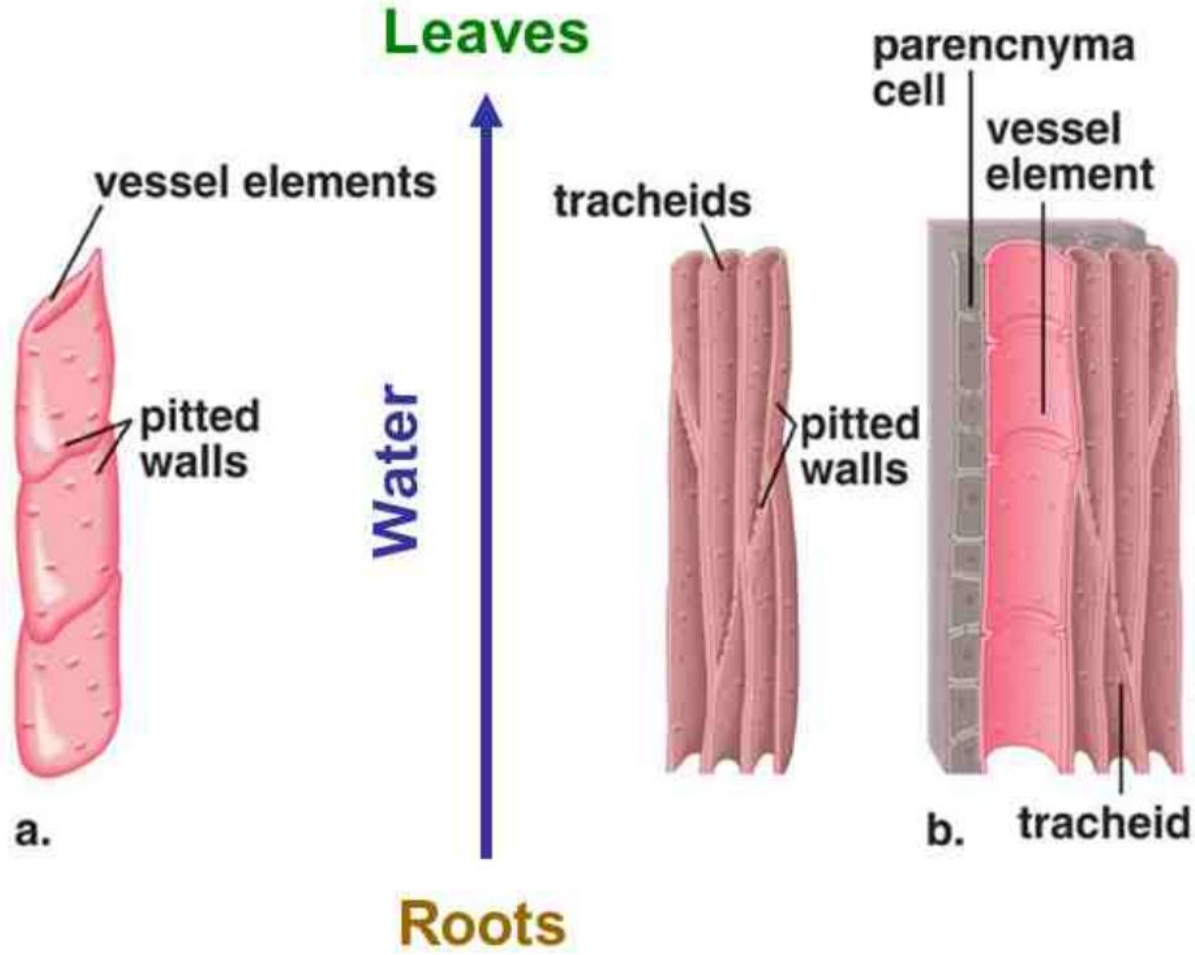
Vascular tissues

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

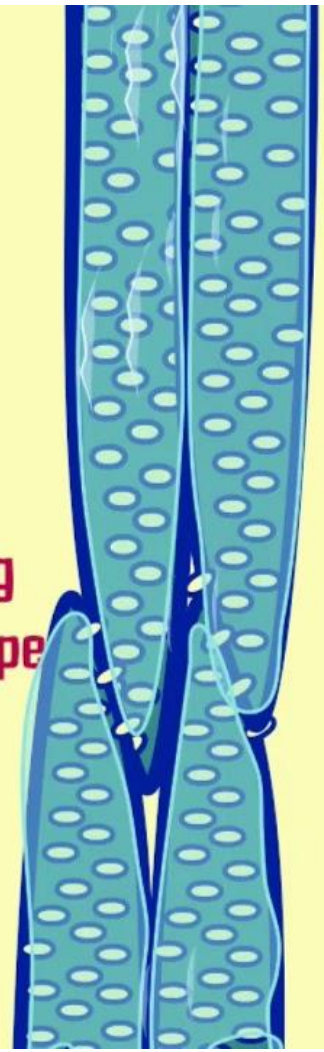
Contains two types of conducting cells: ***tracheids*** **and** ***vessel elements*****.**



TRACHEIDS

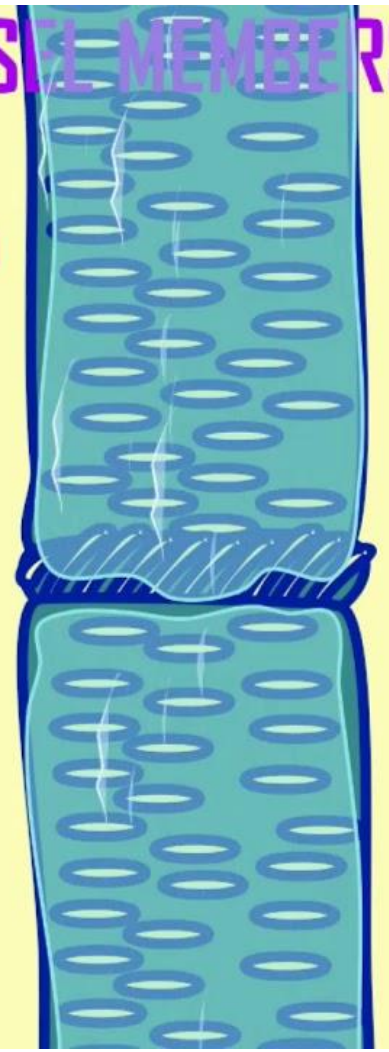
longer; thinner;
ends taper

in many nonflowering plants, the only cell type in xylem

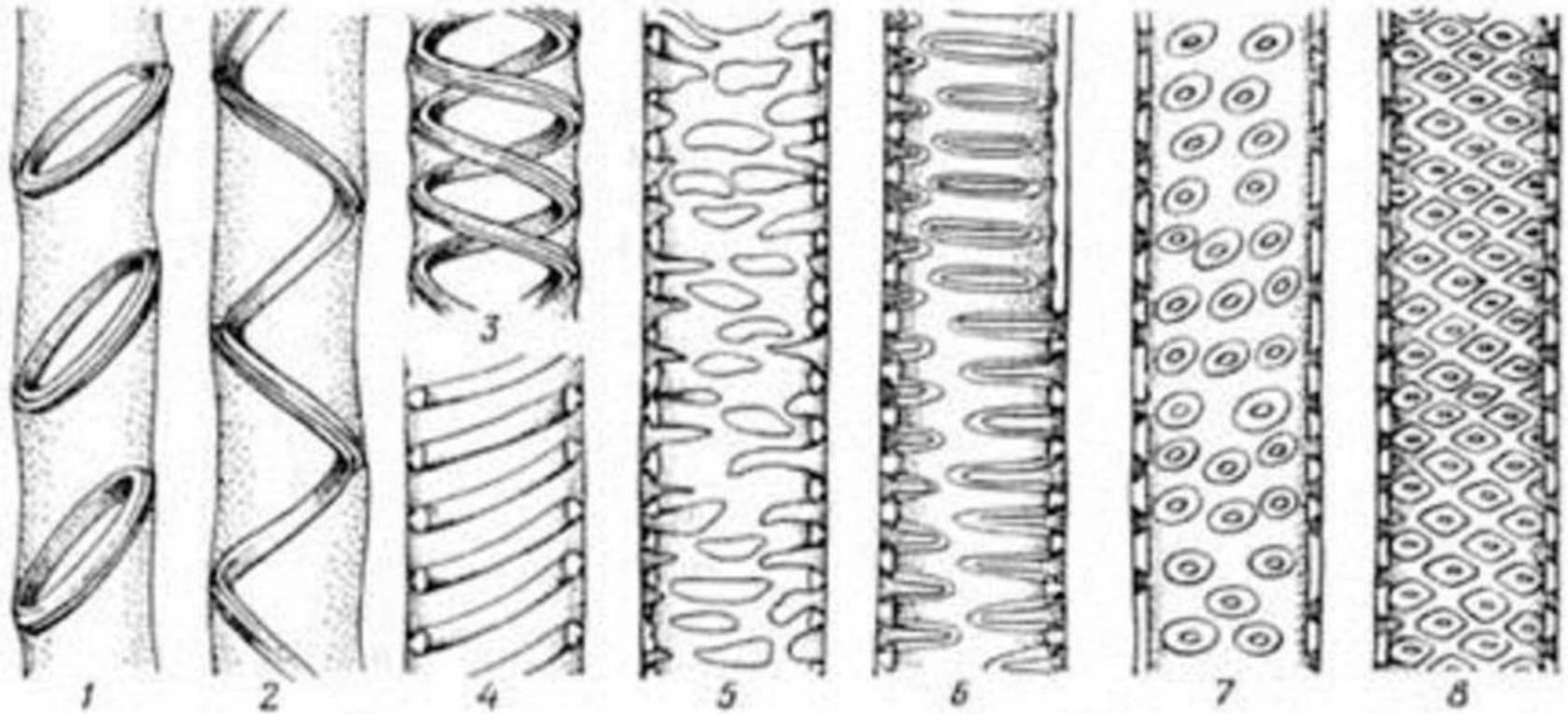


VESSEL MEMBERS

wider, cylindrical, joined at perforation plates

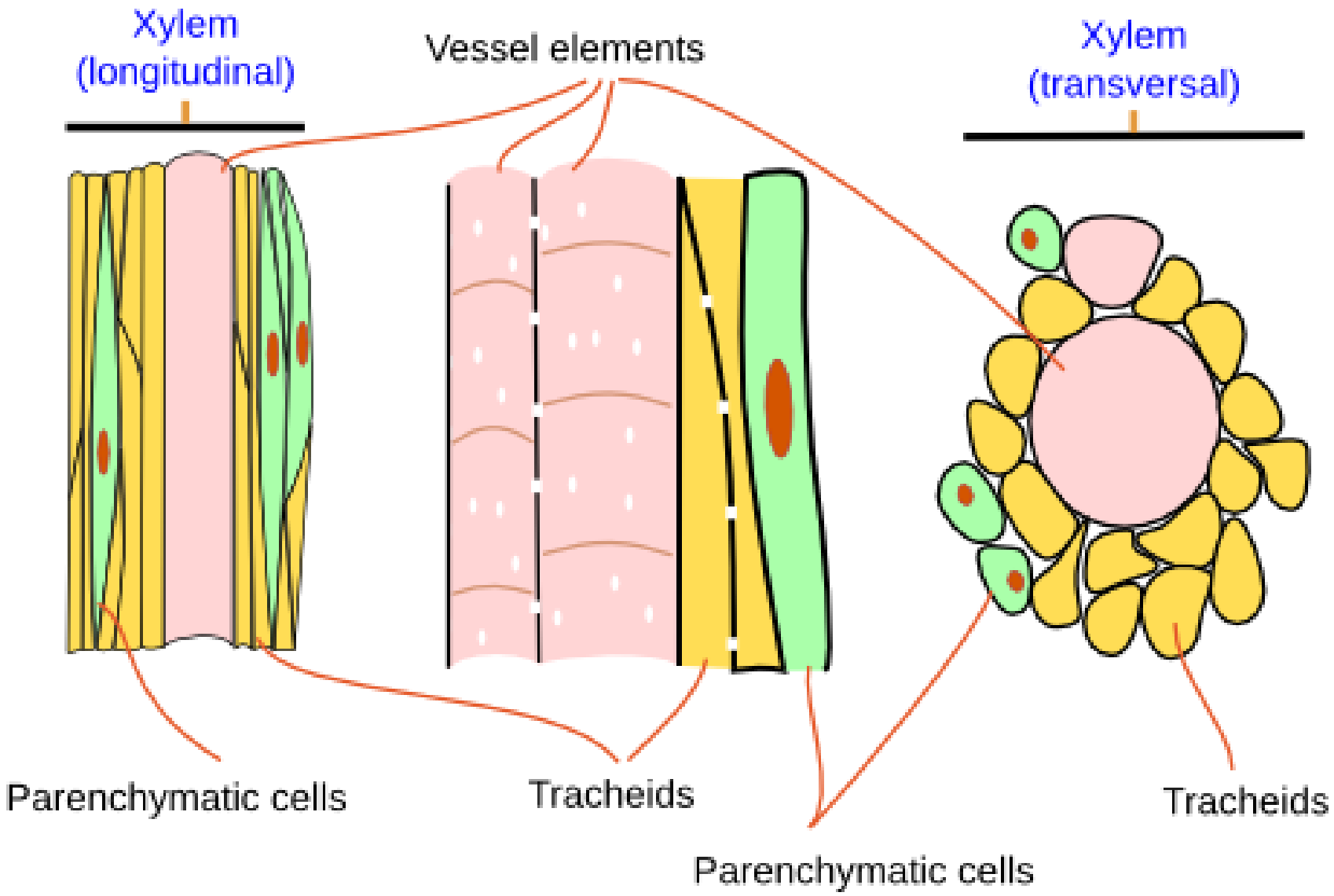


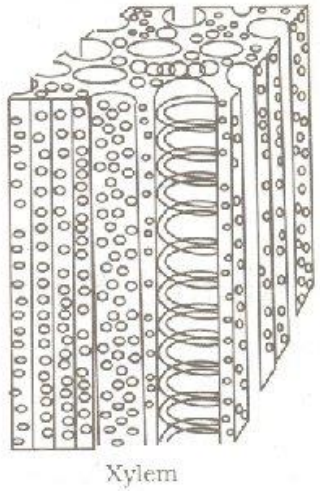
Secondary Wall Thickenings



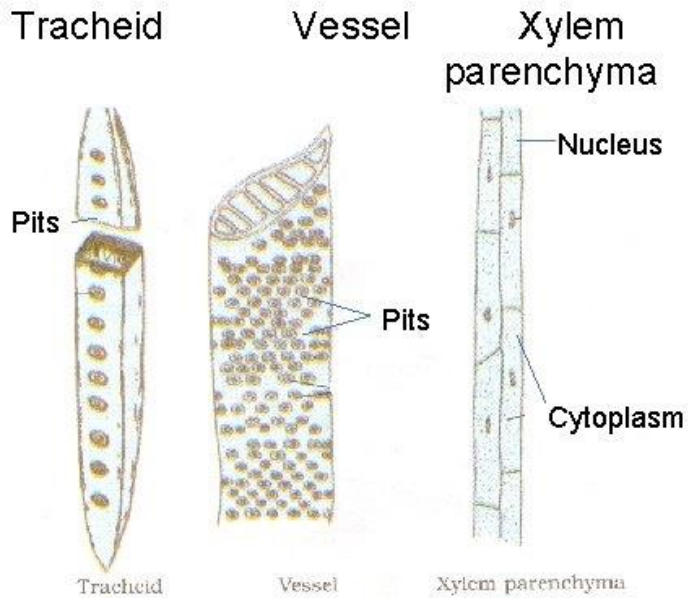
1 = annular thinckening 2-4 = helical thickening 5 = reticulate thickening

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

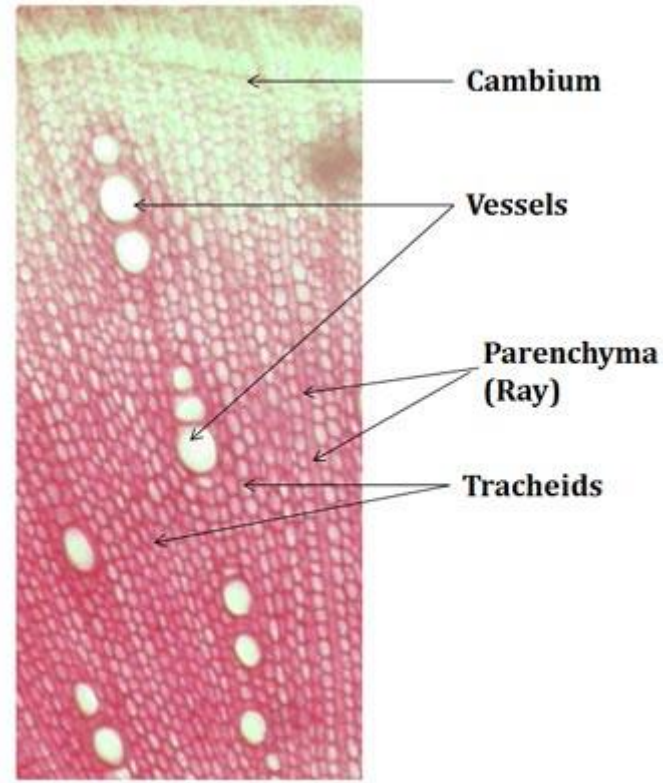

Xylem
(longitudinal)
Vessel elements
Xylem
(transversal)
Parenchymatic cells
Tracheids
Parenchymatic cells
Tracheids



Xylem



Types of Xylem

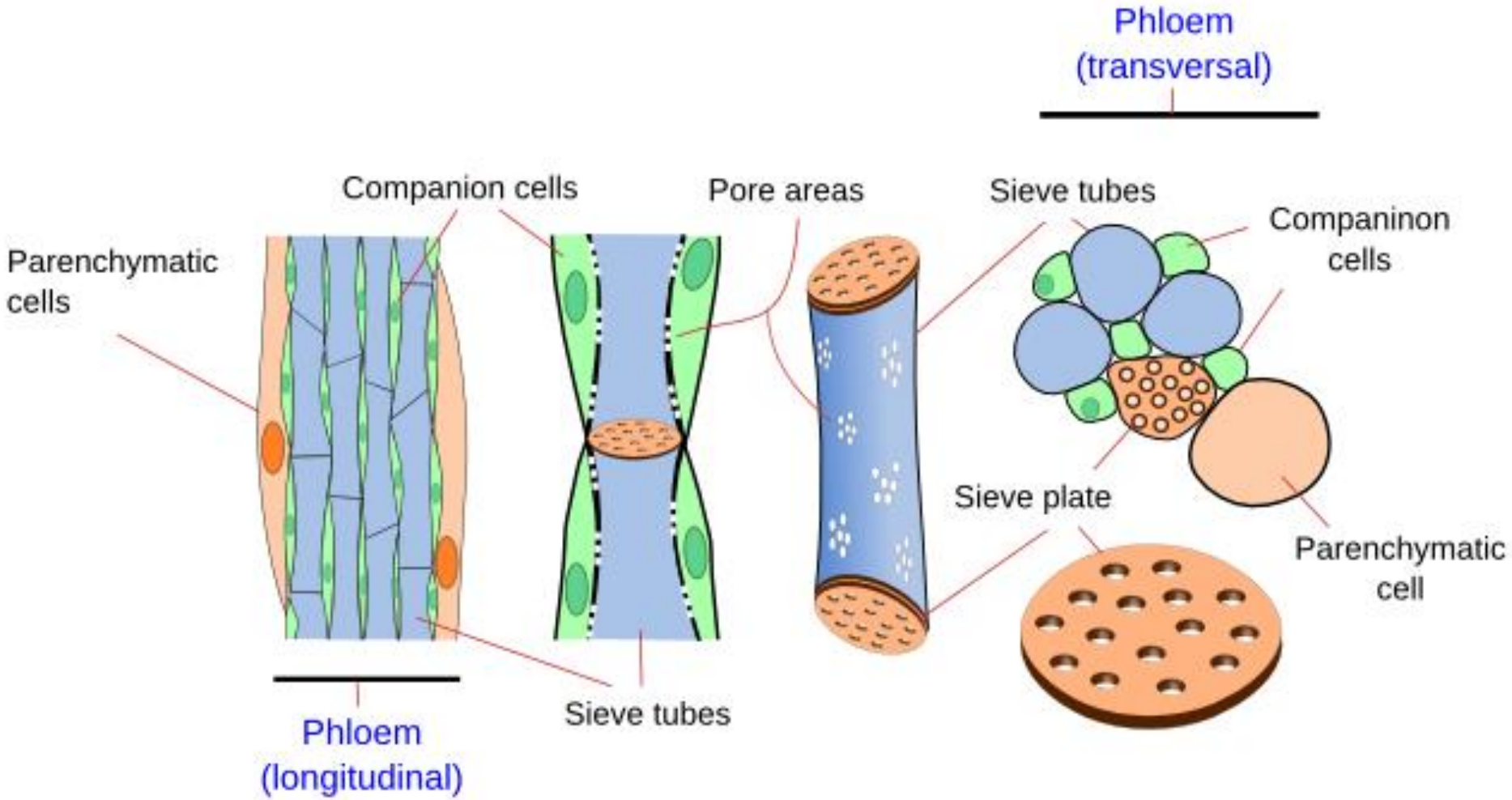


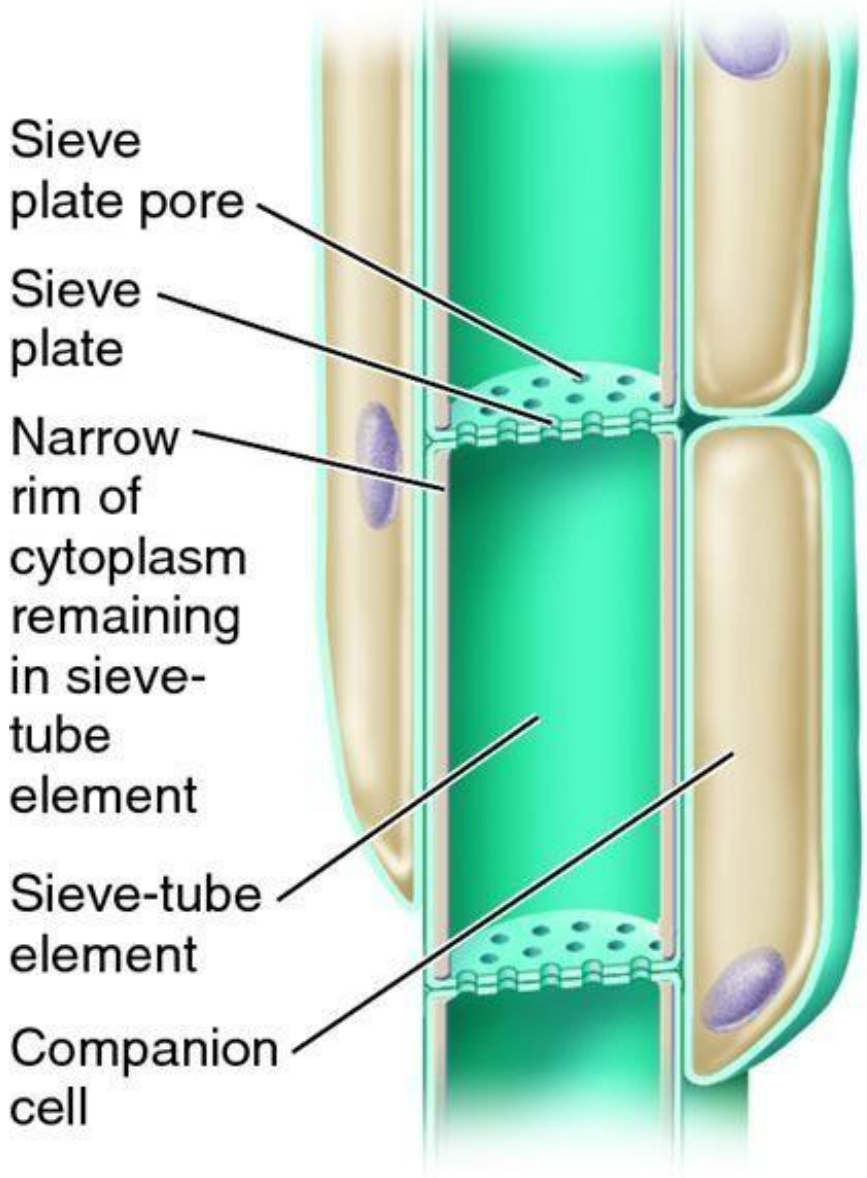
Components of Xylem

Phloem.

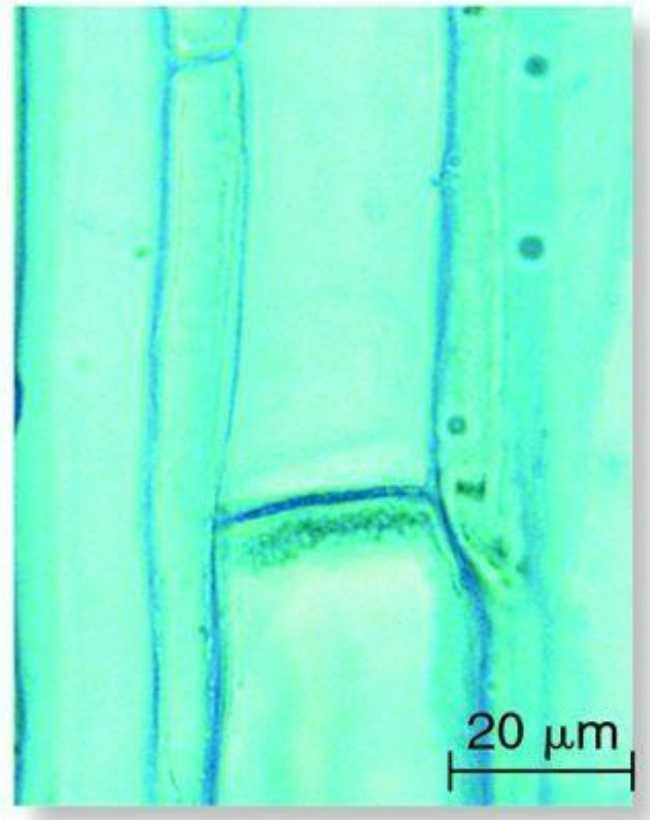
The phloem is similar to the xylem in that it also has tubular structures modified in accordance with their conducting function. However, these tubes are made up of living cells that have a cytoplasm; they do not carry a mechanical function.

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

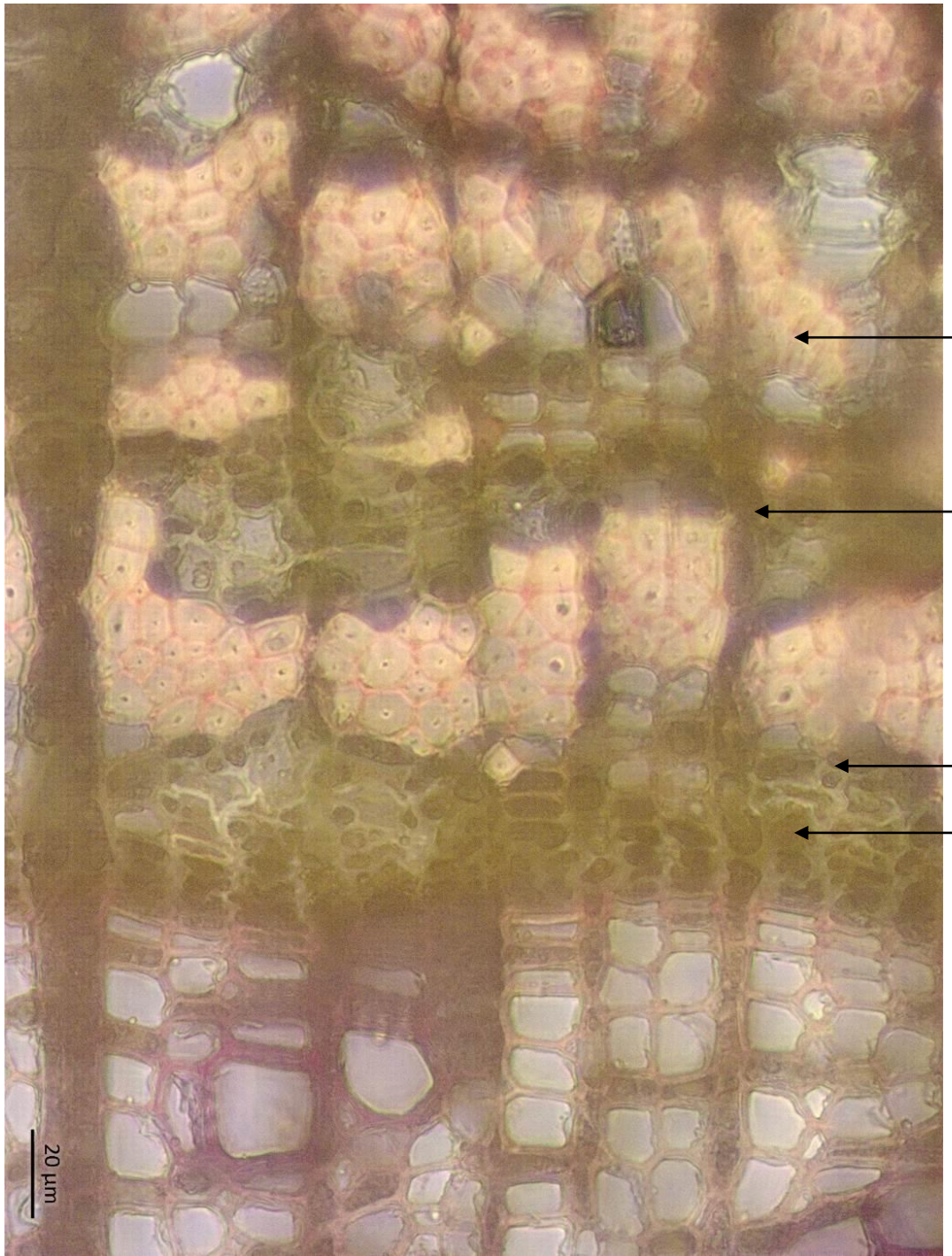

Phloem
(transversal)
Companion cells
Pore areas
Sieve tubes
Companinon
cells
Parenchymatic
cells
Sieve plate
Parenchymatic
cell
Phloem
(longitudinal)
Sieve tubes



(a) Sieve-tube elements and companion cells



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

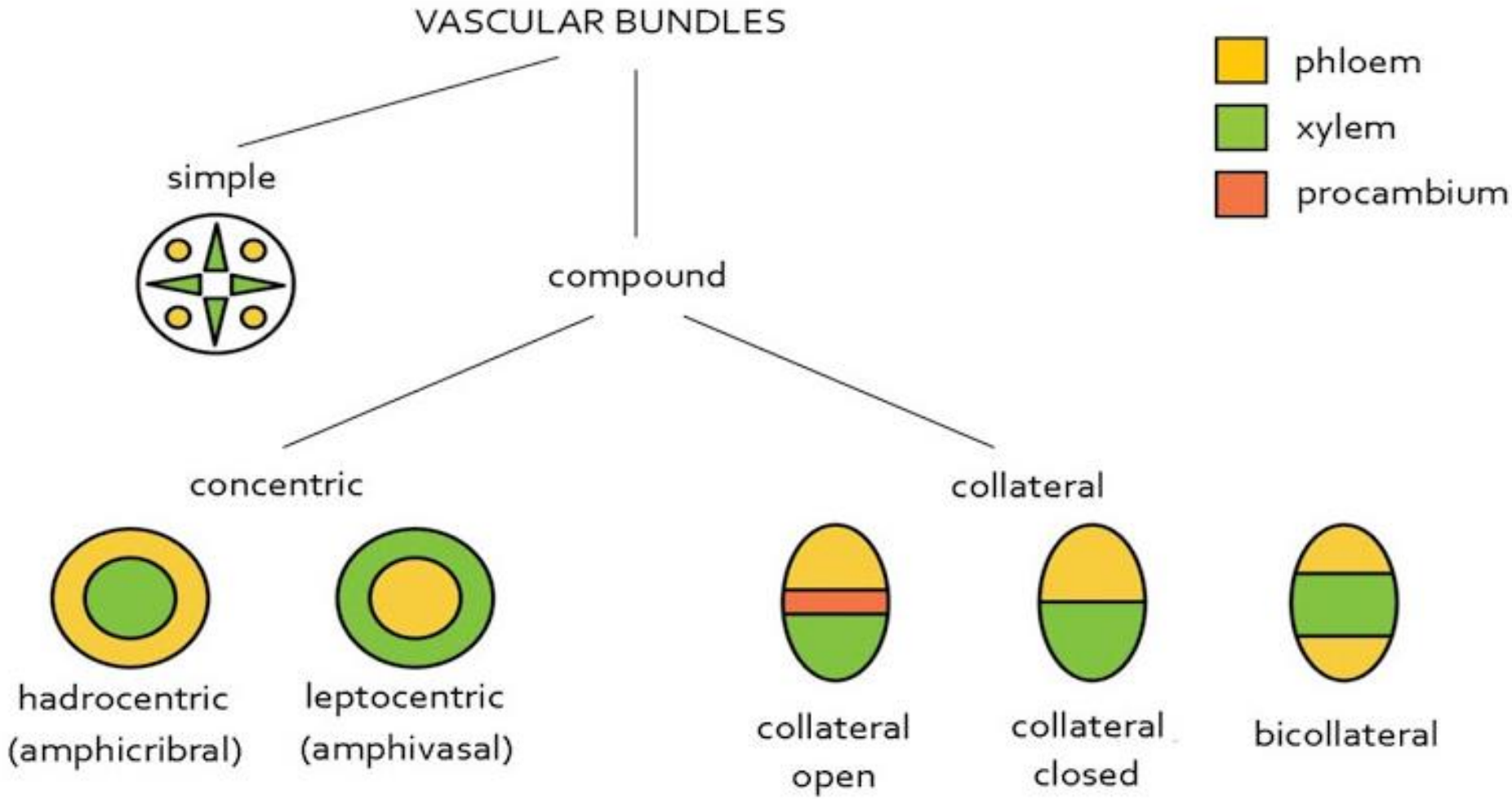


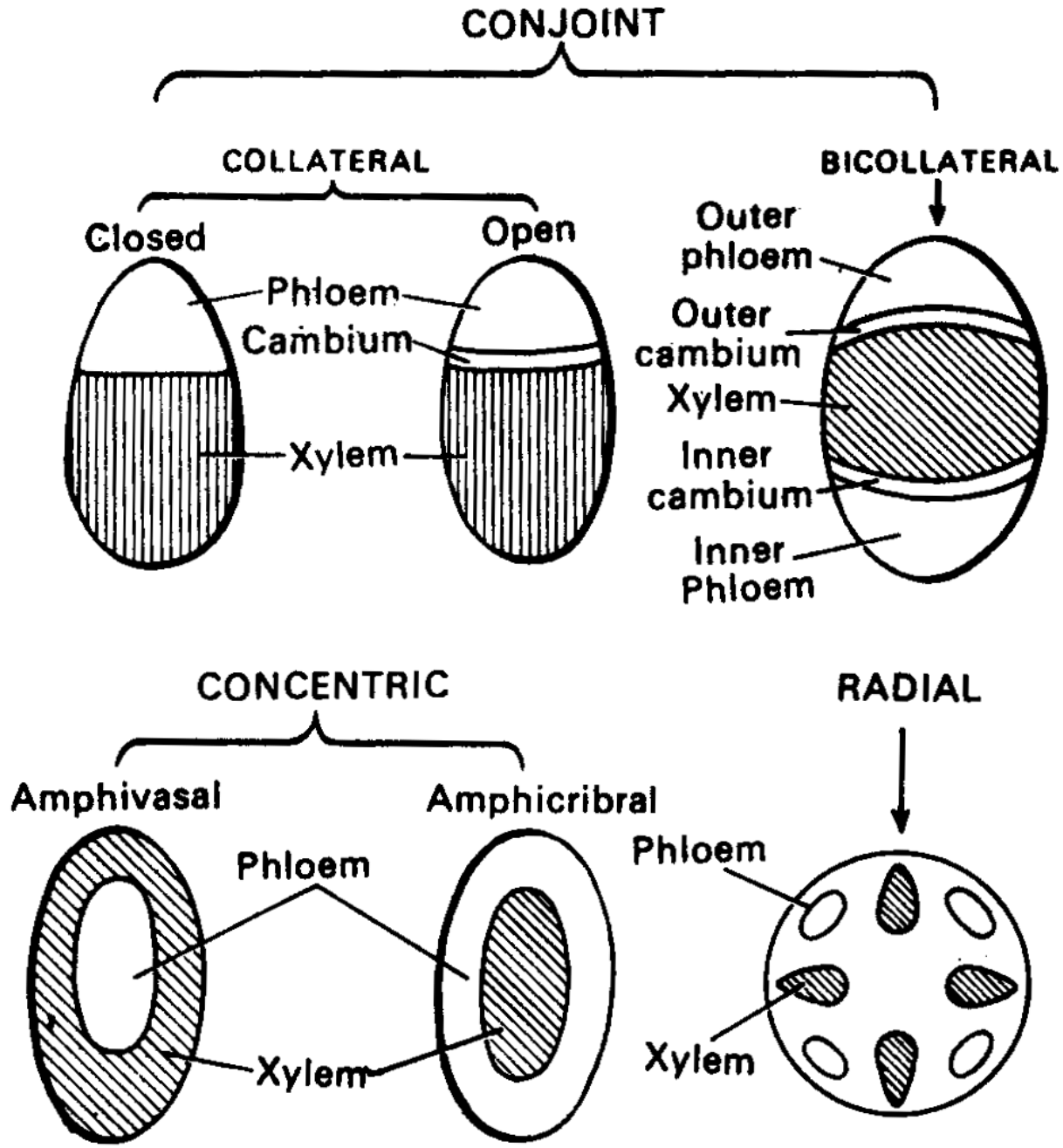
Bast fibers

Pith rays

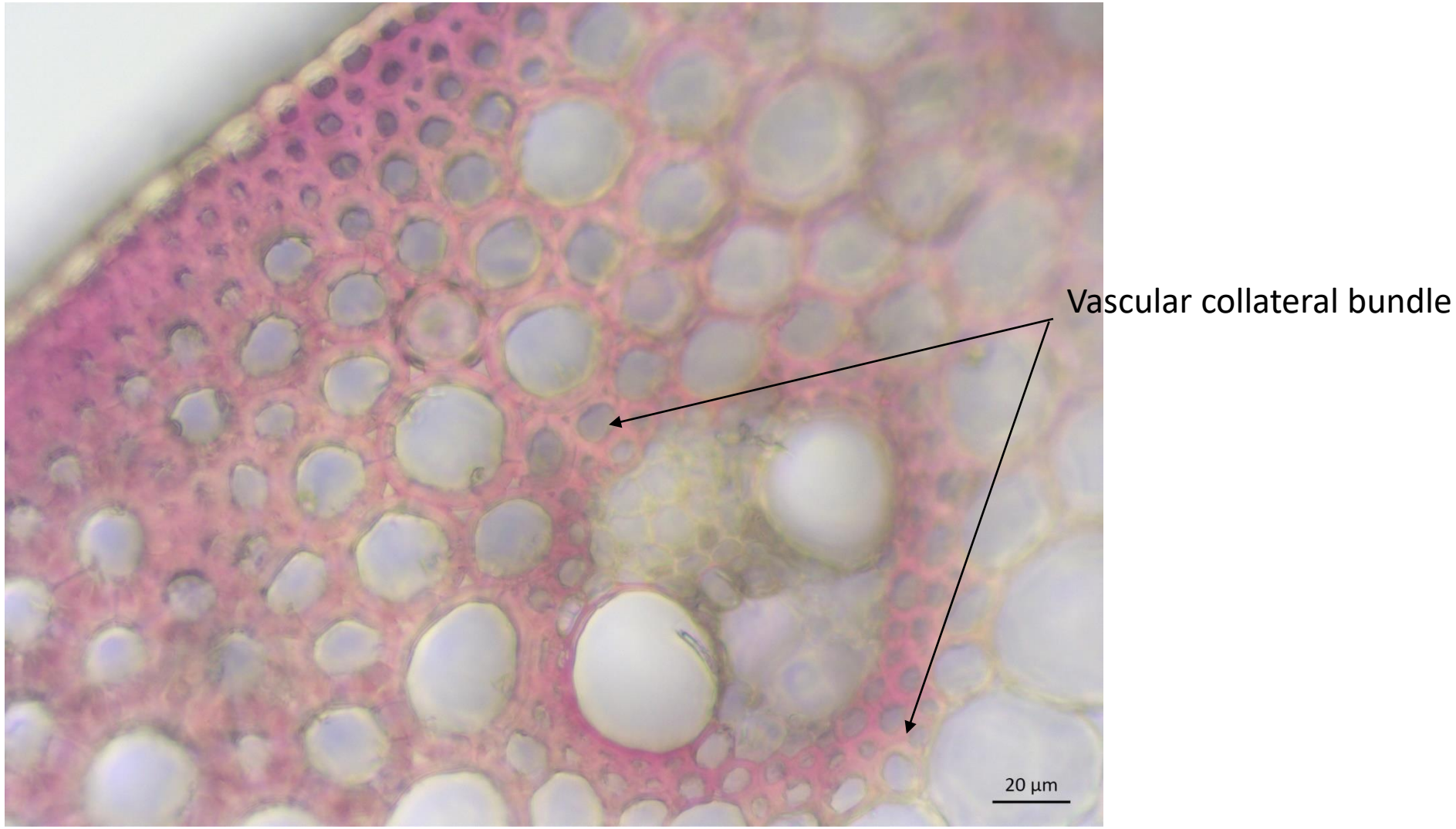
Companion cell

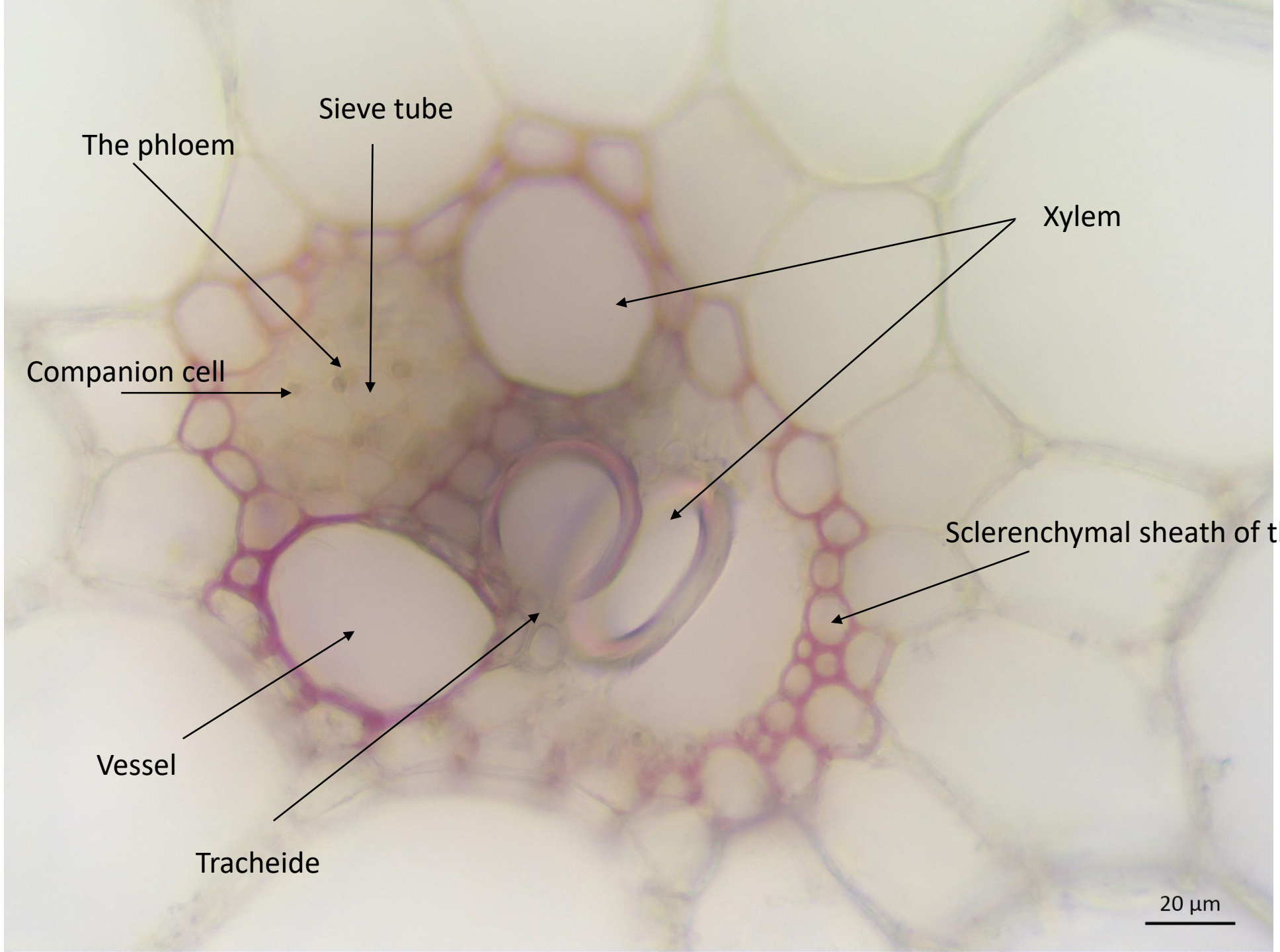
Sieve tube


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

Closed collateral bundle of corn stem (Zea mays L.).



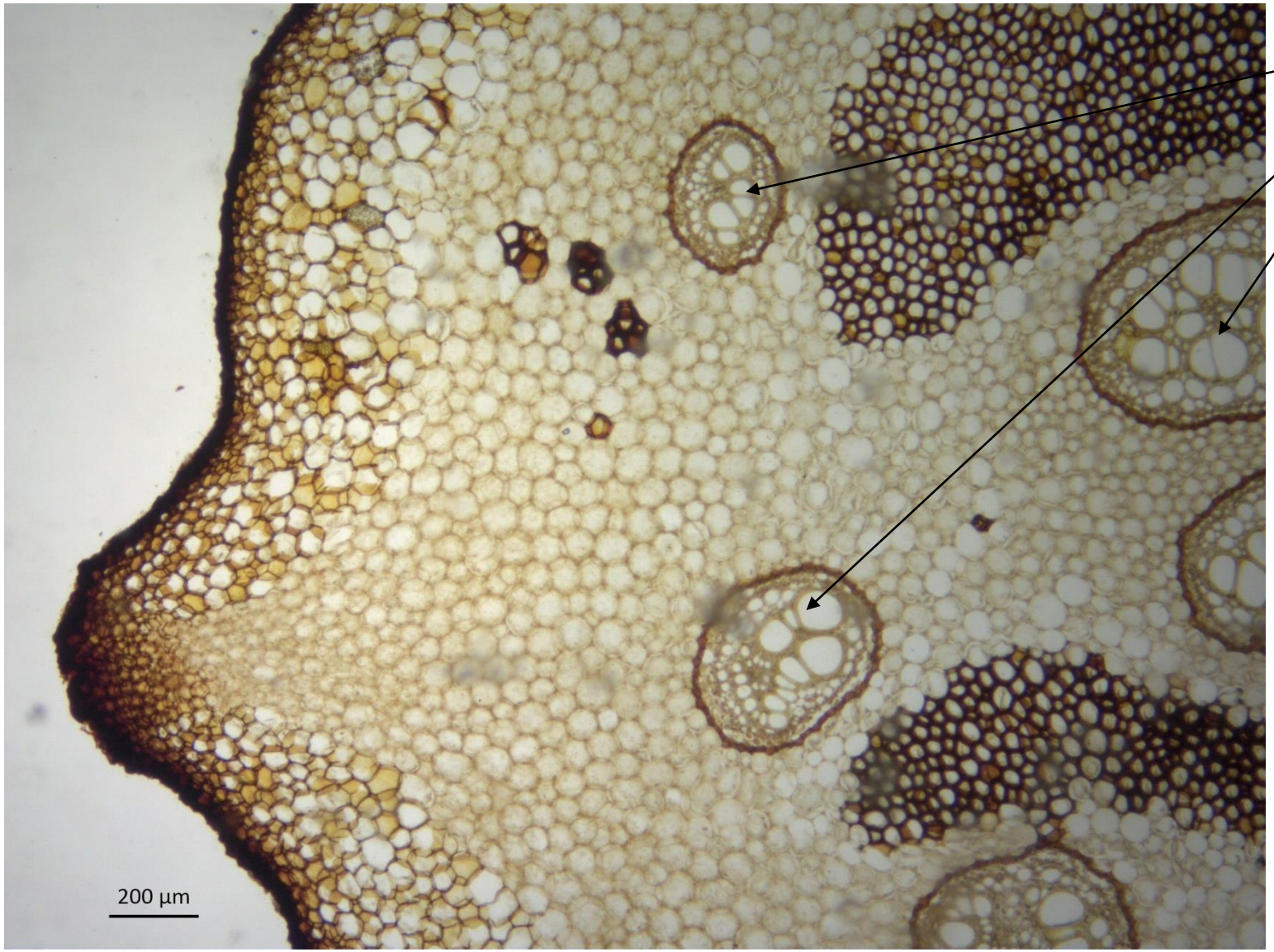

Sieve tube
The phloem
Xylem
Companion cell
Sclerenchymal sheath of the bundle
Vessel
Tracheide
20 µm

Bicollateral bundle of pumpkin stem (Cucurbita pepo L.)

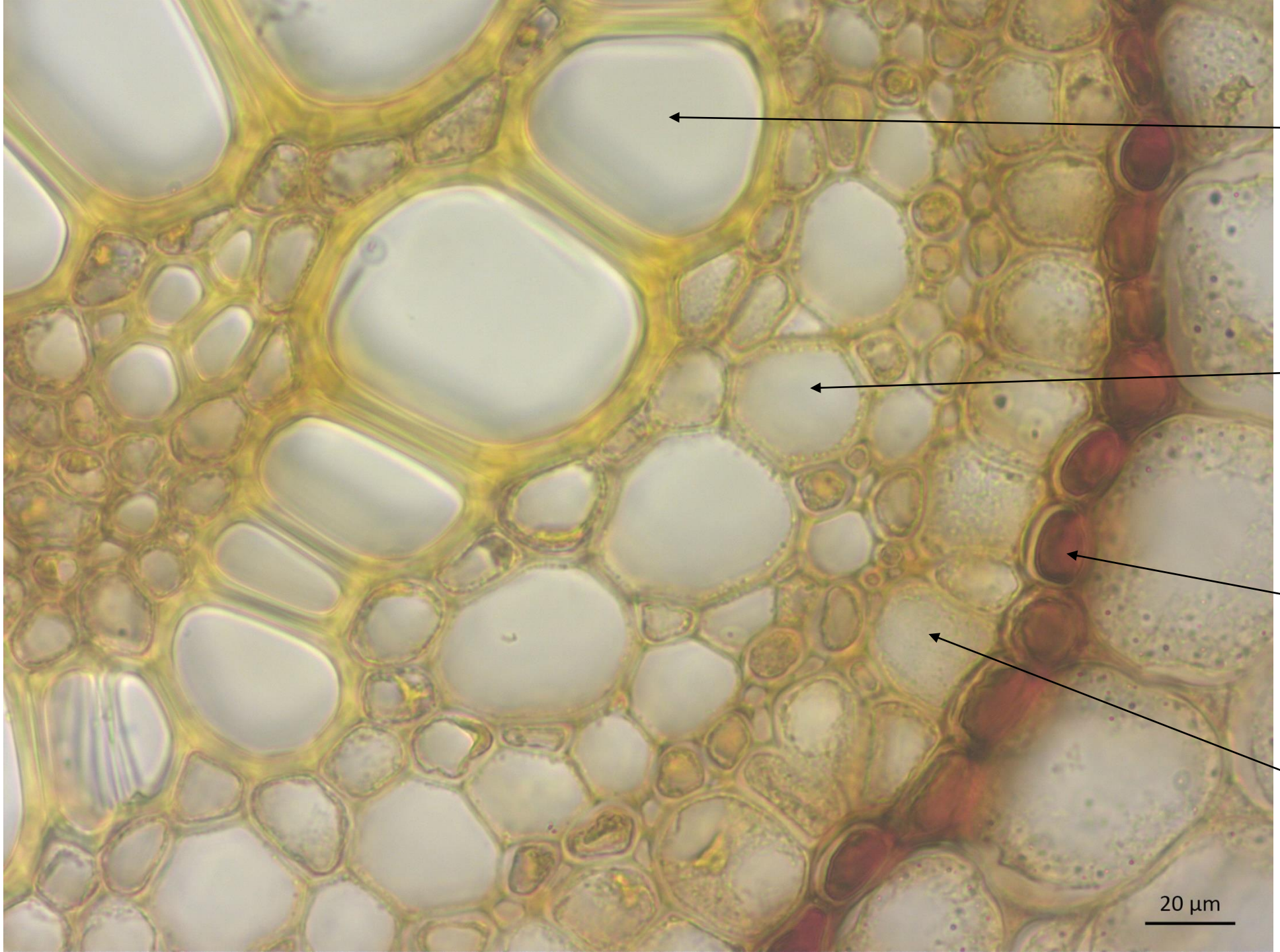

The secondary phloem
The cambium
The xylem
The primary phloem
100 µm

Conducting bundle of the stalk of Aristolochia clematitis L.

Conducting bundle of the rhizome of the bracken fern (Pteridium aquilinum (L.) Kuhn ex Decken).



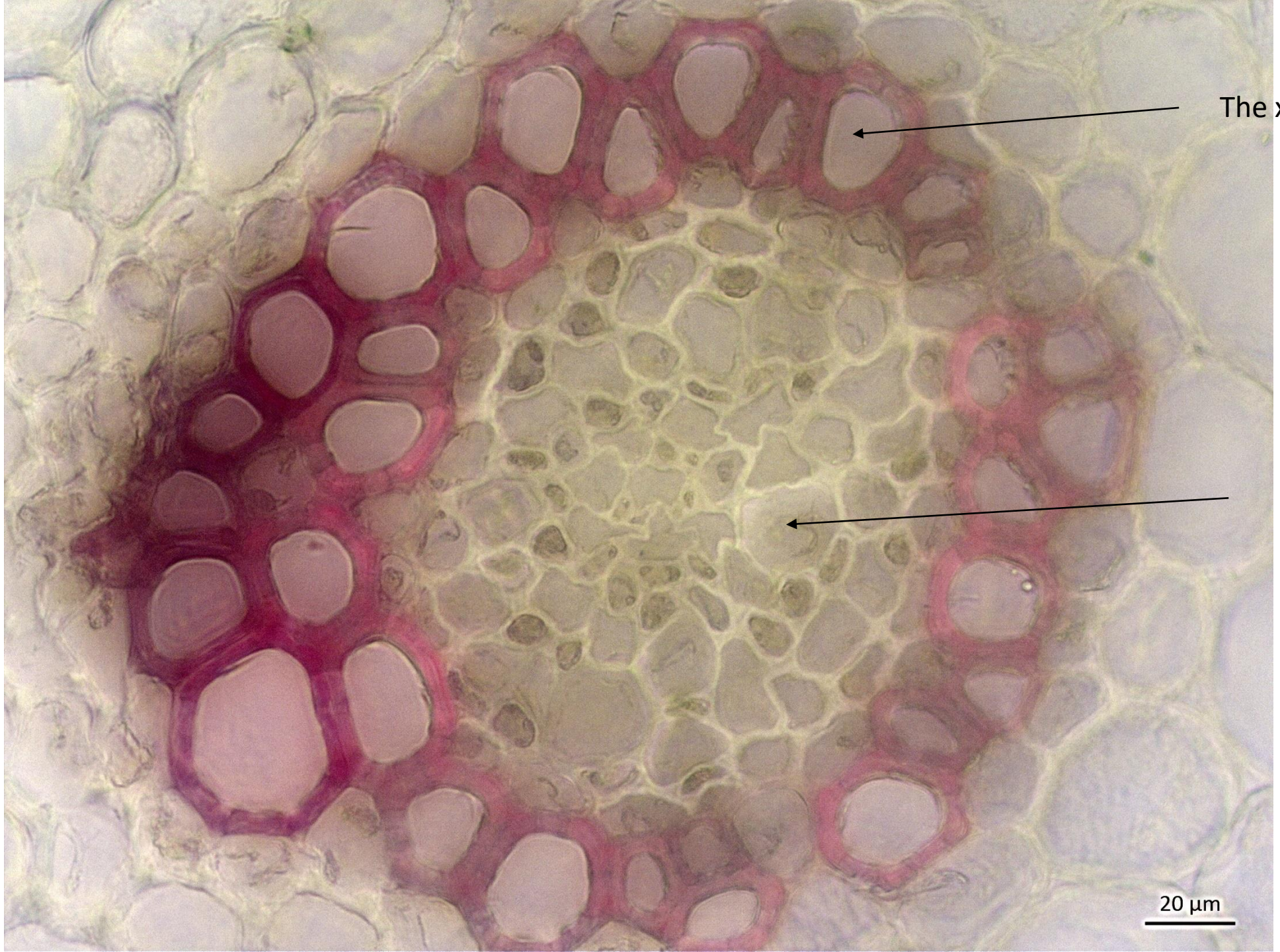
Vascular amphicribral bundle


The xylem
The phloem
The endoderm
The pericycle
20 µm

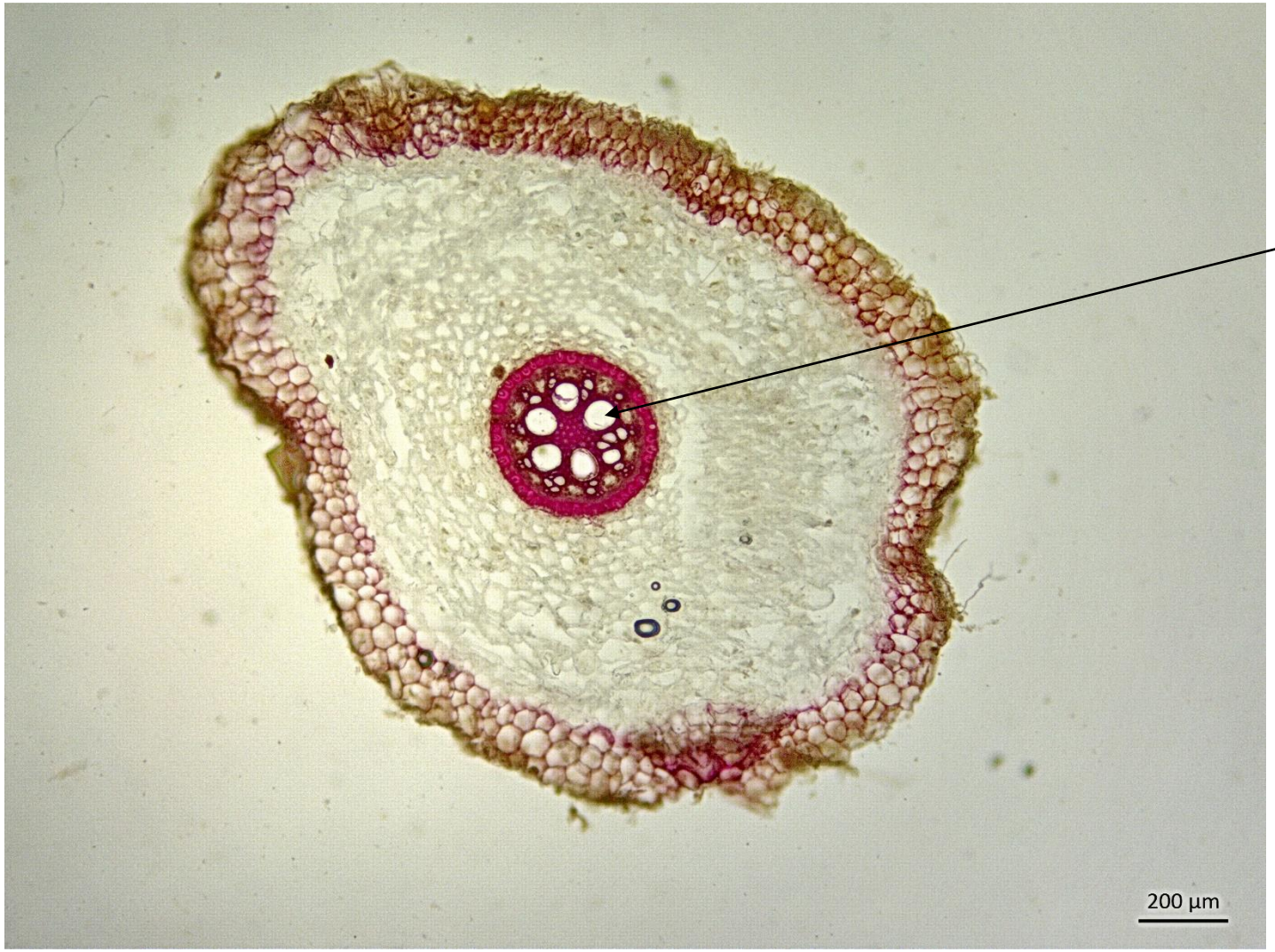
Conducting bundles in the rhizome of lily of the valley (Convallaria majalis L.).

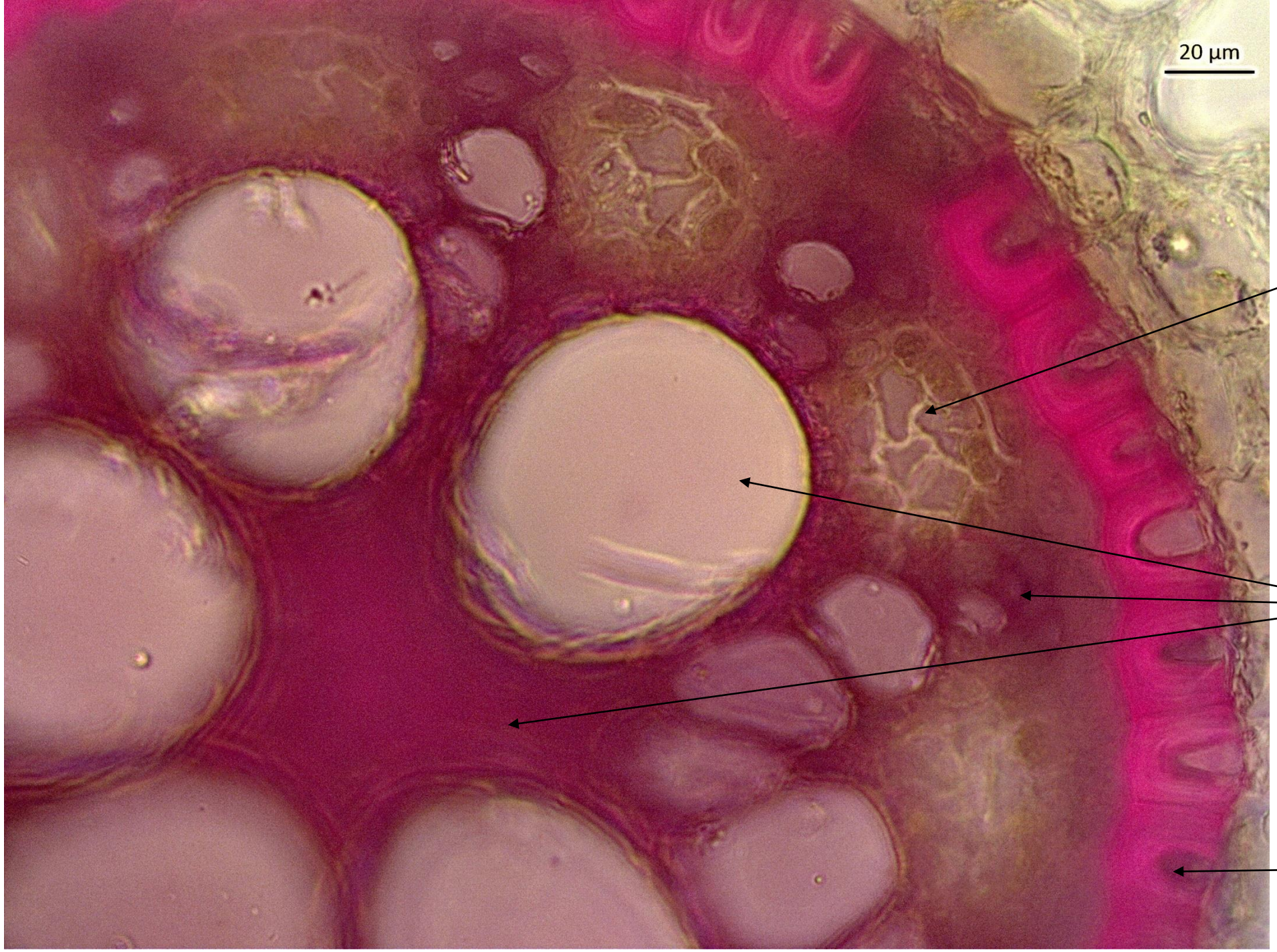
The collateral bundle

The concentric amphivasal bundle


The xylem
The phloem
20 µm

The radial vascular bundle of the root of Iris germanica




20 µm
The phloem
The xylem
The endoderm