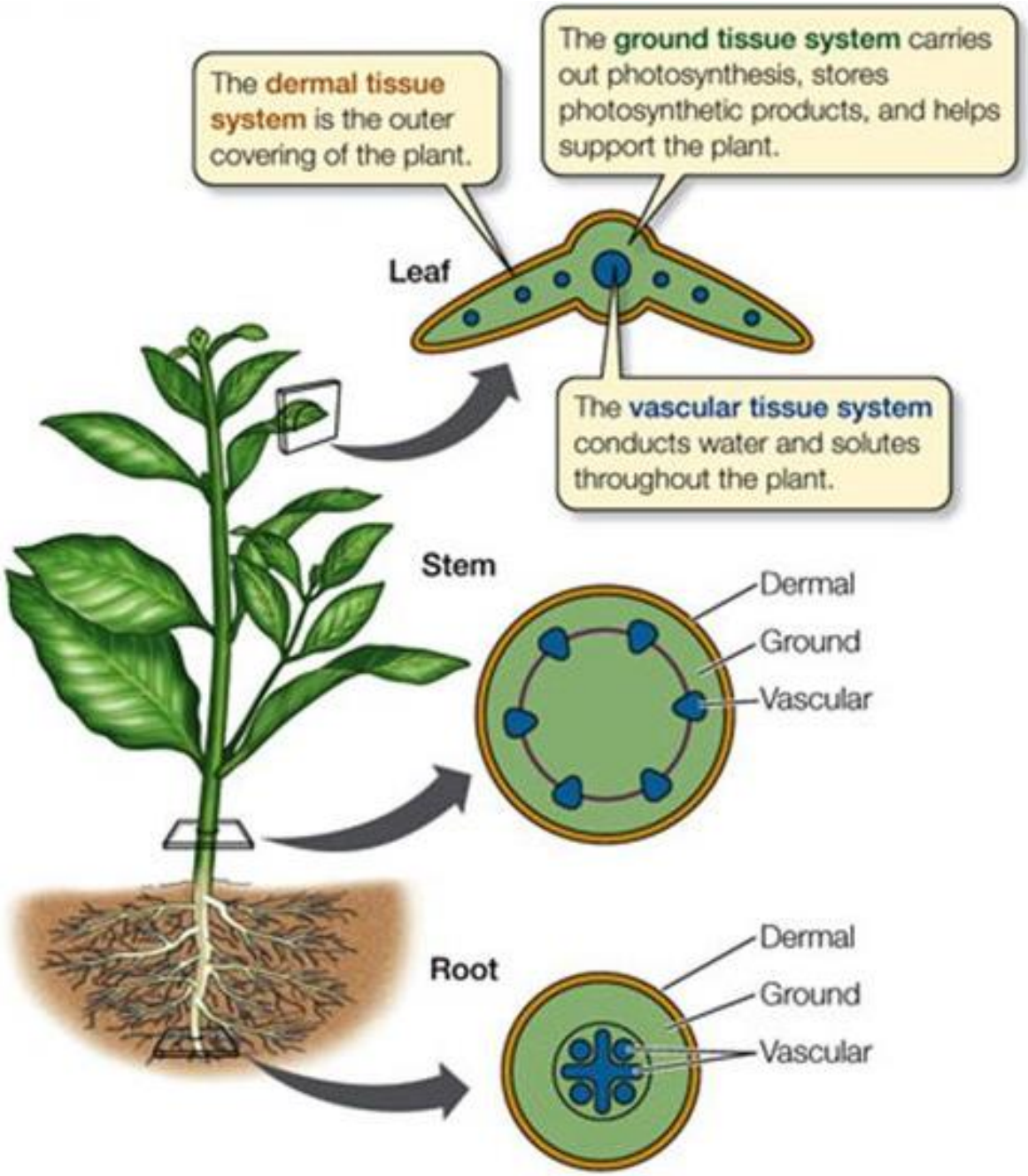
Plant tissues.

Mechanical (supporting) plant tissues.
Vascular tissues

Plan

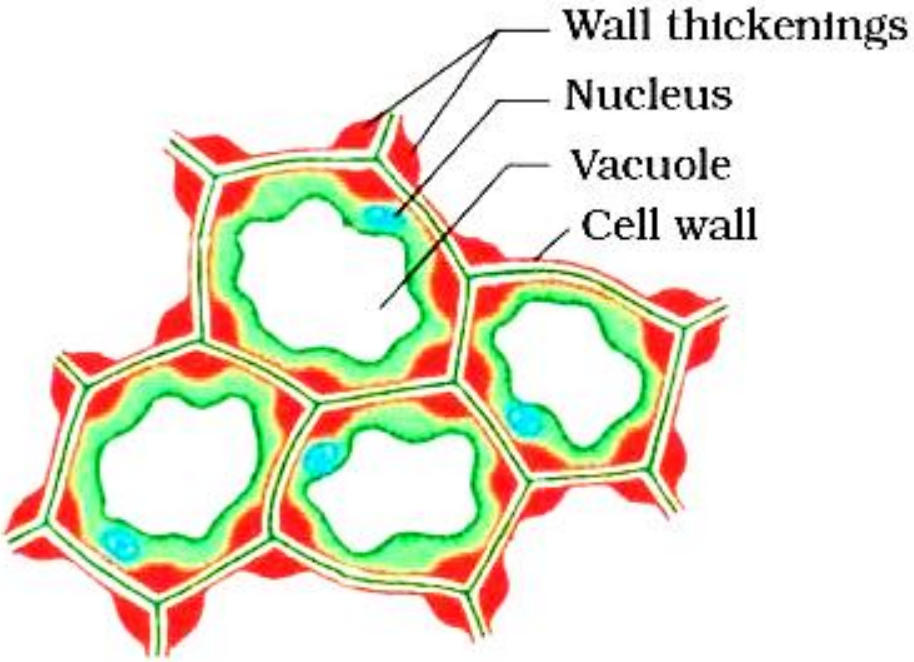
1. Mechanical tissues Concept, functions, structural features, classifications
2. Collenchyma
3. Sclerenchyma
4. Vascular tissues. Concept, functions, structural features, classifications
5. Xylem
6. Phloem

Mechanical (reinforcement/ supporting) tissues are tissues that provide the strength of plant organs, the ability to withstand loads. They fulfill their purpose only when combined with other tissues

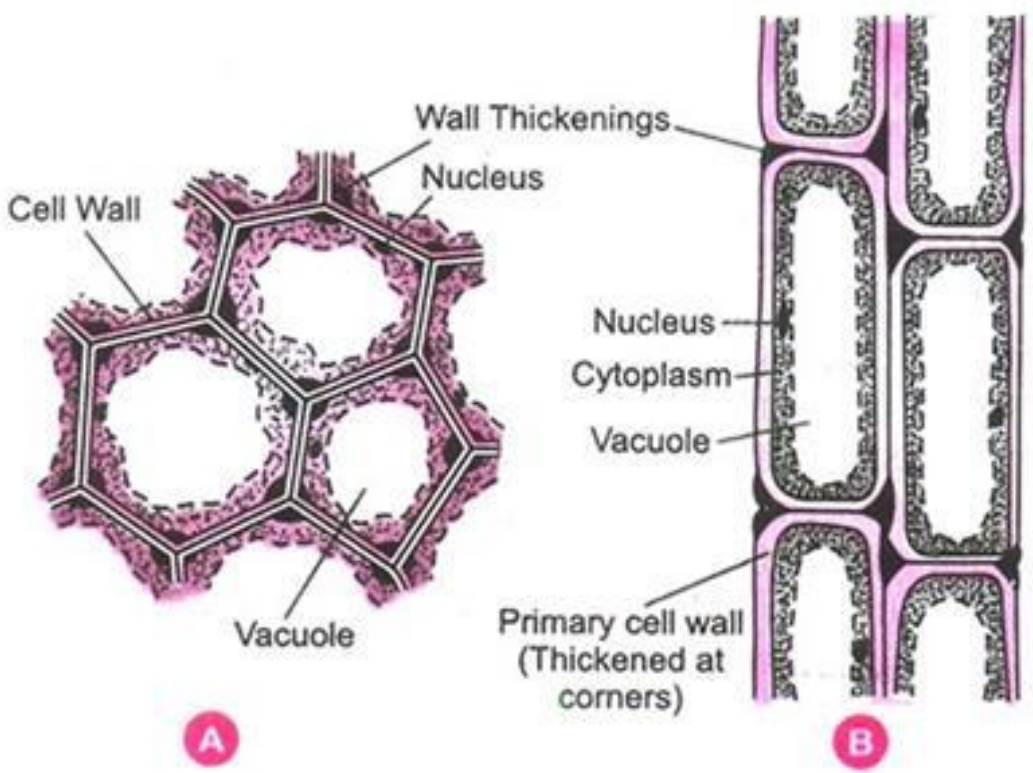

The dermal tissue system is the outer covering of the plant.
The ground tissue system carries out photosynthesis, stores photosynthetic products, and helps support the plant.
Leaf
The vascular tissue system conducts water and solutes throughout the plant.
Stem
Dermal
Ground
Vascular
Root
Dermal
Ground
Vascular

Collenchyma is a living tissue consisting of parenchymal or prosenchymal living cells. Their cell walls are unevenly thickened.

Depending on the nature of the thickening of the cell walls, angular, lamellar, annular and lacunar collenchyma are distinguished.

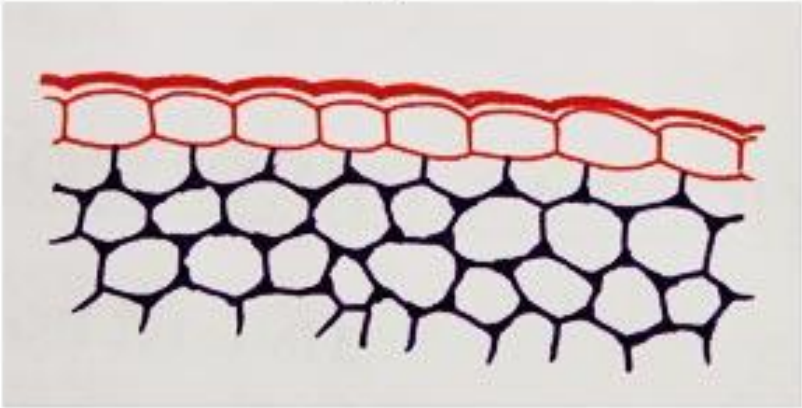


Collenchyma Tissue

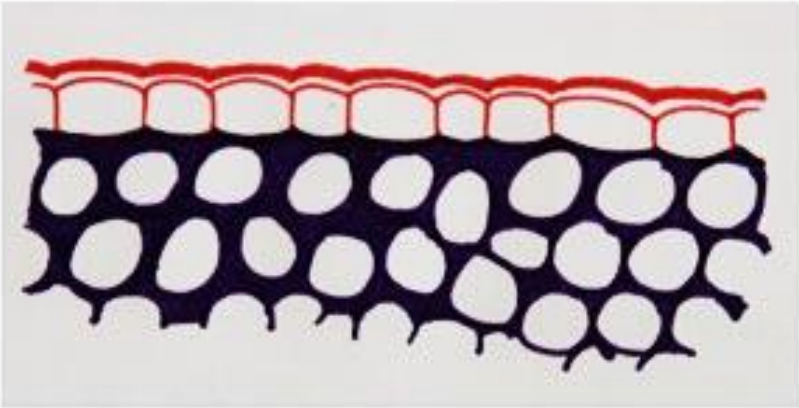


Types of Collenchyma in Plants

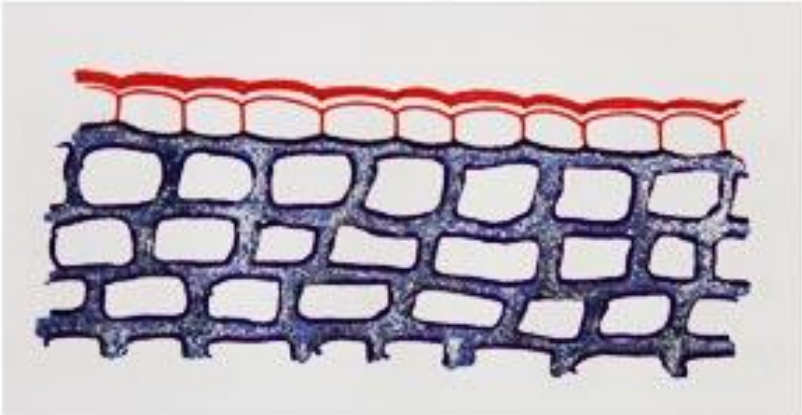
Angular



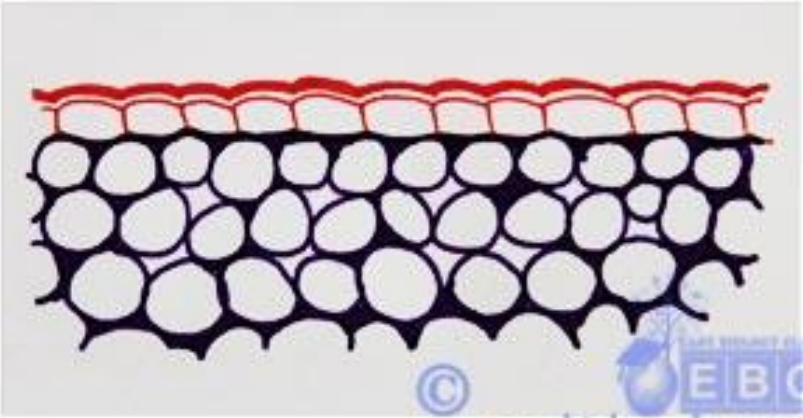
Annular

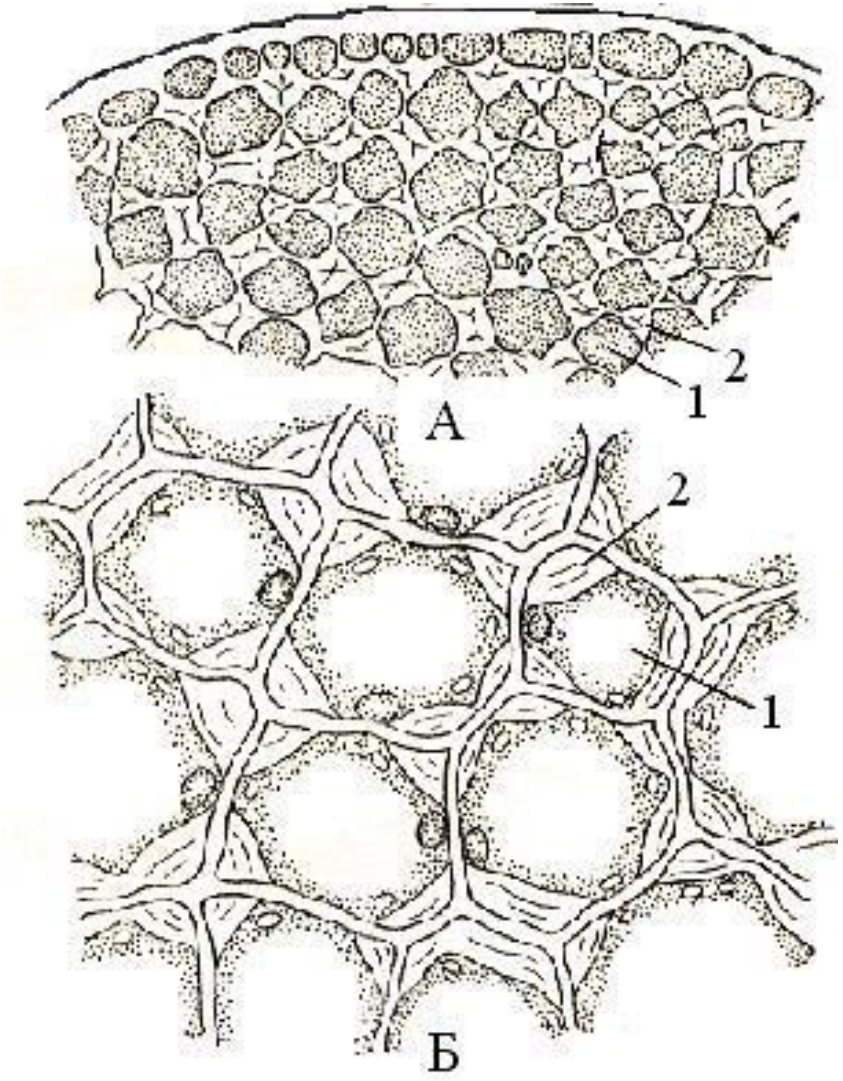


Lamellar



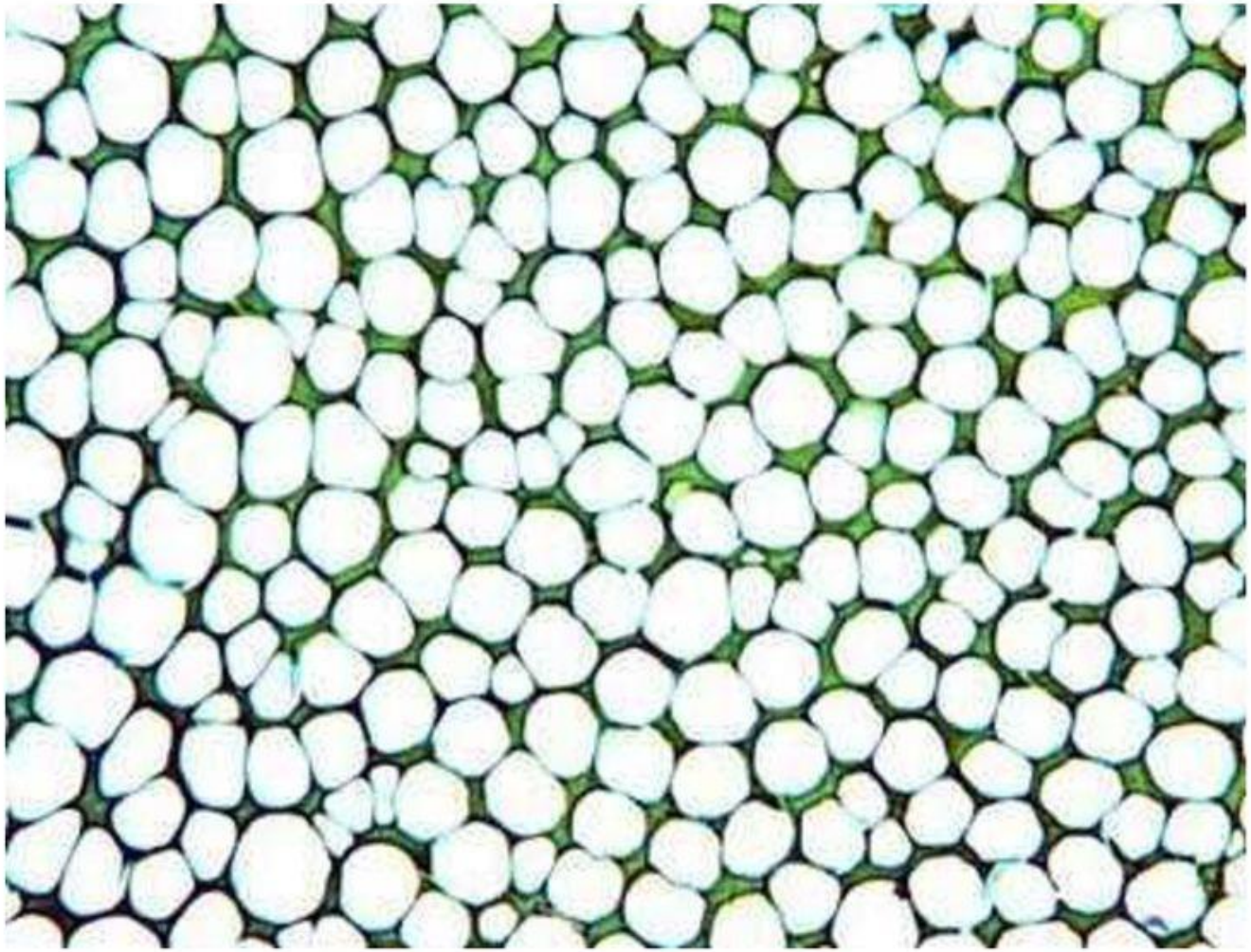
Lacunar



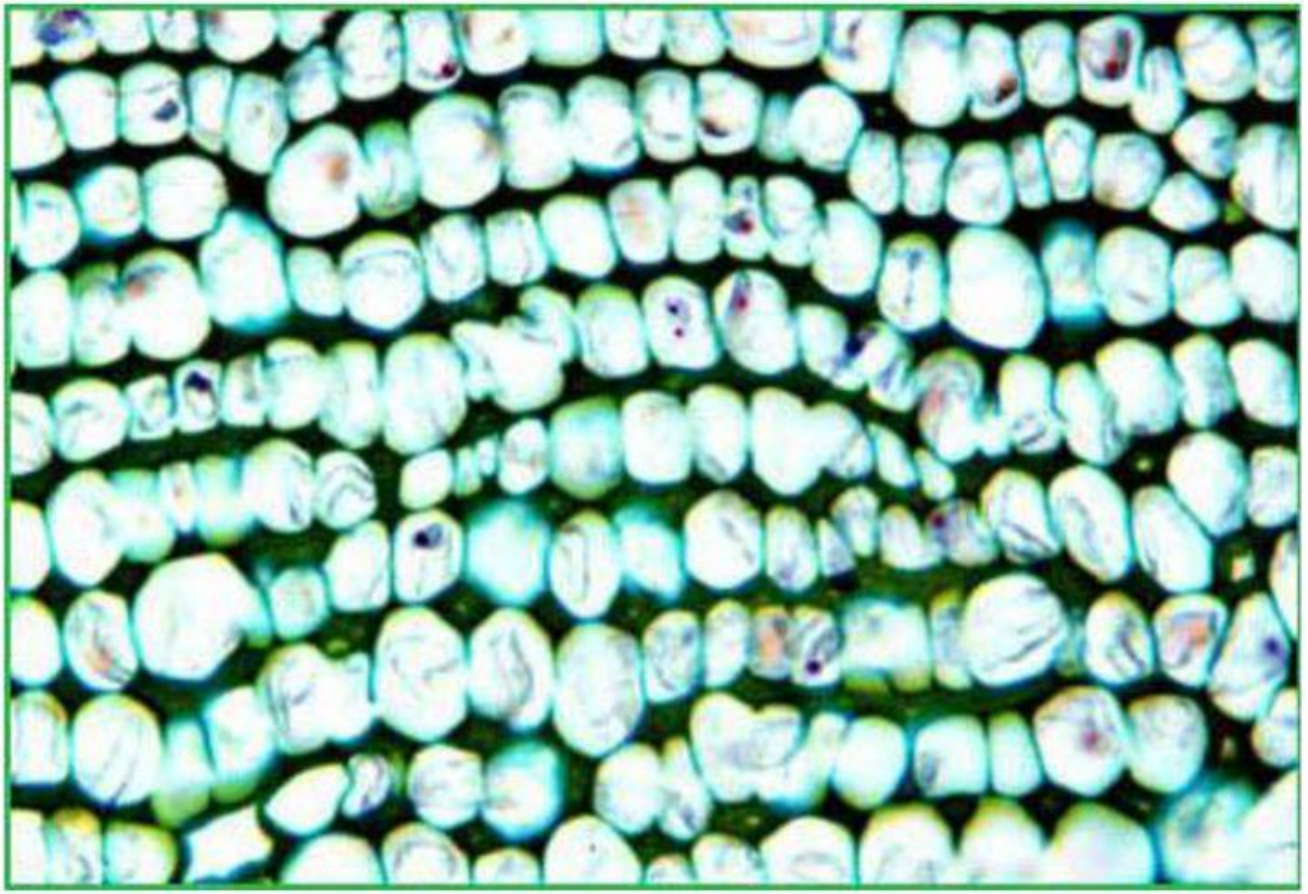


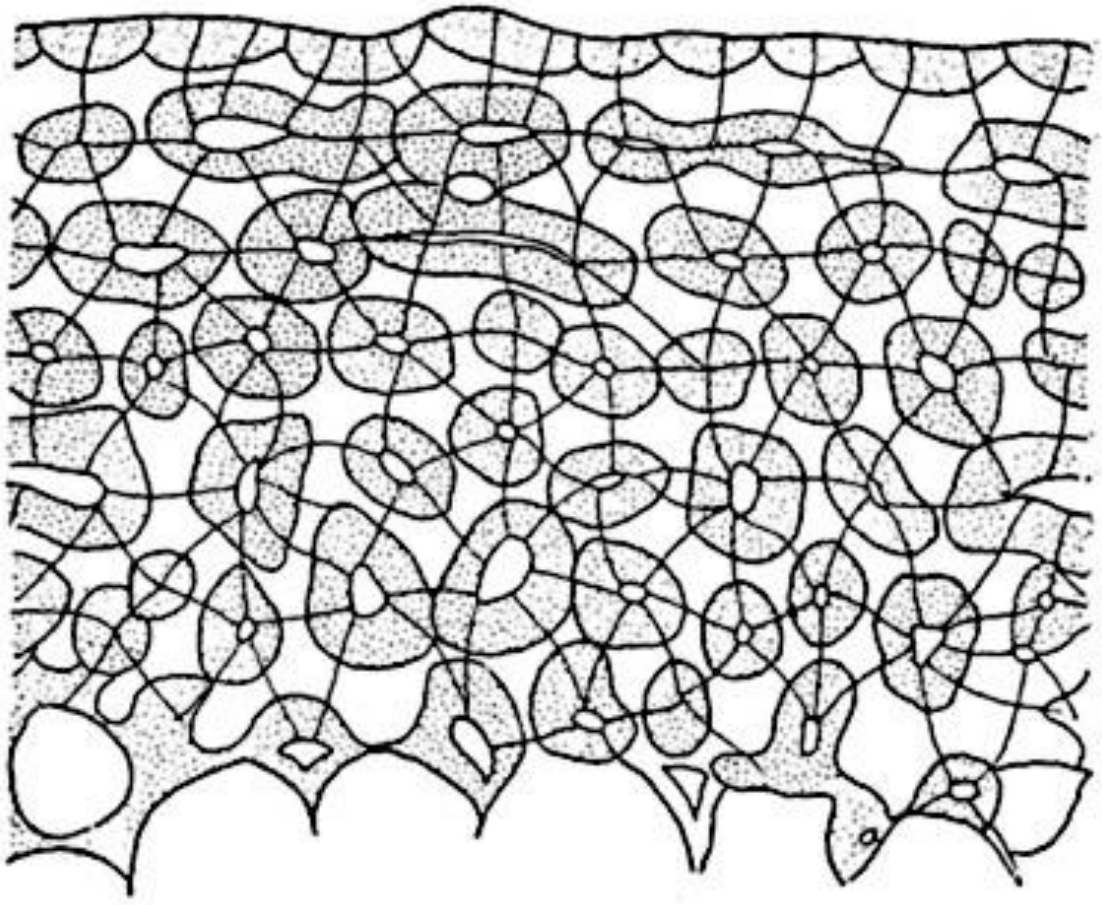
The angular collenchyma

Angular collenchyma in celery

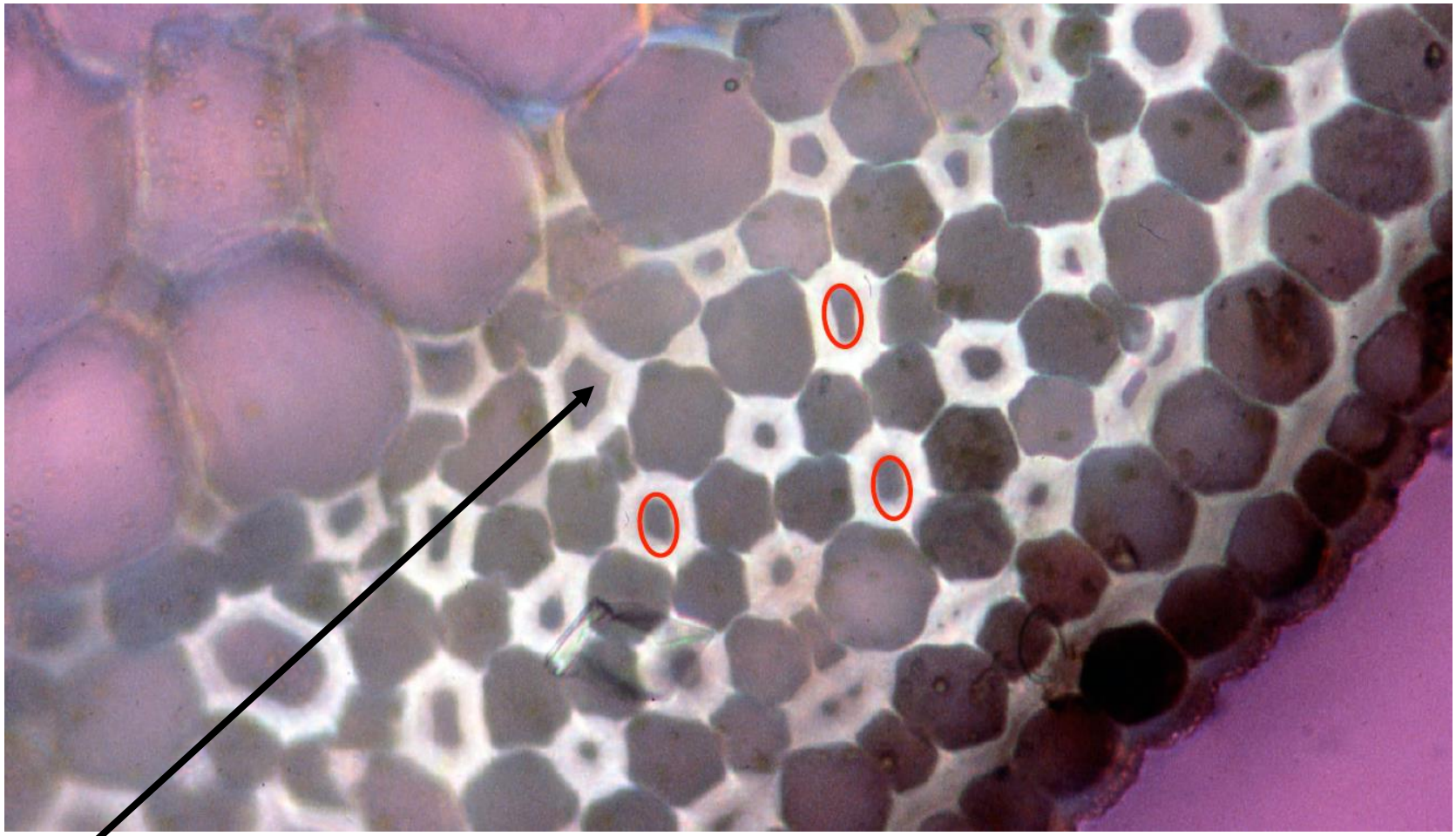


Lamellar collenchyma in castor-bean stem



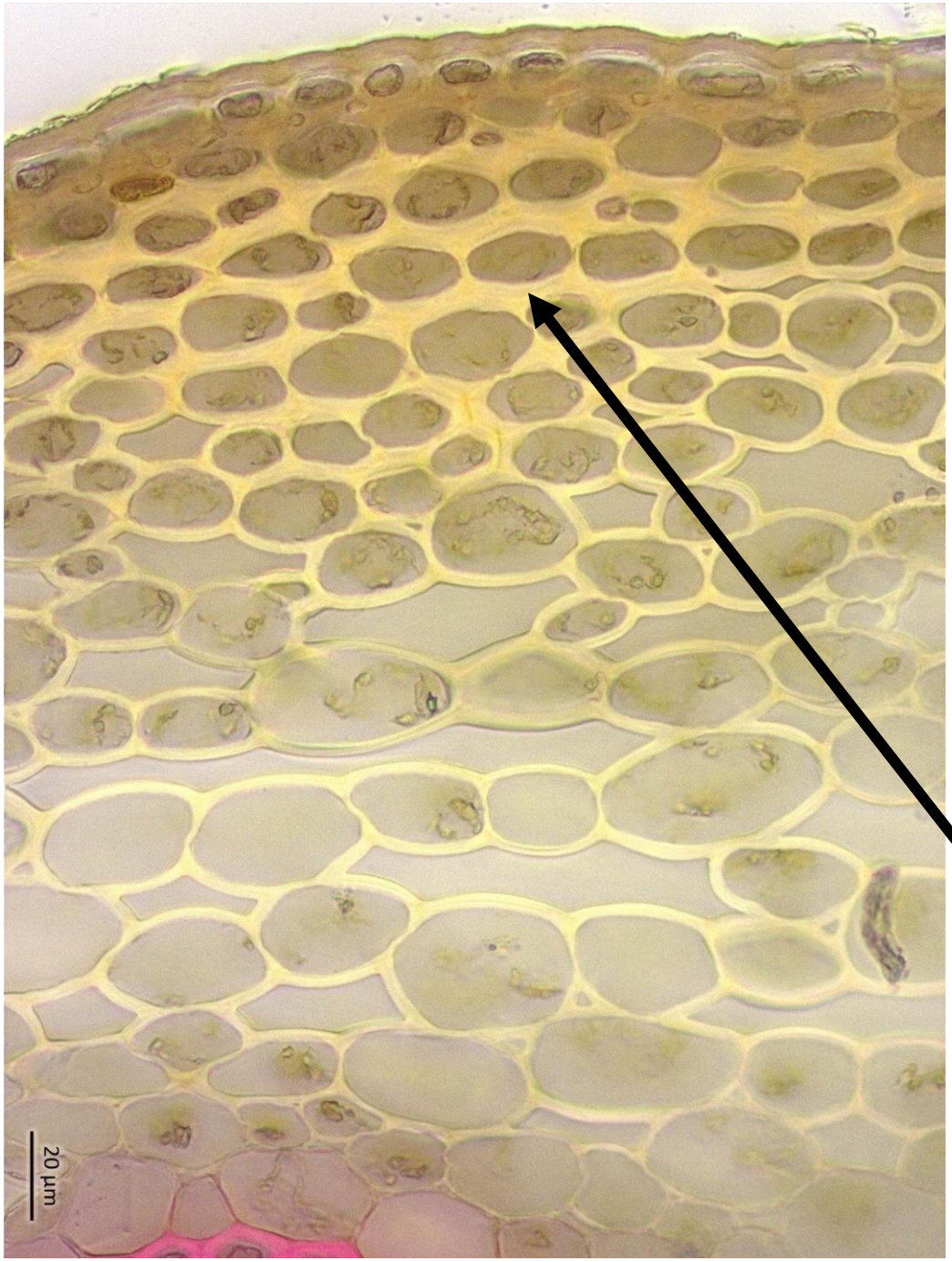


The lacunar collenchyma



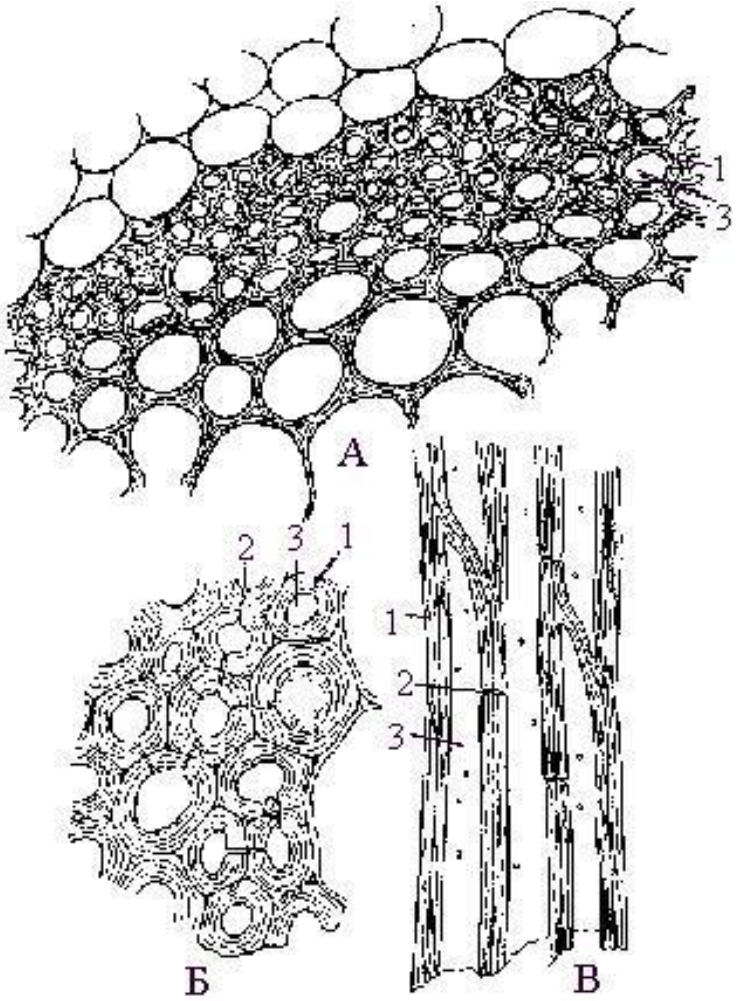
The lacunar collenchyma

The intercellular place

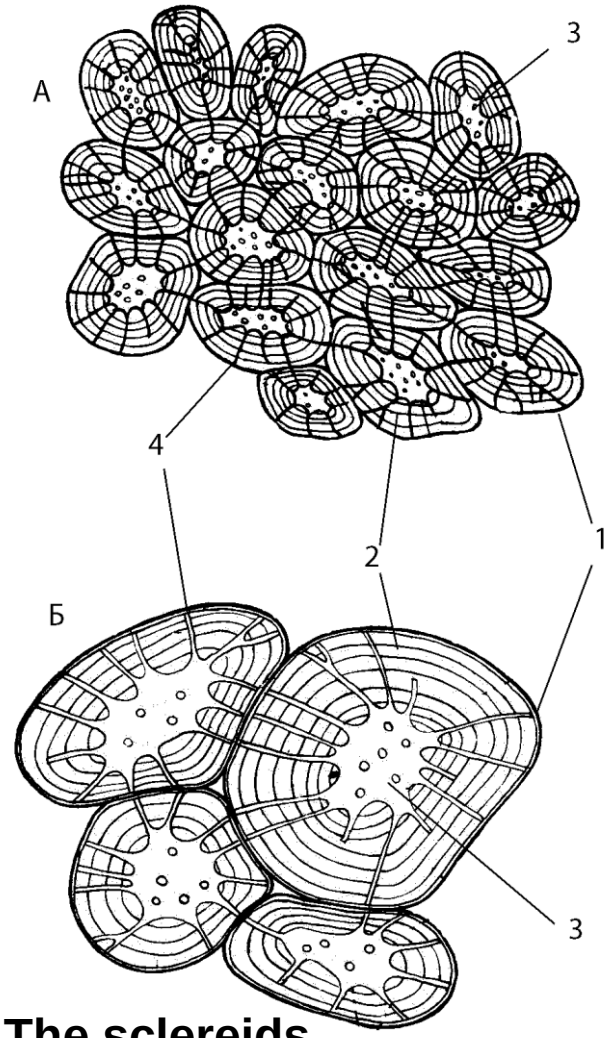


The annular collenchyma

Sclerenchyma is a dead mechanical tissue consisting of cells with uniformly thickened lignified cell walls. Sclerenchyma performs a supporting function after the death of cell protoplasts.



There are two main types of sclerenchyma cells: **fibers** and **sclereids.**



The sclereids

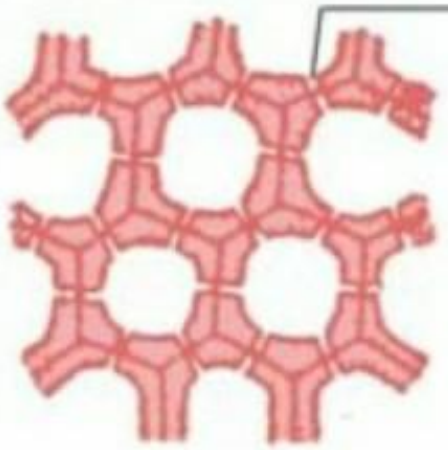
The fibers

Fibers are very elongated cells that can be found in stems, roots, and vascular bundles in leaves:

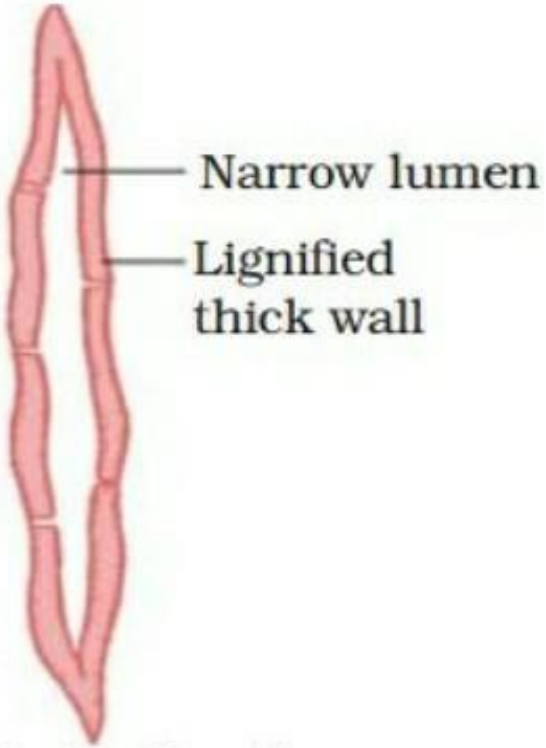
- Depending on the location of the fibers, there are:
- a) wood (xylem) fibers (libriform) — strengthen the conductive elements of vessels,
- b) bark fibers — are located in the primary bark of plant stems, c
- c) perivascular (pericyclic) fibers — strengthen the central axial cylinder,
- d) bast (phloem) fibers (cambiform) — protect the living tissues of the phloem (sieve tubes).

The fibers act as the internal skeleton of the plant. They are found in all parts of the plant and protect the plants from mechanical damage.

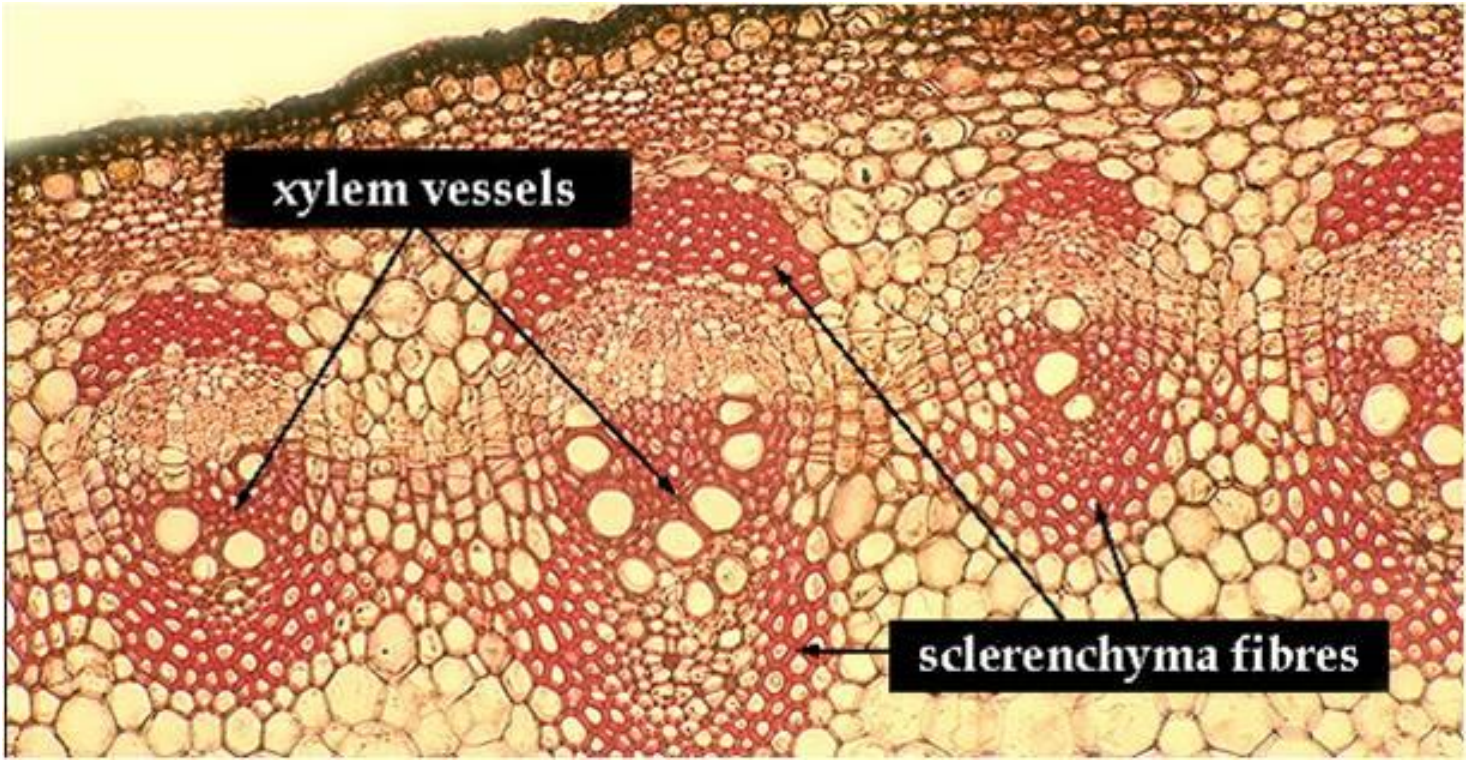
Sclerenchyma

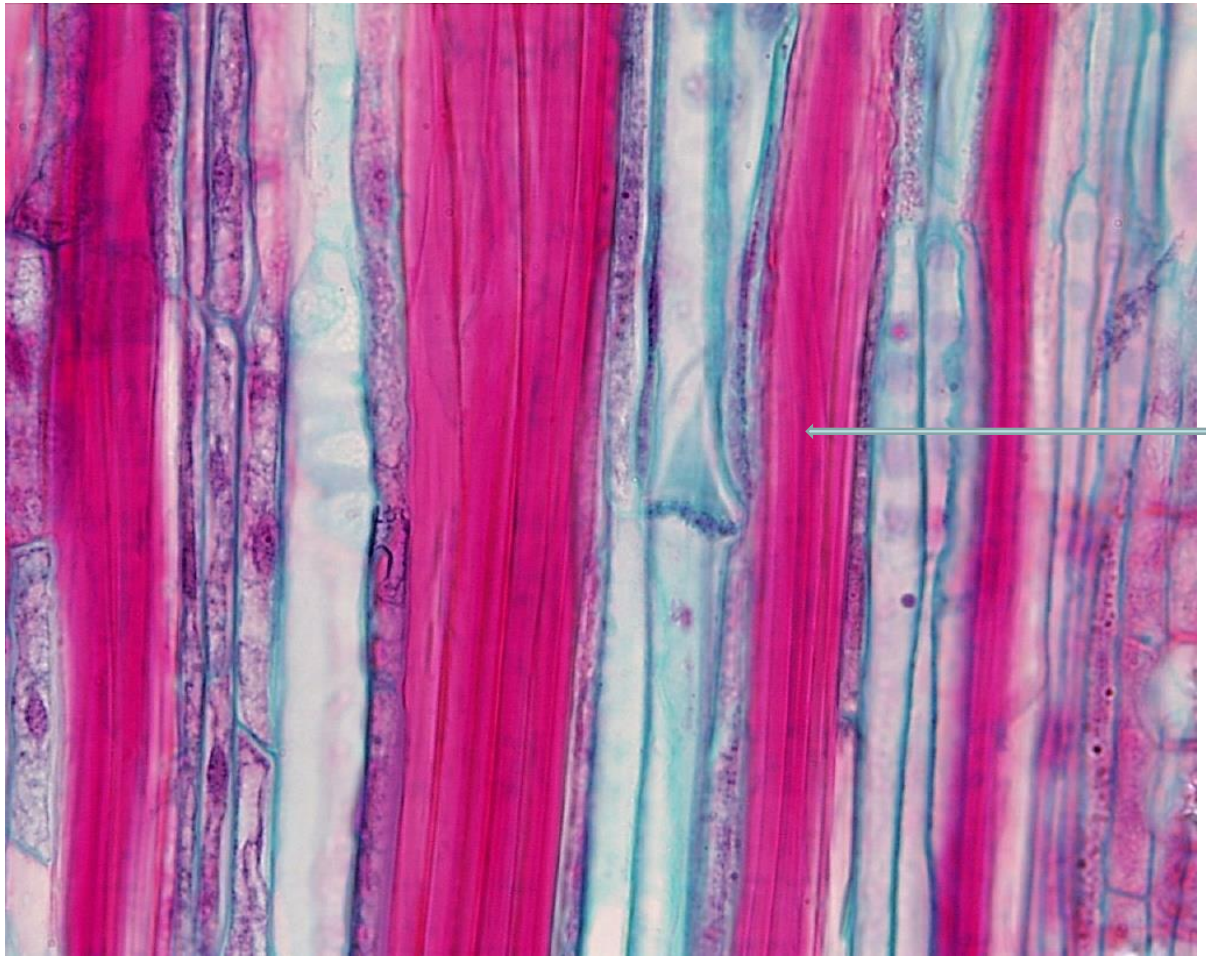


Transverse section



Longitudinal section


xylem vessels
sclerenchyma fibres



The bast (phloem) fibers

Sclereids are roughly isodiametric, and clumps of these “stone cells” (brachysclereids) give the Bartlett pear (Pyrus communis) its distinctive grittiness. Testas (seed coats) of many plants, especially legumes, are made of two layers of sclereids while sclereids comprise the thick dense layer forming the shell (endocarp) of the coconut. Star-shaped or branched astrosclereids make water lily leaves (Nymphaea sp.) tough but pliable, allowing them to withstand the tearing forces of waves and currents.

Various types of sclereids:

Brachysclereids or Stone Cells - These are unbranched, short and isodiametric with ramiform pits. For example: grit of Guava, Sapota, Apple and Pear.

Macrosclereids - These are elongated and columnar or rod-like. For example: epidermal covering of legume seeds.

Osteosclereids - These are bone-like or columnar with swollen ends. For example: sub-epidermal covering of legume seeds.

Astrosclereids - These are branched as star. For example: petiole of lotus, tea leaves.

Filiform Sclereids - These are fibre like, sparingly branched. For example: Olea.

Trichosclereids- These are elongated hair-like. These branch once and extend into intercellular spaces.

TYPES OF SCLEREIDS

Macrosclereids

Osteosclereids

Astrosclereids

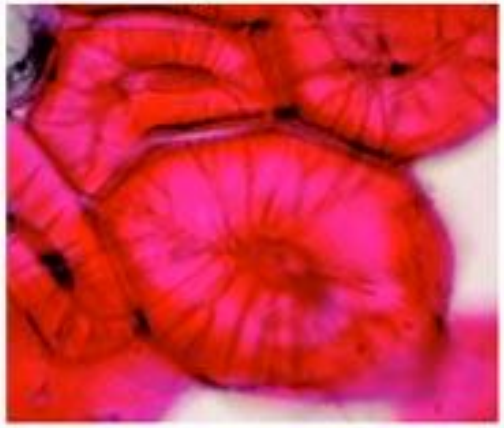
Brachysclereids

Trichosclereids

Filiform sclereids

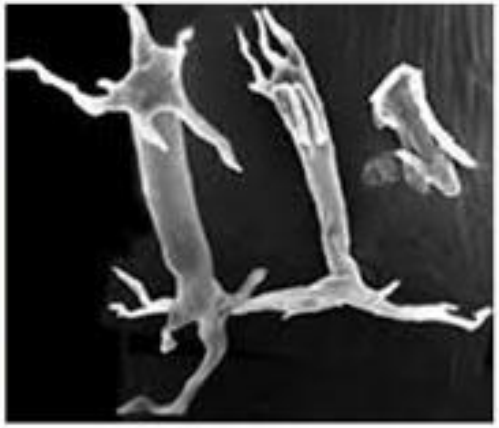
Types of Sclereids

Brachysclereide

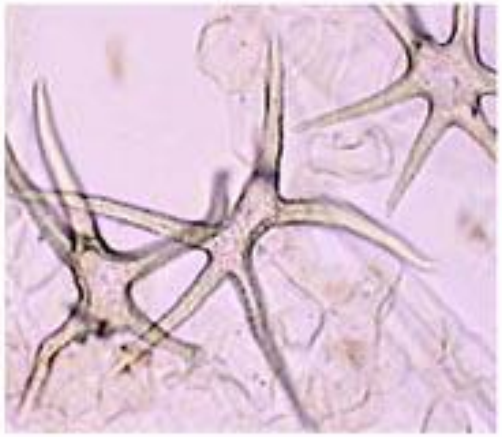


Macrosclereide

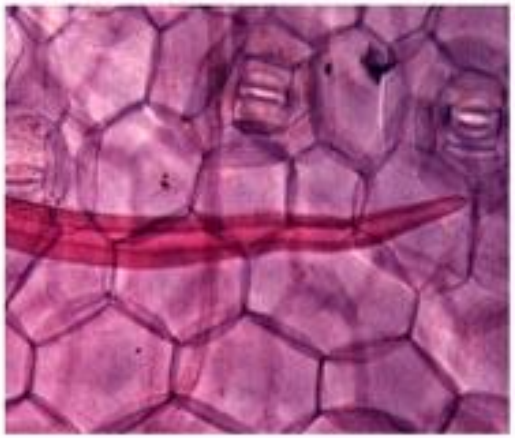
Osteosclereide

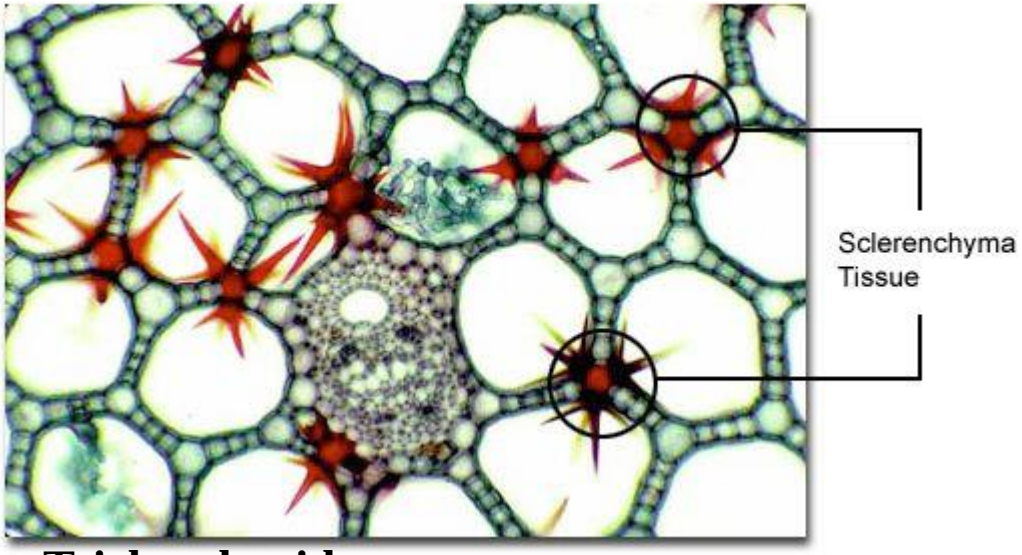


Asterosclereide

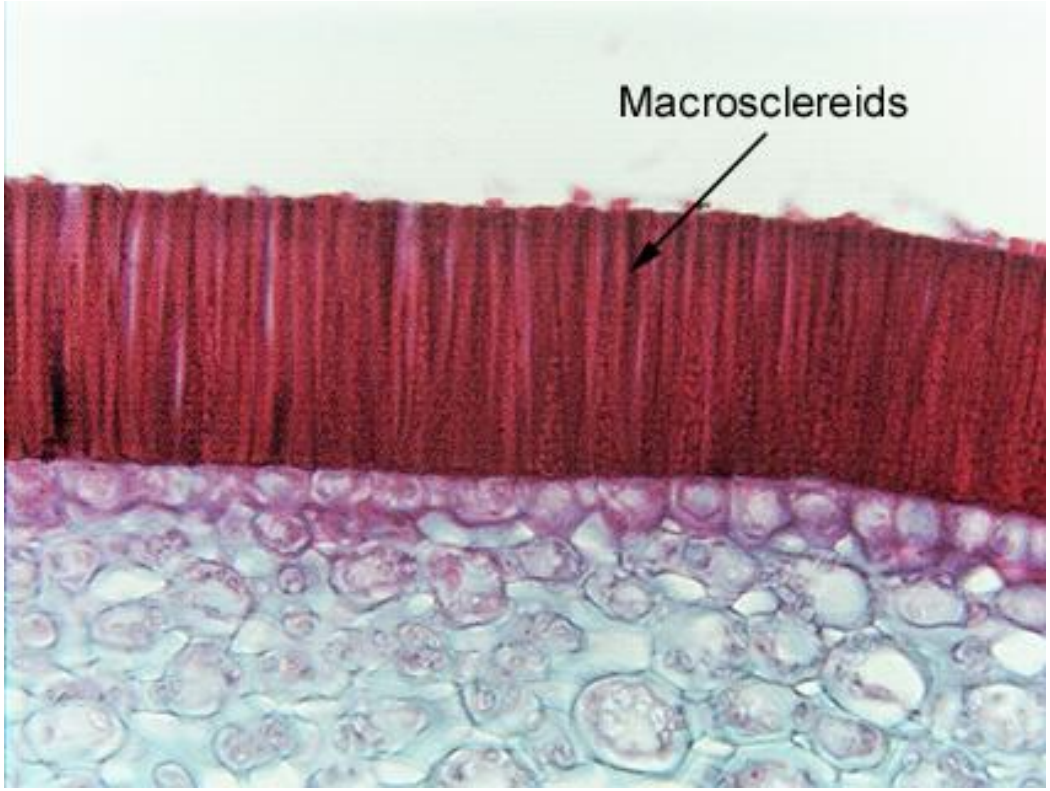


Trichosclereide





Trichosclereids



Vascular tissue

Vascular tissue are tissue that perform the function of conducting water and organic and mineral substances dissolved in it through the plant.

All conductive tissues are complex.

Any vascular tissue consists of three types of elements: conductive, mechanical and basic (parenchymal).

- **Conducting elements** perform the main functions of conducting tissues.
- **Mechanical elements** maintain the integrity of the conductive elements and protect them from compression and breaking.
- **The parenchymal elements** carry out the transfer and distribution of substances in the radial direction.

Xylem and **phloem** have a number of common features:

1. they form a continuous branched system in the plant body, connecting all the organs of the plant from the thinnest roots to the youngest shoots.

2. xylem and phloem are complex tissues, i.e. they are composed of heterogeneous elements: vascular, mechanical, storage, excretory

3. the vascular elements both in the xylem and in the phloem are elongated in the direction of the current of substances, sometimes very significantly.

4. the walls of the vascular elements contain pores or perforations (through holes) that facilitate the passage of the current of substances.

Xylem.

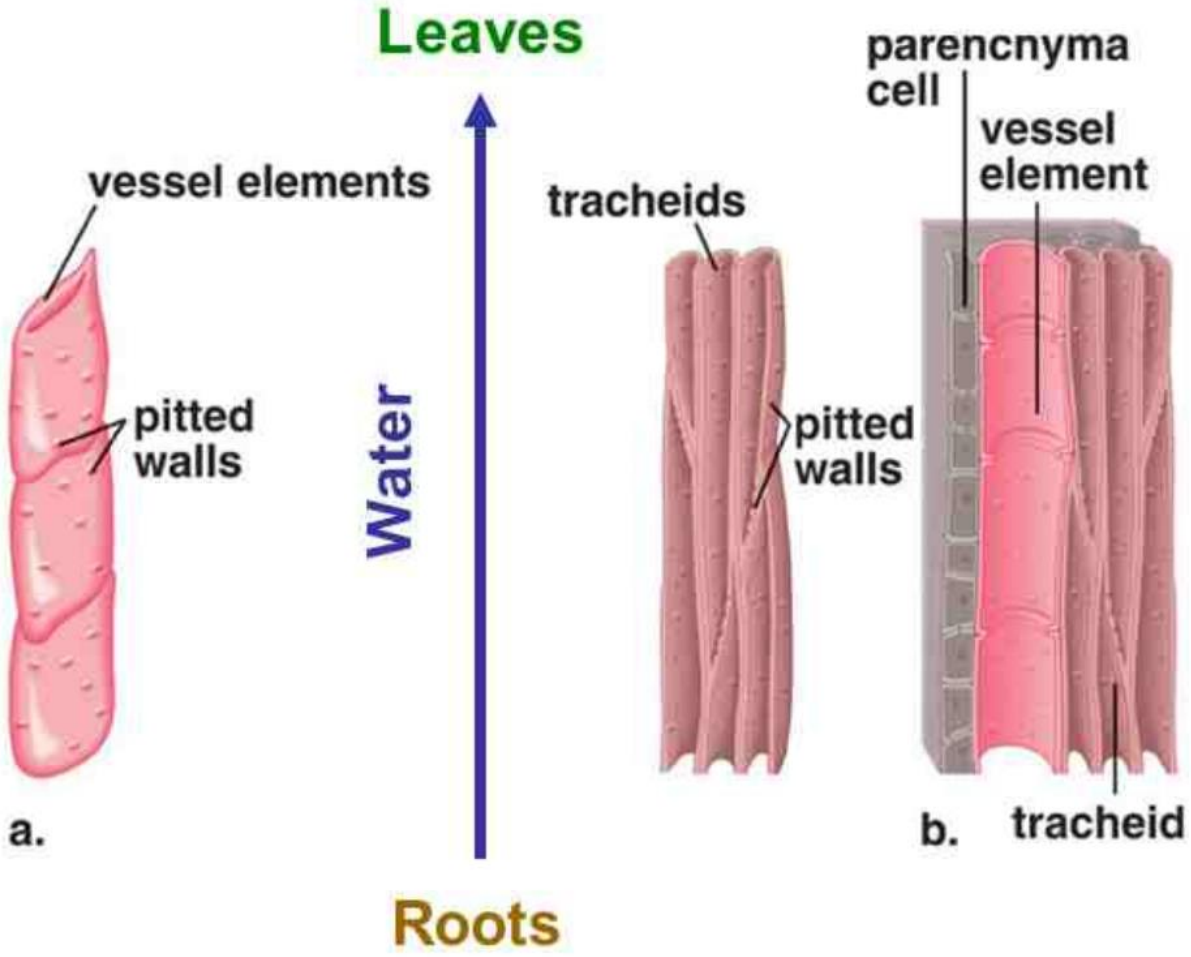
The vascular (conducting) elements of the xylem carry out an "ascending current" of substances. These include vessels and tracheids, which are dead cells with lignified and often unevenly thickened walls. Therefore, they can also perform a mechanical function.

A vessel (trachea) is a tube made up of a chain of closed cells (segments) with perforated common walls.

Tracheids are single-celled formations of a fusiform shape with pointed ends.

Xylem **transports water and minerals from roots to leaves**

Contains two types of conducting cells: ***tracheids*** **and** ***vessel elements*****.**



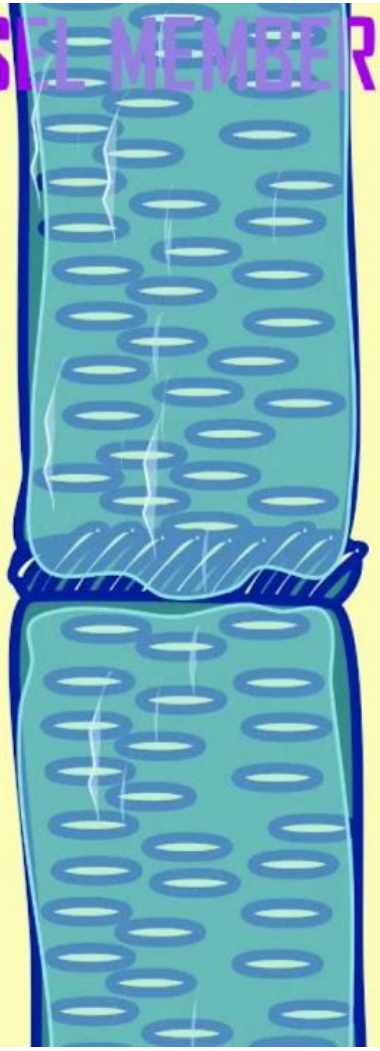
TRACHEIDS

longer; thinner;
ends taper

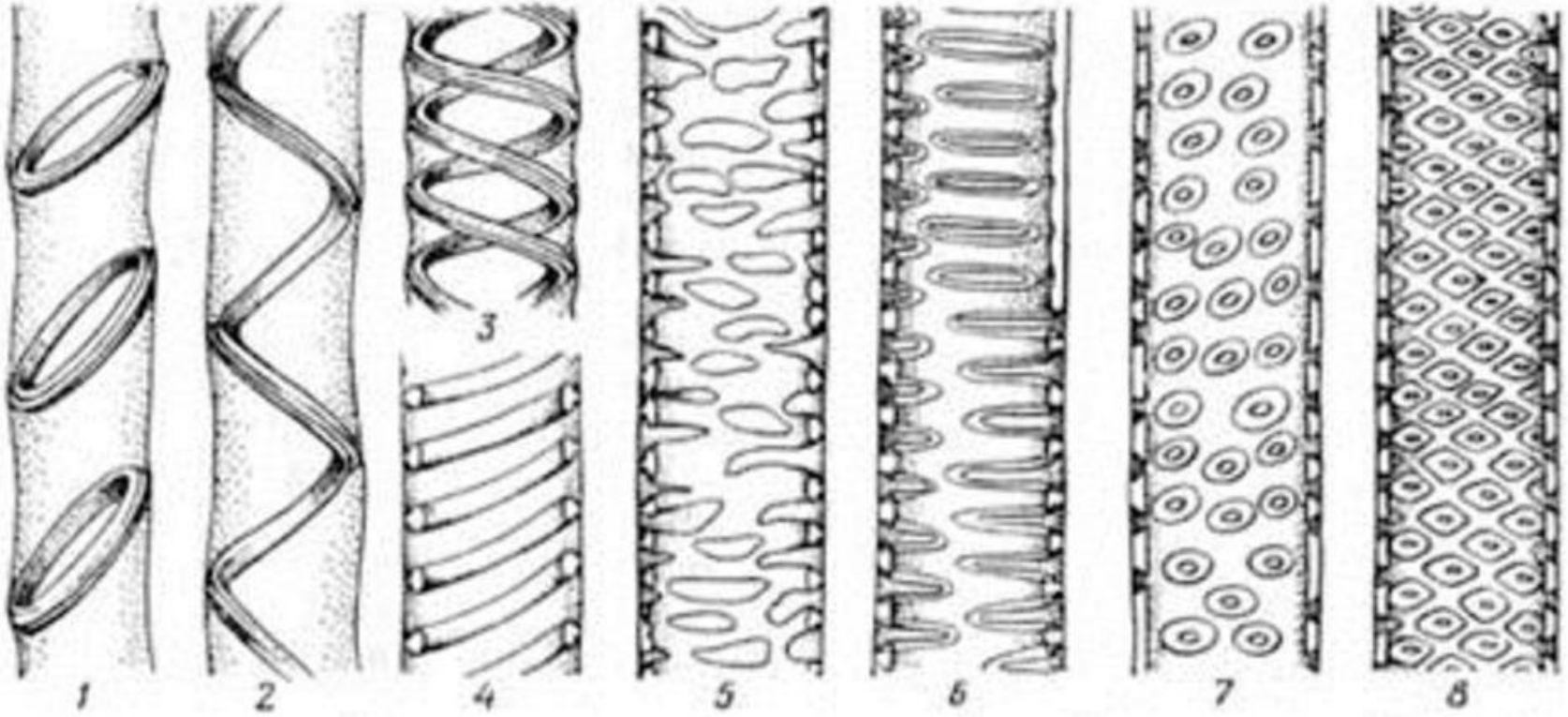
in many nonflowering plants, the only cell type in xylem

VESSEL MEMBERS

wider, cylindrical, joined at perforation plates

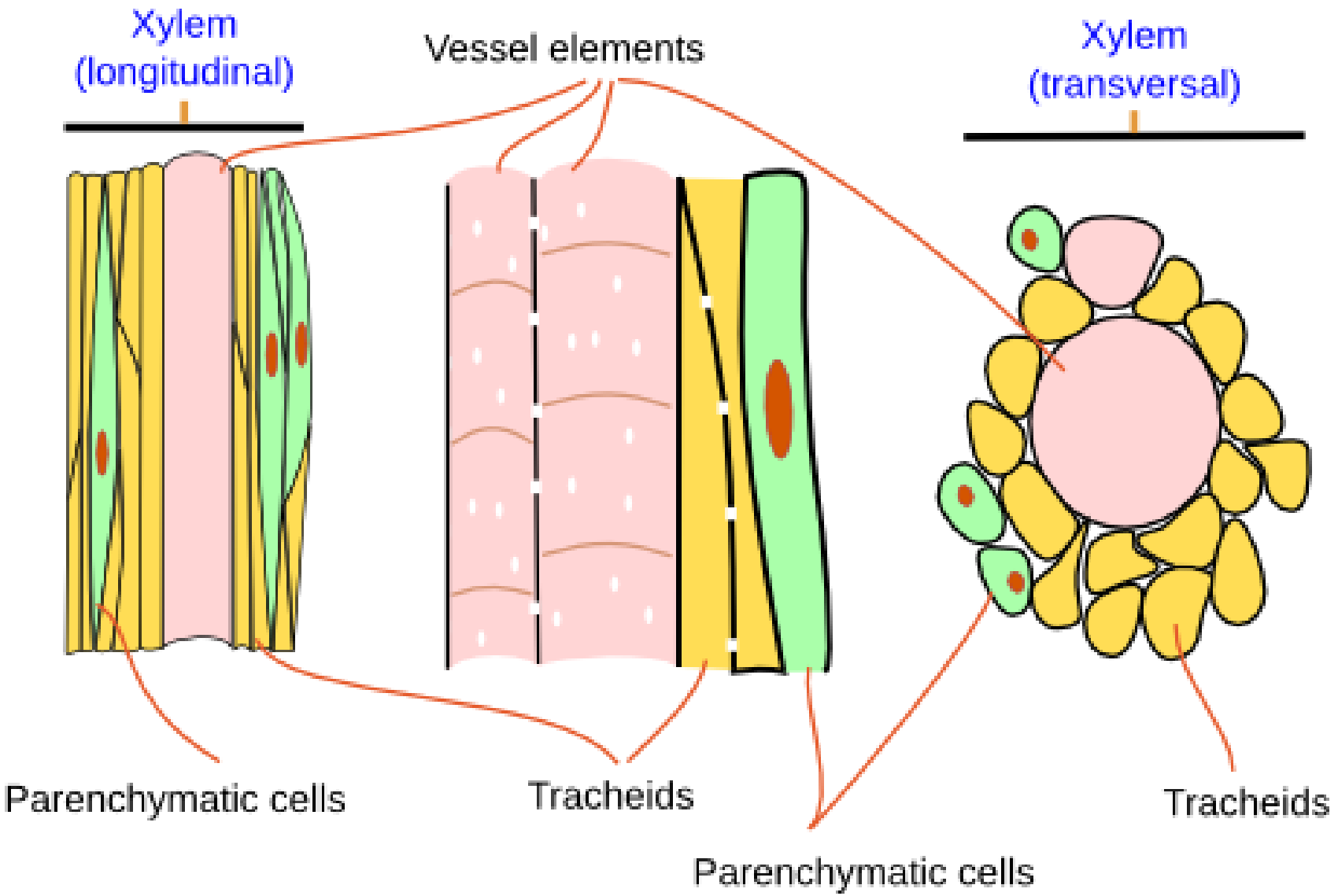


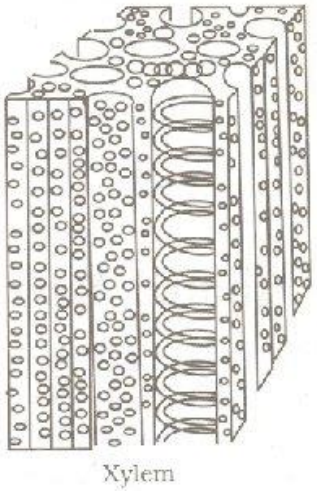
Secondary Wall Thickenings



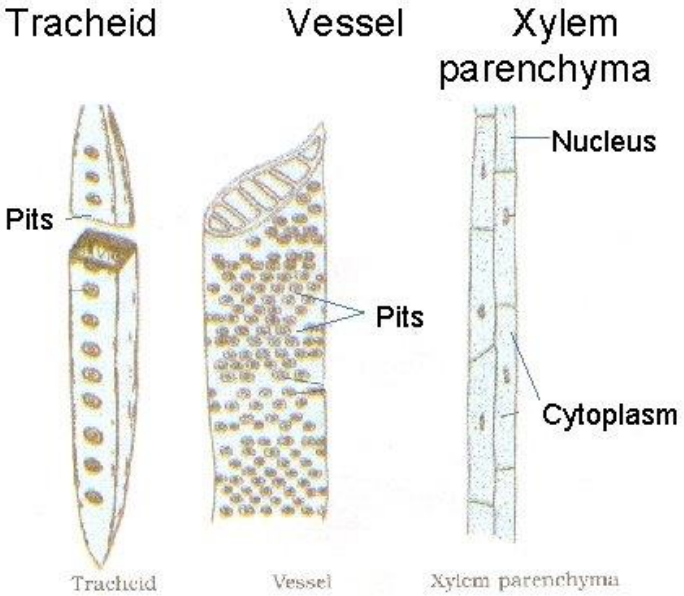
1 = annular thinckening 2-4 = helical thickening 5 = reticulate thickening

6 = scalariform pitted wall 7 = opposite pitted wall 8 = alternate pitted wall

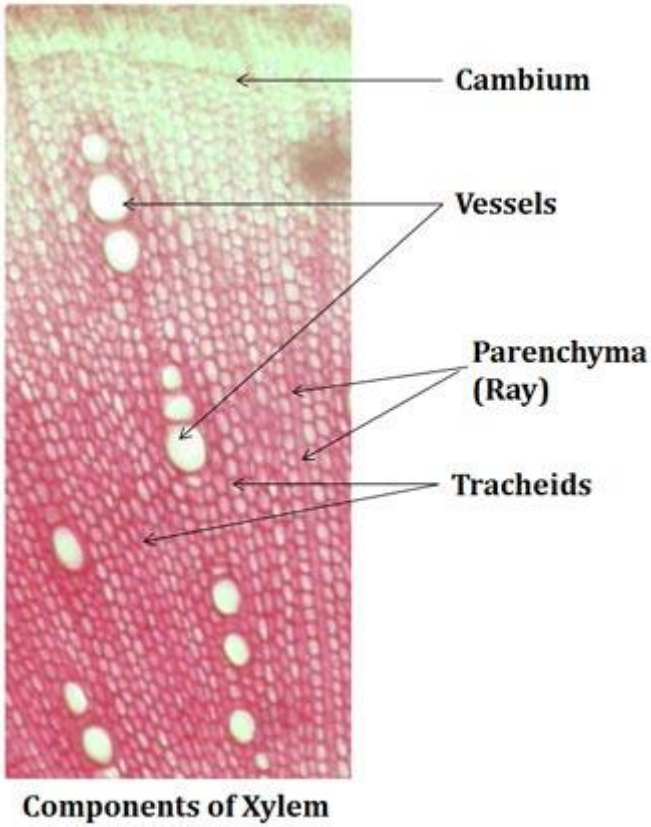

Xylem
(longitudinal)
Vessel elements
Xylem
(transversal)
Parenchymatic cells
Tracheids
Tracheids
Parenchymatic cells



Xylem



Types of Xylem

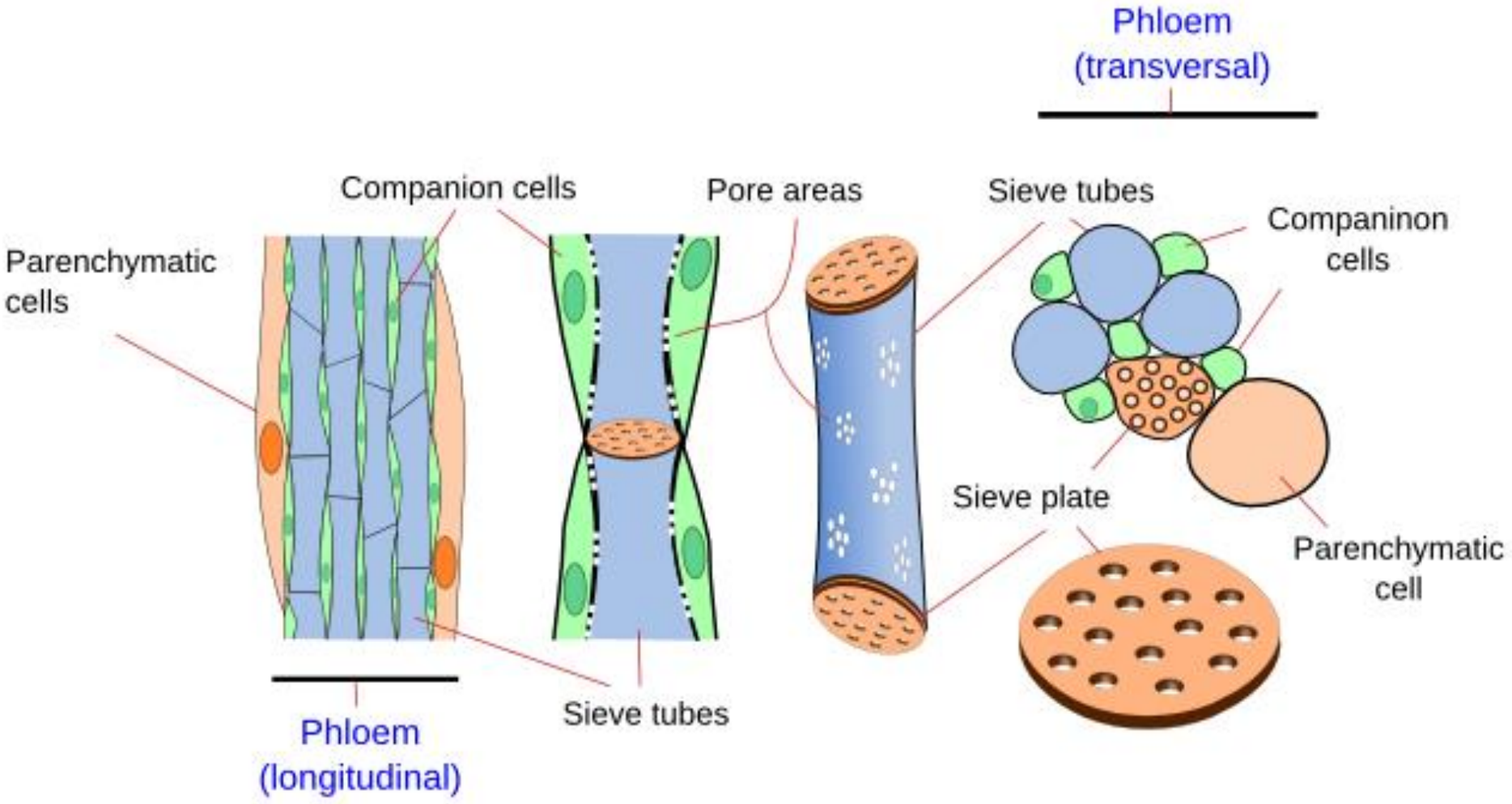


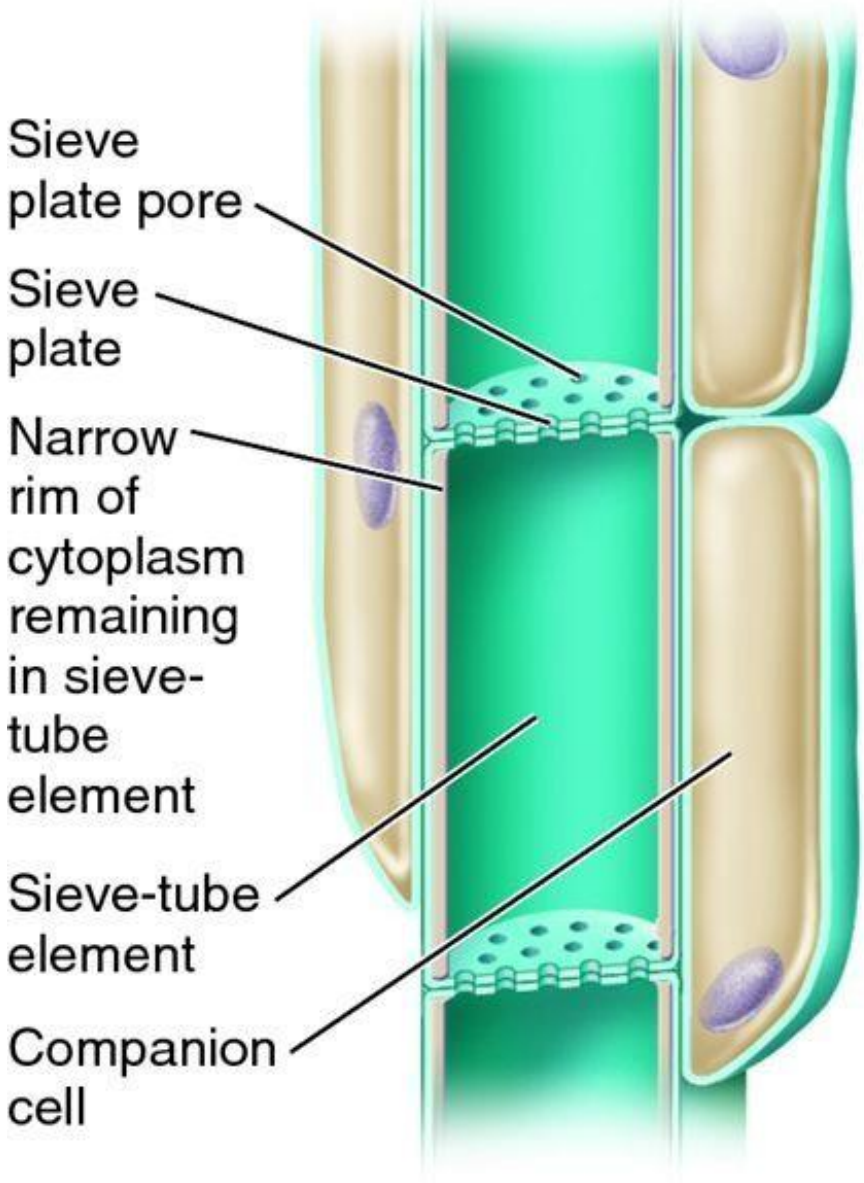
Components of Xylem

Phloem.

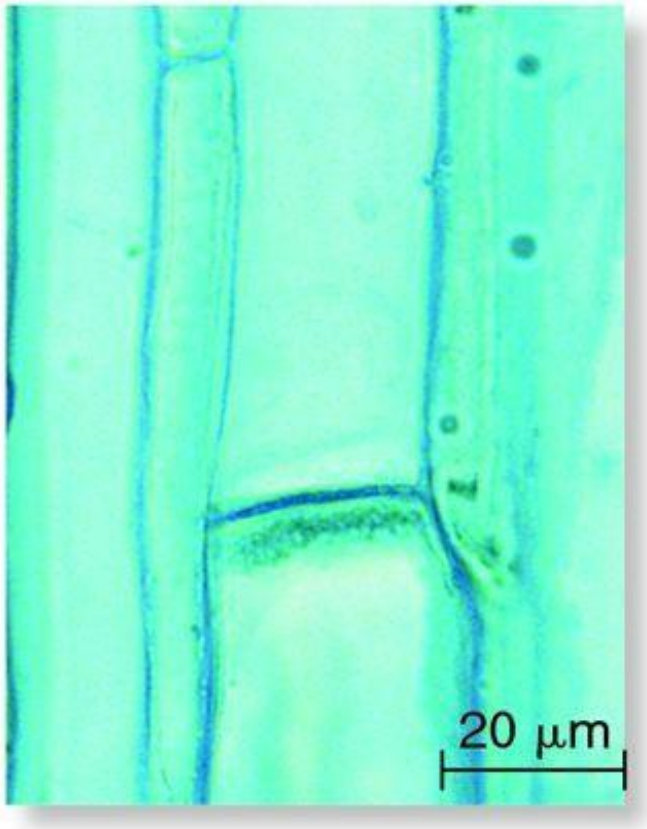
The phloem is similar to the xylem in that it also has tubular structures modified in accordance with their conducting function. However, these tubes are made up of living cells that have a cytoplasm; they do not carry a mechanical function.

There are five types of cells in the phloem: segments of the sieve tubes, companion cells, parenchymal cells, fibers and sclereids.

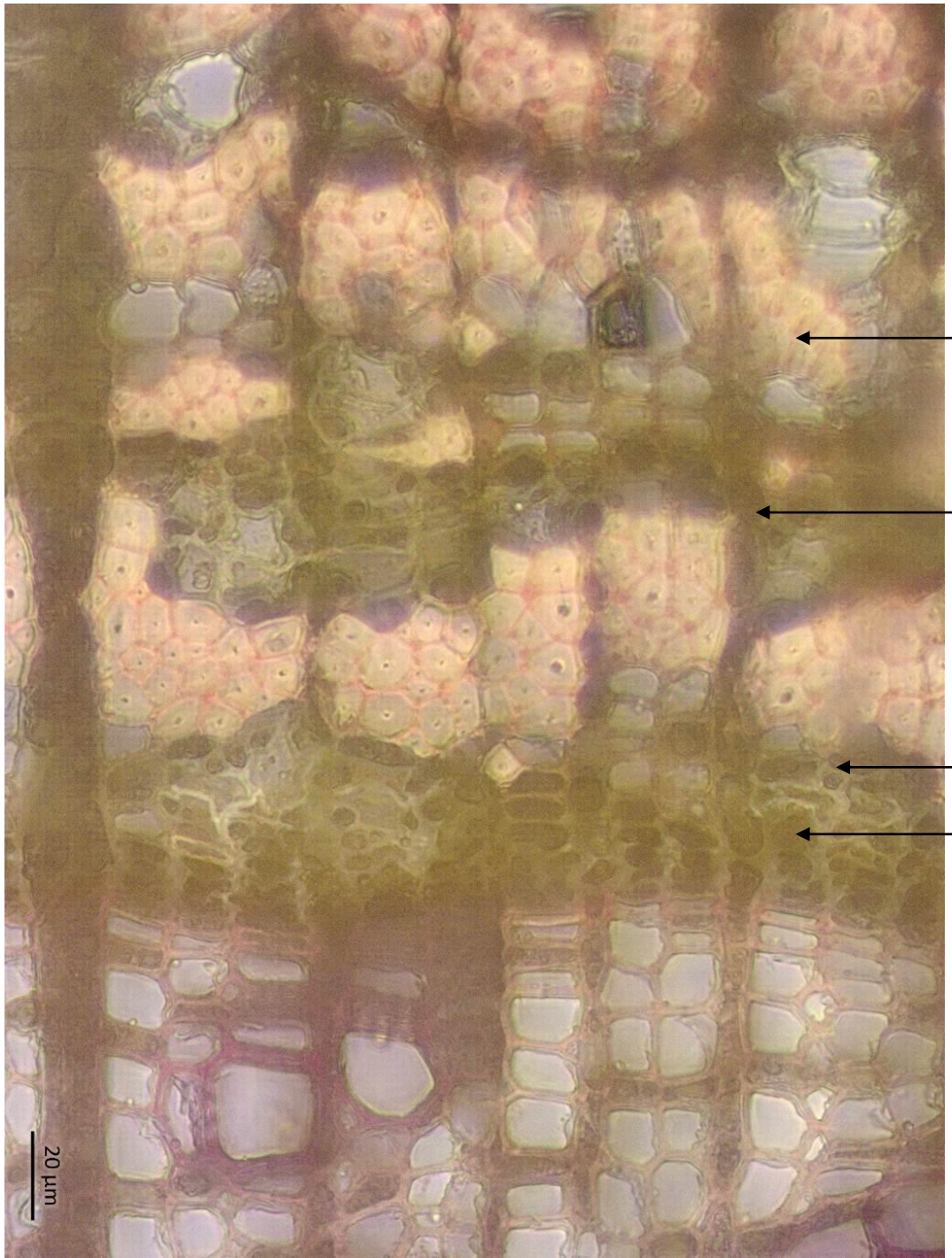

Phloem
(transversal)
Companion cells
Pore areas
Sieve tubes
Companinon
cells
Parenchymatic
cells
Sieve plate
Parenchymatic
cell
Phloem
(longitudinal)
Sieve tubes



(a) Sieve-tube elements and companion cells



(b) Light micrograph of phloem stained with blue dye, showing sieve-tube elements

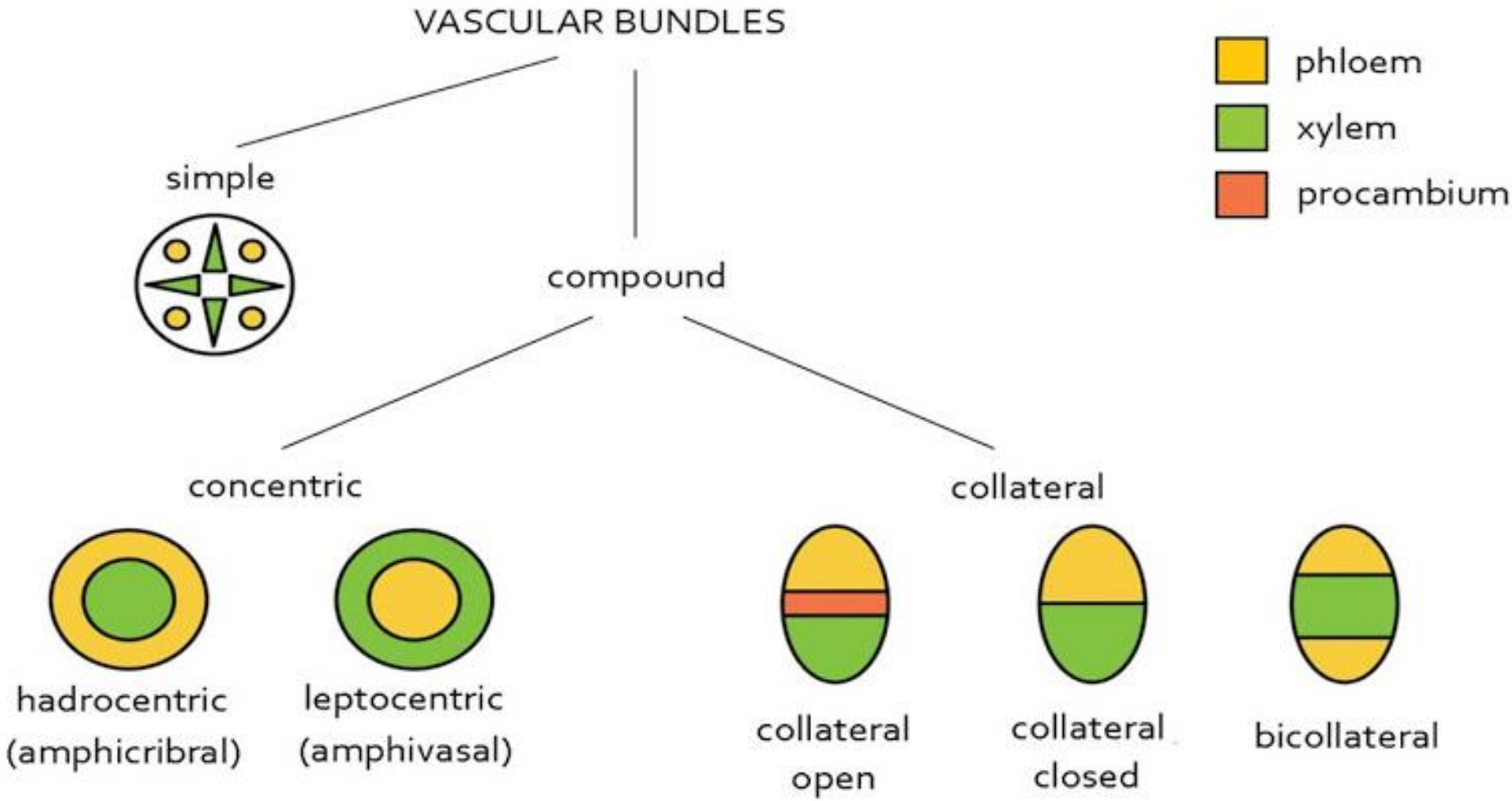


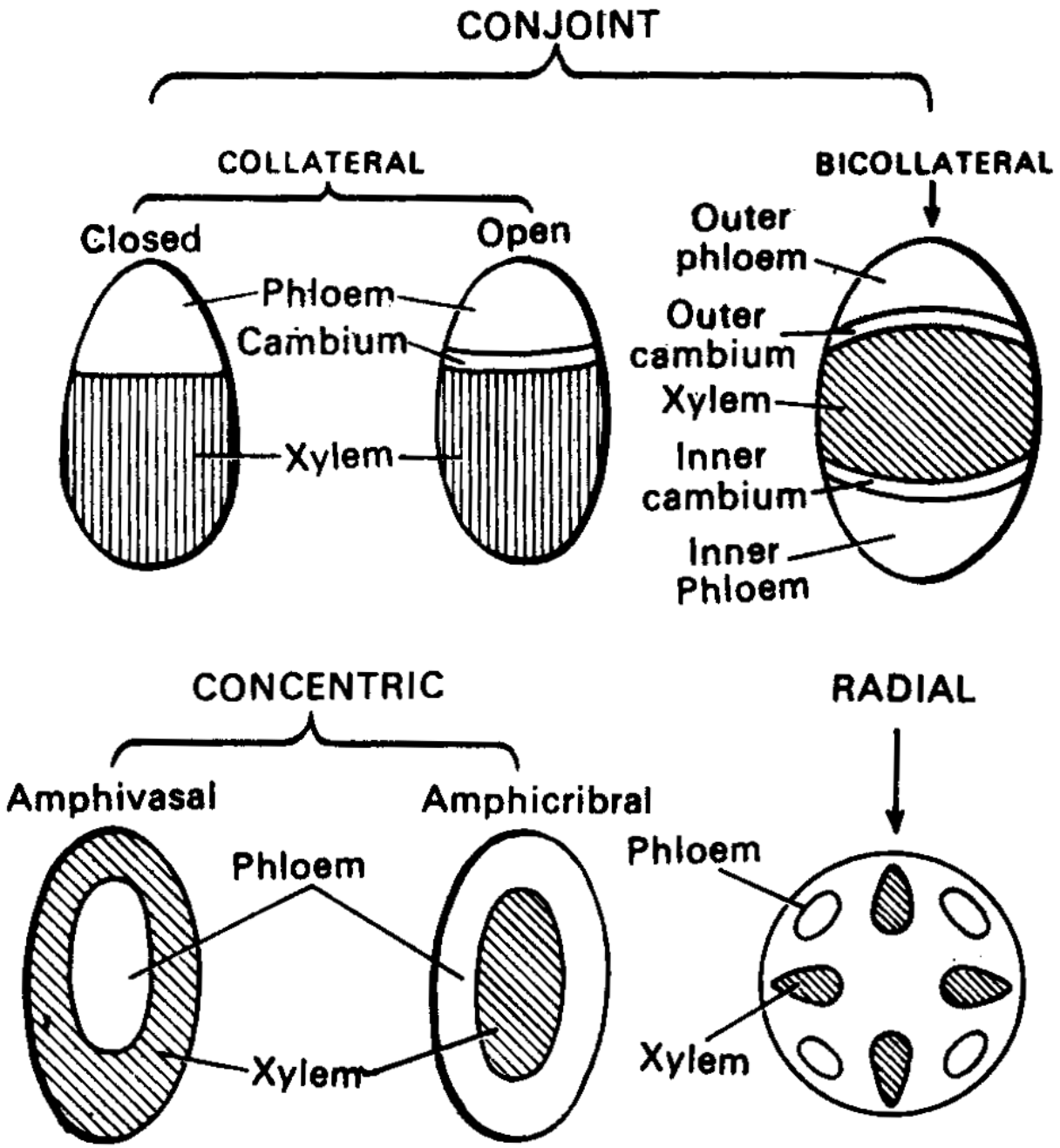
Bast fibers

Pith rays

Companion cell

Sieve tube


VASCULAR BUNDLES
phloem
xylem
procambium
simple
compound
concentric
collateral
hadrocentric
(amphicribral)
leptocentric
(amphivasal)
collateral
open
collateral
closed
bicollateral


CONJOINT
COLLATERAL
Closed
Open
Phloem
Cambium
Xylem
BICOLLATERAL
Outer phloem
Outer cambium
Xylem
Inner cambium
Inner Phloem
CONCENTRIC
Amphivasal
Amphicribral
Phloem
Xylem
RADIAL
Phloem
Xylem