

Anatomy, Embryology and Morphogenesis

Anatomy of Monocot and Dicot Root, Stem and Leaf

Presented by

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TRICHY – 24.

Roots

- Roots anchor the plant
- Roots absorb water and dissolved minerals from the ground.
- Roots may also be modified to store food.
Ex. Carrots, radish, turnip etc.

Anatomy of Monocot Root

Epidermis: rhizodermis, epiblema or piliferous layer

- compact tabular cells
- root hairs present

Cortex : thin-walled parenchyma cells

Endodermis: barrel shaped compact cells

- Casparian strips(anticlinal wall)
- passage cells

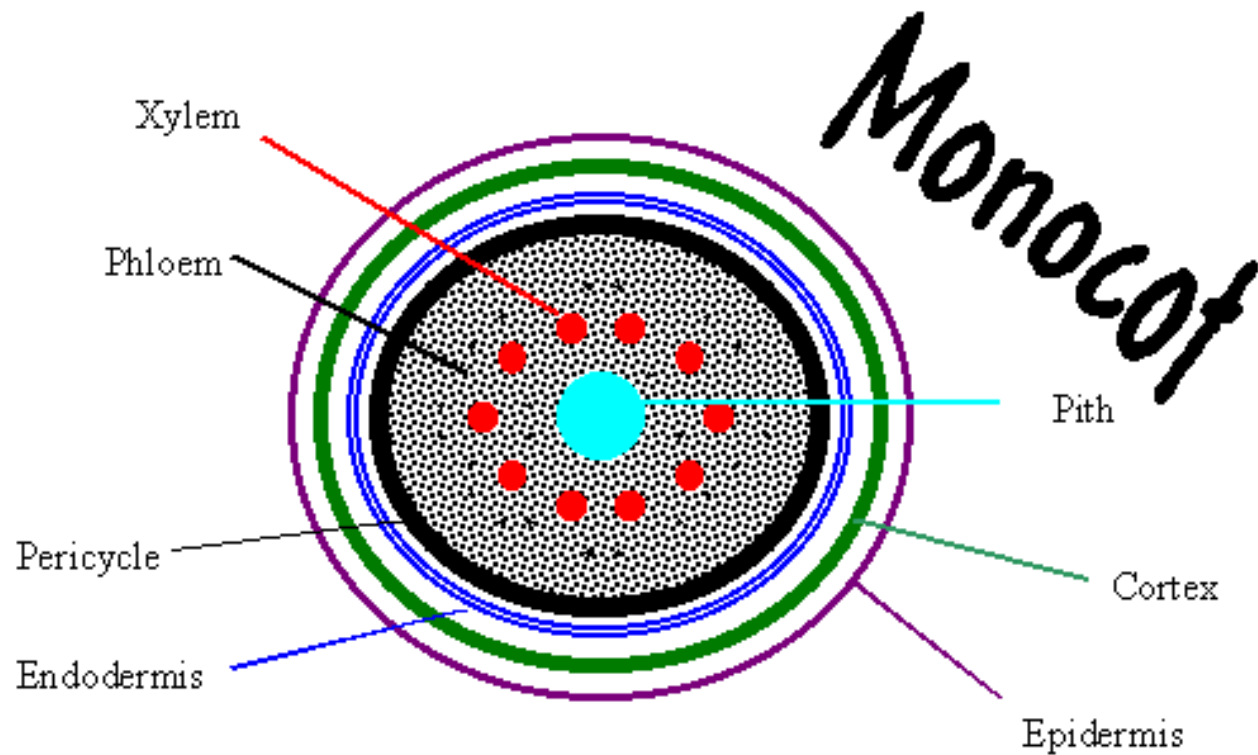
Pericycle: Parenchyma cells

Vascular tissue: xylem-polyarch

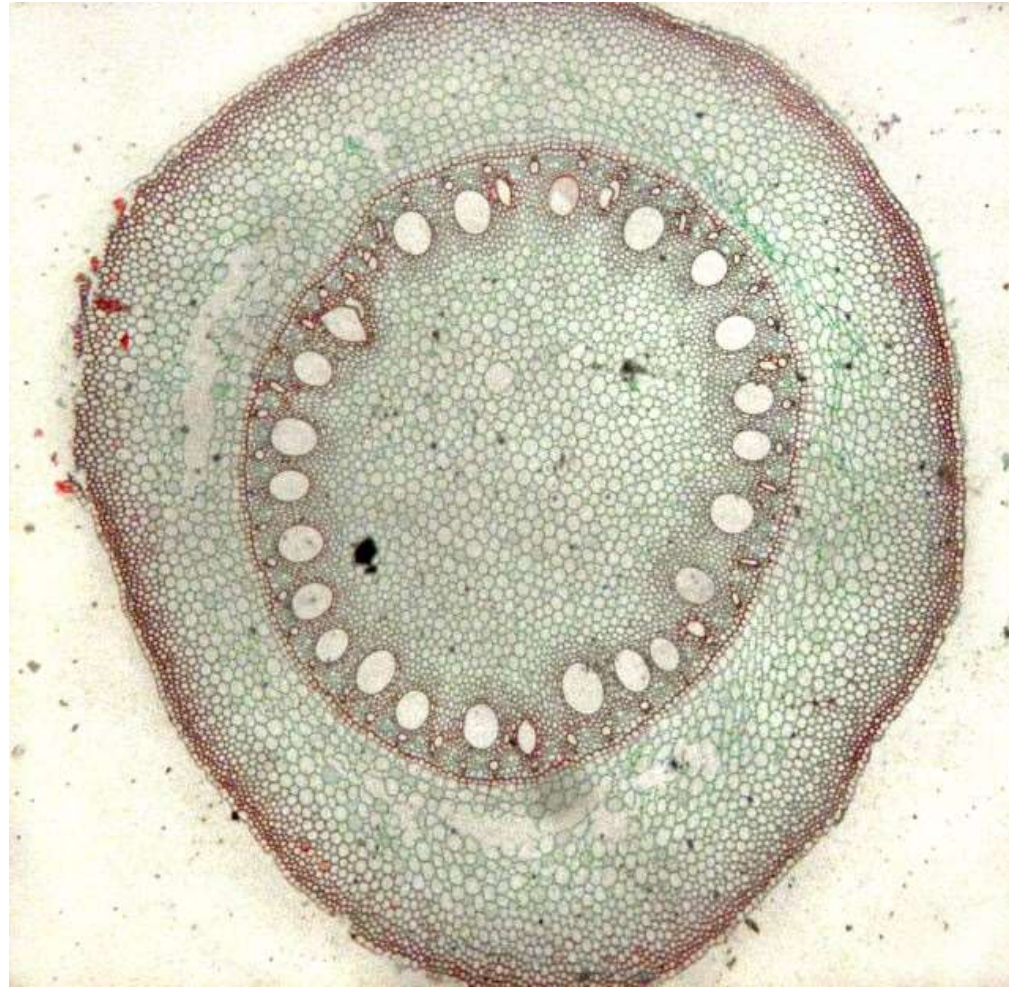
- pith-Parenchymatous or

Sclerenchymatous

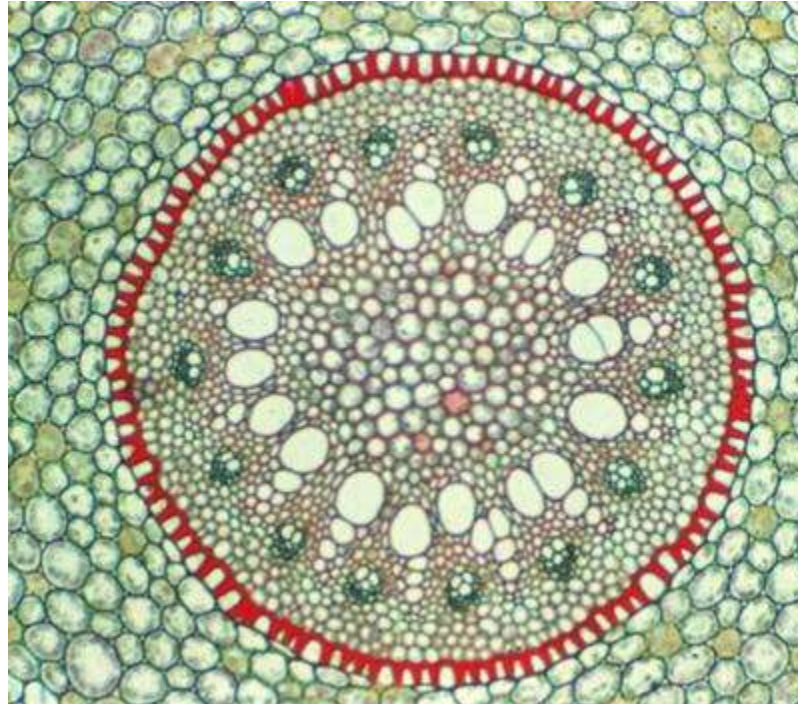
C.S. Monocot Root (line)



C. S. of Monocot Root



Steel



Anatomy of Dicot Root

Epidermis: rhizodermis, epiblema or piliferous layer

- closely packed elongated cells
- root hairs present

Cortex : thin-walled parenchyma cells

Endodermis: barrel shaped compact cells

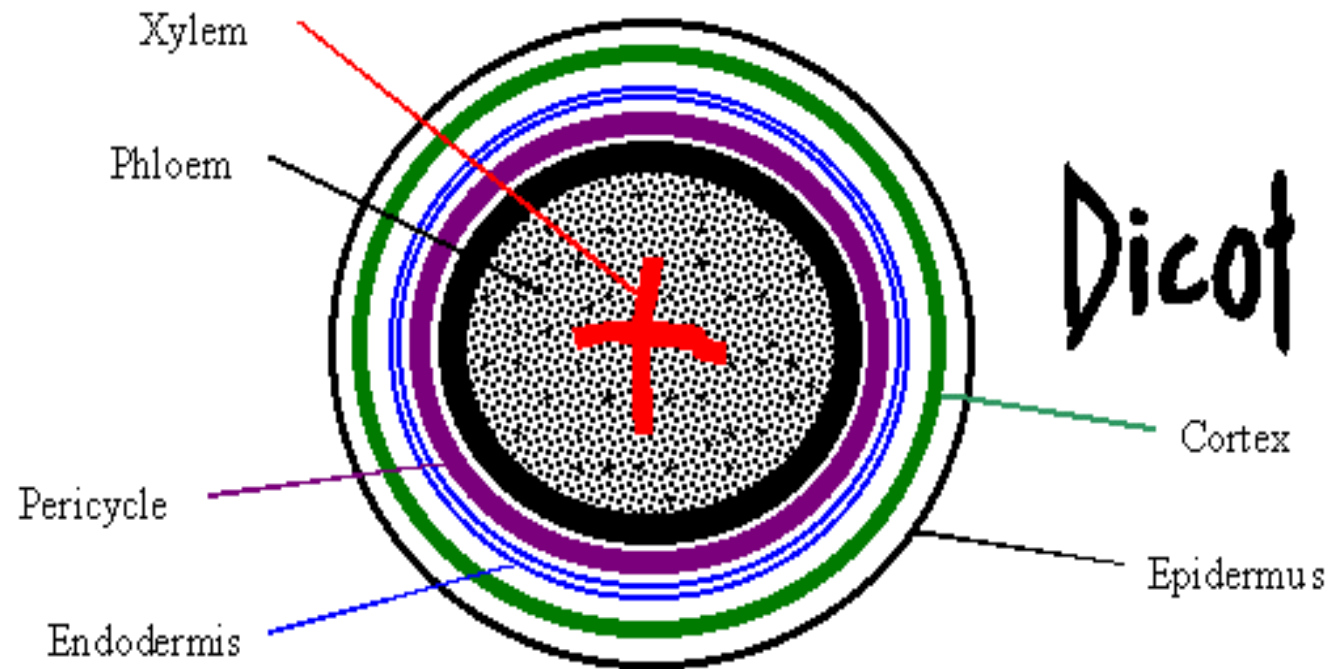
- Casparian strips(anticlinal wall)
- passage cells

Pericycle: thin-walled Parenchyma cells

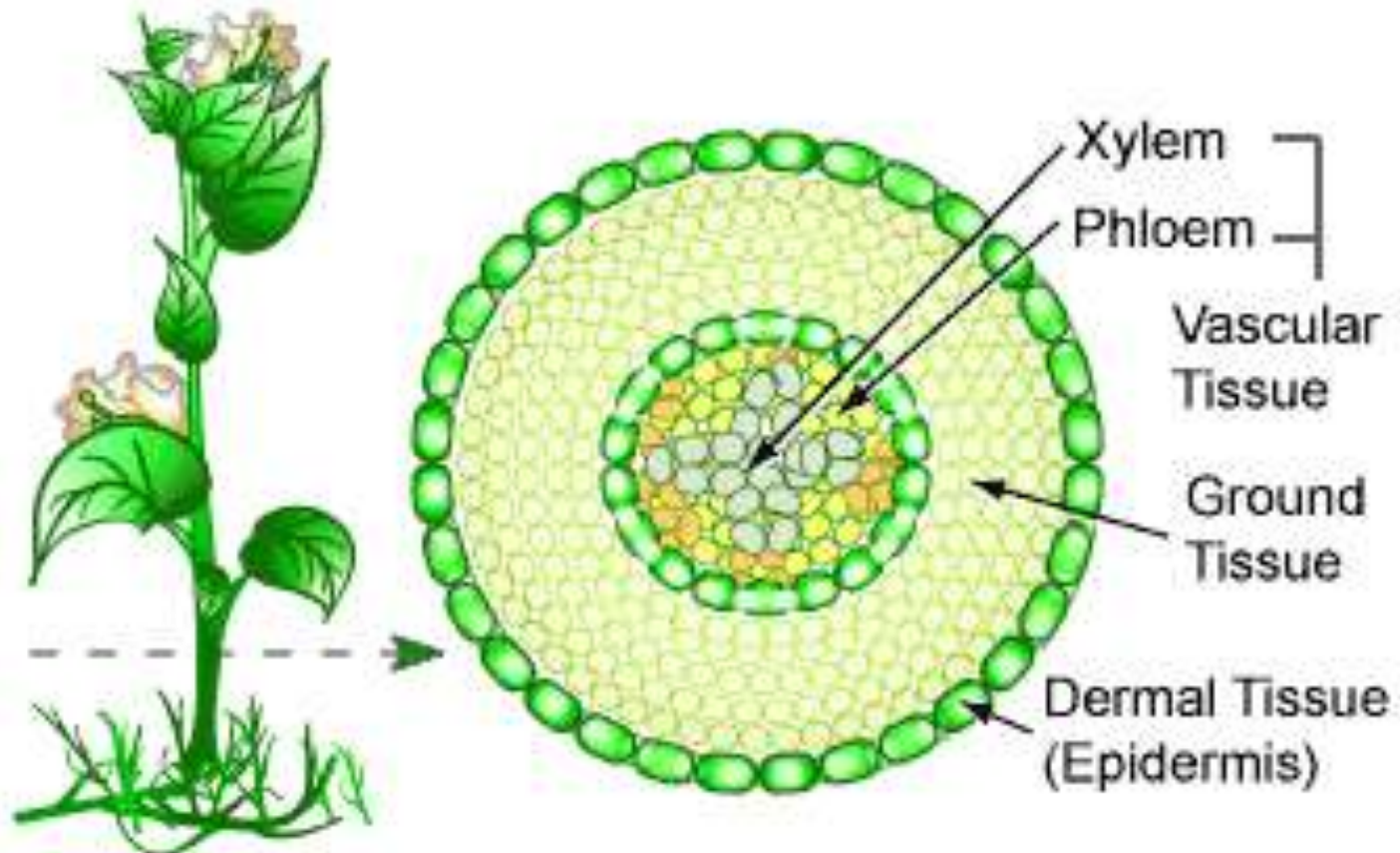
Vascular tissue: xylem-exarch(protoxylem –periphery...)

- pith- absent

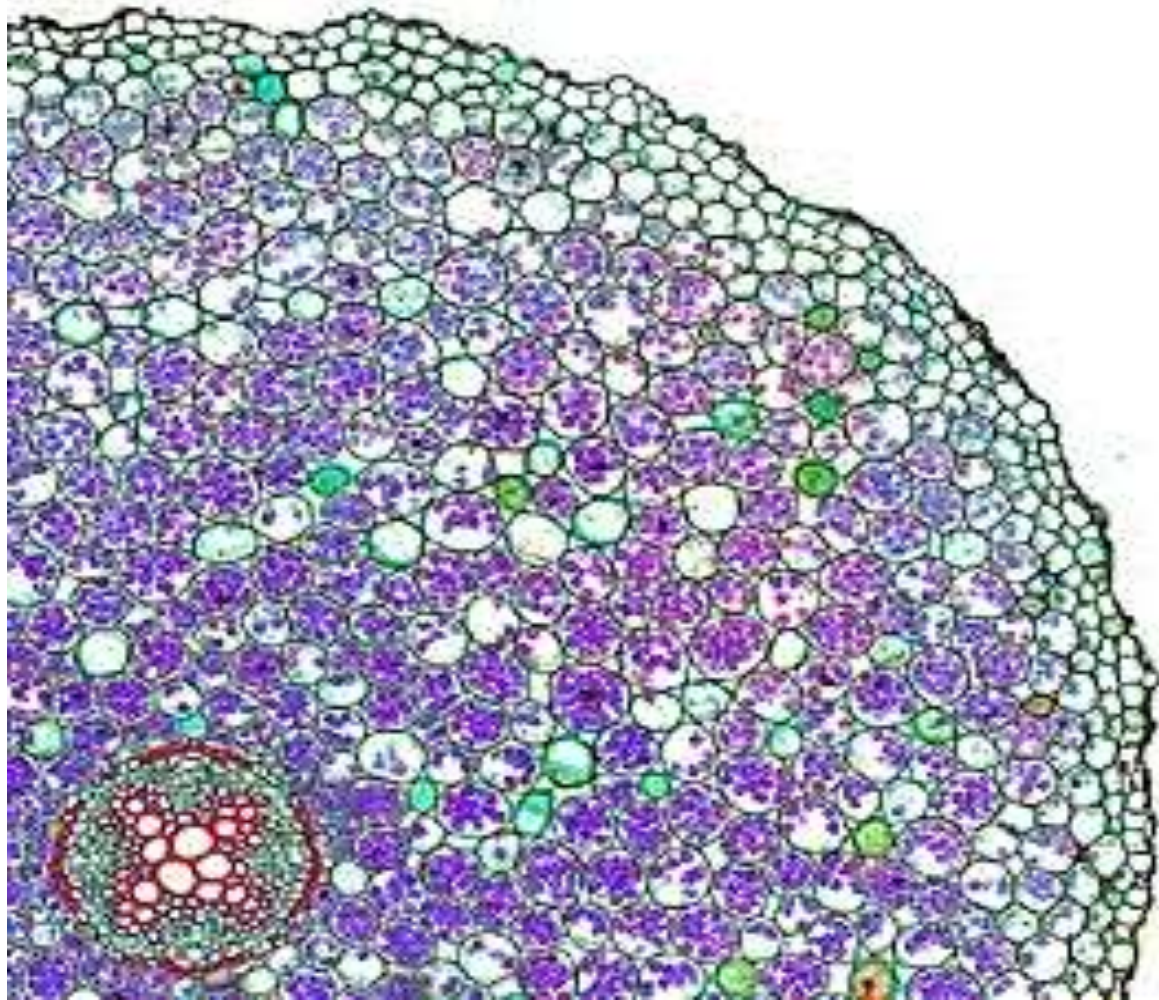
C.S. Dicot Root (line diagram)



C.S. Dicot Root



V. Cylinder Dicot Root



Stems

- Supports leaves and flowers
- Stem transports water and dissolved sugars.
- Stem may photosynthesize. Ex. Cactus, green stems
- Stem may also store food

Transport in stems

Water lost through leaves is replaced by water moving up through xylem. Xylem also carries minerals with water.

Phloem transports sugars and hormones.

Portion of the plant that stores these sugars is called a “**Sink**”.

Anatomy of Monocot stem

Epidermis: - single layer compact cells
- cuticle present

Hypodermis : 2 or 3 layer sclernchyma cells

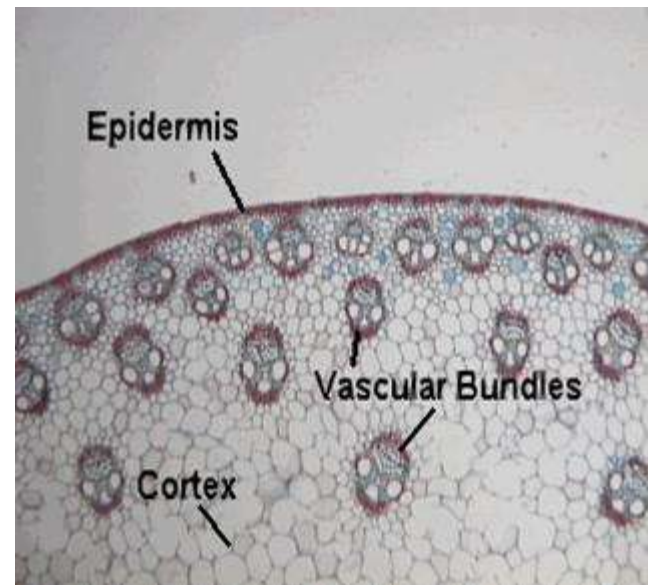
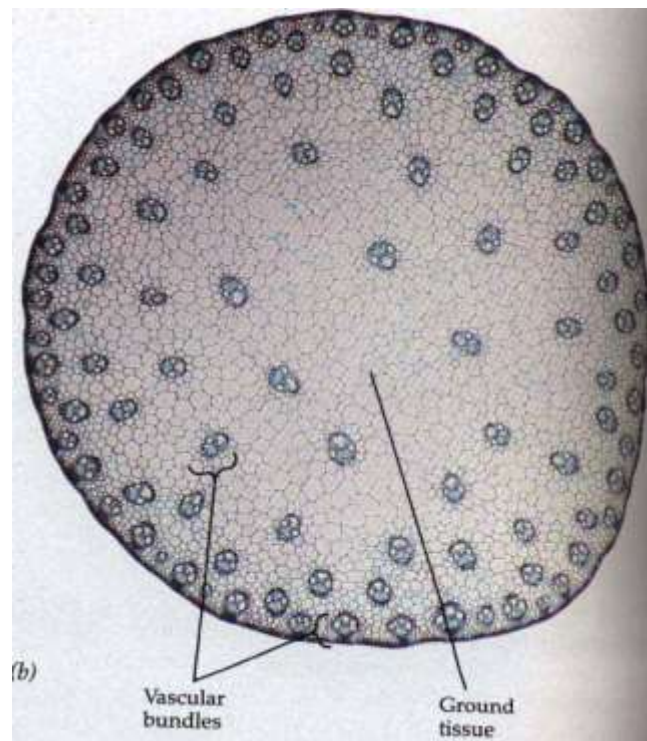
Ground tissue: cortex, endodermis, pericycle and pith

Vascular system: collateral and closed

- scattered –ground tissue
- bundle-oval shape
- xylem ‘Y’ shaped

Cross section of Monocot stem

- Scattered V.B.'s
- V.B.'s enlarged



Growth in Monocots

Monocots are annual plants and do not show secondary growth

Anatomy of Dicot stem

Epidermis: - single layer compact cells
- stomata and trichomes present

Cortex : - starch –sheath
-outer-collenchyma
-inner-parenchyma

Endodermis: barrel shaped elongated cells
-starch sheath

Stele: pericycle, vascular bundle and pith

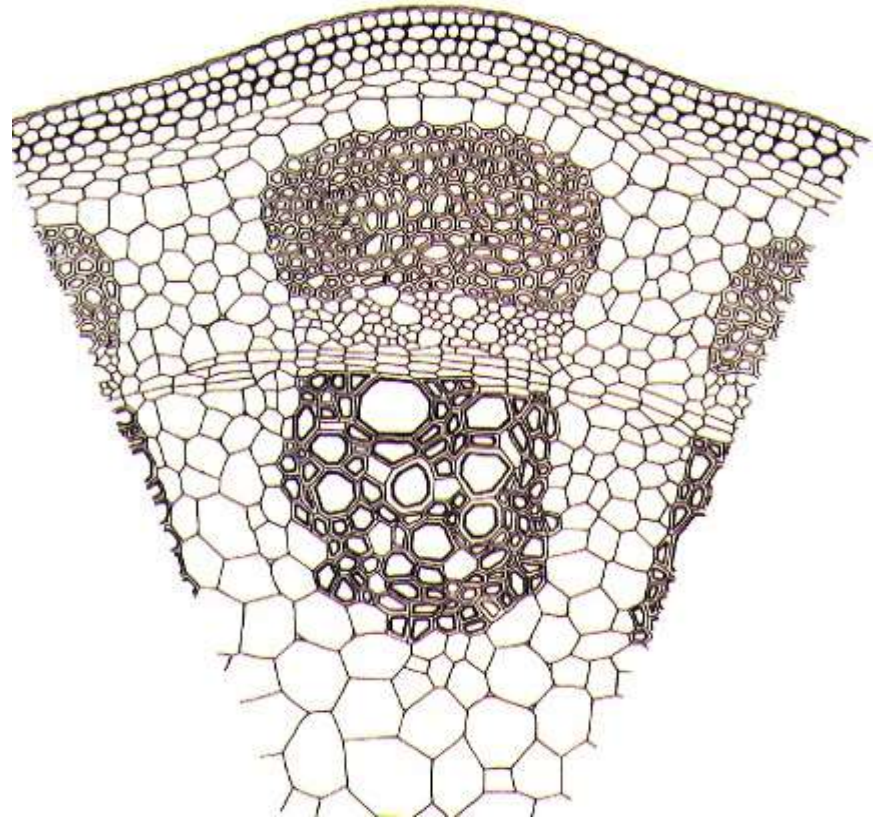
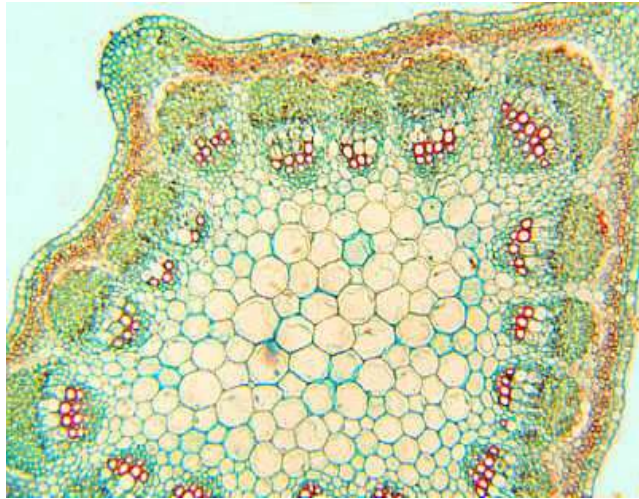
Pericycle: parenchyma and sclerenchyma cells

Vascular bundle:- xylem(primary&sec), phloem and cambium
-xylem-tracheary cells-tracheids and vessels, wood fibres
and wood parenchyma
-phloem-sieve tubes, companion cells & Phloem
parenchyma

Pith: thin-walled parenchyma cells

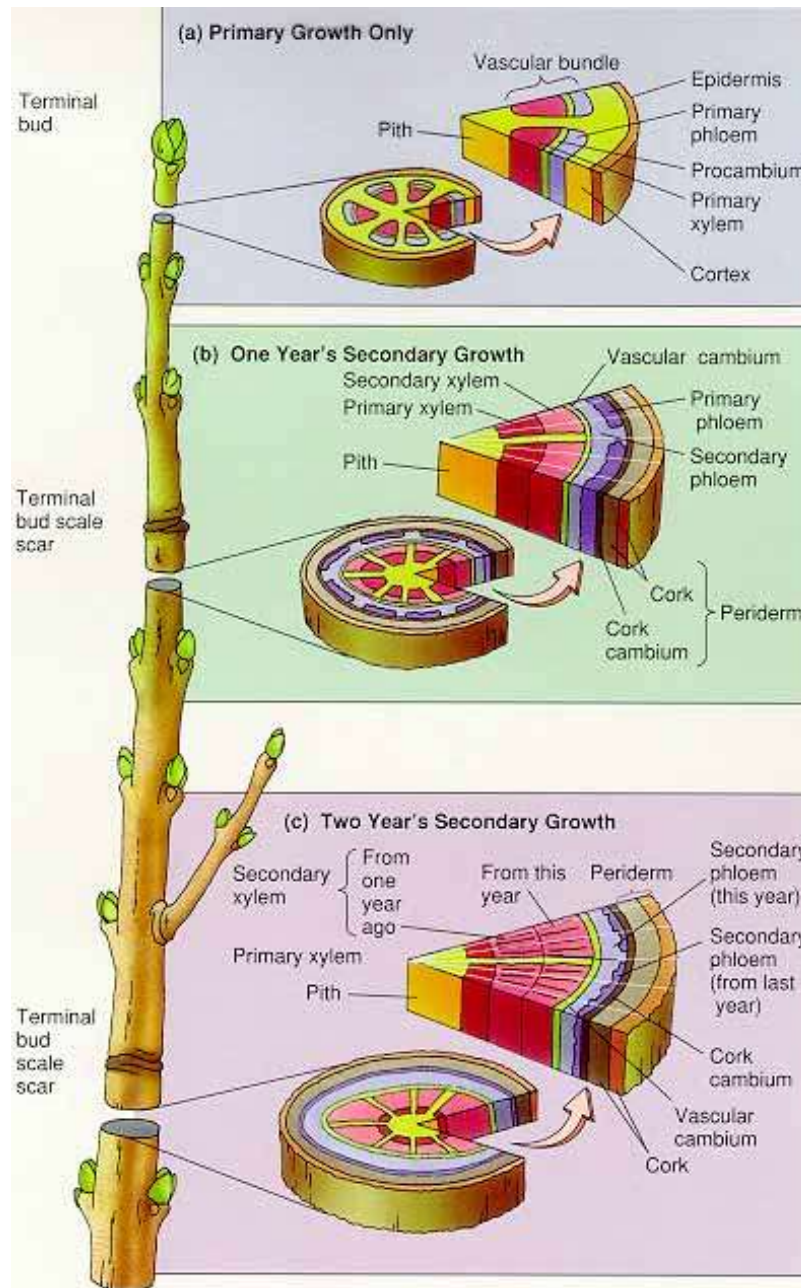
Cross section of a dicot stem

- Vascular bundles are arranged in a ring
- V. B. enlarged



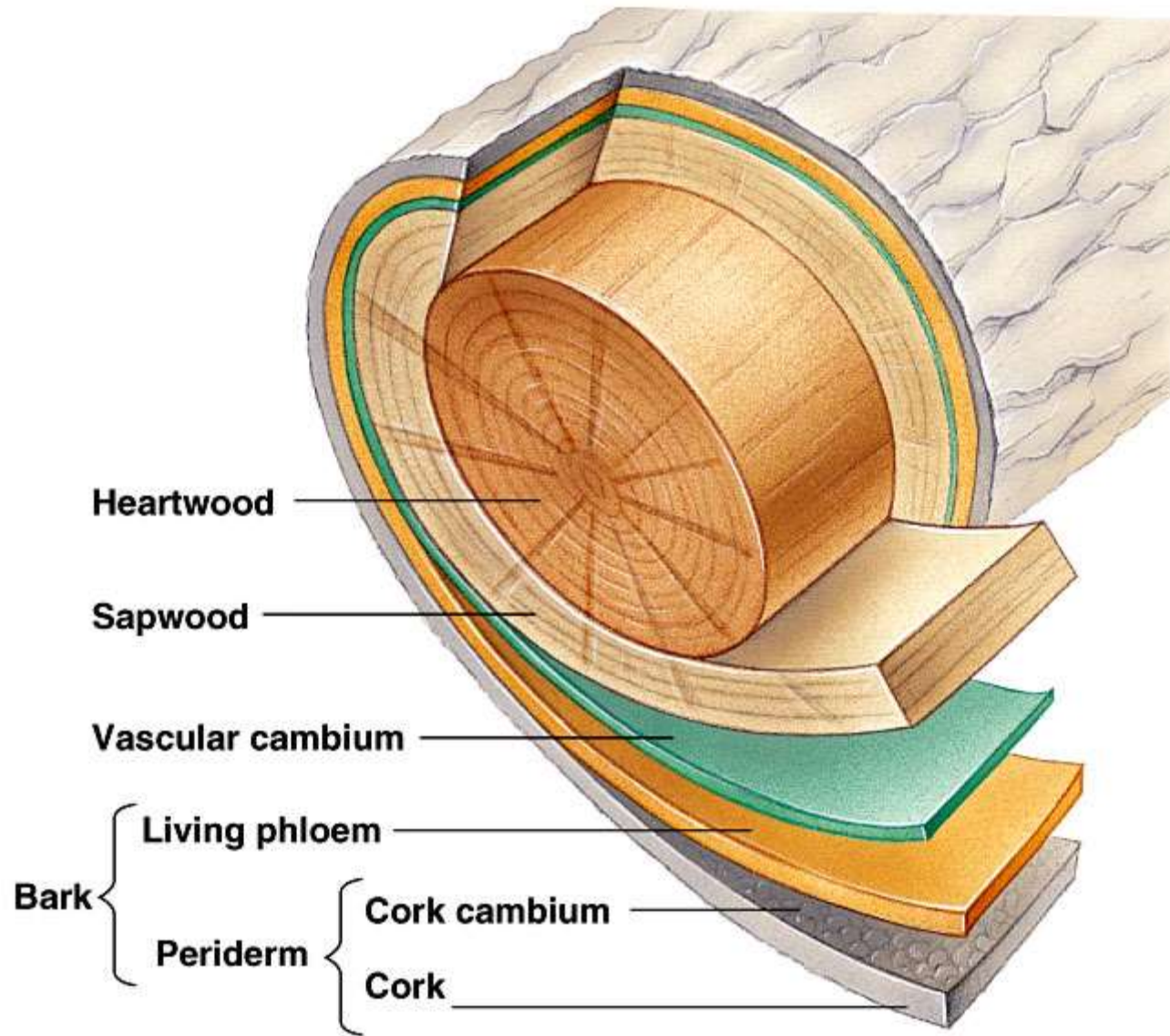
Growth in dicots

- Dicot plants are perennial and show secondary growth.
- Vascular cambium and cork cambium increase the girth of stem.
- Vascular cambium grows in between primary xylem and primary phloem.



Woody stems

- As stem grows in height it also grows in thickness.
- The xylem tissue produced by secondary growth is wood.
- Outer portion develops bark.
- Bark is composed of phloem cells and cork cambium.
- Bark protects the stem from damage.



Shapes of leaves

LEAF MARGINS

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undulate



sinuate



serrate



dentate



lobate



scalloped



palmate



digitate



bipinnatisect



tripinnatisect



pinnatisect



palmatisect



pedate



palmatilobate



bipartite



tripartite



palmatipartite



pinnatipartite



pinnatifid

Monocot and Dicot leaves



Anatomy of Monocot leaf

Epidermis: upper and lower oval cells

- cuticle and stomata
- upper epidermis-bulliform cells

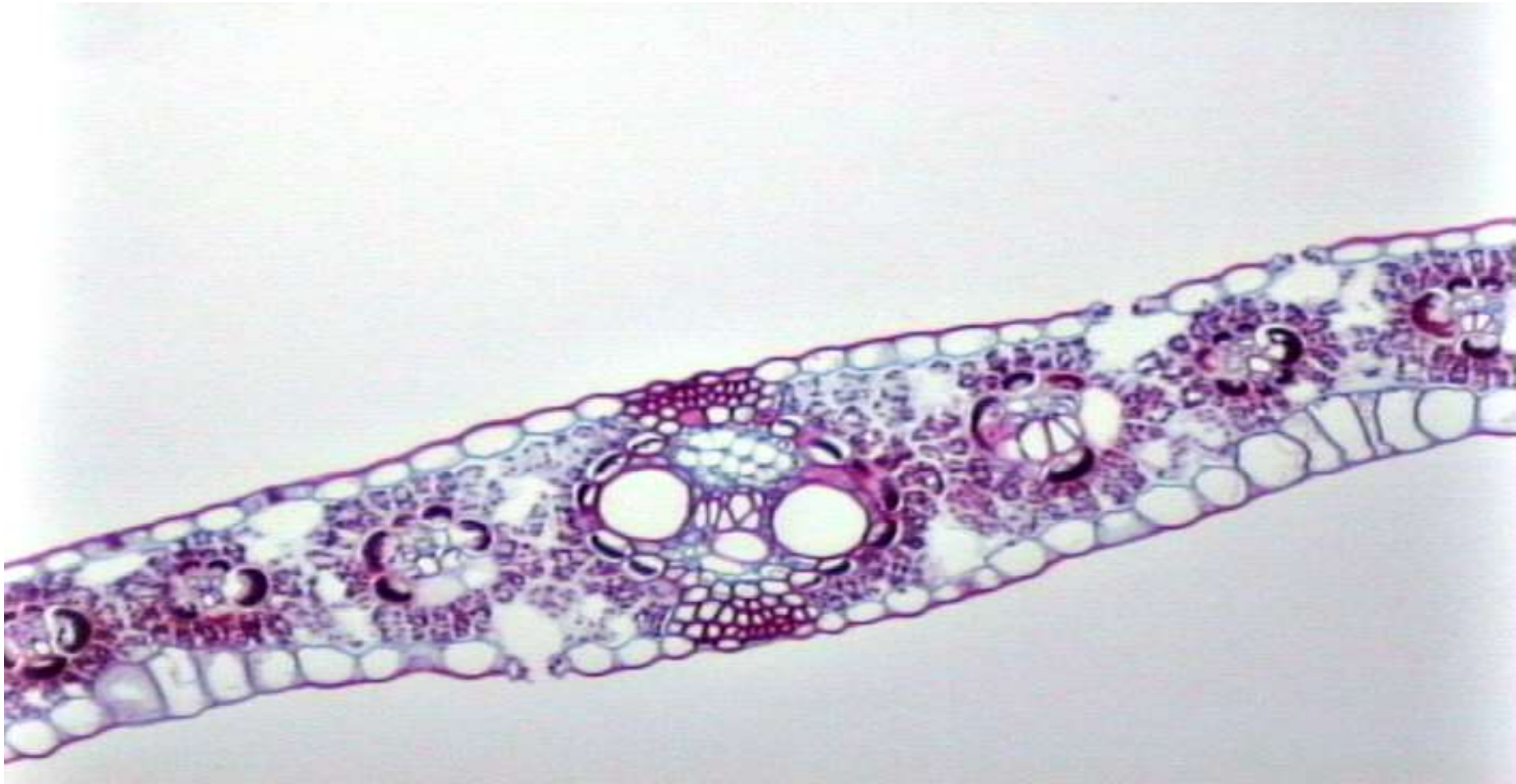
Mesophyll: isobilateral

- chlorenchymatous cells

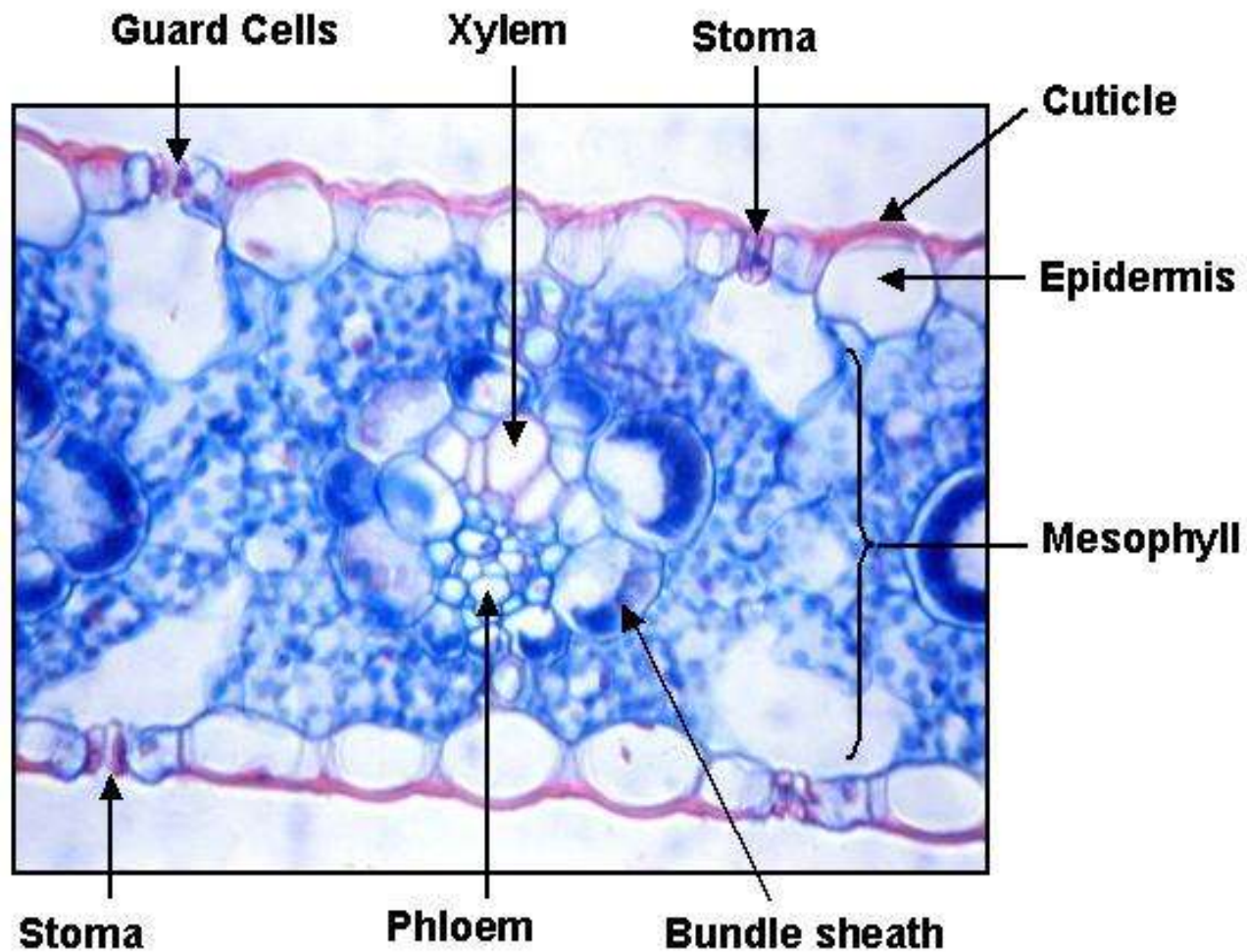
Vascular bundles: collateral and closed

- xylem-vessels and
phloem of sieve tubes and companion cells
- patches-sclerchymatous cells

C.S. of Monocot leaf



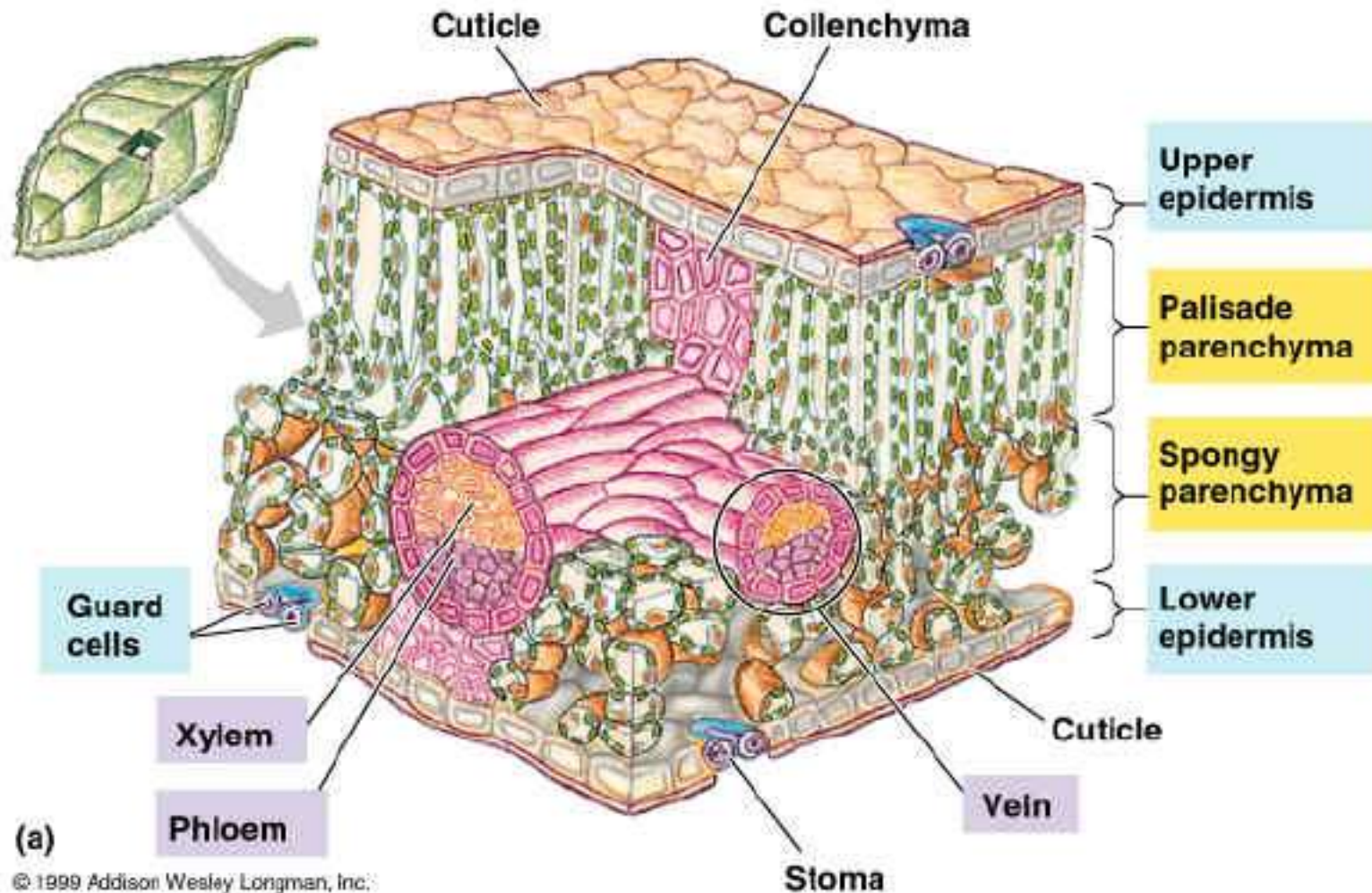
Monocot Leaf - Zea



C.S. of Monocot leaf

- Monocot leaves have parallel veins.
- Monocot leaves have thin cuticle on both sides of the leaf.
- They also have stomata on both sides.
- Examples: Grass family: wheat, corn etc.

C. S. of a Dicot leaf



Anatomy of Dicot leaf

Epidermis: - thick cuticle upper surface and
very thin or no cuticle - lower surface.

-Stomata - lower epidermis

Mesophyll - palisade layer- upper surface
spongy parenchyma- lower surface

Mechanical support: collenchyma ,sclerenchyma,
turgid parenchyma and woody xylem

xylem –upper side(vessels, tracheids, wood fibres
and wood parenchyma)

phloem- lower side(sieve tubes, companion cells and
phloem parenchyma)