

# **Organization of the Plant Body:**

## **Plant Cells and Tissues**

**Flower/  
Fruit**

Flower

**Terminal Bud**

Node

Internode

Axillary

**Axillary Bud**

Terminal  
bud of  
branch

Vegetative  
branch

**Leaf**

Petiole

Blade

**Stem**

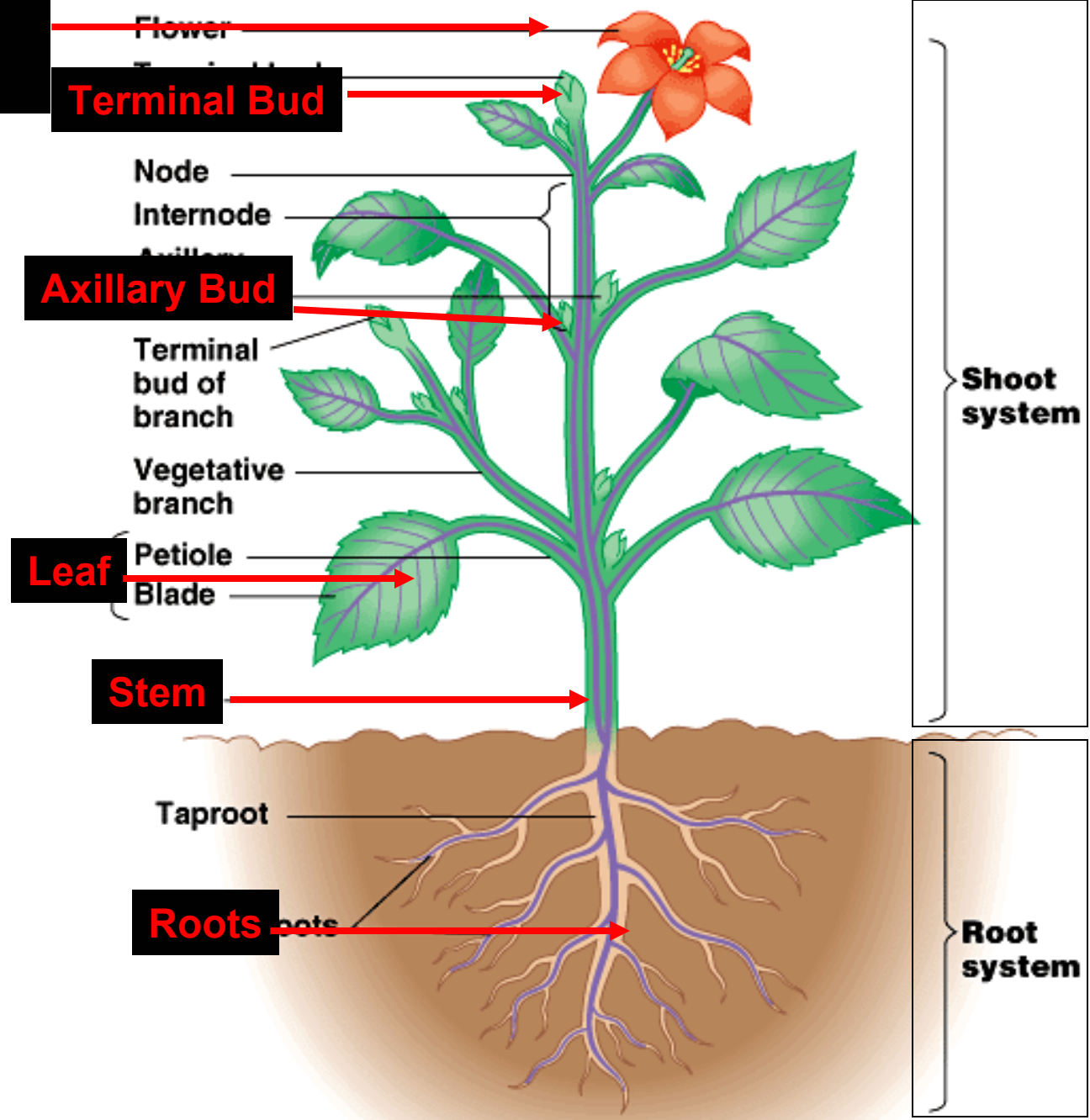
Taproot

**Roots**

Roots

**Shoot  
system**

**Root  
system**



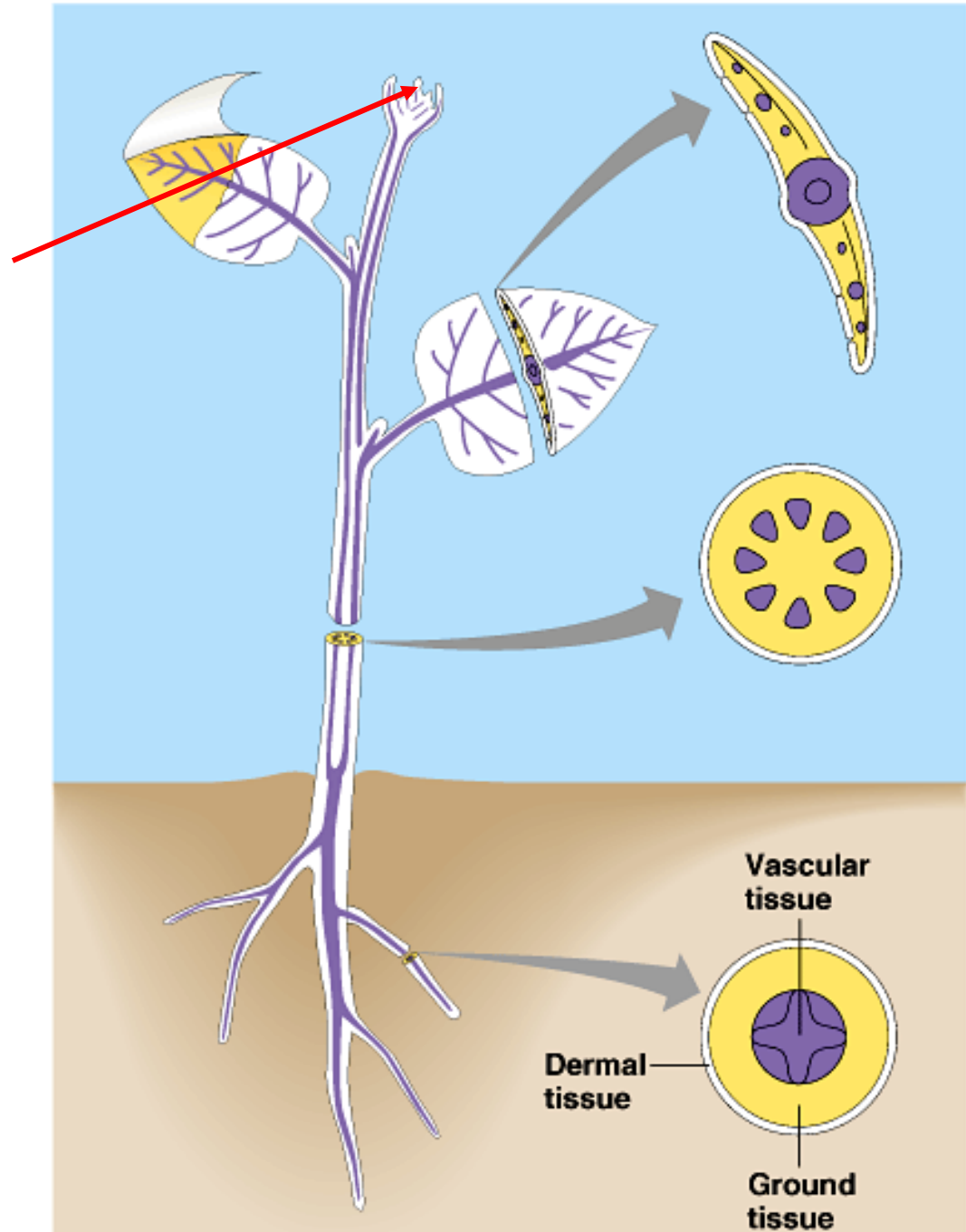
# Plant Tissues

**Meristematic tissue**

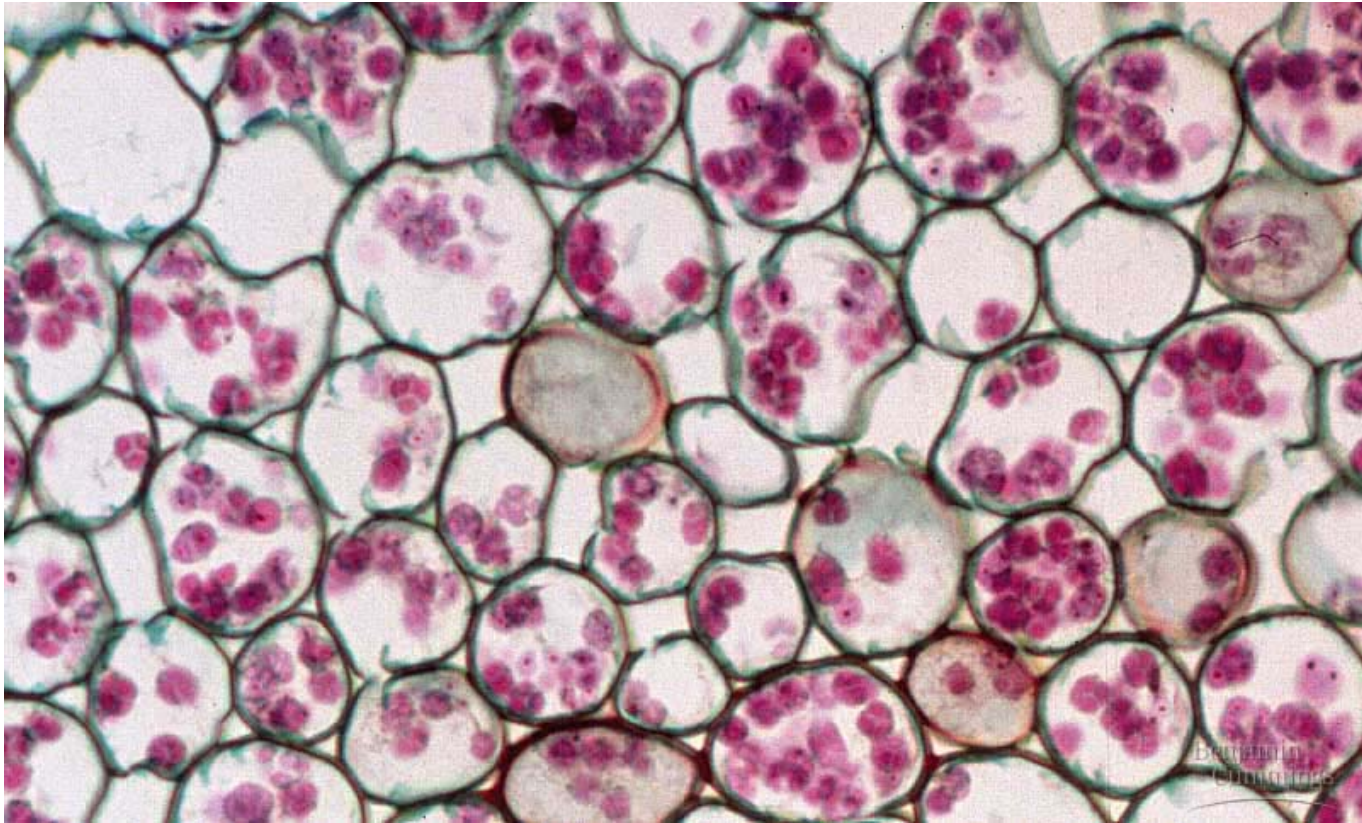
**Dermal tissue**

**Vascular tissue**

**Ground tissue**

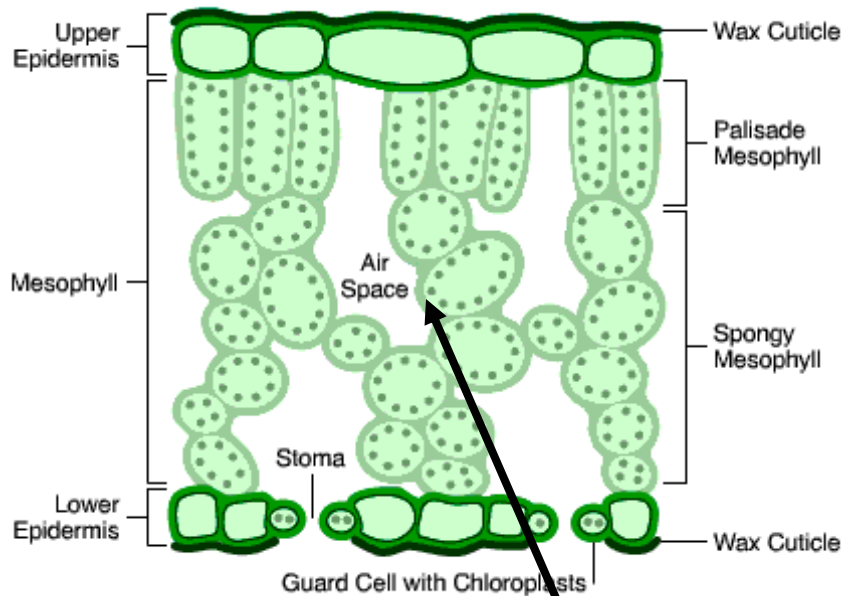


# Parenchyma



# Parenchyma locations:

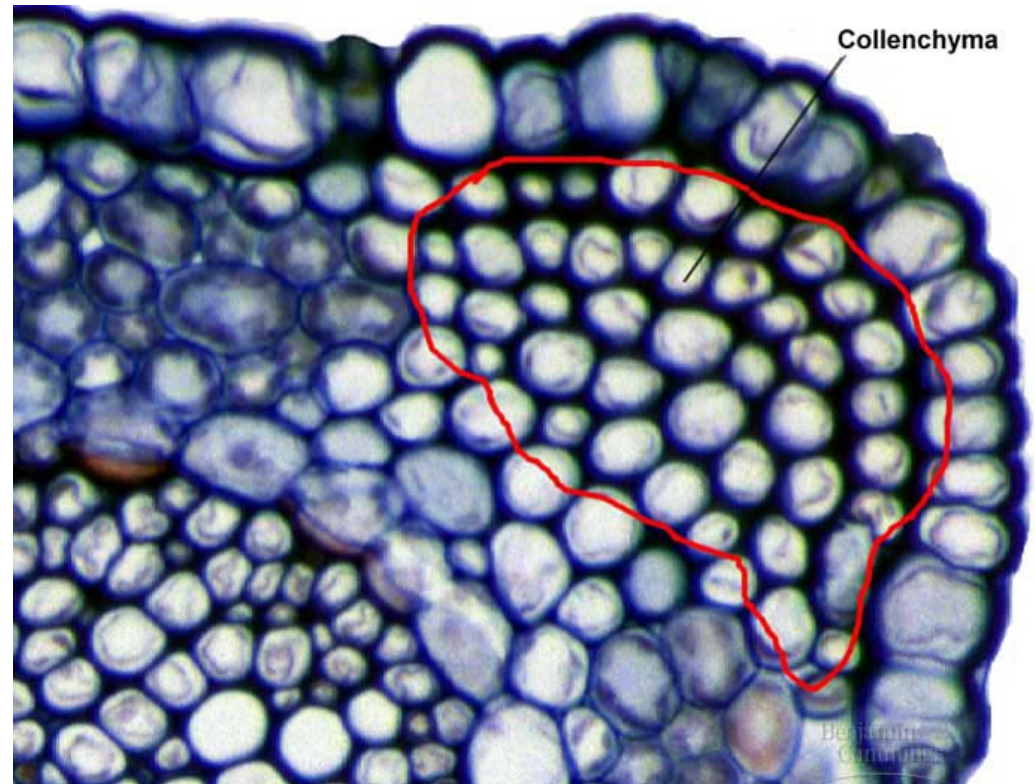
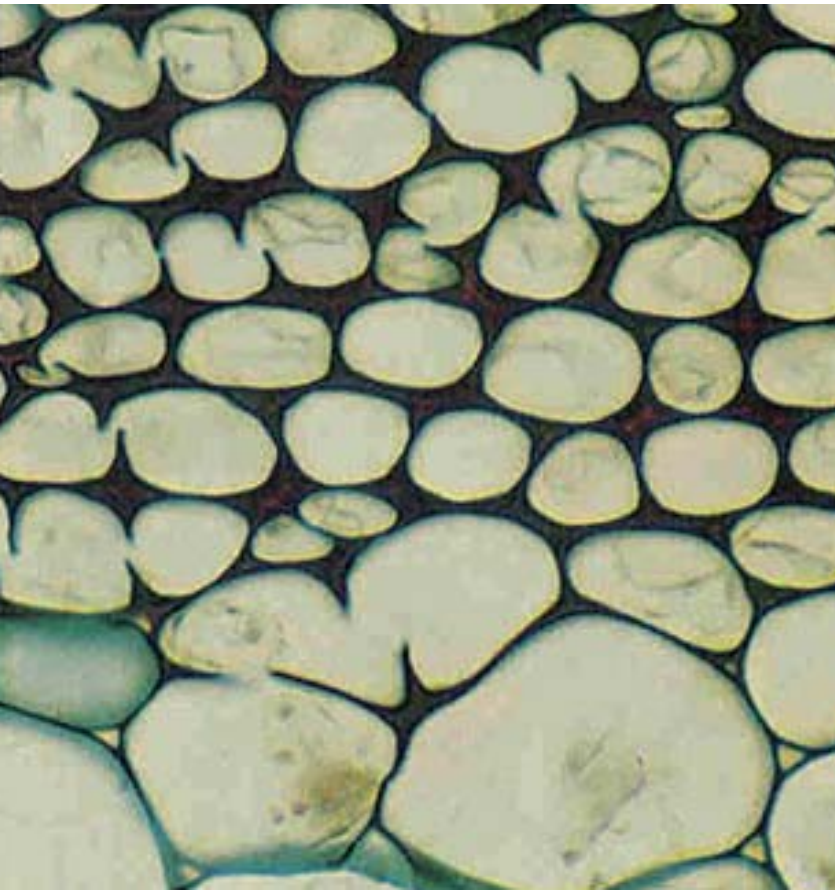
**Cortex**



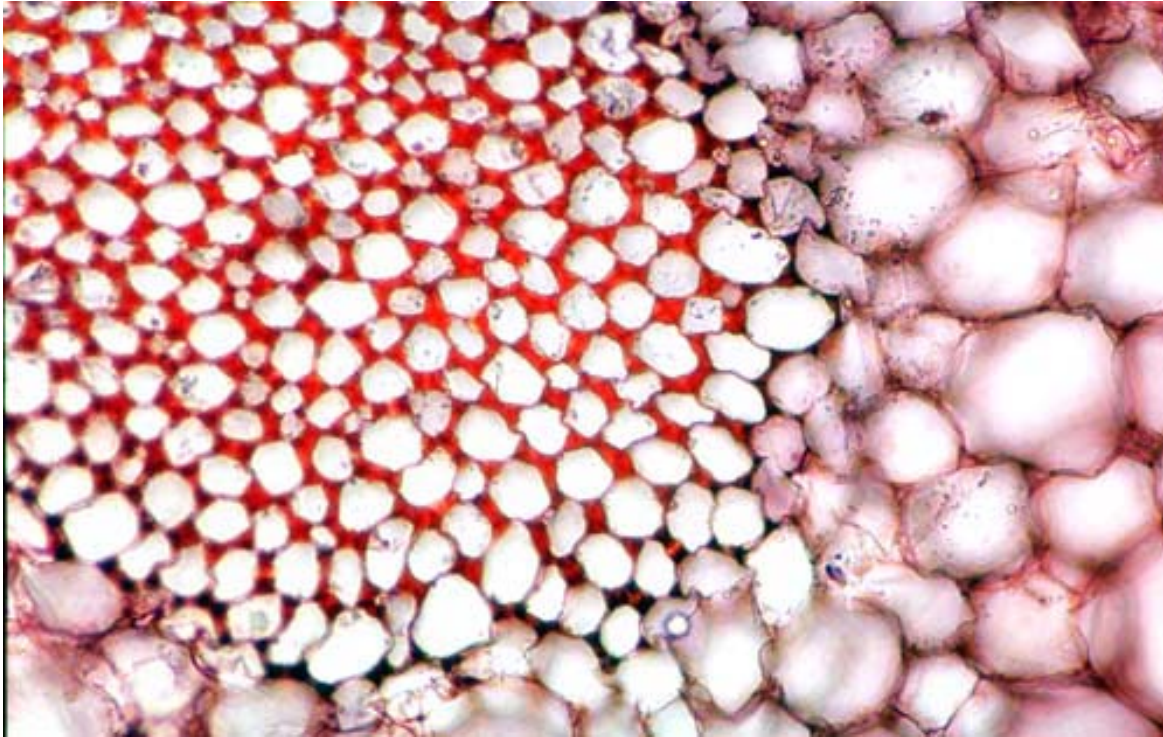
**Pith**

**Mesophyll**

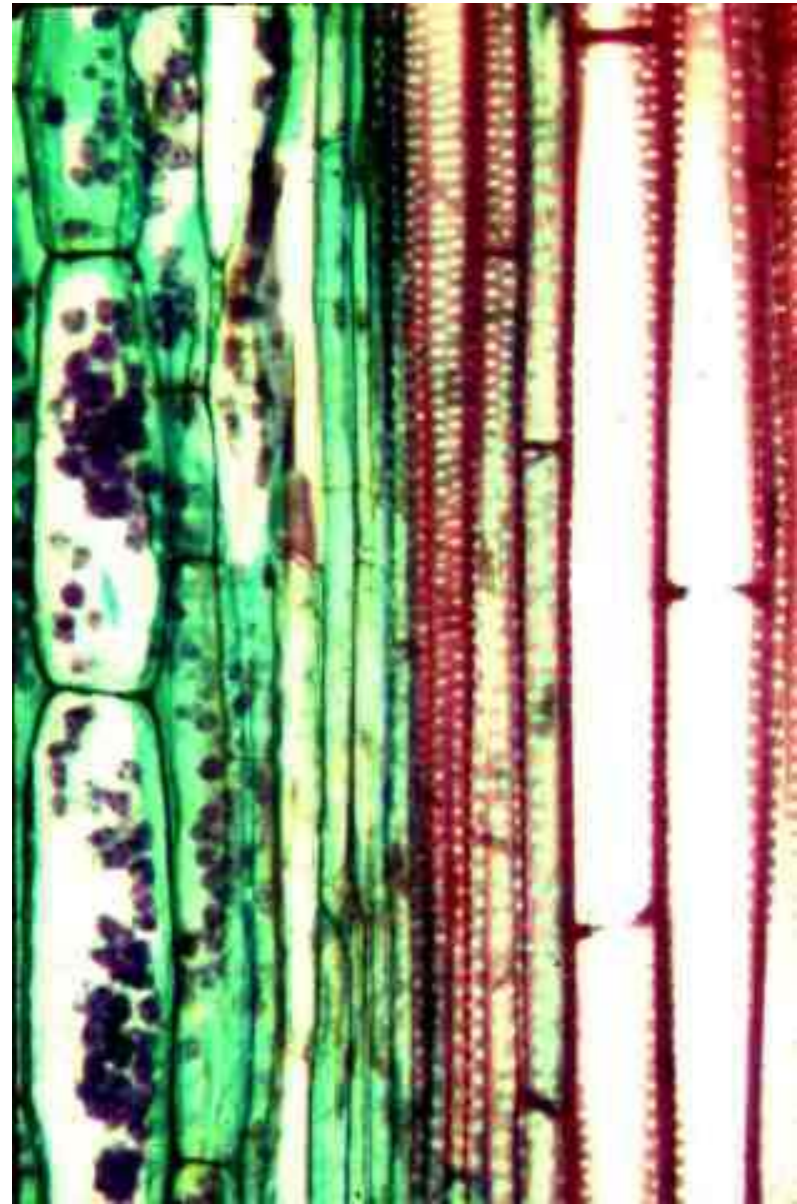
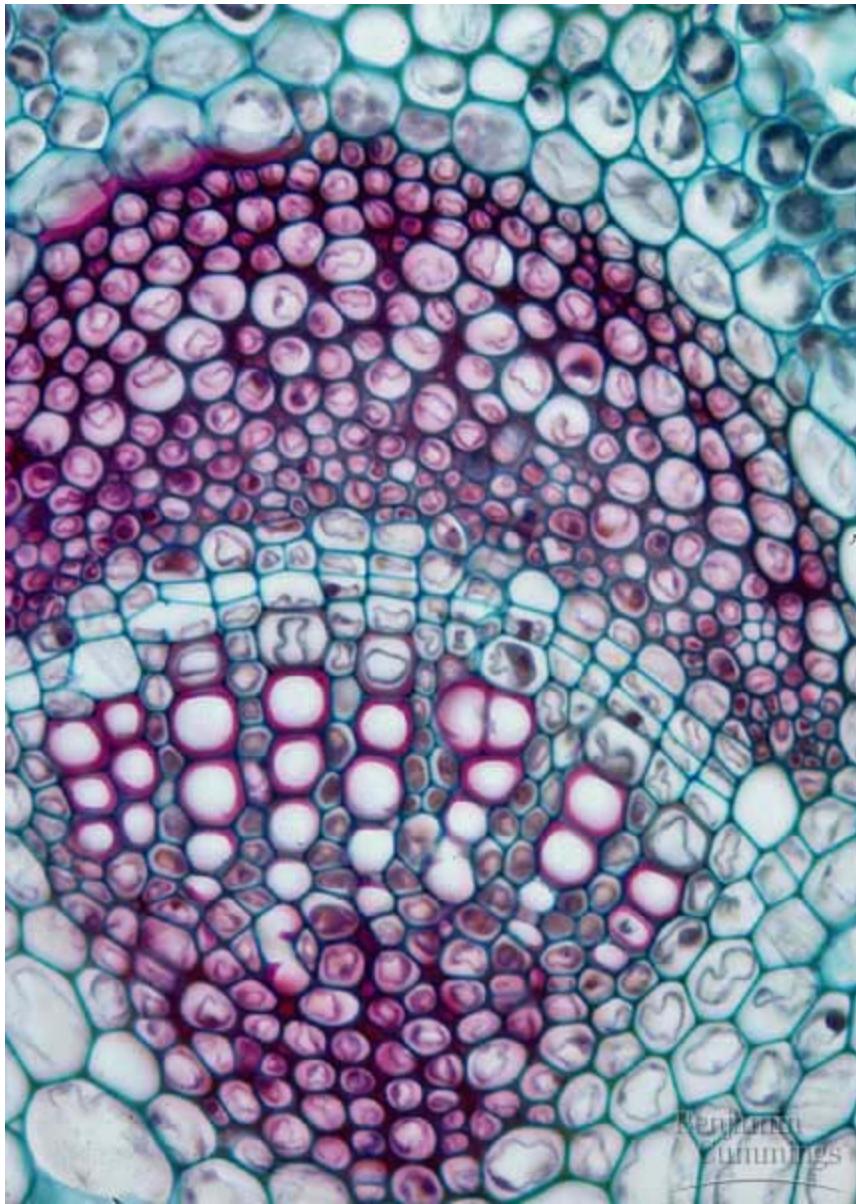
# Collenchyma



# Collenchyma: celery



# Sclerenchyma: fiber cells





# ***Linum usitatissimum* (flax)**



# ***Cannabis sativa* (hemp)**



# *Musa textilis* (manila hemp)



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*Musa textilis*

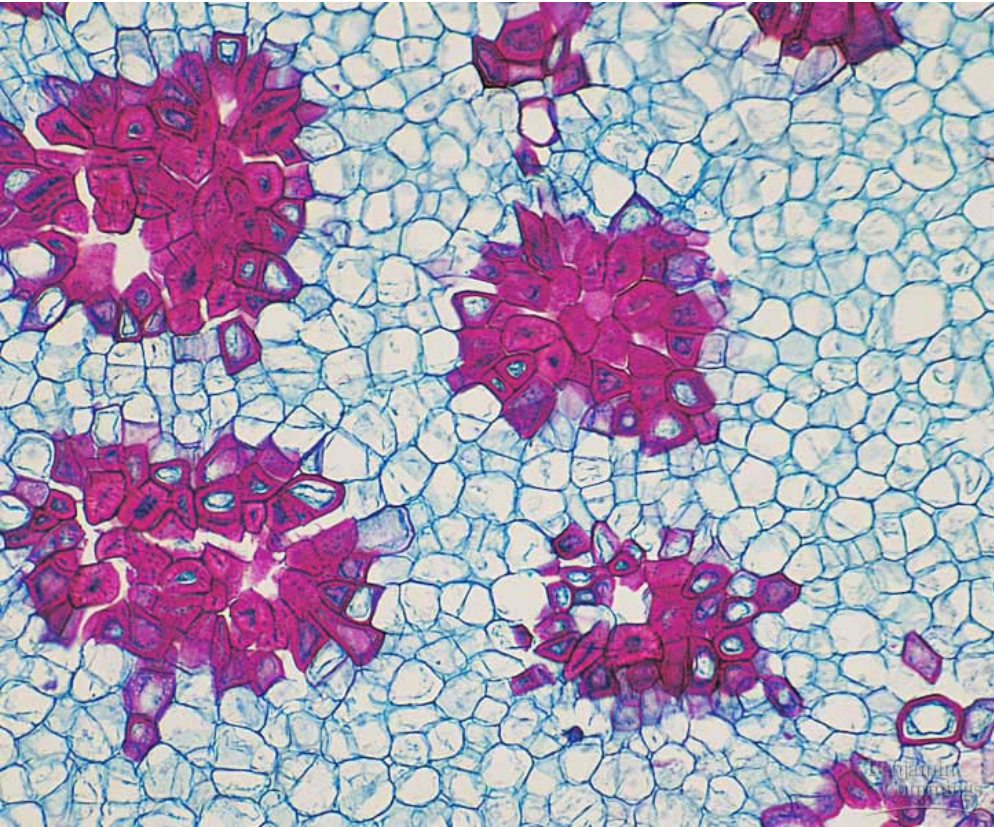
# ***Agave sisalana* (century plant)**



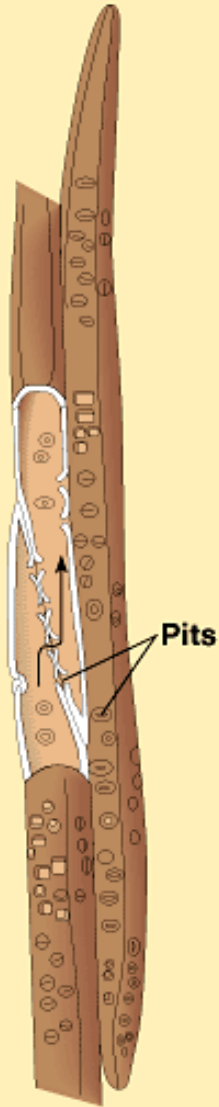
# *Corchorus capsularis* (jute)



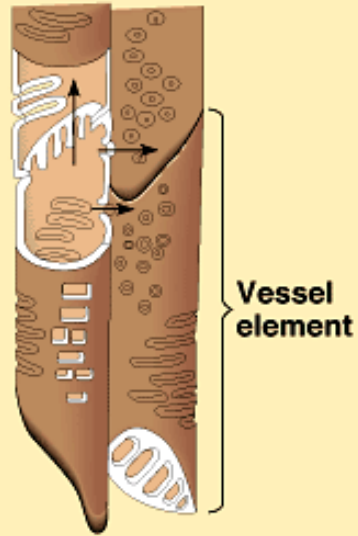
# Sclerenchyma: sclerids



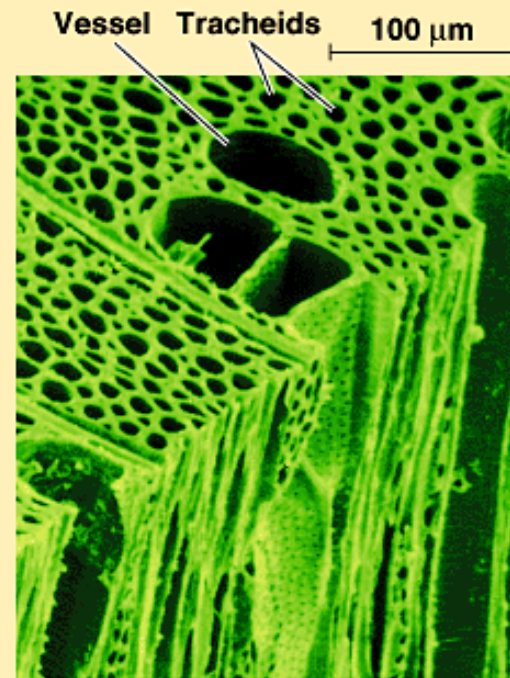
# Xylem



(a) Tracheids

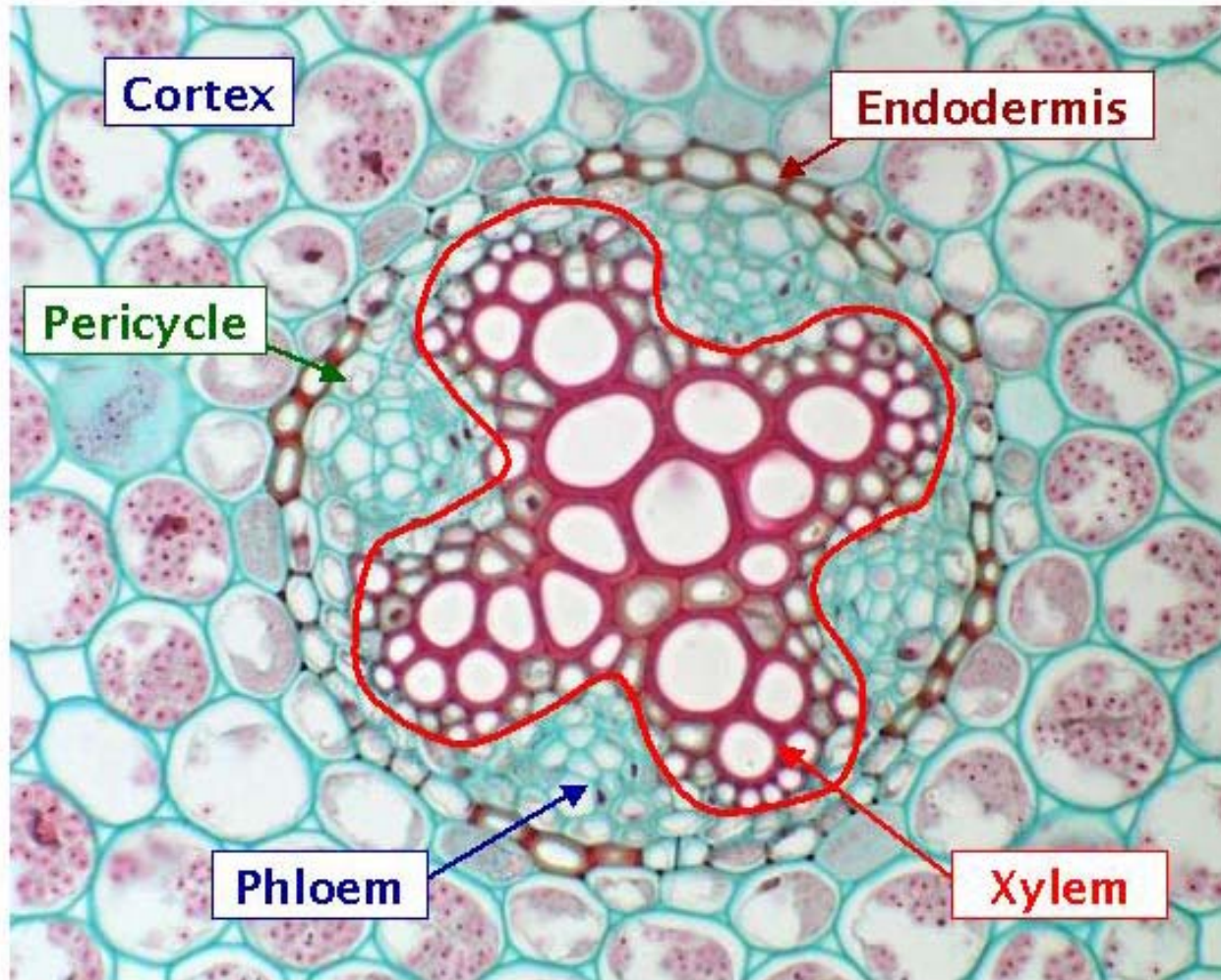


(b) Vessel elements with partially perforated end walls



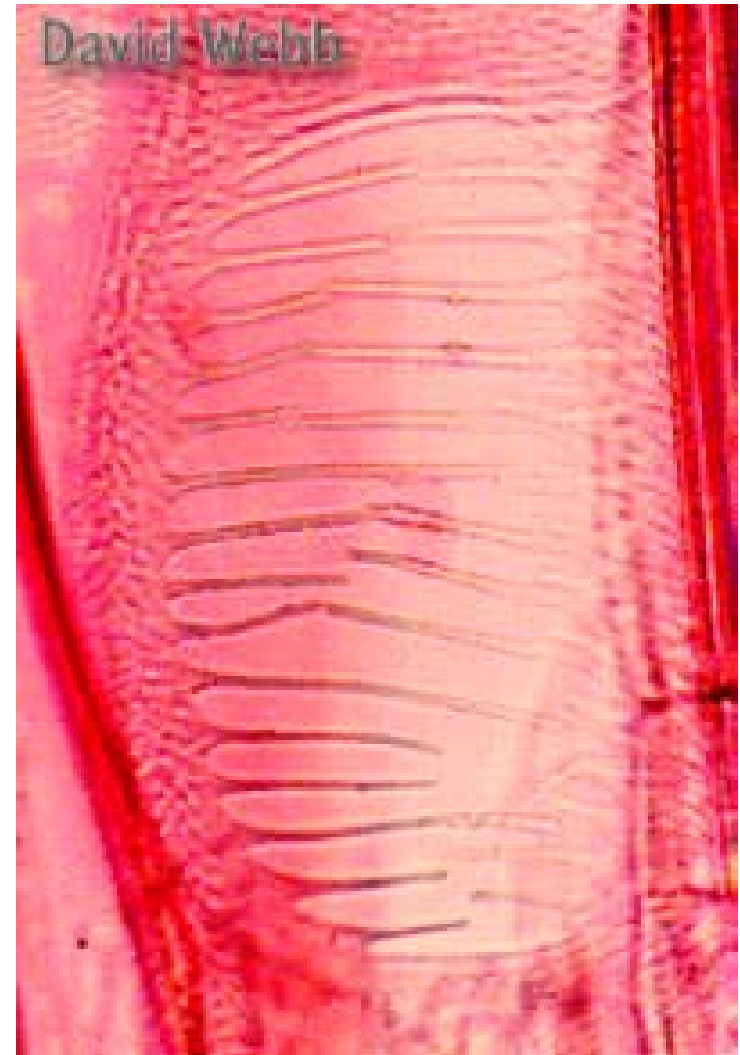
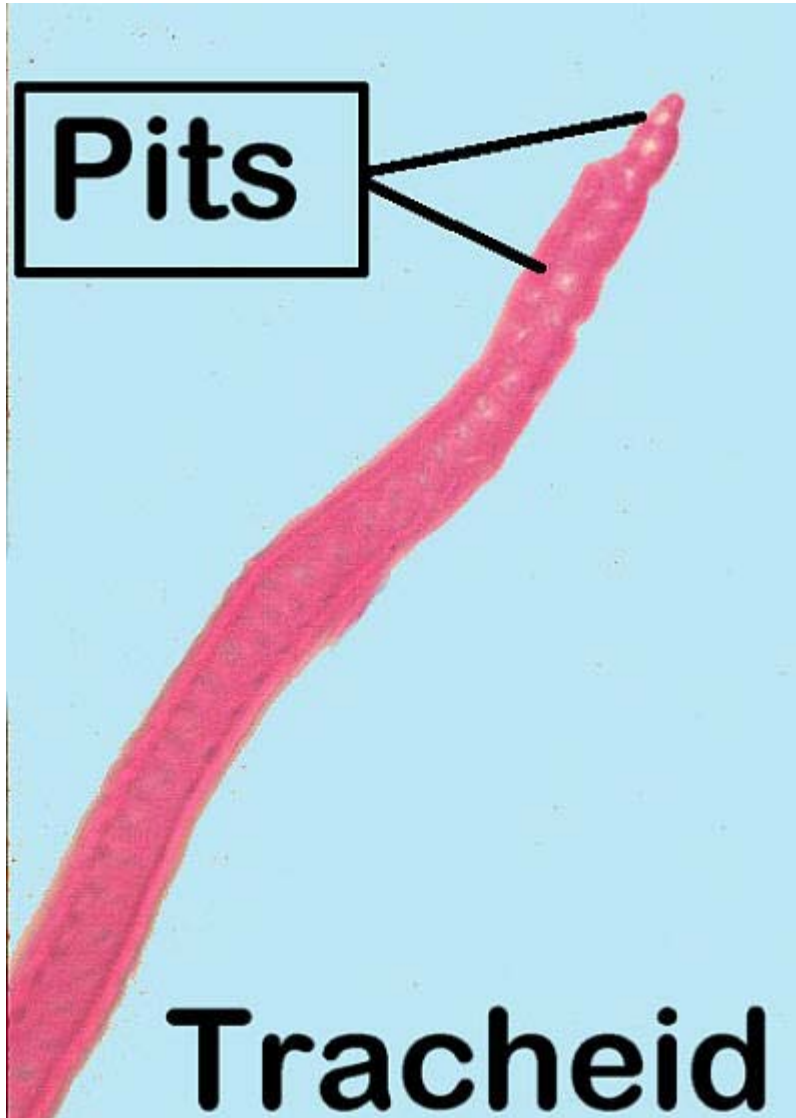
(c) Tracheids and vessels (colorized SEM)

# Vascular cylinder

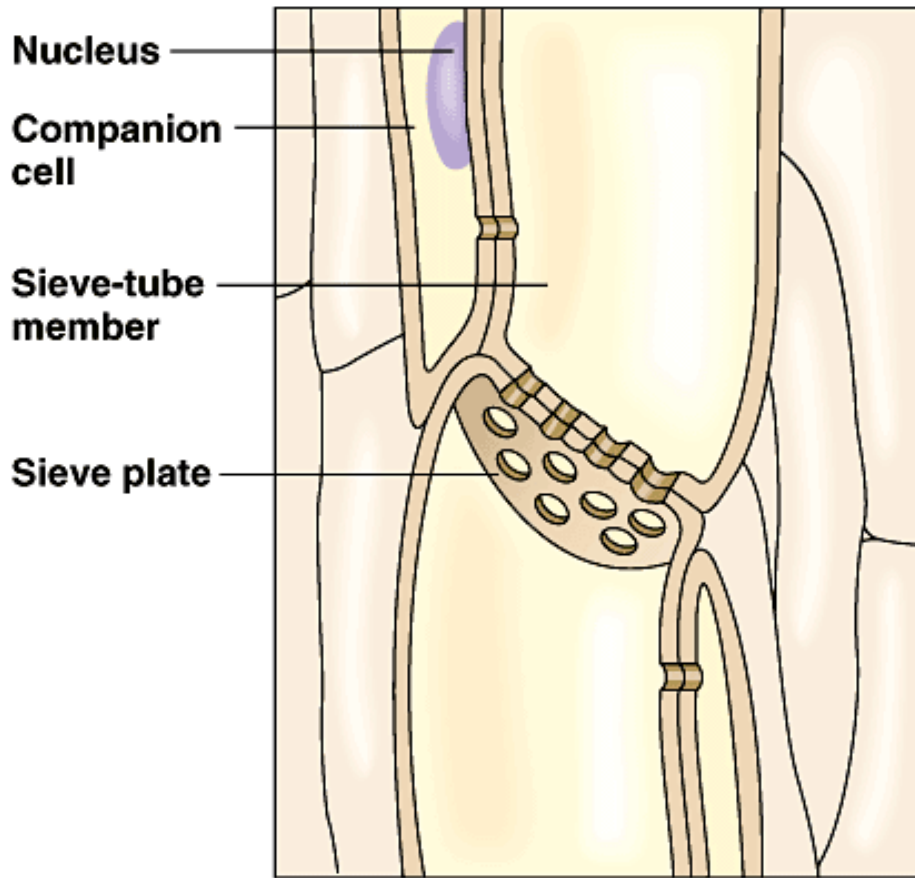




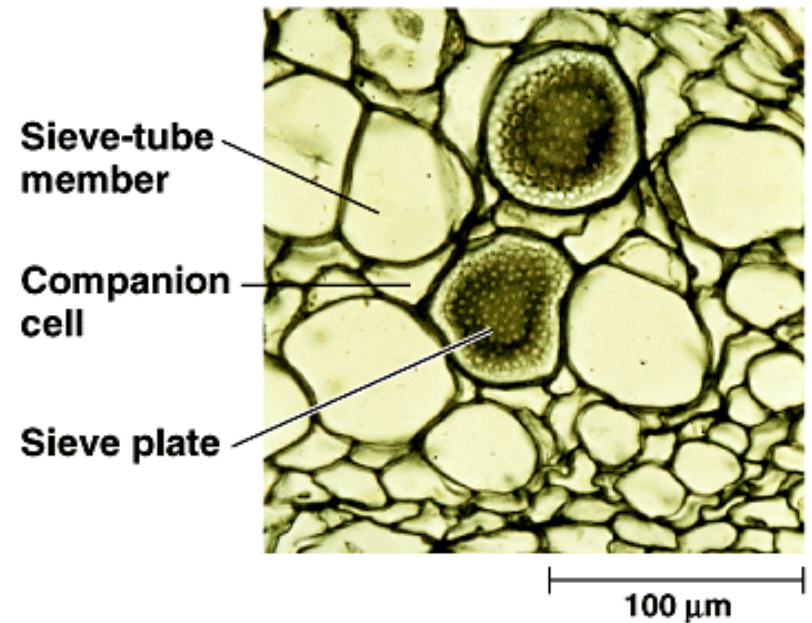
# Pits and plates



# Phloem

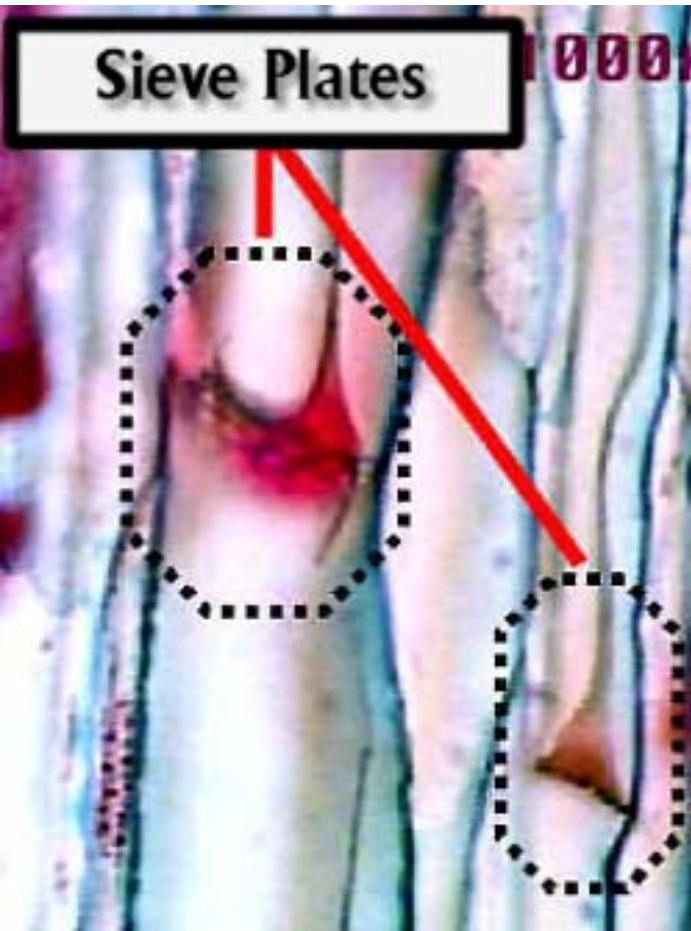


(a) Longitudinal view

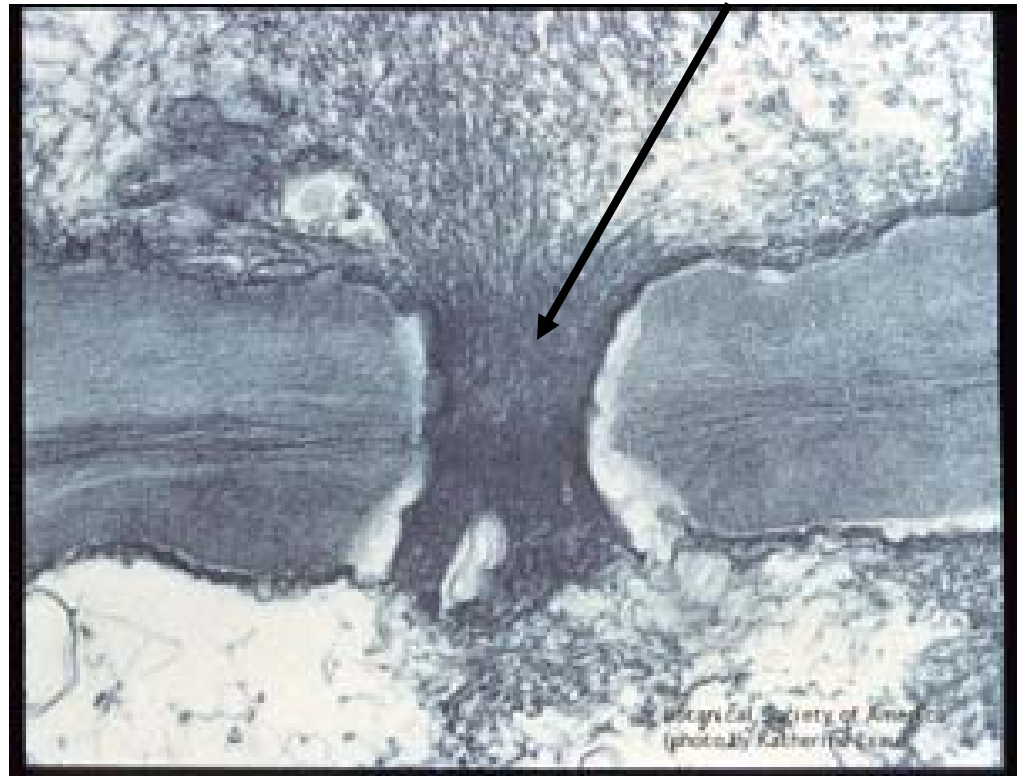


(b) Transverse section (LM)

# P-protein



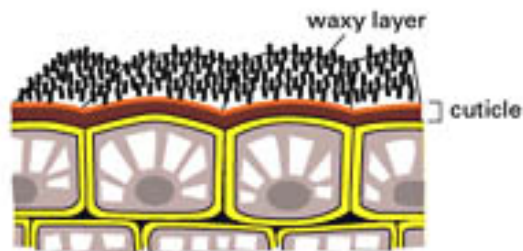
**P-protein plug**



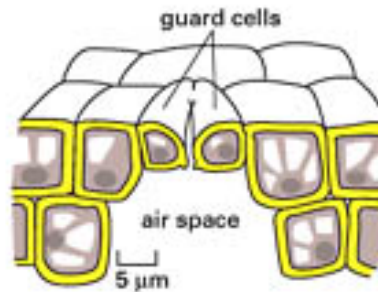
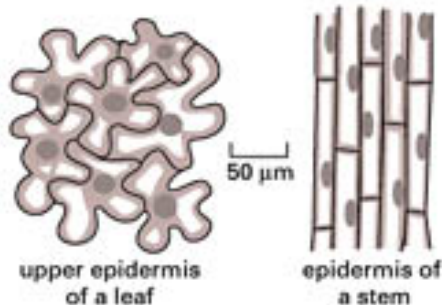
# Dermal Tissues

## DERMAL TISSUE

The **epidermis** is the primary outer protective covering of the plant body. Cells of the epidermis are also modified to form stomata and hairs of various kinds.

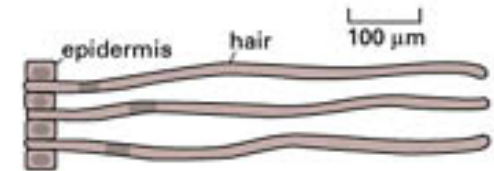


The epidermis (usually one layer of cells deep) covers the entire stem, leaf, and root of the young plant. The cells are living, have thick primary cell walls, and are covered on their outer surface by a special cuticle with an outer waxy layer. The cells are tightly interlocked in different patterns.

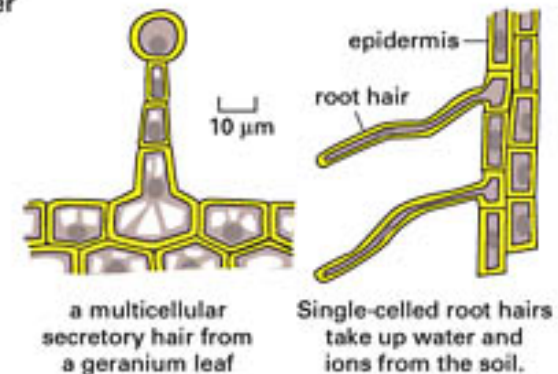


**Stomata** are openings in the epidermis, mainly on the lower surface of the leaf, that regulate gas exchange in the plant. They are formed by two specialized epidermal cells called *guard cells*, which regulate the diameter of the pore. Stomata are distributed in a distinct species-specific pattern within each epidermis.

Hairs (or trichomes) are appendages derived from epidermal cells. They exist in a variety of forms and are commonly found in all plant parts. Hairs function in protection, absorption, and secretion; for example,



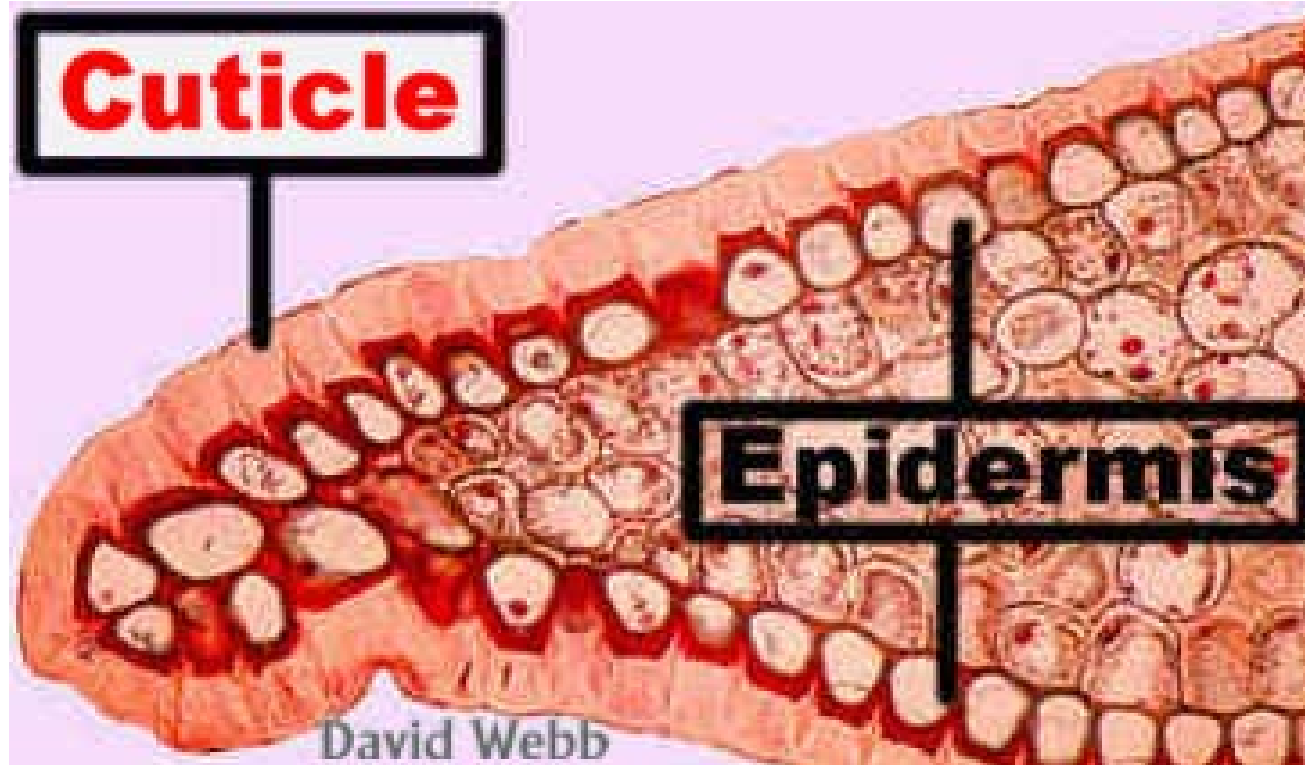
young, single-celled hairs develop in the epidermis of the cotton seed. When these grow, the walls will be secondarily thickened with cellulose to form cotton fibers.



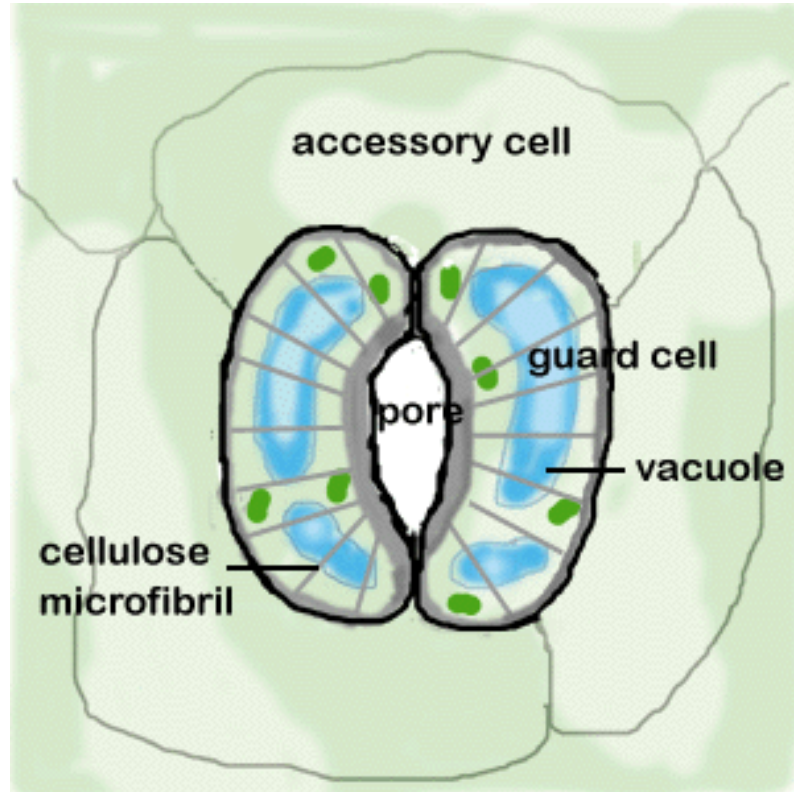
a multicellular secretory hair from a geranium leaf

Single-celled root hairs take up water and ions from the soil.

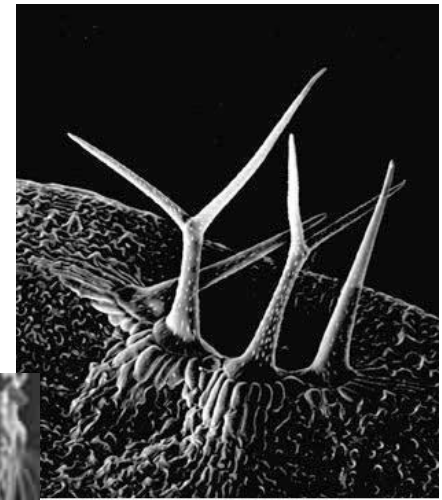
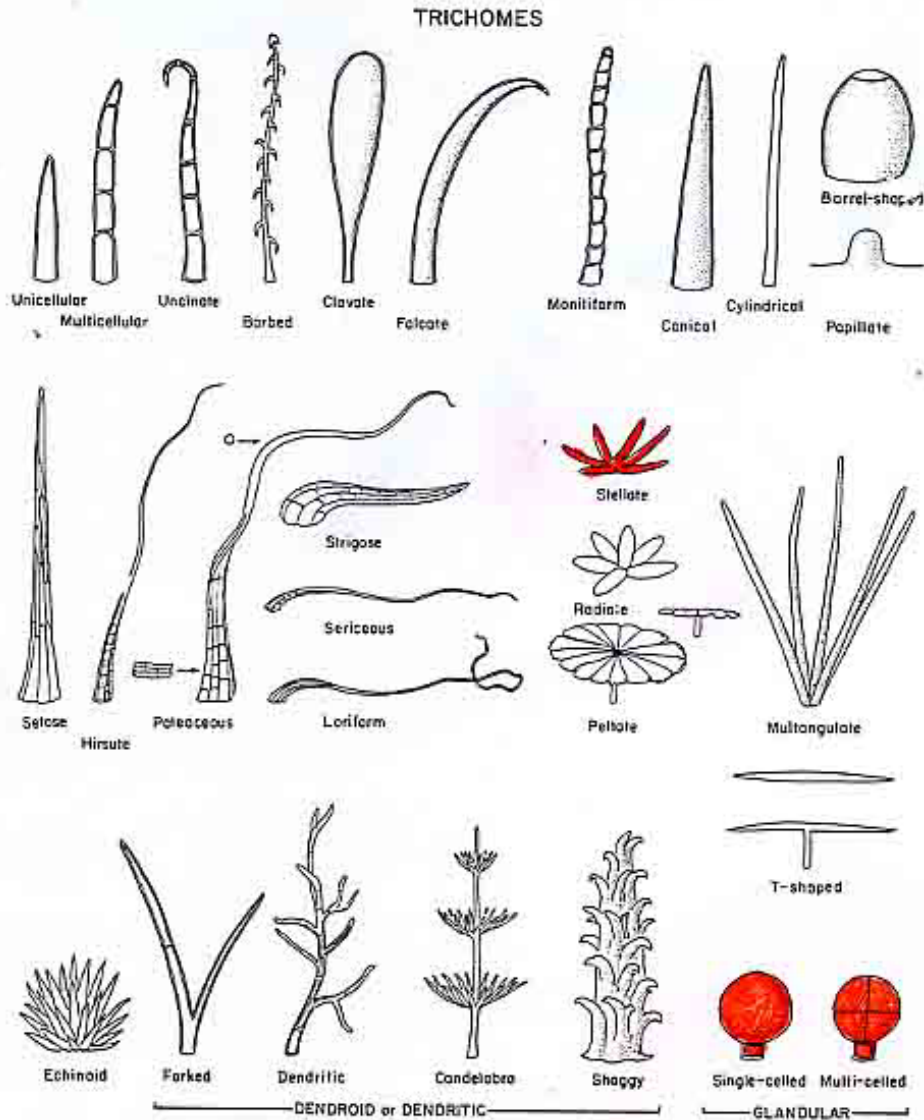
# Epidermis, Cuticle



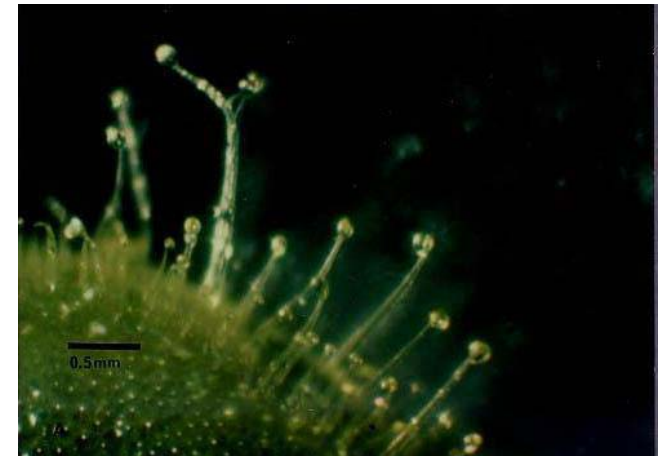
# Guard Cells



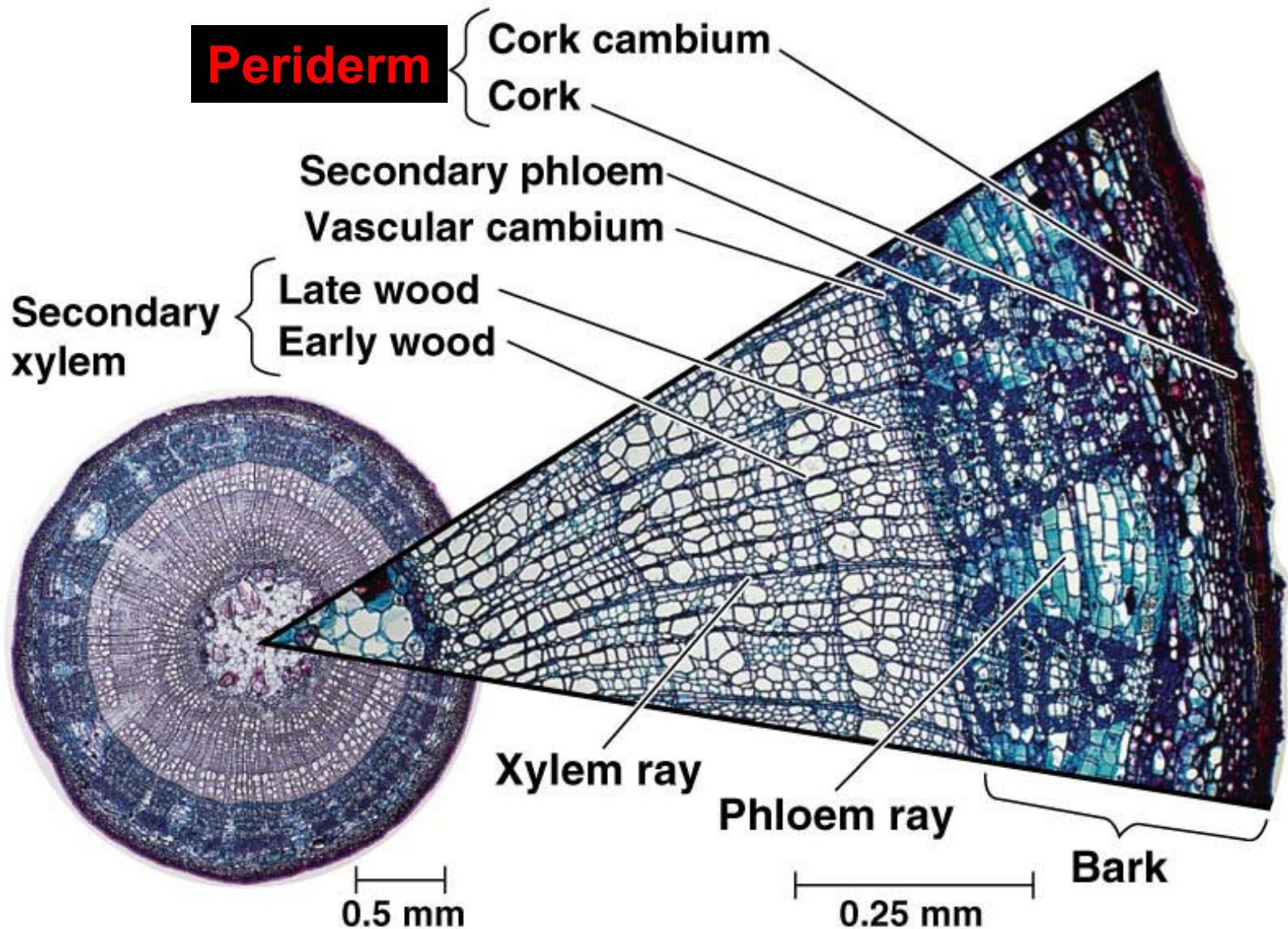
# Trichomes



Trichomes of the plant *Arabidopsis thaliana*  
John Larkin

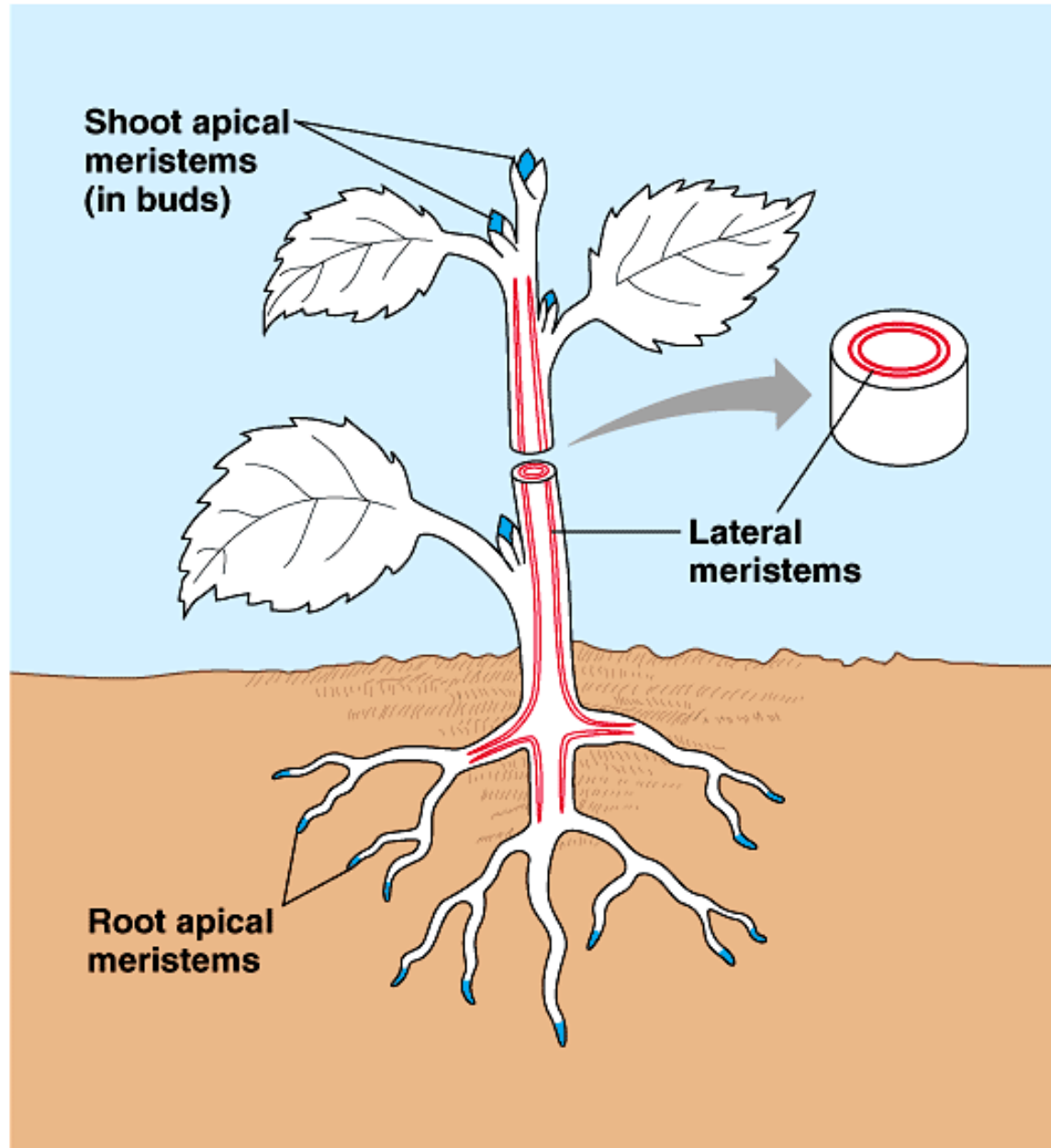


# Periderm

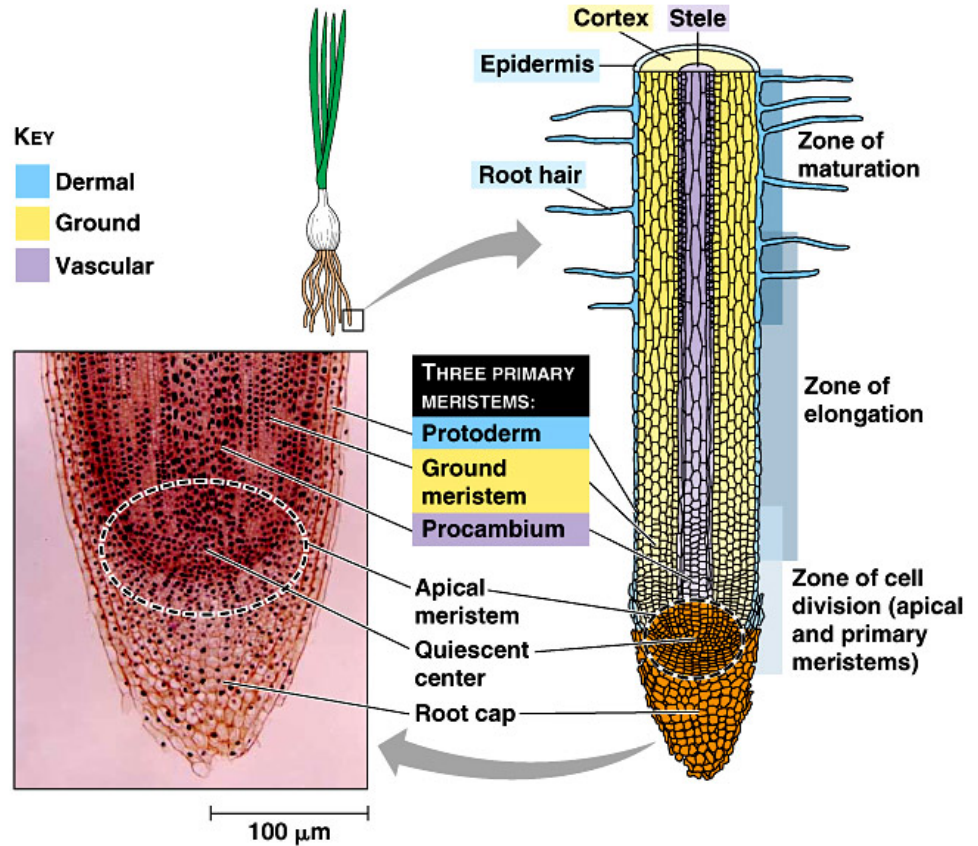
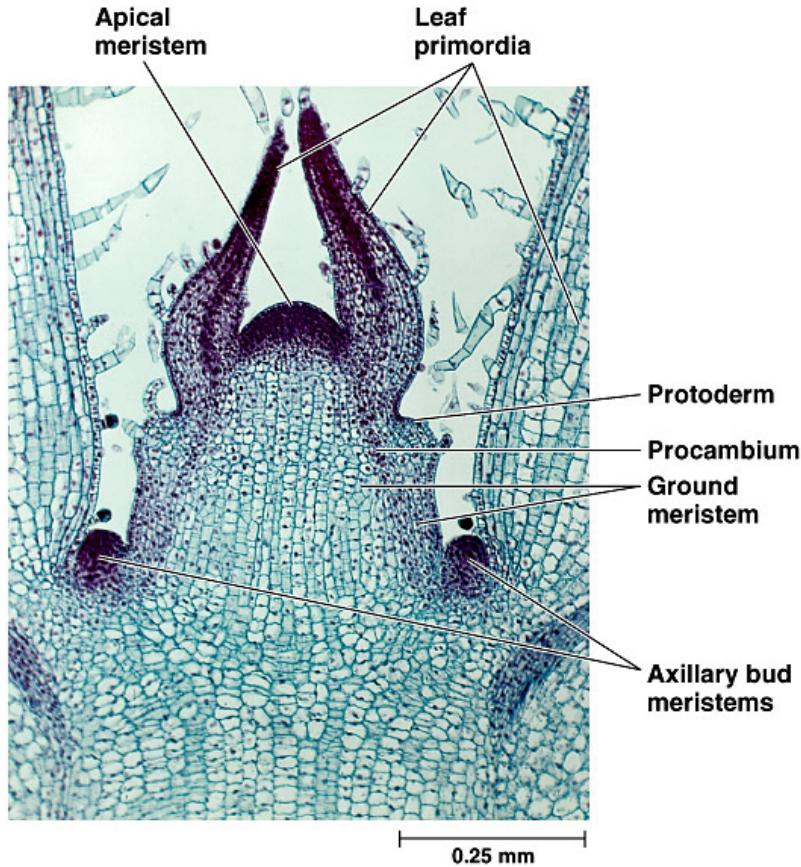




# Plant Meristems



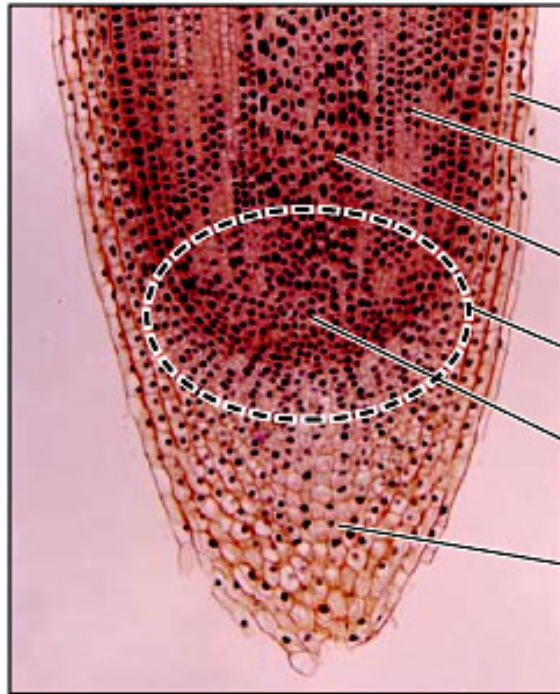
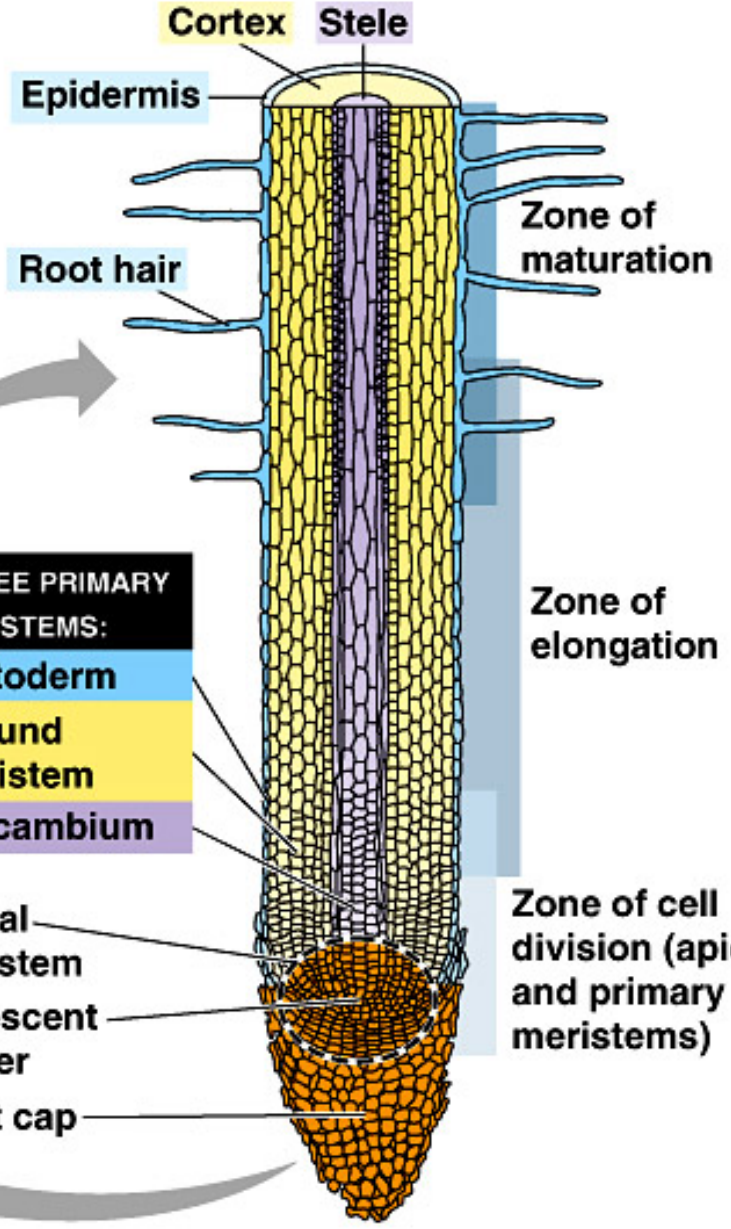
# Apical Meristems



# Primary Meristems

KEY

- Dermal
- Ground
- Vascular



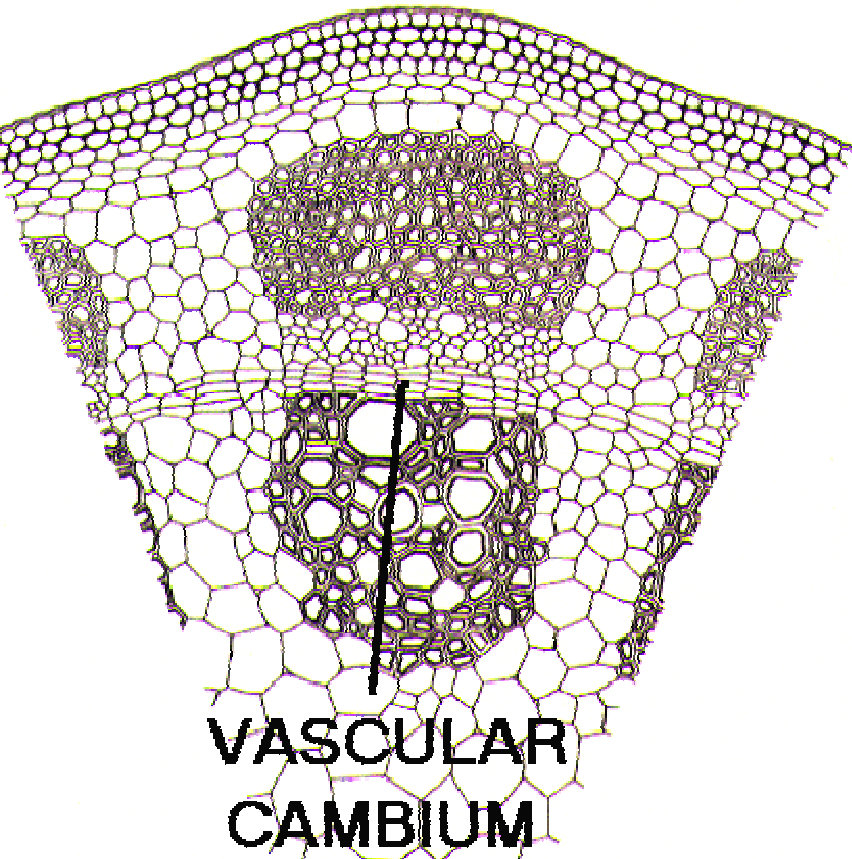
**THREE PRIMARY MERISTEMS:**  
Protoderm  
Ground meristem  
Procambium

Apical meristem  
Quiescent center  
Root cap

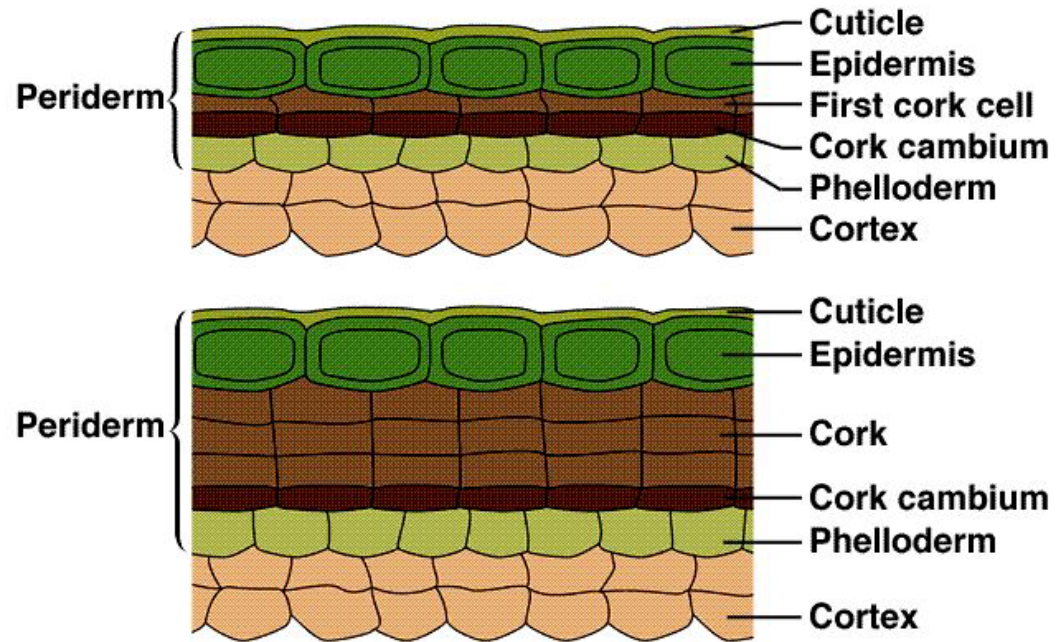
100  $\mu$ m

# Secondary Meristems

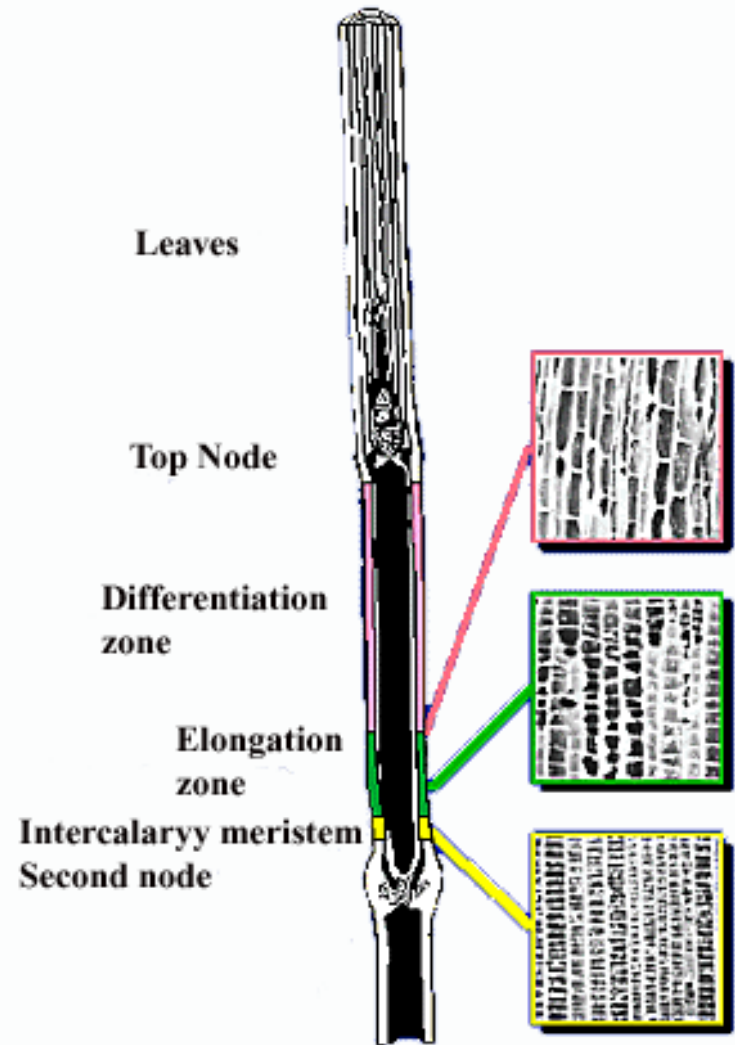
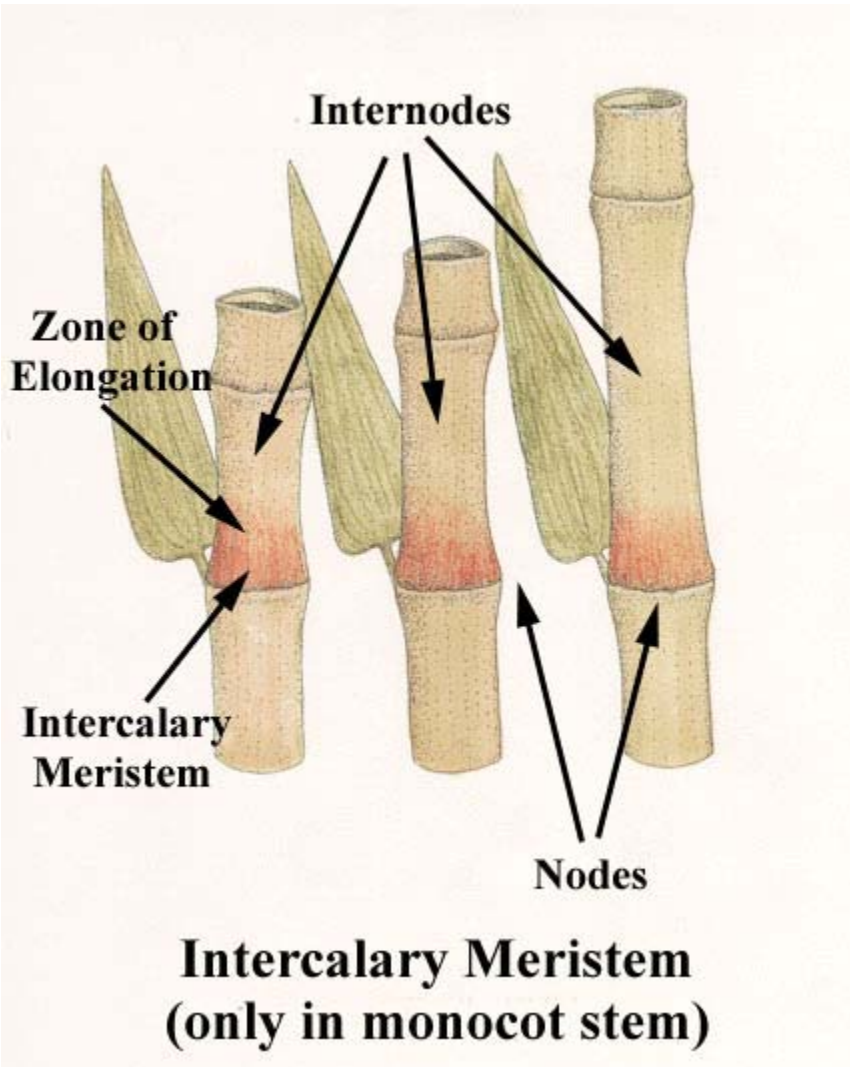
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## Periderm



# Intercalary Meristem



# Other Meristems

