











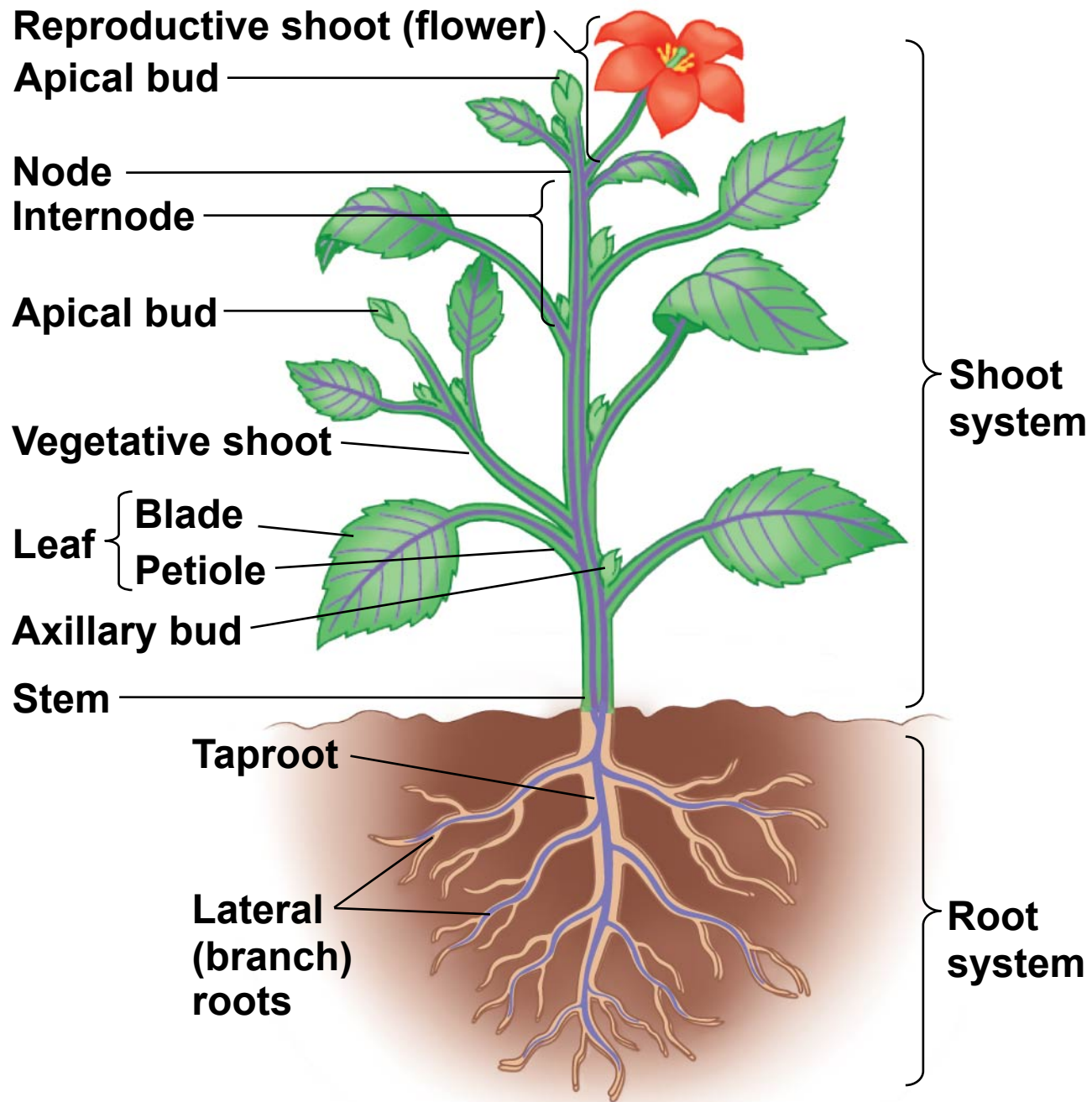


	Monocots	Eudicots
<b>Embryos</b>	 <p>One cotyledon</p>	 <p>Two cotyledons</p>
<b>Leaf venation</b>	 <p>Veins usually parallel</p>	 <p>Veins usually netlike</p>
<b>Stems</b>	 <p>Vascular tissue scattered</p>	 <p>Vascular tissue usually arranged in ring</p>
<b>Roots</b>	 <p>Root system usually fibrous (no main root)</p>	 <p>Taproot (main root) usually present</p>
<b>Pollen</b>	 <p>Pollen grain with one opening</p>	 <p>Pollen grain with three openings</p>
<b>Flowers</b>	 <p>Floral organs usually in multiples of three</p>	 <p>Floral organs usually in multiples of four or five</p>







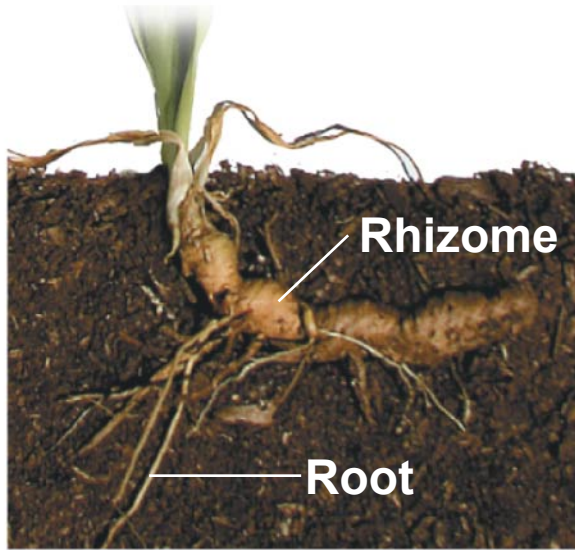
**Pneumatophores**



**Storage roots**



**“Strangling” aerial roots**



**Rhizomes**



**Stolons**



**Tubers**



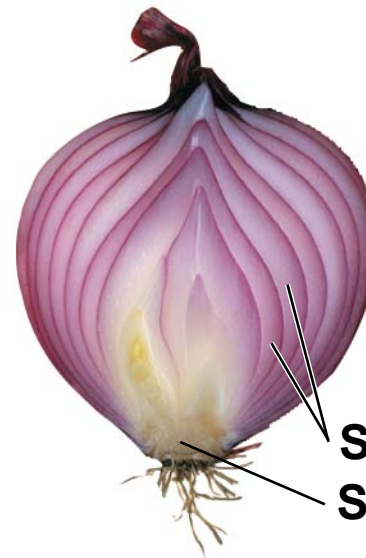
**Spines**



**Tendrils**

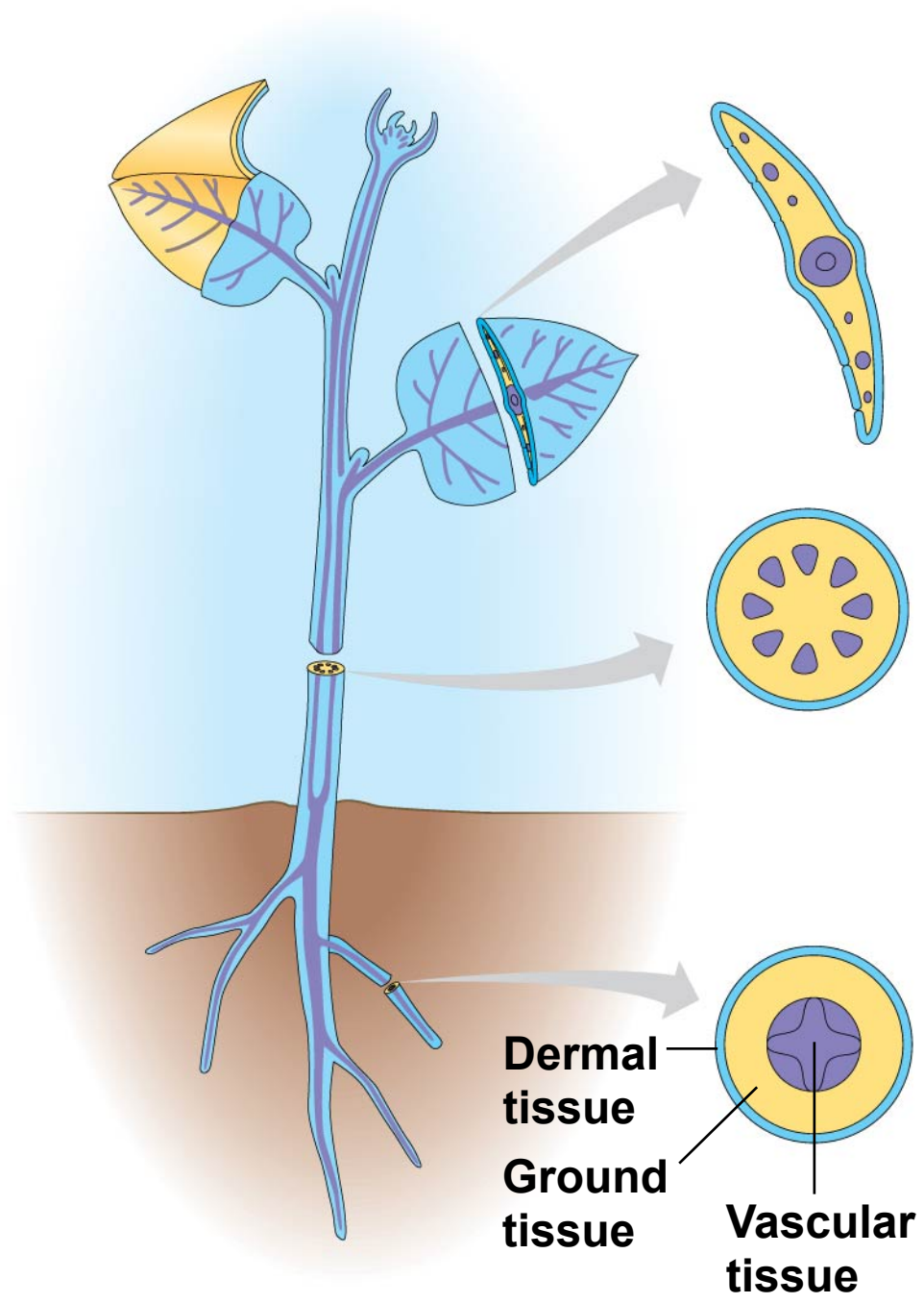


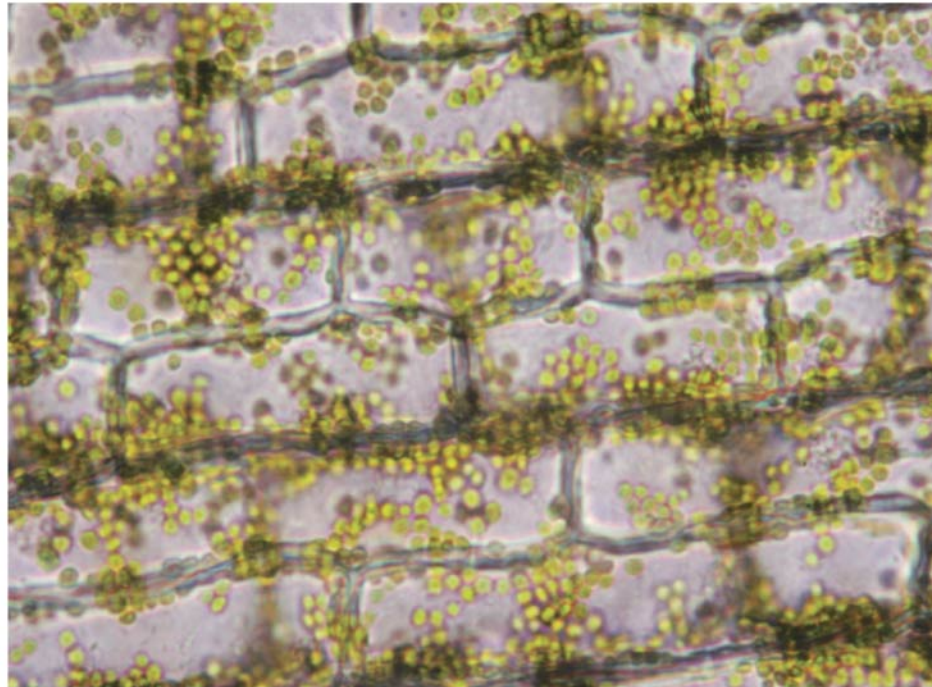
**Reproductive leaves**



**Storage leaves**  
**Stem**

**Storage leaves**

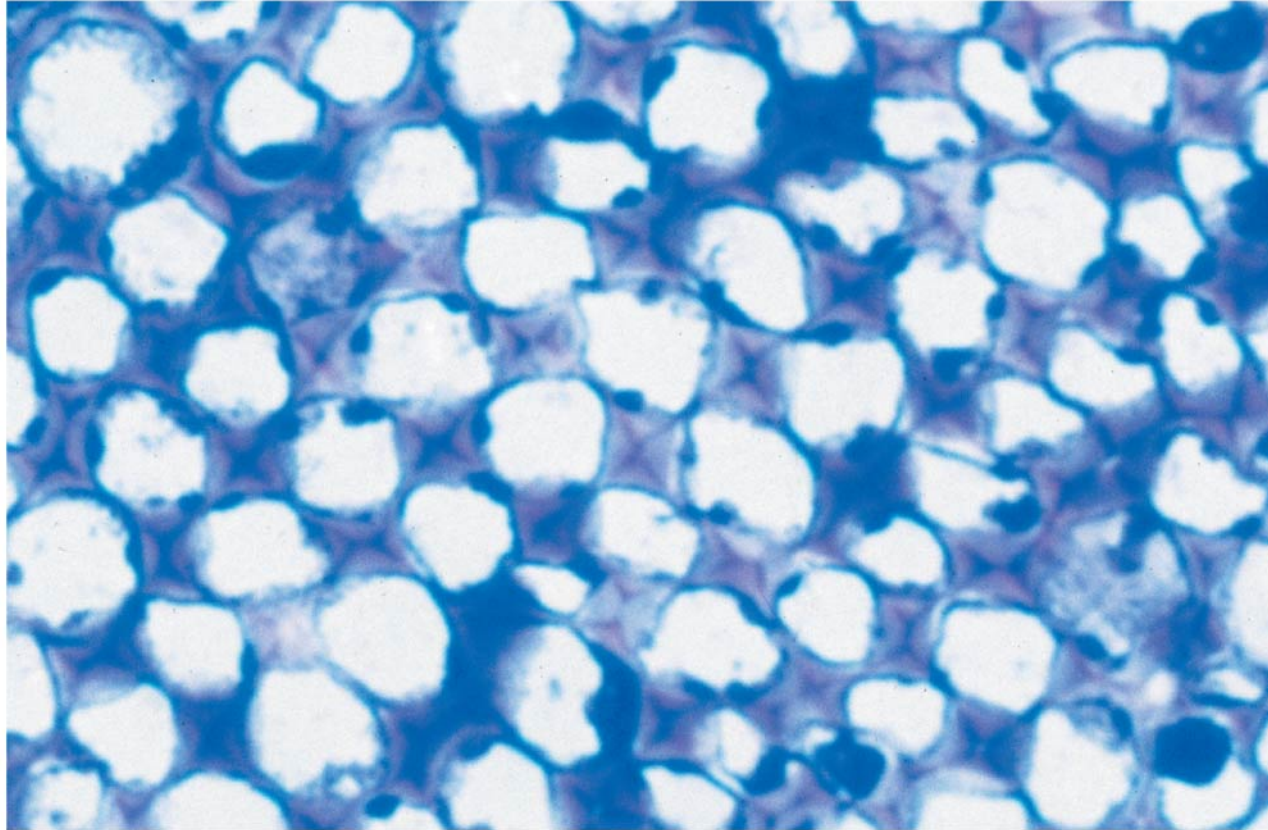




**Parenchyma cells with  
chloroplasts (in *Elodea* leaf)  
(LM)**

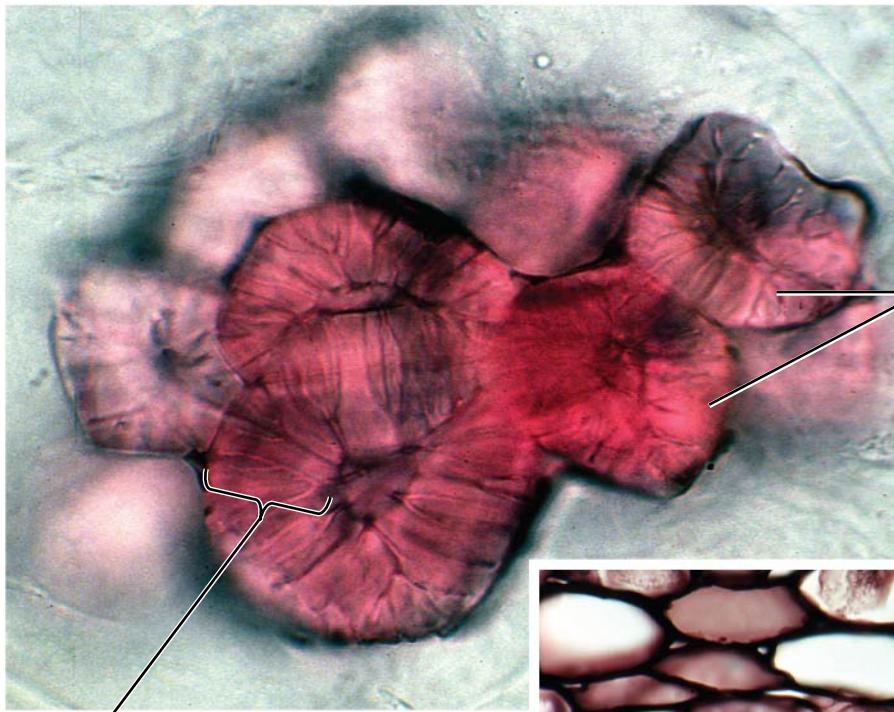
60  $\mu\text{m}$





**Collenchyma cells**  
**(in *Helianthus* stem) (LM)**

—| |—  
**5  $\mu$ m**

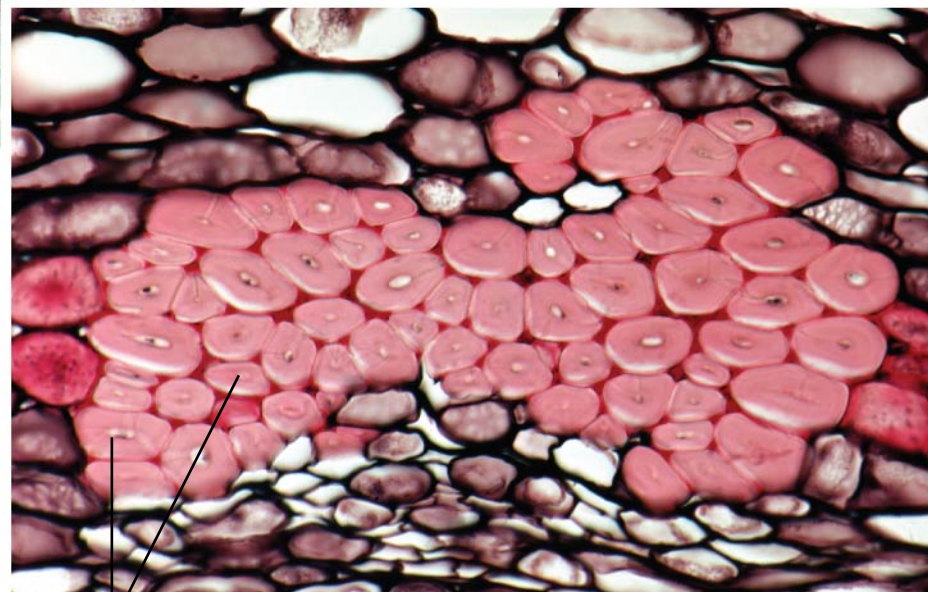


5  $\mu\text{m}$

Sclereid cells (in pear) (LM)

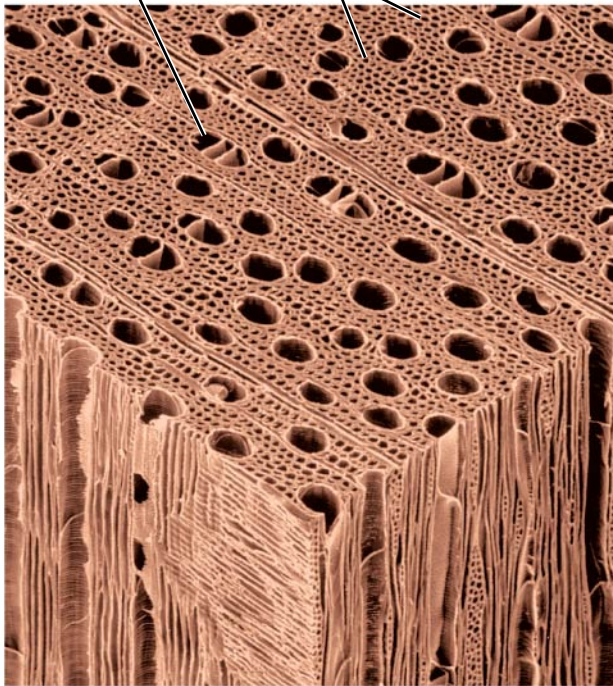
Cell wall

25  $\mu\text{m}$



Fiber cells (cross section from ash tree) (LM)

Vessel Tracheids 100  $\mu\text{m}$

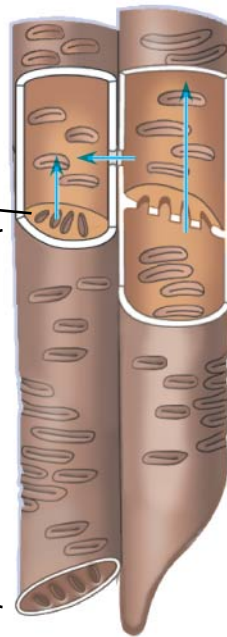


Tracheids and vessels  
(colorized SEM)

Perforation  
plate

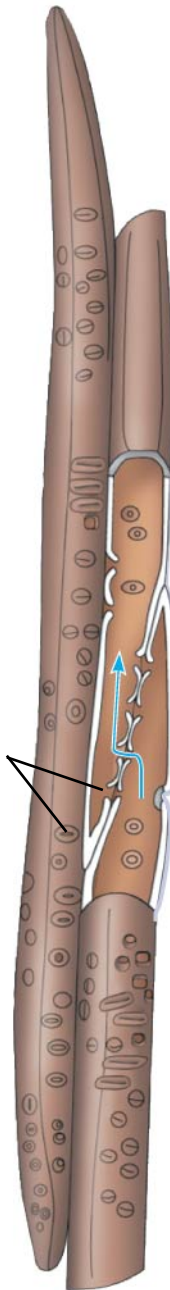
Vessel element

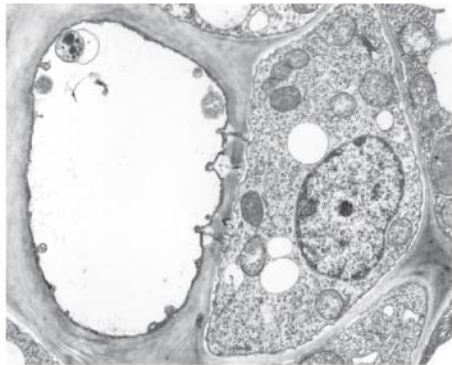
Vessel elements, with  
perforated end walls



Pits

Tracheids





3  $\mu\text{m}$

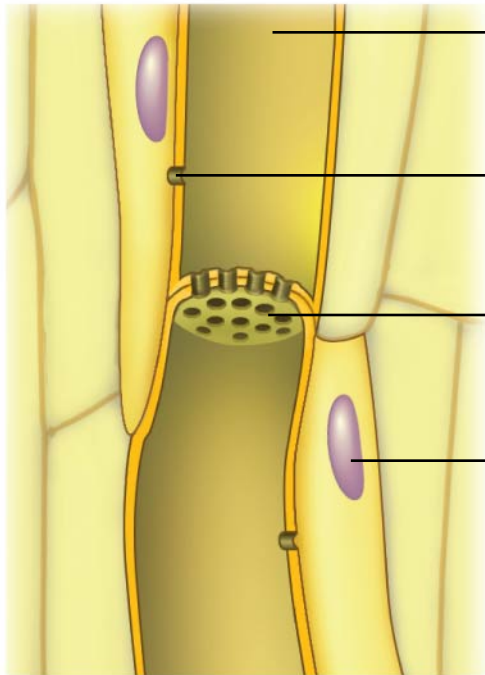
**Sieve-tube element (left) and companion cell: cross section (TEM)**

**Sieve-tube elements: longitudinal view (LM)**



Sieve plate

Companion cells



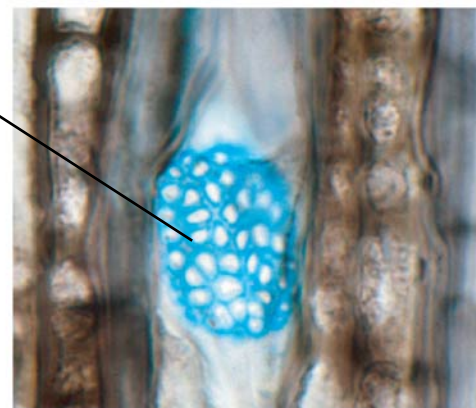
Sieve-tube elements

Plasmodesma

Sieve plate

Nucleus of companion cell

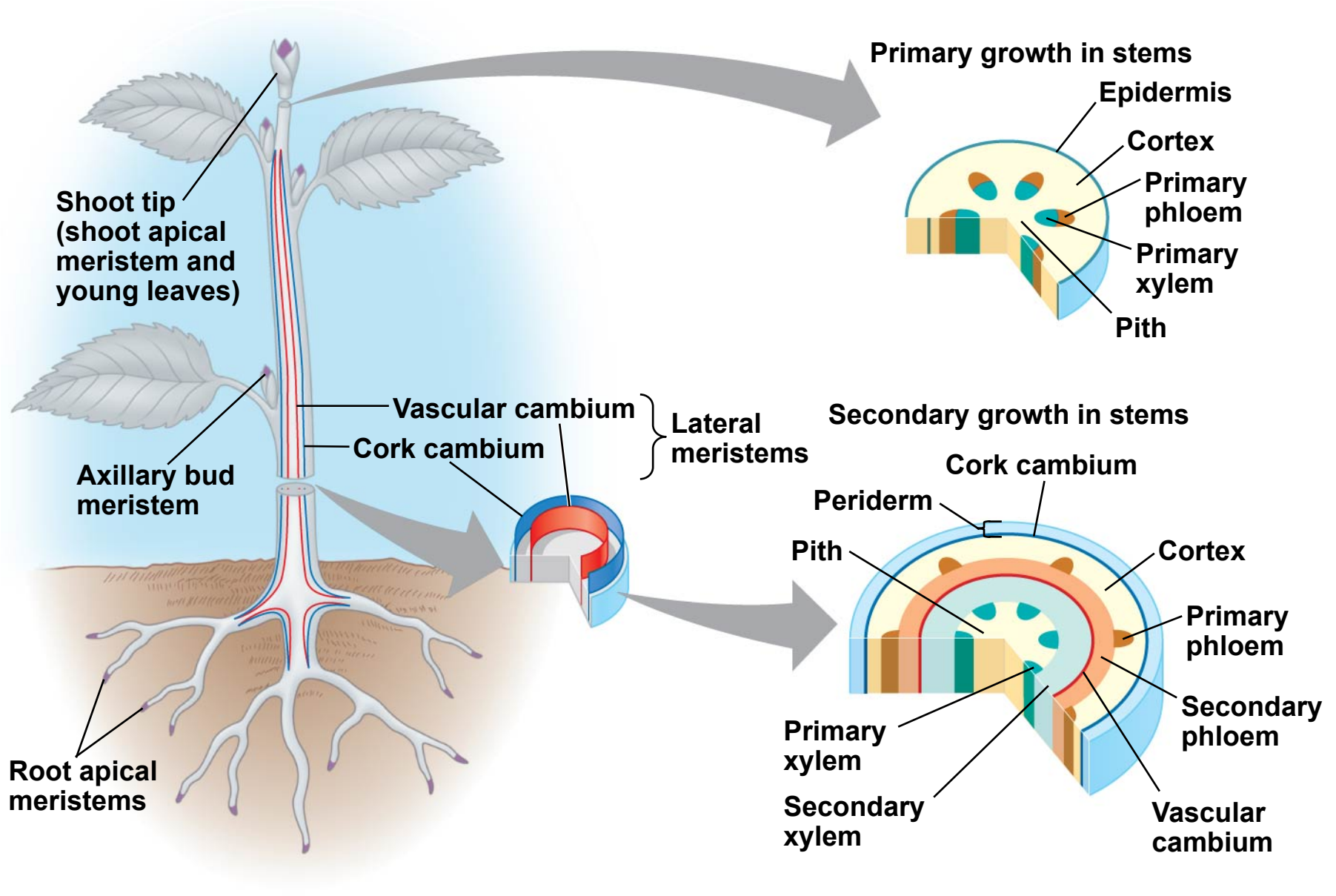
**Sieve-tube elements: longitudinal view**

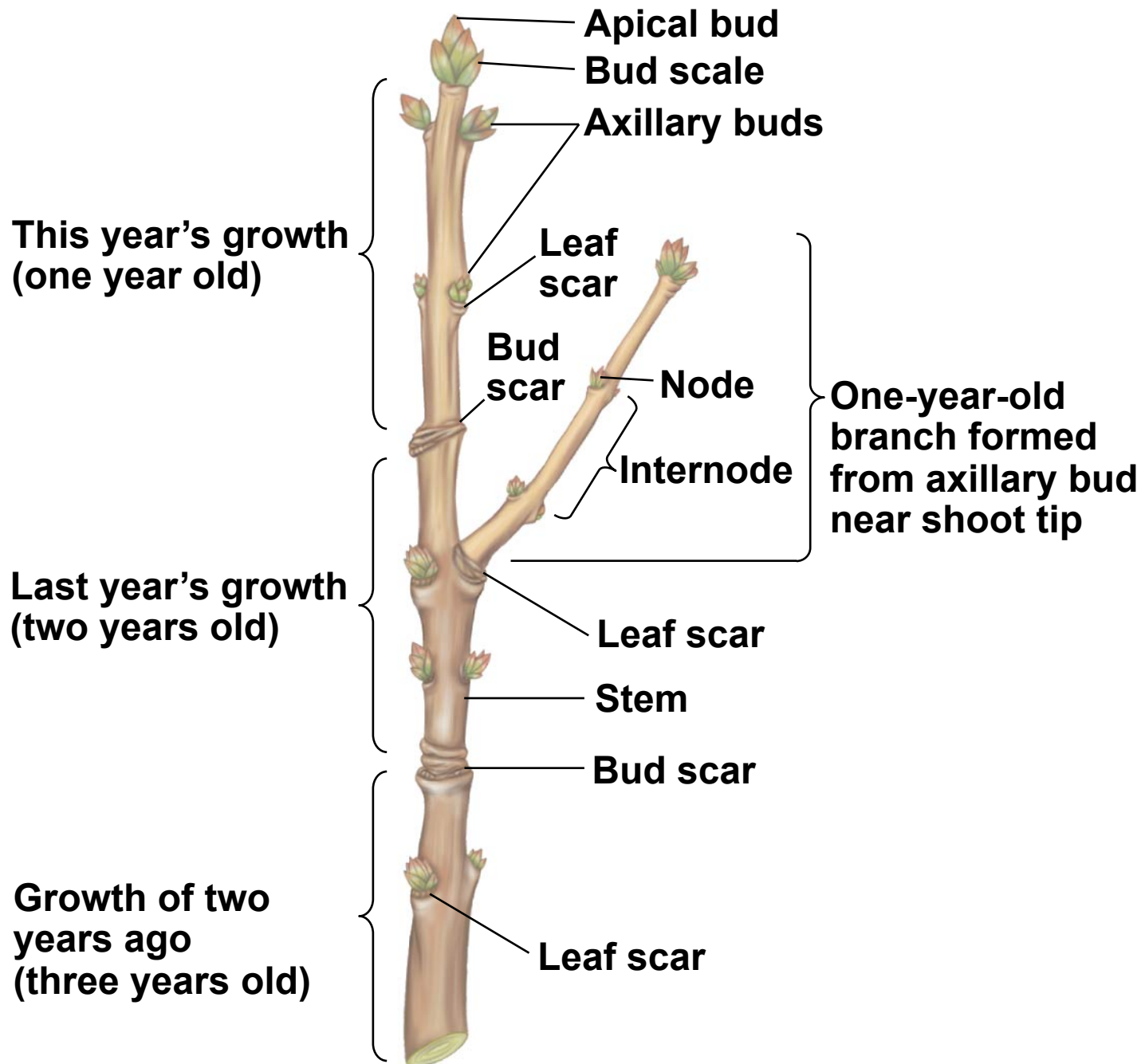


30  $\mu\text{m}$

15  $\mu\text{m}$

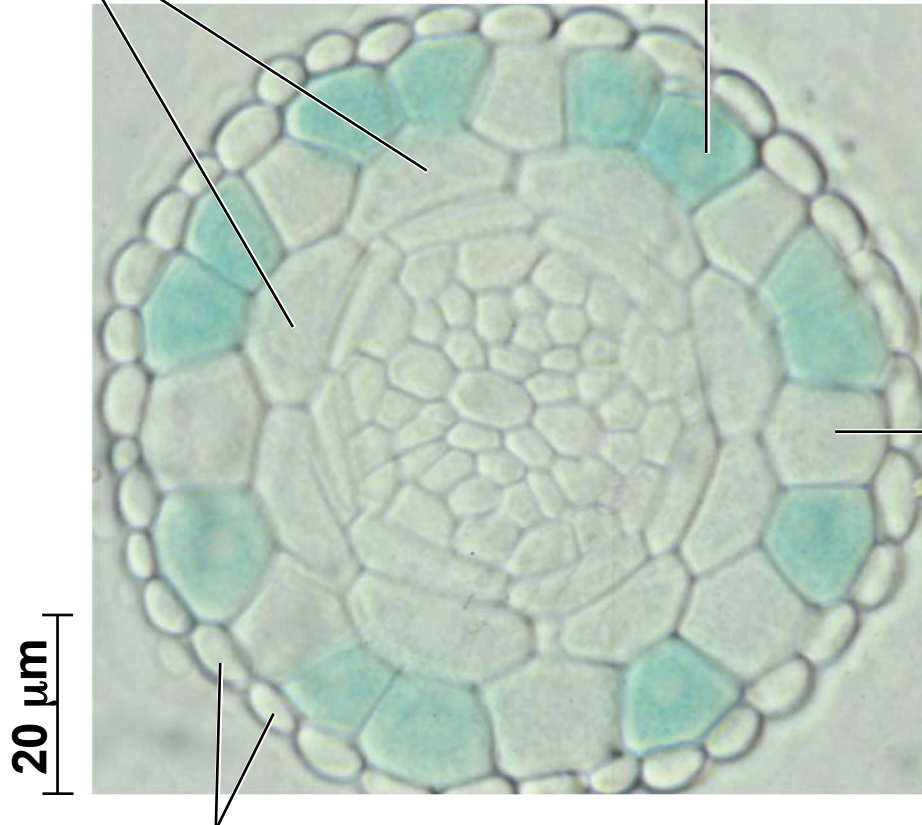
**Sieve plate with pores (LM)**





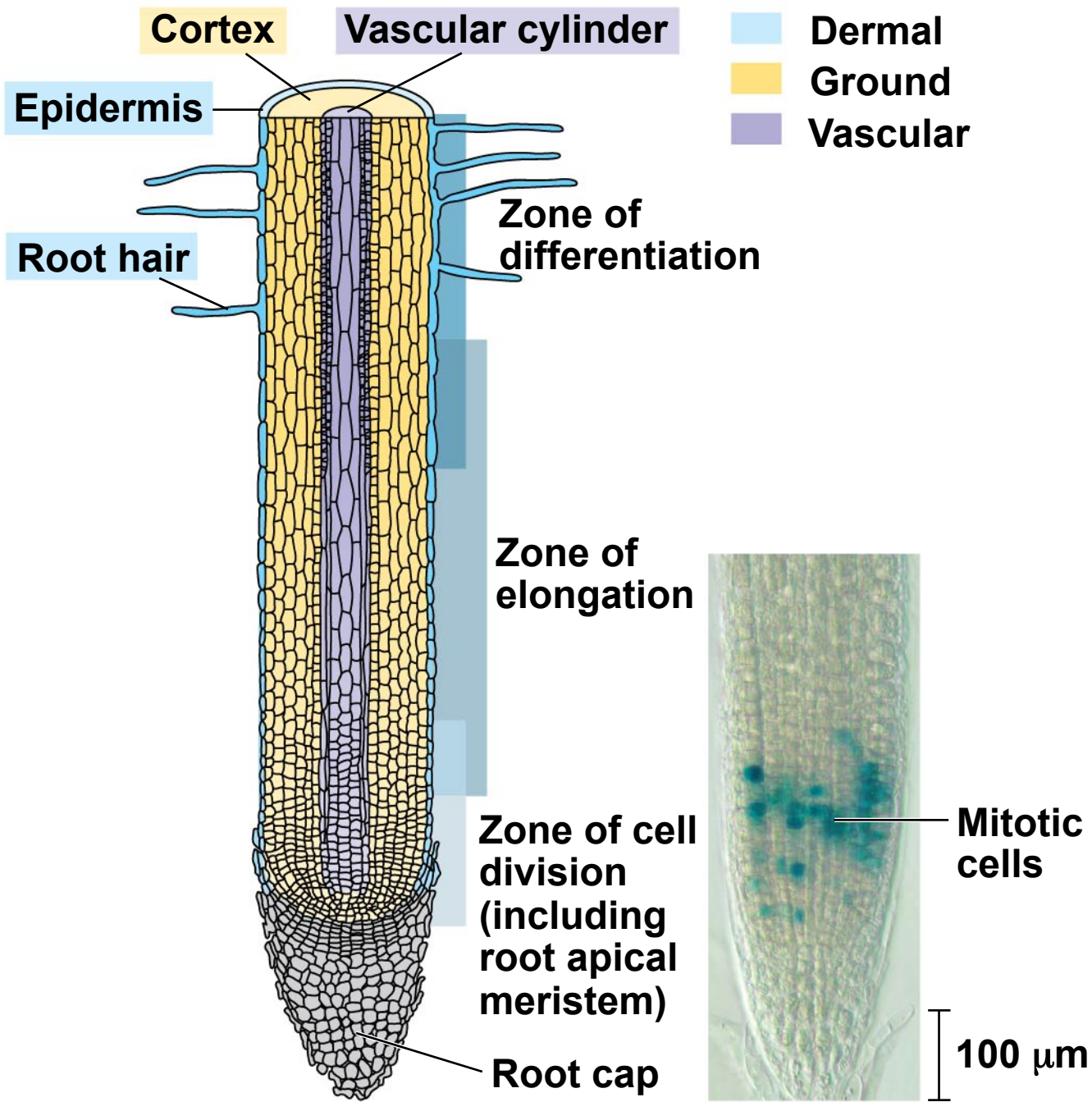
**Cortical cells**

***GLABRA-2* is expressed,  
and the cell remains hairless.**

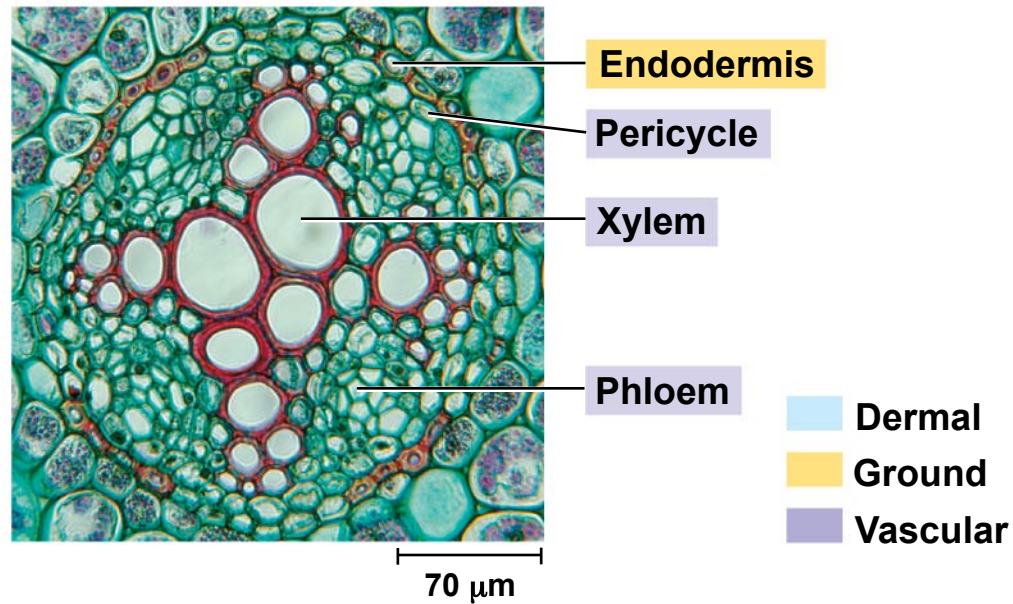
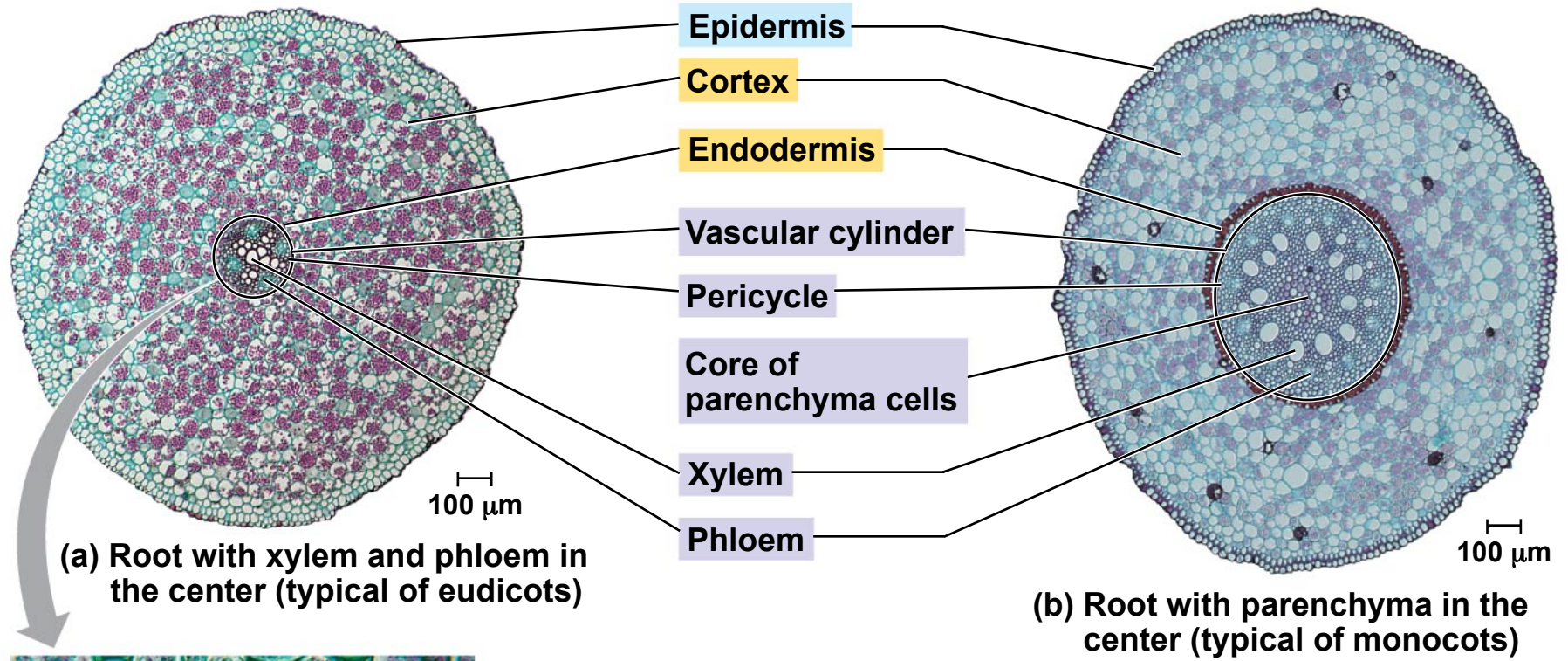


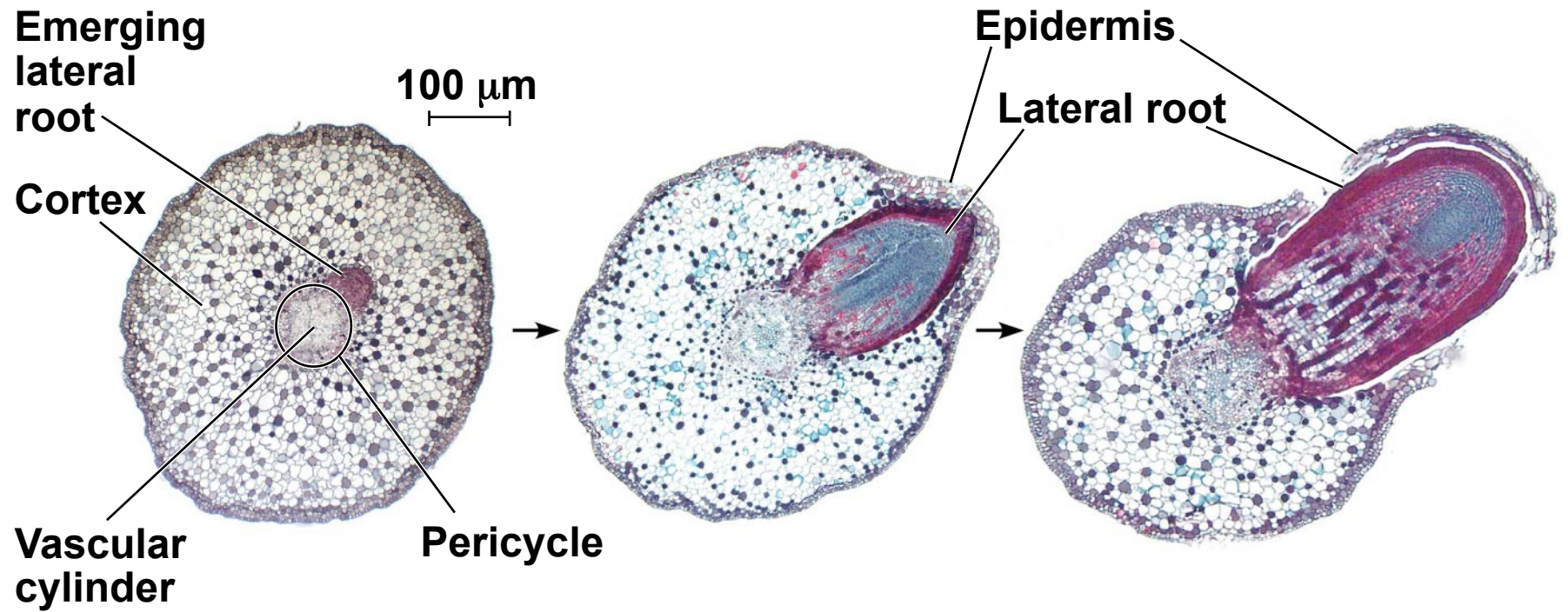
***GLABRA-2* is  
not expressed,  
and the cell  
will develop  
a root hair.**

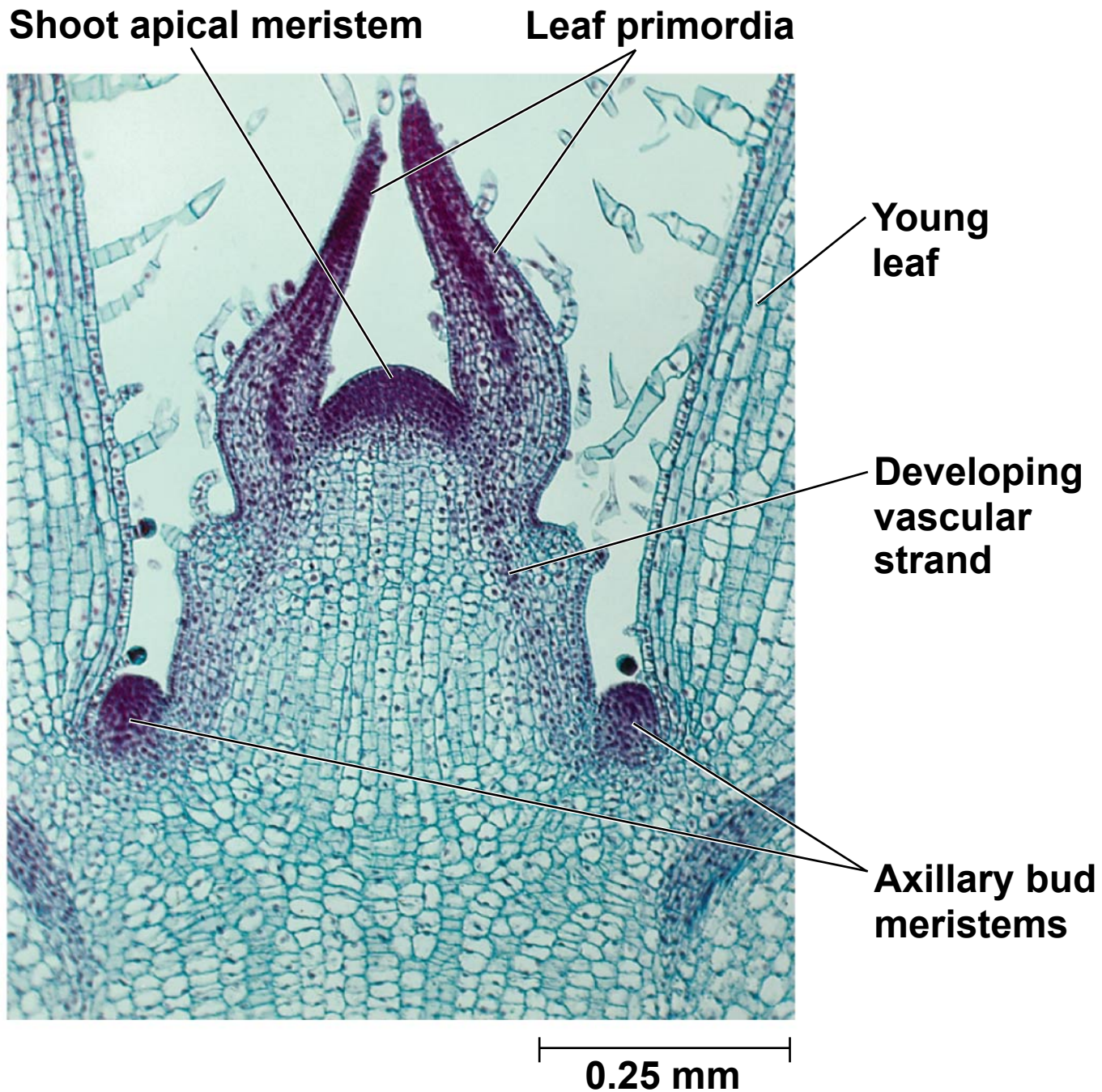
**The root cap cells will be sloughed  
off before root hairs emerge.**

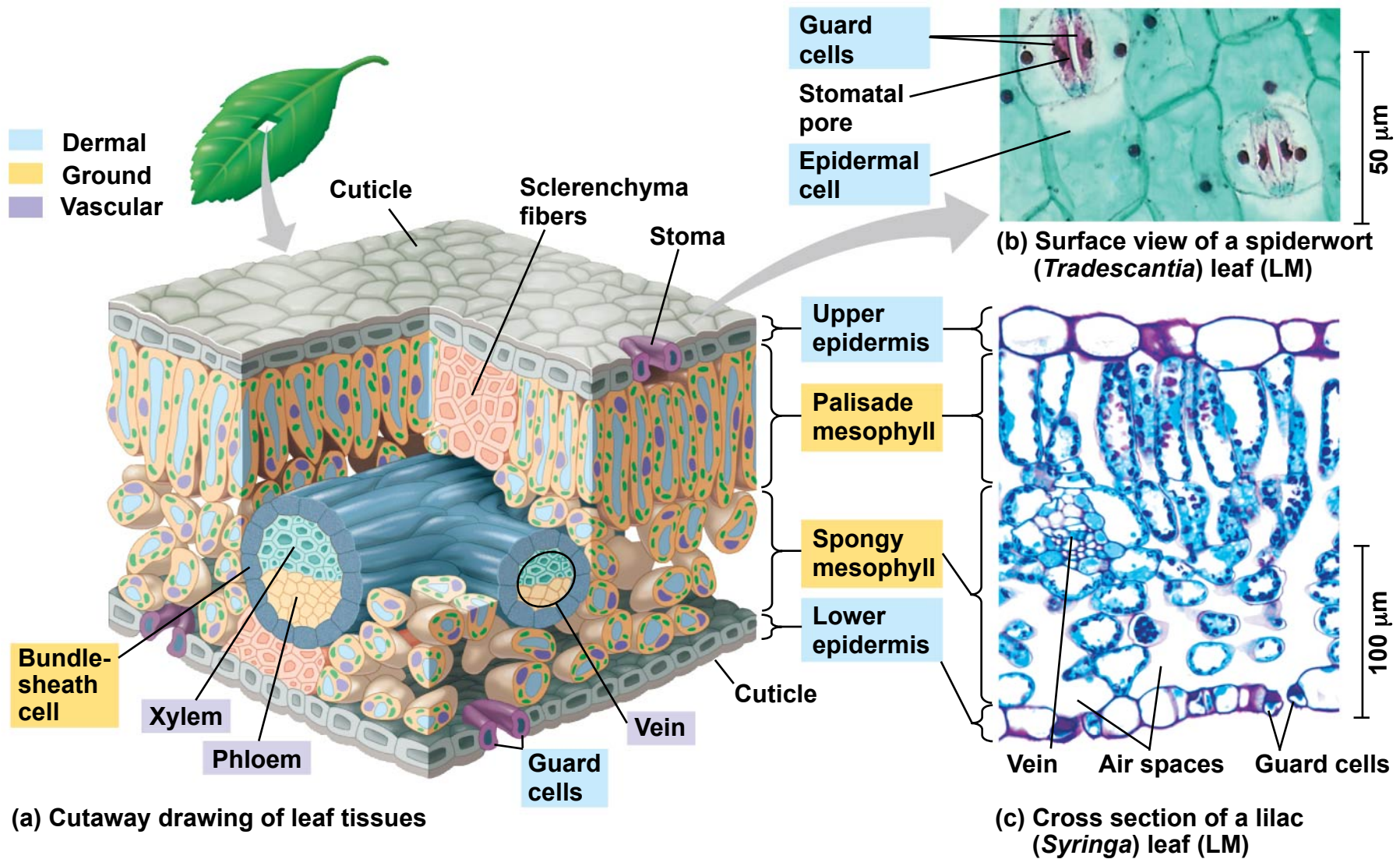


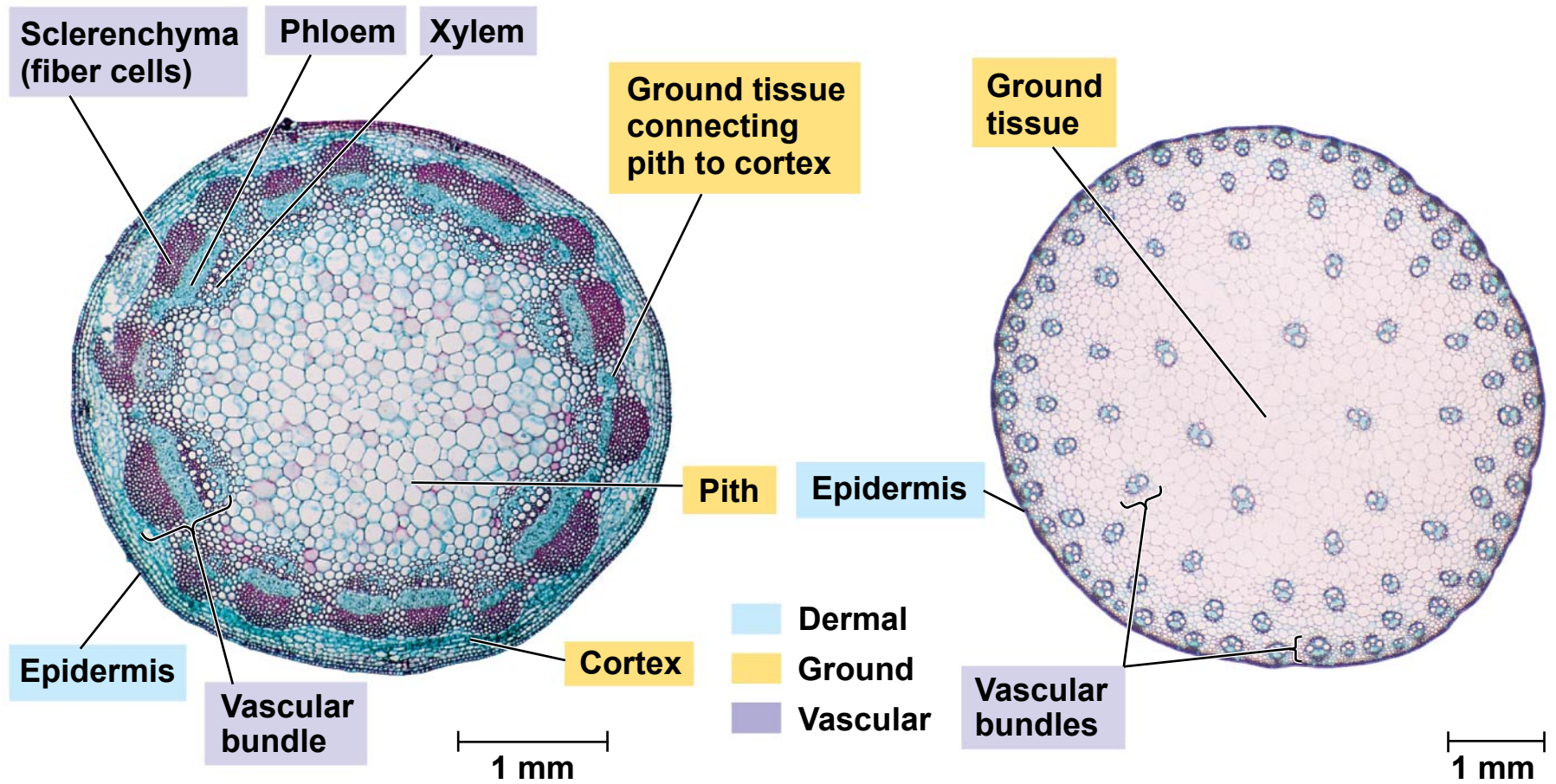












(a) Cross section of stem with vascular bundles forming a ring (typical of eudicots)

(b) Cross section of stem with scattered vascular bundles (typical of monocots)

(a) Primary and secondary growth in a two-year-old woody stem

