

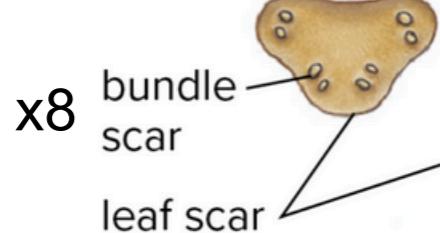
This week, you will be studying a winter branch of
Aesculus hippocastanum L (Horse Chestnut)

As it is an angiosperm dicot, it is deciduous and thus loses **palmate compound leaves** in the winter, produces blossoms (flowers) in the spring and fruit (nuts) in autumn.



Woody Branch Undergoing Overwintering

Bundle scars mark the vascular (conducting) tissue within leaf scars



Deciduous trees and shrubs lose all leaves annually. After leaves fall off, have dormant axillary buds with leaf scars below: axillary bud located in the **axil** of leaf (scar)

Only current season's growth is considered a twig (newest growth after most recent bud scale scar)

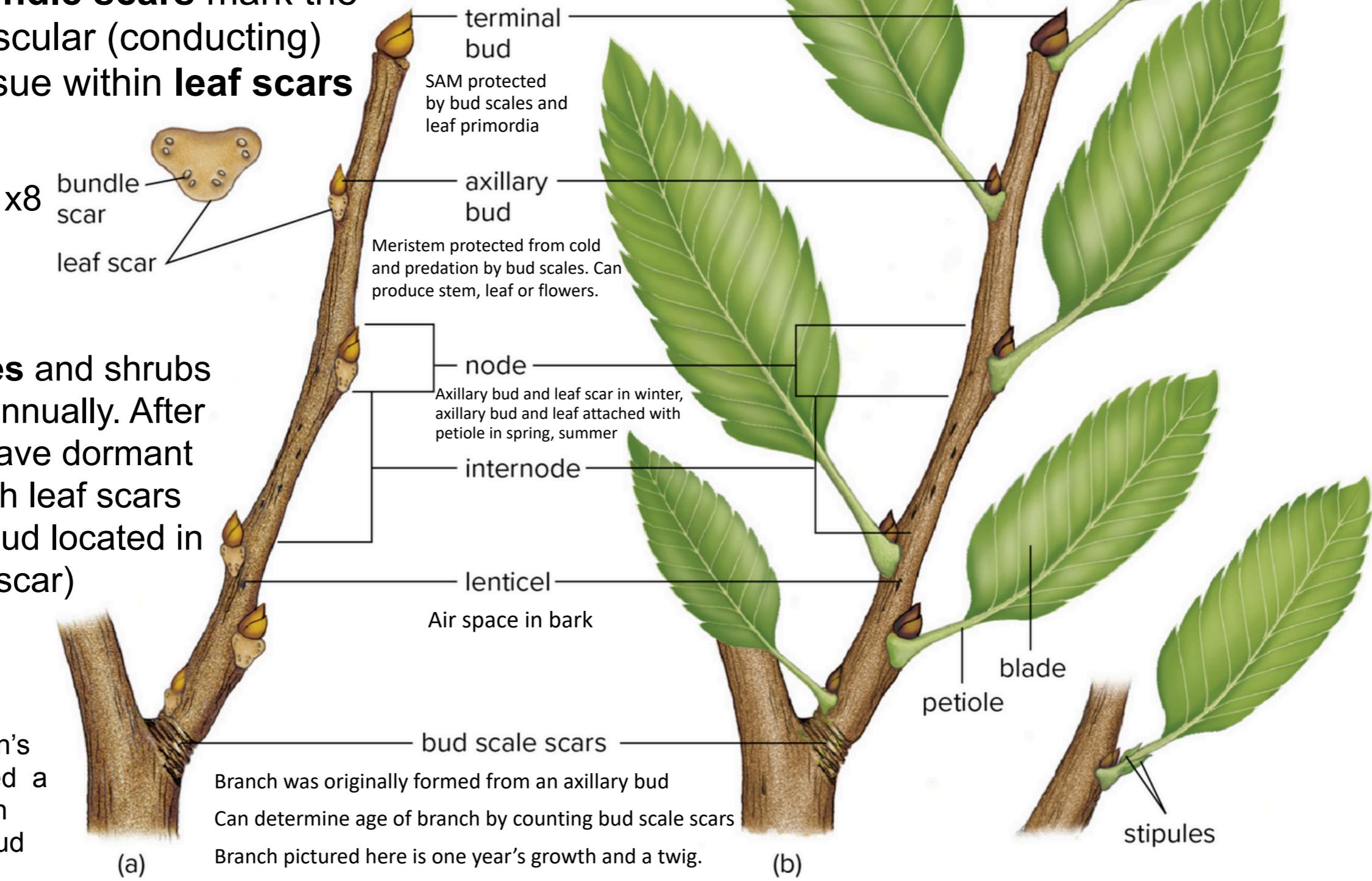


FIGURE 6.1 A woody twig. (a) The twig in its winter condition. (b) The twig as it appeared the summer

Primary Growth: Shoot Apical Meristem (SAM)

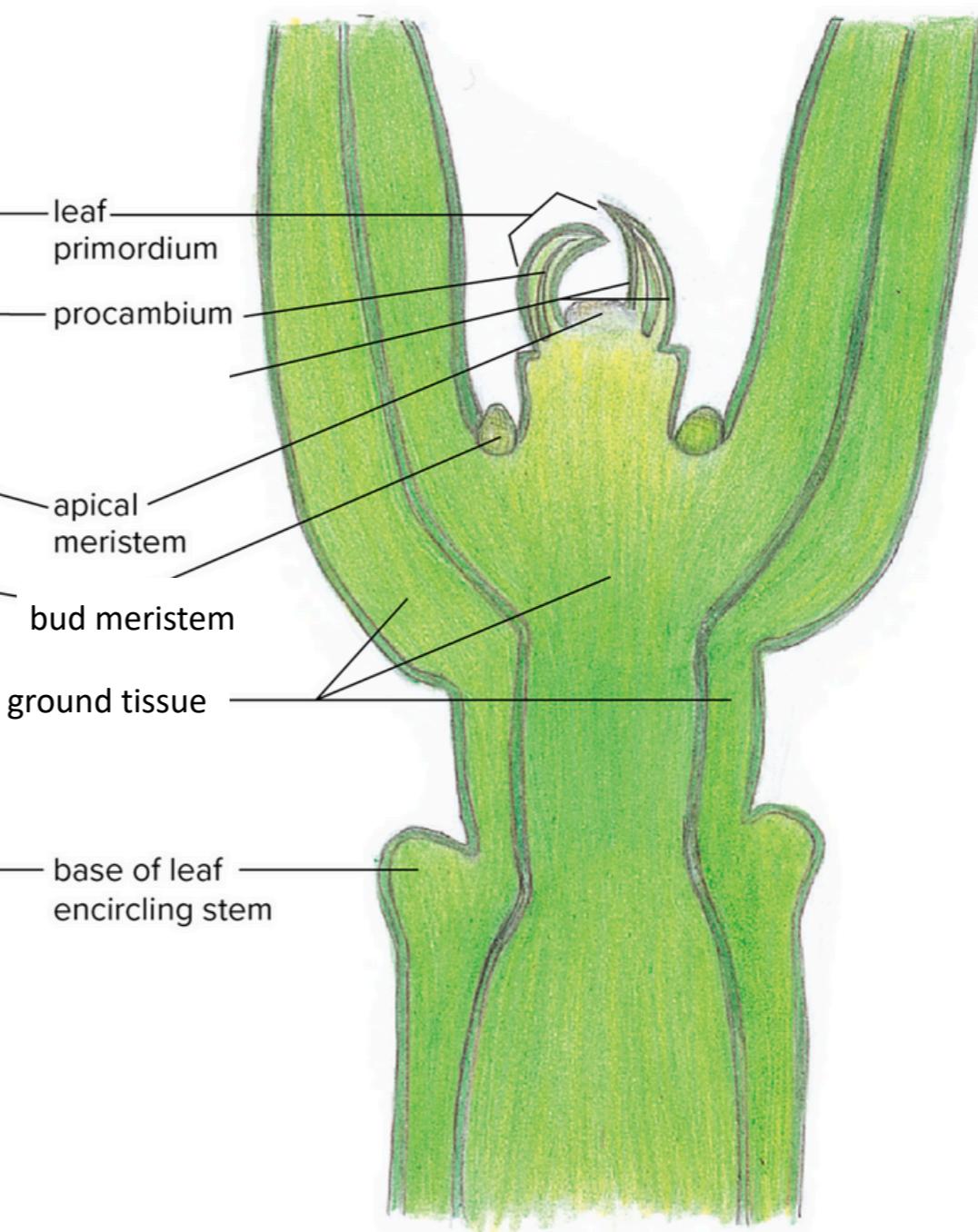
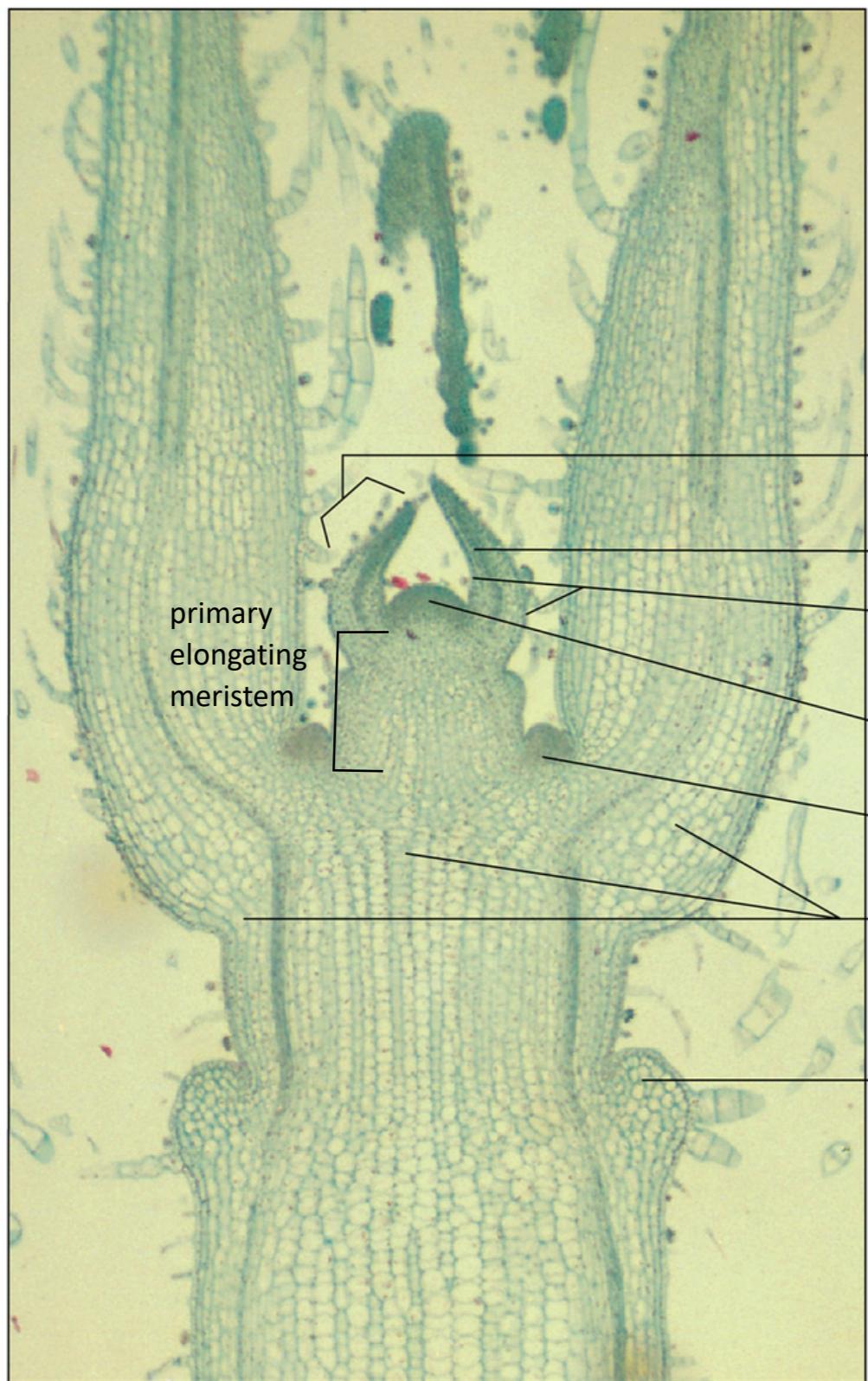


FIGURE 6.2 A longitudinal section through the tip of a *Coleus* stem. $\times 800$.

Leaf Phyllotaxy (Arrangement) on Stems



Alternate (spiral)



Distichous

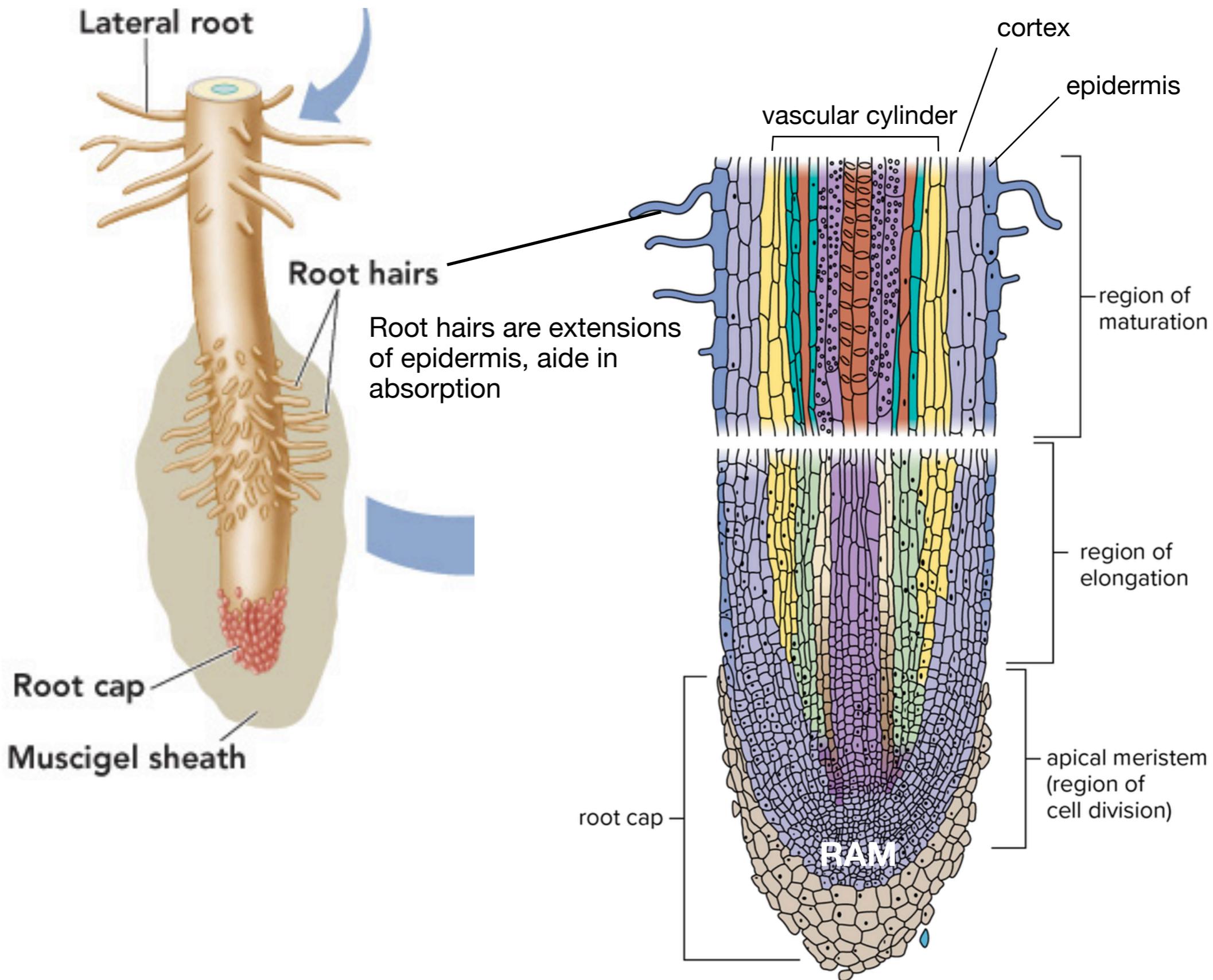


Decussate



Verticillate

Primary Growth: Roots



Primary Growth: Stem Vascular Bundles of Dicot

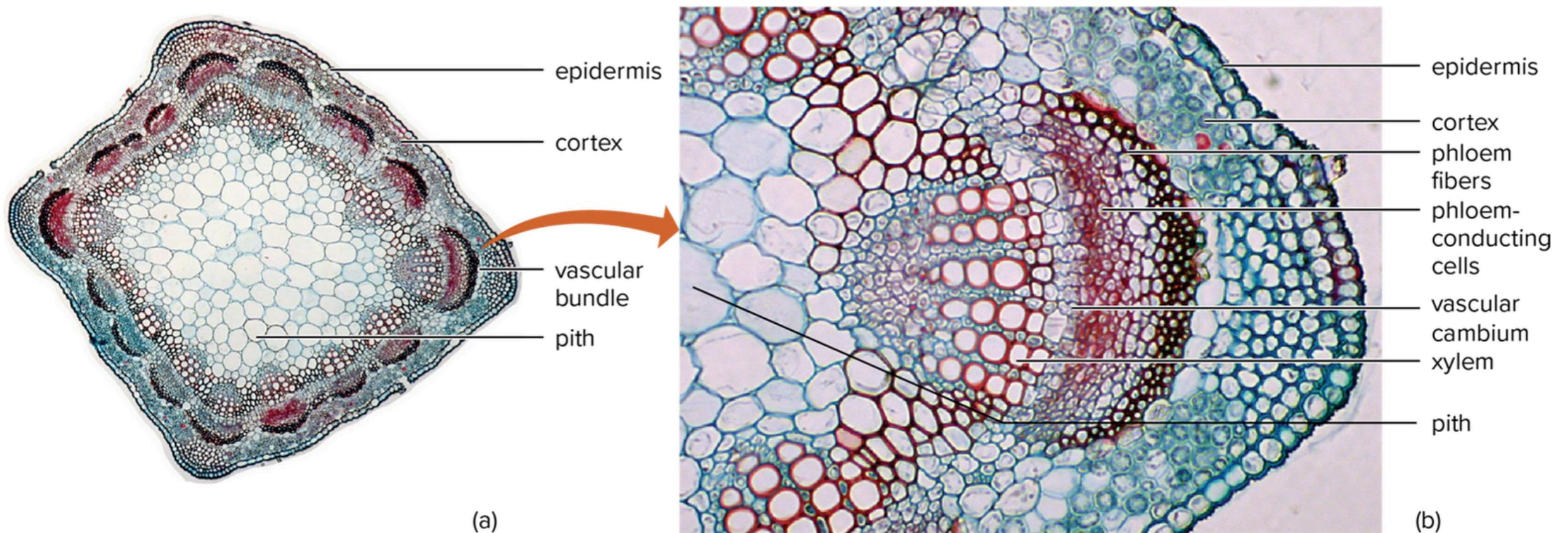


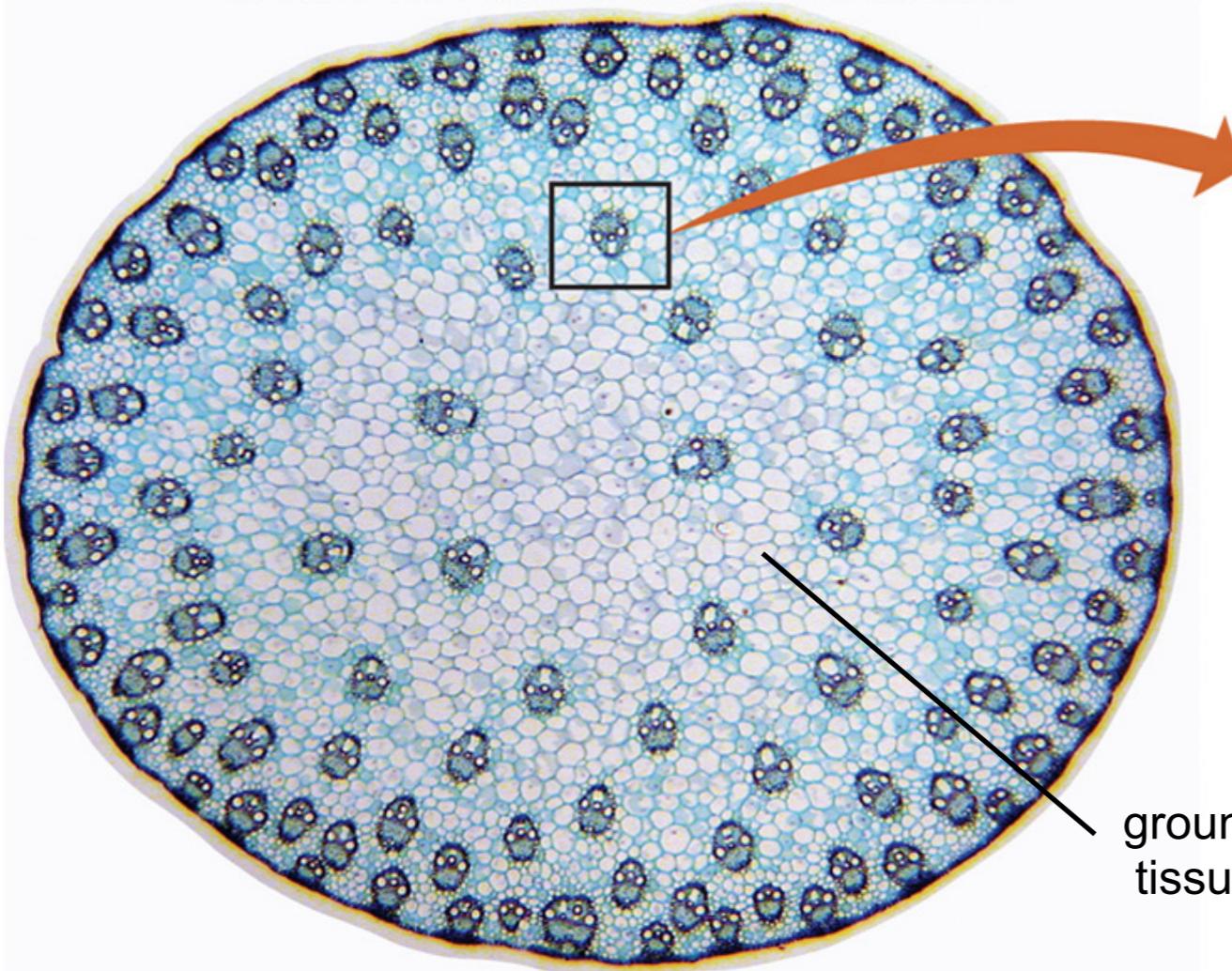
FIGURE 6.5 (a) A cross section of an alfalfa (*Medicago*) stem. $\times 40$. The tissue arrangement is typical of herbaceous dicot stems. (b) An enlargement of a small portion of the outer part of the stem. $\times 400$.

(a-b) © James E. Bidlack

Will be looking at buttercup, pith might be broken away, still label “empty space” as pith

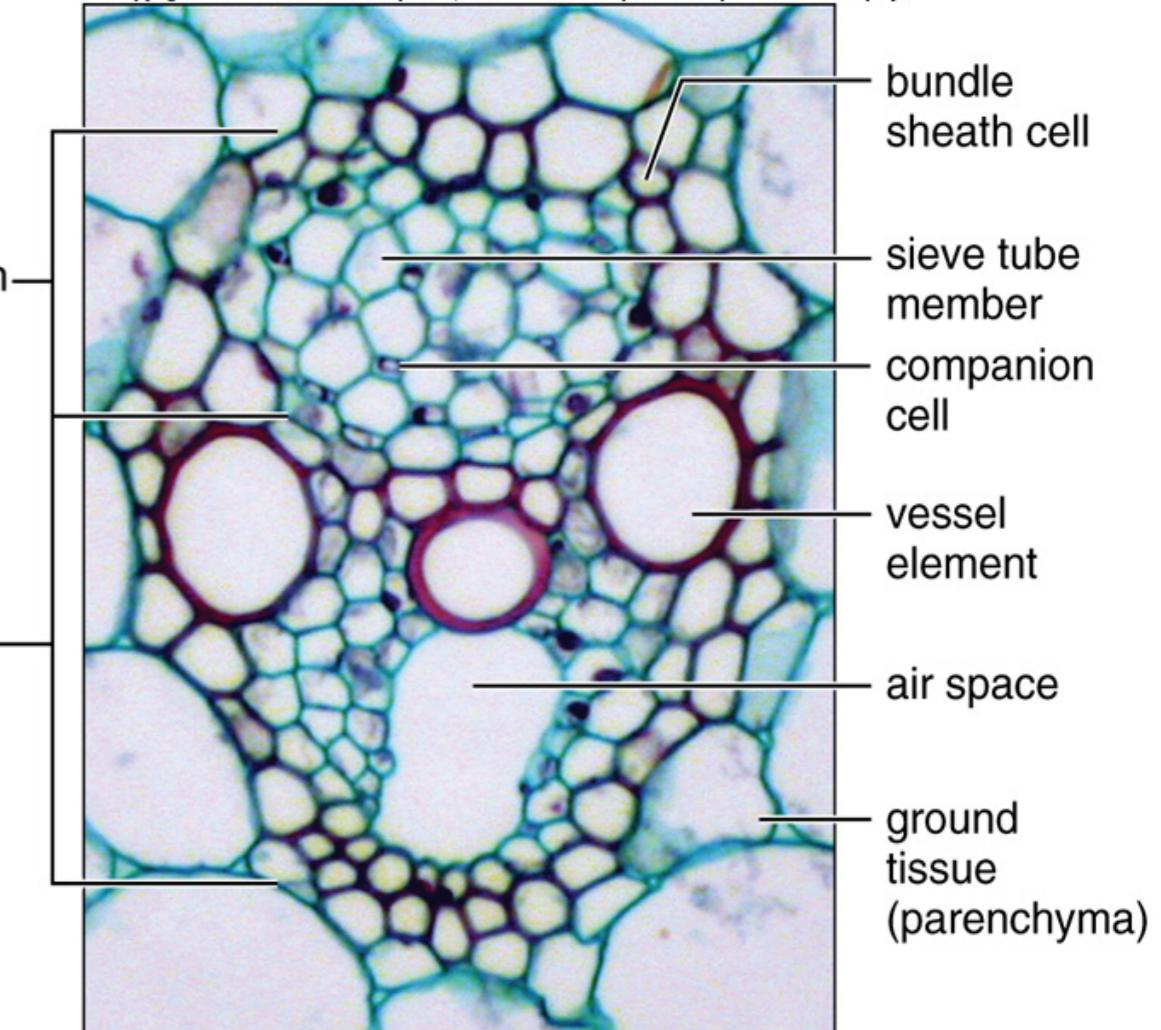
Primary Growth: Stem Vascular Bundles of Monocot

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.



Cross section of monocot stem

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.



Vascular bundle surrounded by sclerenchyma bundle sheath

Fig.6.12

Primary Growth: Root Cross Section of Dicot

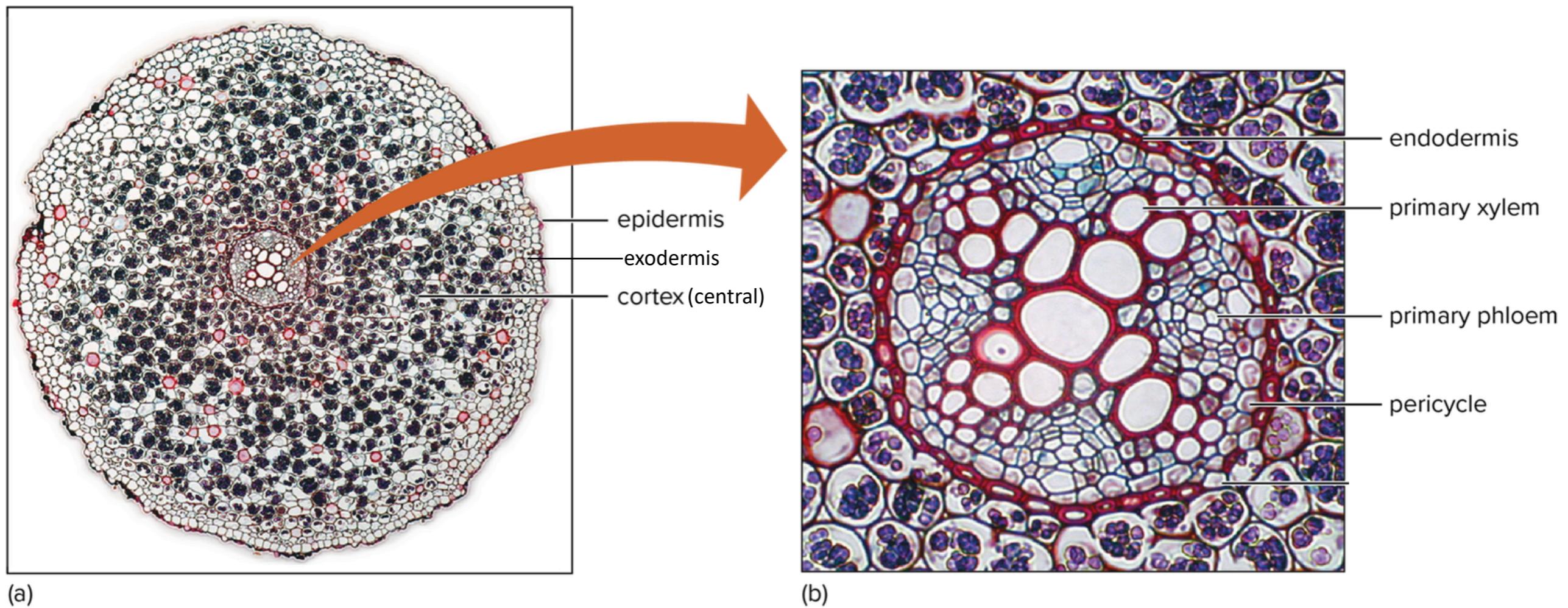


FIGURE 5.5 A cross section of a dicot (buttercup—*Ranunculus*) root. (a) Complete view. $\times 40$. (b) Enlargement of the root center (vascular cylinder). $\times 400$.

(a-b) © James E. Bidlack

Epidermis is outermost cell layer, exodermis is next; both are one cell layer thick

Primary Growth: Root Cross Section of Monocot

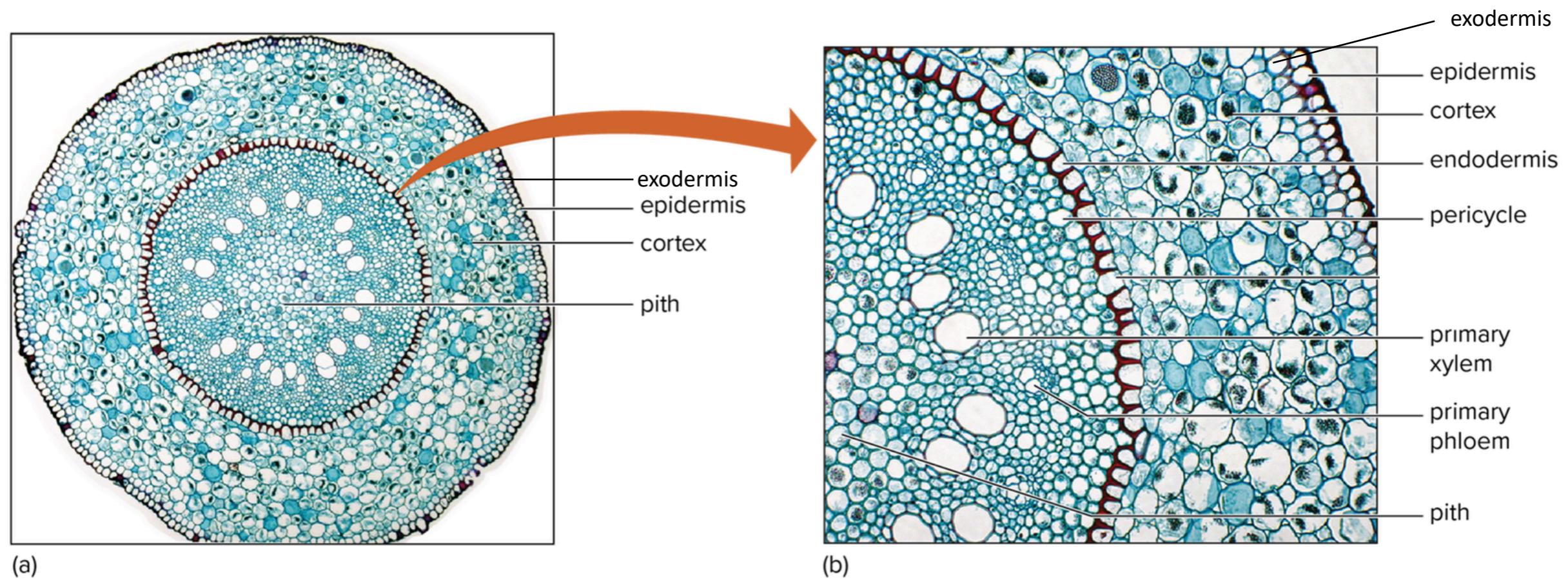


FIGURE 5.3 A cross section of a monocot (greenbrier—*Smilax*) root. (a) Complete view. $\times 40$. (b) Enlargement showing partial section of the root interior. $\times 100$.

(a-b) © James E. Bidlack

Unlike stems, monocot roots have ground tissue parenchyma separated into pith and cortex

primary phloem
phloem fibers
vascular cambium

Secondary Growth:
Stem Cross Section of Dicot

primary xylem

pith

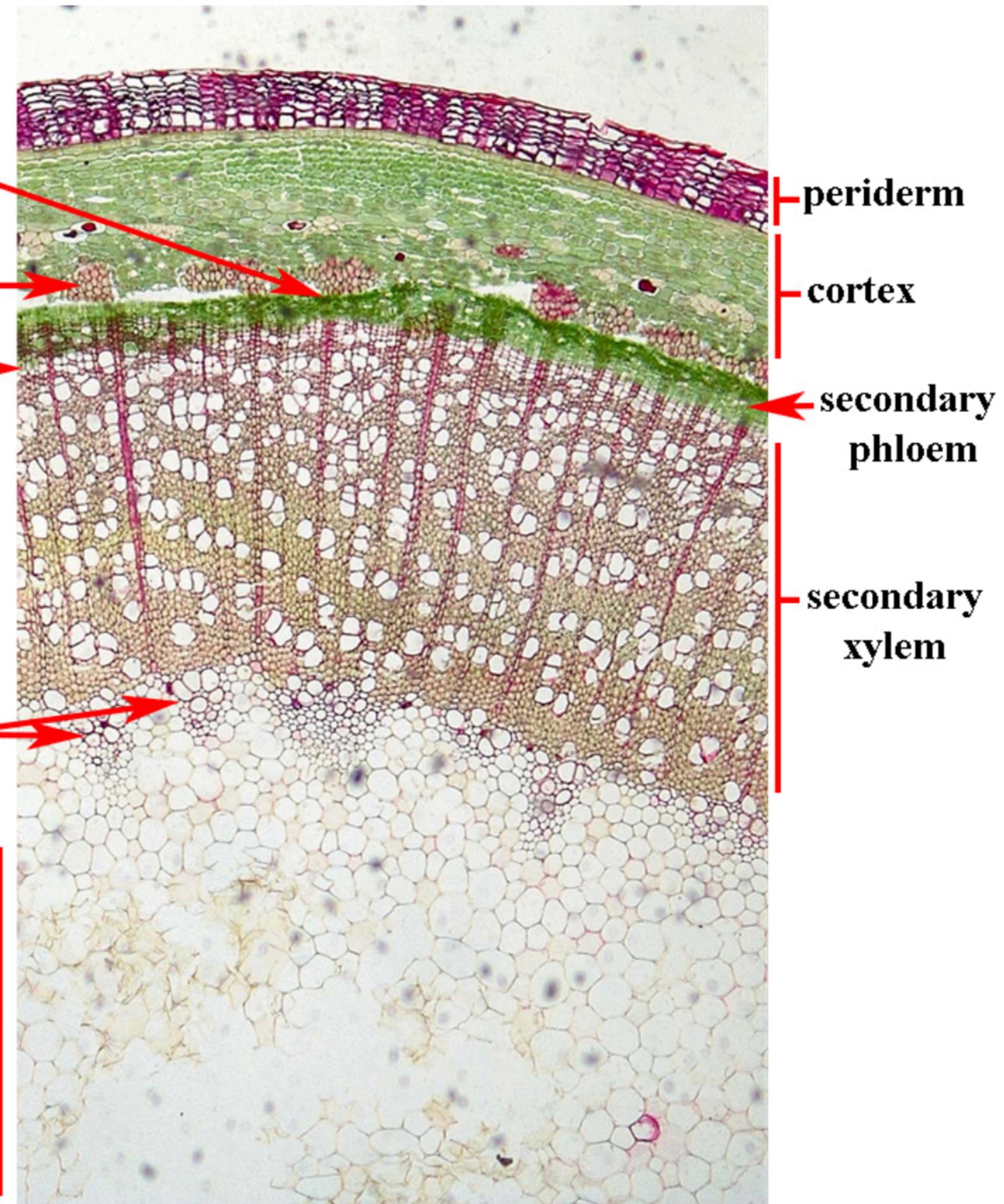


Figure 3.24. Cross section of *Sambucus* sp. stem showing considerable secondary growth.

Secondary Growth: Periderm (bark)

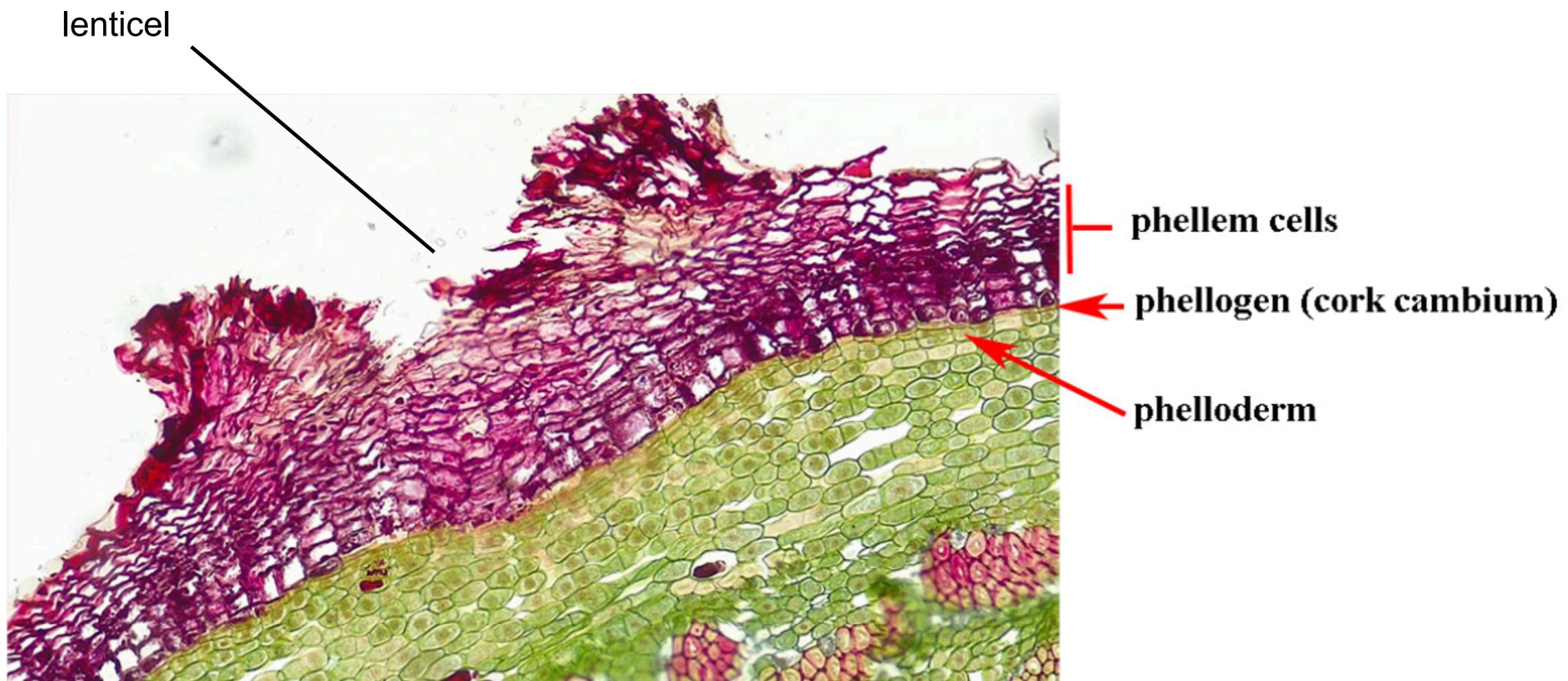


Figure 3.25. Cross section of *Sambucus* sp. stem showing the development of a lenticel in the outer phellem.