.00	4

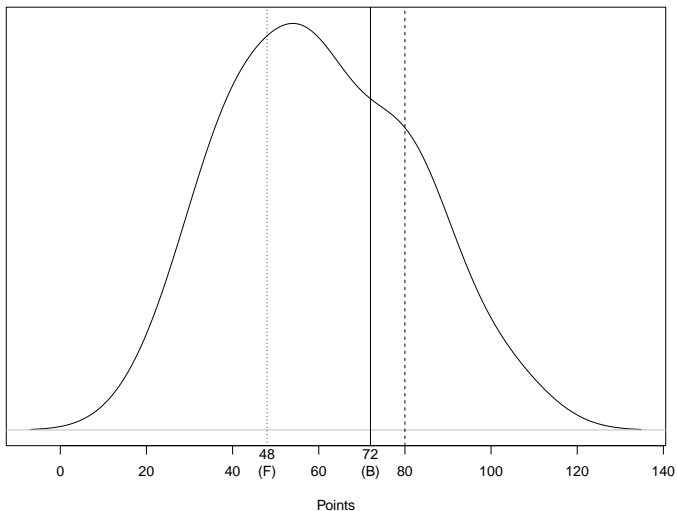
Grades:

F	D	C	B	max
48	56	64	72	80



Results of Exam 2: the curve

Density estimation for Exam 2 (Biol 154)



1. Two motile but unequal cells fused during syngamy. How to call these cells?
 - A. “+” and “-”
 - B. **Male and female**
 - C. Spermatozoon and oocyte
 - D. All of above

26. If meiosis takes place in an organism with a $2n$ number of 48, how many pairs of homologous chromosomes will be at the end of meiosis?
 - A. 48
 - B. 24
 - C. **0**
 - D. 12



Previous final question: the answer

How are plant tissues different from animal tissues?



Previous final question: the answer

How are plant tissues different from animal tissues?

- Live on land vs. hunting
- Epidermis with cuticle and stomata + parenchyma vs. kinoblast + phagocytoblast
- Sometimes complex vs. (almost) always simple



Tissues

Origin of tissues



Origin of tissues and organs of plants: first steps

- Plants went on land:
 - ① To escape from competition
 - ② To escape from predators
 - ③ To obtain several times more more light
 - ④ To escape from temperature-gases conflict
- To prevent drying, they develop a “plastic bag” (**epidermis** with cuticle) and regulated pore system (stomata)
- The rest of their body was parenchyma (main, or ground tissue)



More about plants₂ classification

- Mosses (Bryophyta)
- Ferns and allies (Pteridophyta)
- Seed plants (Spermatophyta)
 - Conifers (Pinopsida)
 - Some other classes of seed plants
 - Angiosperms (Magnoliopsida)
 - Monocots (Liliidae)
 - Other subclasses of angiosperms (together: “dicots”)



Tissues

Step two: skeleton. Supportive tissues

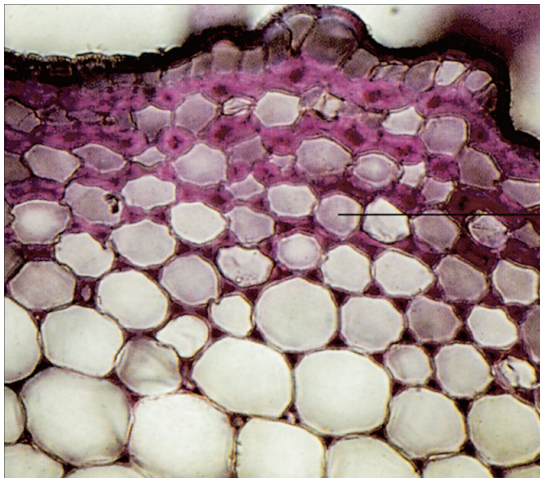


Collenchyma: living supportive tissue

- Elongated cells
- Thick primary cell wall (pectins + cellulose)
- Main functions: mechanical support of young stems and leaves



Angled collenchyma



collenchyma cell

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Collenchyma cells of marigold (*Calendula officinalis*)

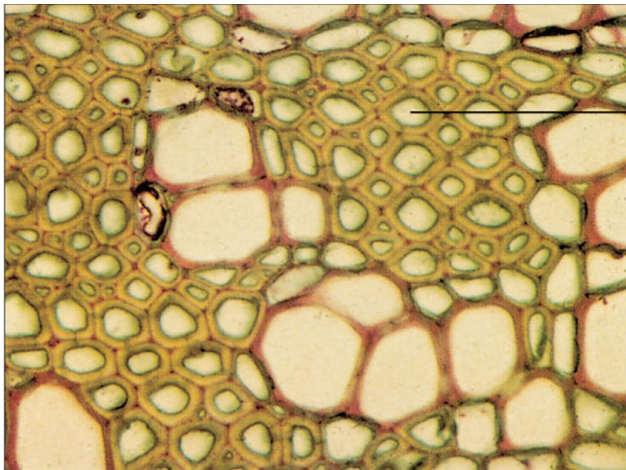


Sclerenchyma: dead supportive tissue

- Long cells (sclerenchyma fibers) or short crystal-like cells (sclereids)
- Dead cells with thick secondary cell wall, rich of lignin
- Supports weight of older plant organs, makes fruits non-edible before they become rip, makes stems firm



Sclerenchyma fibers



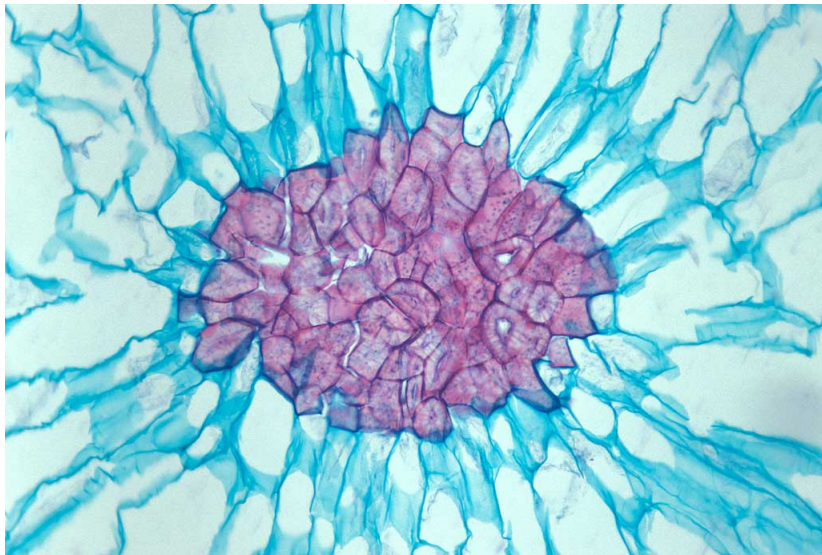
fiber

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Cross-section of sclerenchyma fibers in geranium (*Pelargonium* sp.)



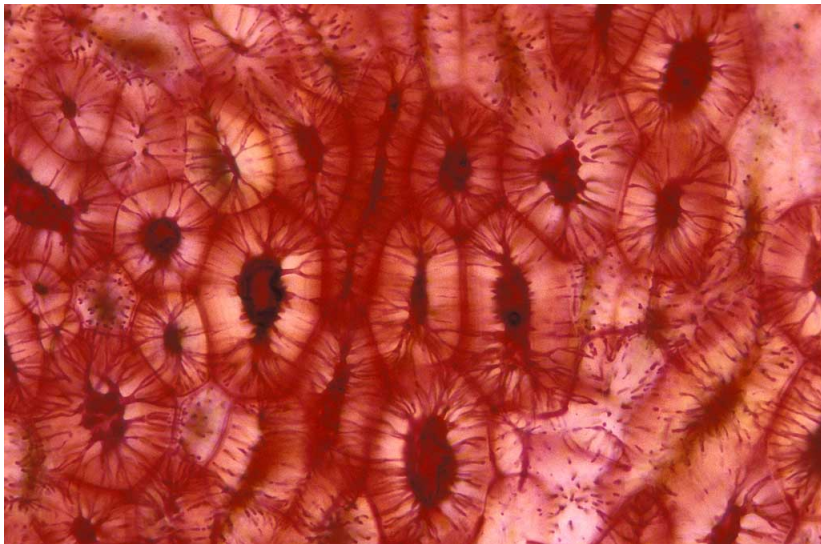
Stone cells



Stone cells (kind of sclereids) in pear fruit (*Pyrus communis*)



Sclereids from cherry pit



Sclereids from cherry (*Prunus* sp.) pit (LM $\times 400$)



Tissues

Step three: construction sites. Meristems

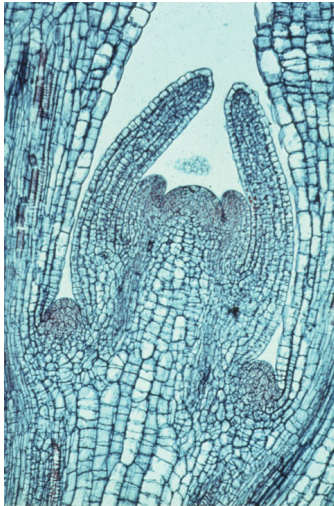


Meristems: apical

- Centers of plant development
- Locate on the very ends of roots (RAM) and shoots (SAM)
- Produce intermediate primary meristems which form all primary tissues



SAM

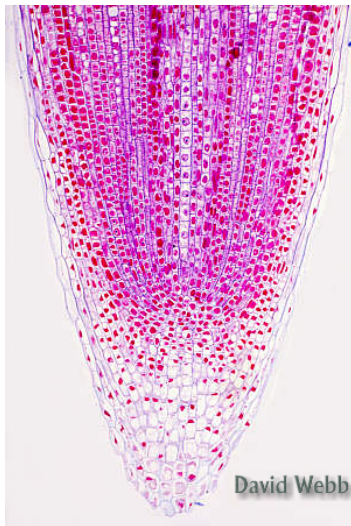


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Coleus sp. stem apical meristem (LM $\times 100$); primordia (embryonic leaves) are visible.



RAM



Corn (*Zea mays*) root apical meristem (© D. Webb)



Lateral meristem: cambium

- Originates from procambium which in turn originates from apical meristems
- Usually arises between two vascular tissues
- Main function: thickening. Produces secondary vascular tissues



Primary and secondary tissues

- Primary tissues originate from stem or root apex through primary meristems
- Secondary tissues originate from lateral meristems



Additional meristems

- **Intercalary** meristems: locate in stems, regulates stem elongation
- **Marginal** meristems are leaf-specific, they regulate leaf shape
- **Repair** meristems help to cure wounds, they form buds and roots in unusual places



Final question (2 points)



Final question (2 points)

What is the difference between collenchyma and sclerenchyma?



Summary

- **Collenchyma** and **sclerenchyma** are simple supportive tissues
- **Secondary tissues** originate from lateral meristems (i.e., cambium)



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 4.

