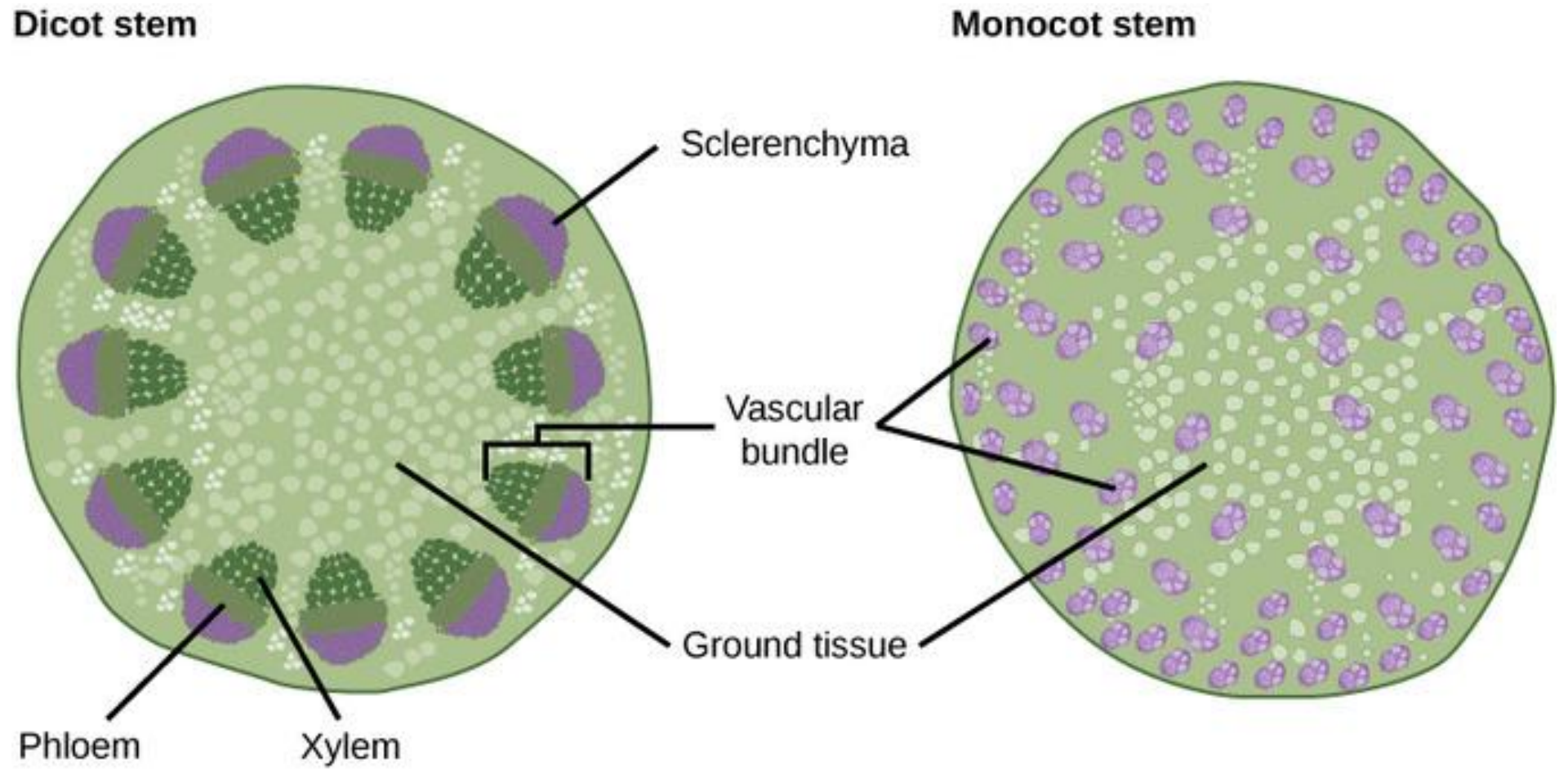
Thematic block: Vegetative organs of plants.

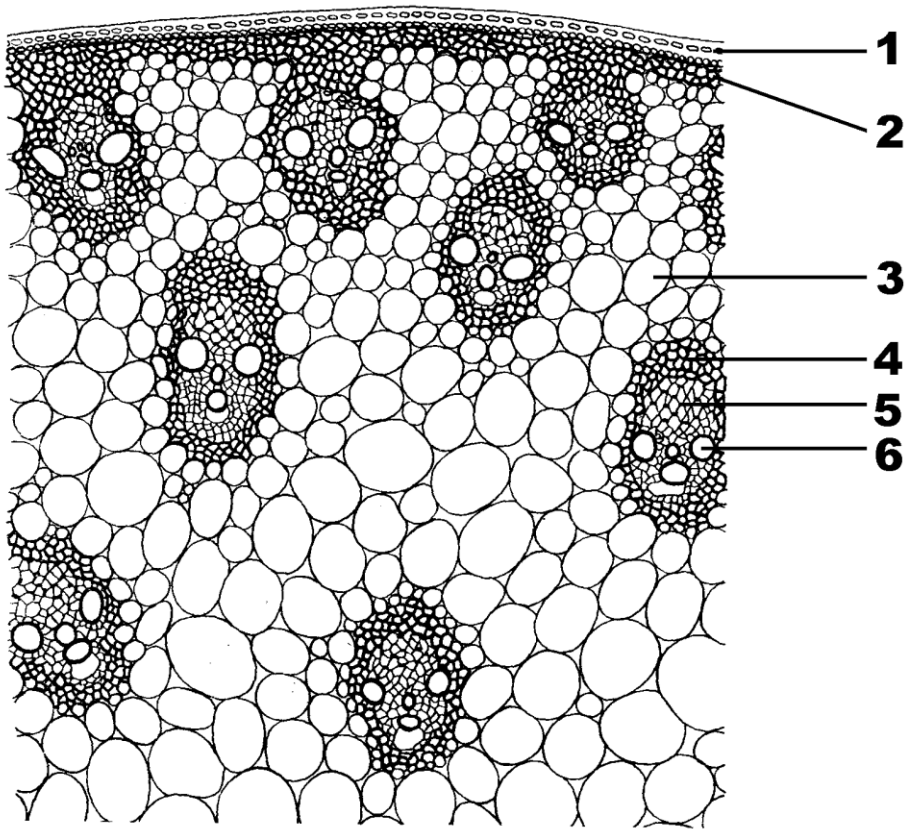
Lesson 3.2. The structure of the herbaceous stem

The primary structure of the stem

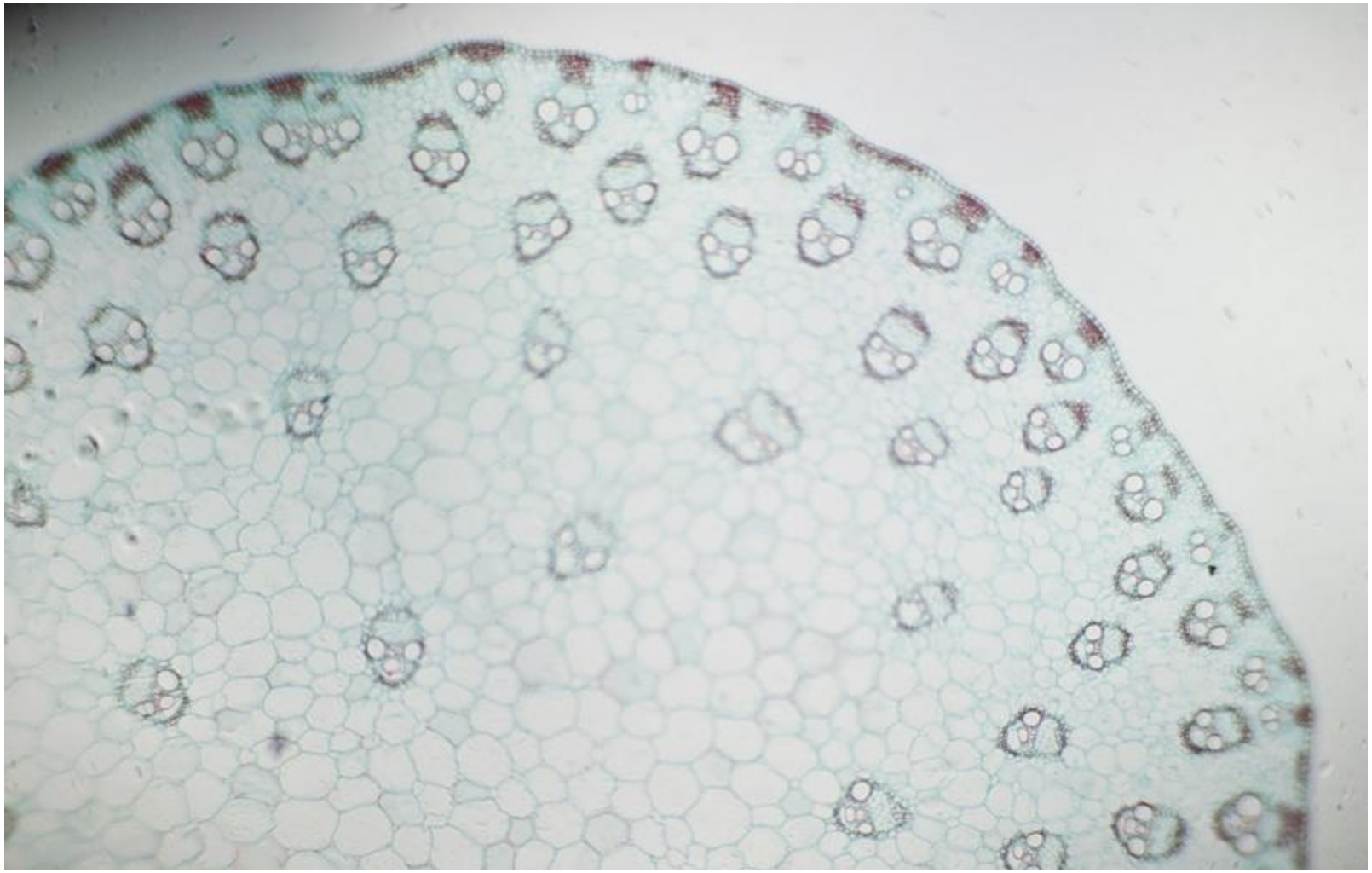
- There are three main parts in the anatomical structure of the stem of herbaceous plants:
- **1. The dermal tissue.**
- **2. Primary cortex.**
- **3. Central axial cylinder.**


Dicot stem
Monocot stem
Sclerenchyma
Vascular bundle
Ground tissue
Phloem
Xylem

Structure of the stem of a herbaceous monocotyledonous plant - maize (Zea mays L.).

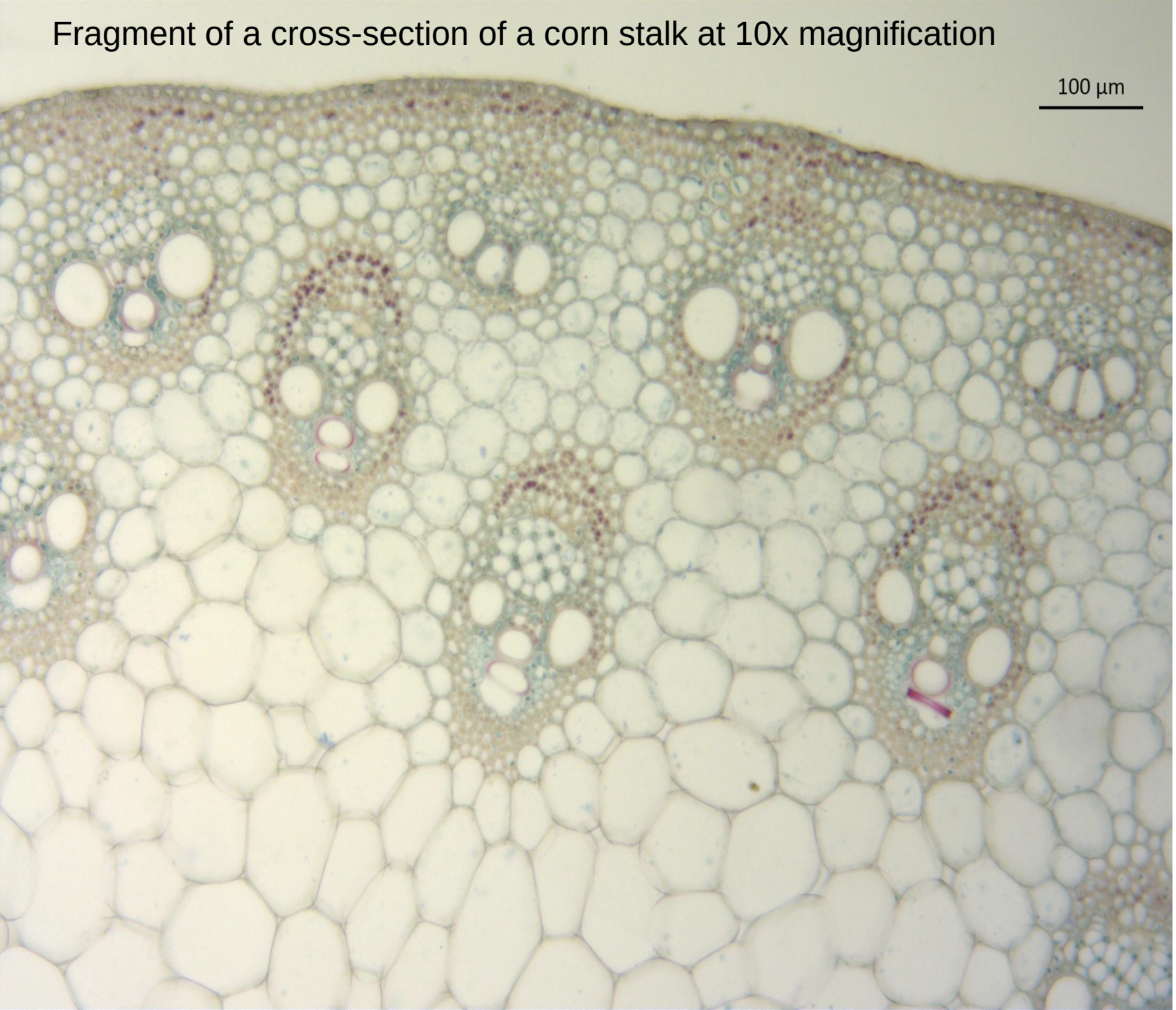


The structure of a corn stem on a cross section: 1 - epidermis, 2 - pericyclic sclerenchyma, 3 - pith parenchyma of the central axial cylinder, 4 - 5 closed collateral vascular bundle: 4 - sclerenchymal sheath of the bundle, 5 - phloem, 6 - xylem



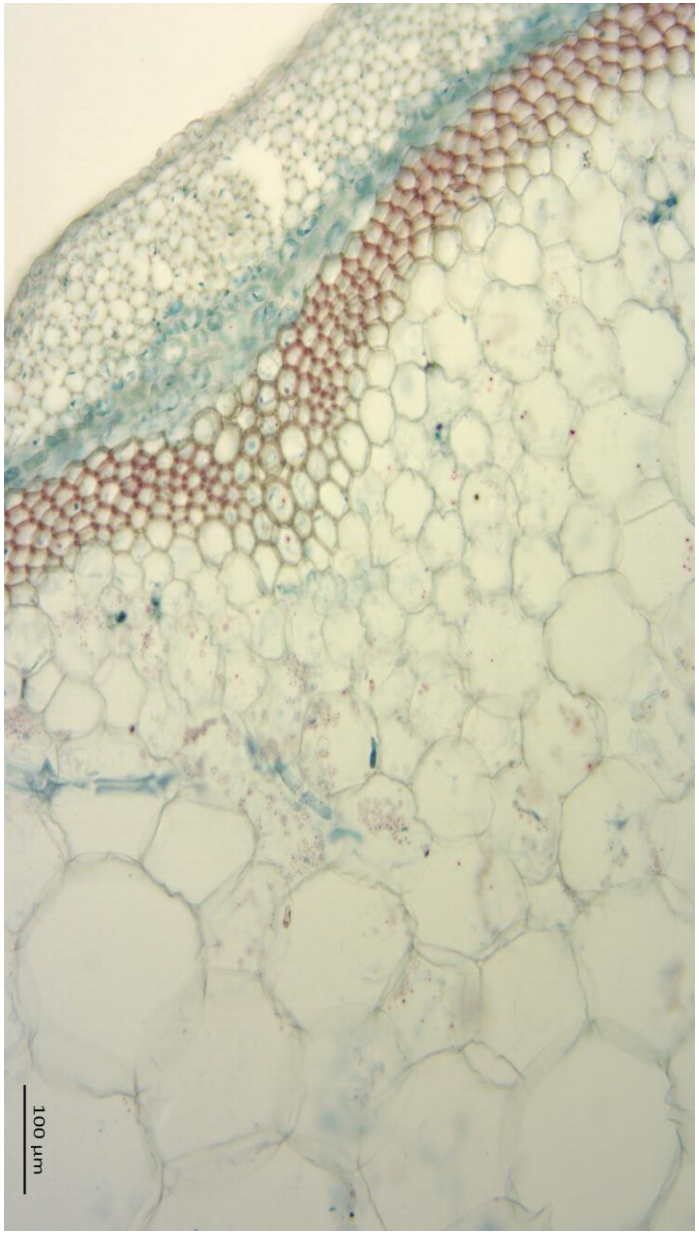
Fragment of a cross-section of a corn stems at 4x magnification

Fragment of a cross-section of a corn stalk at 10x magnification



Fragment of a cross-section of a pumpkin stem under 4x magnification

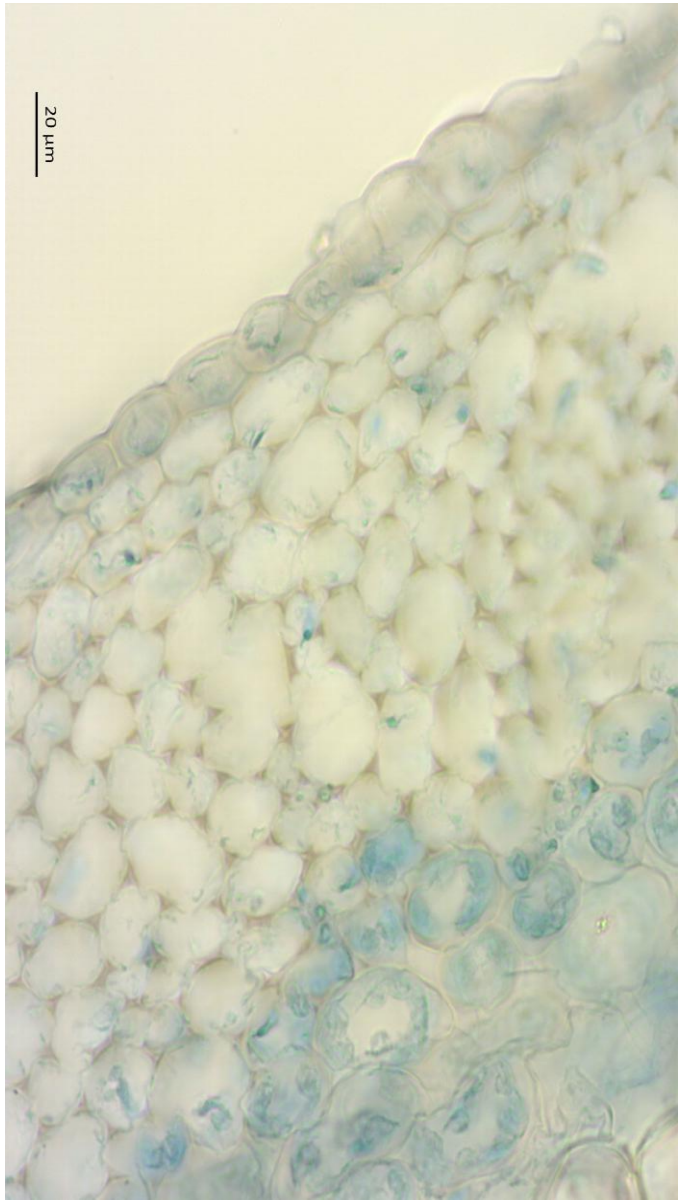
Fragments of a cross-section of a pumpkin stem under 10x magnification



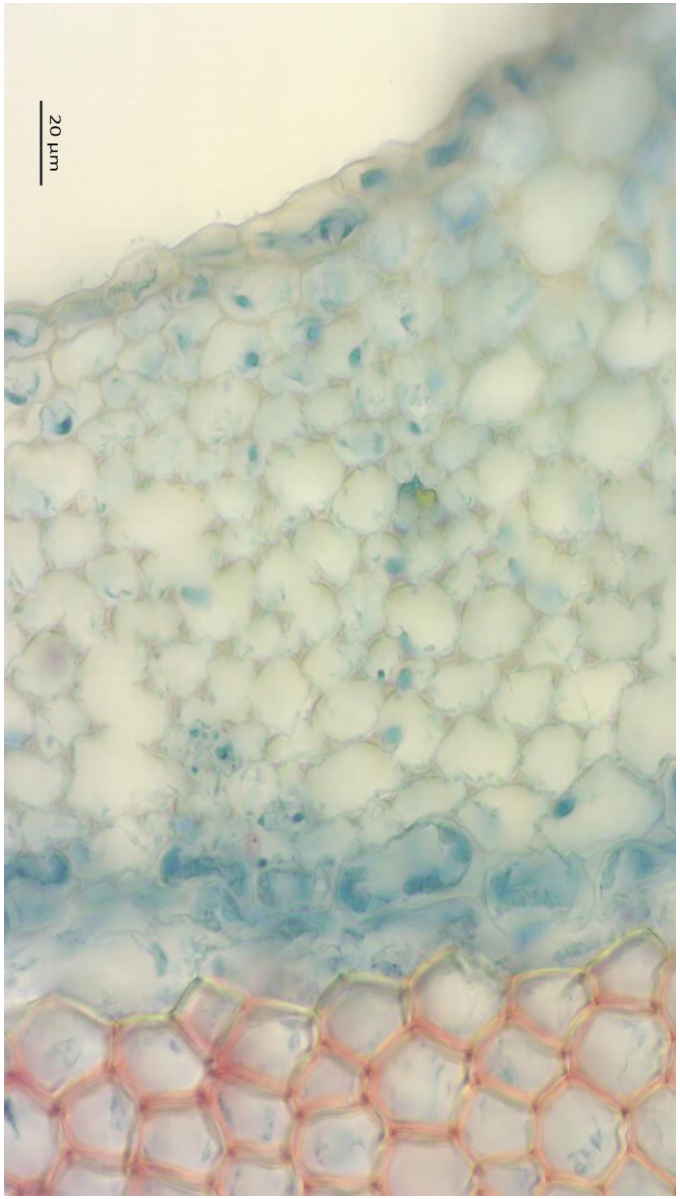
Peripheral part

Bicollateral vascular bundle

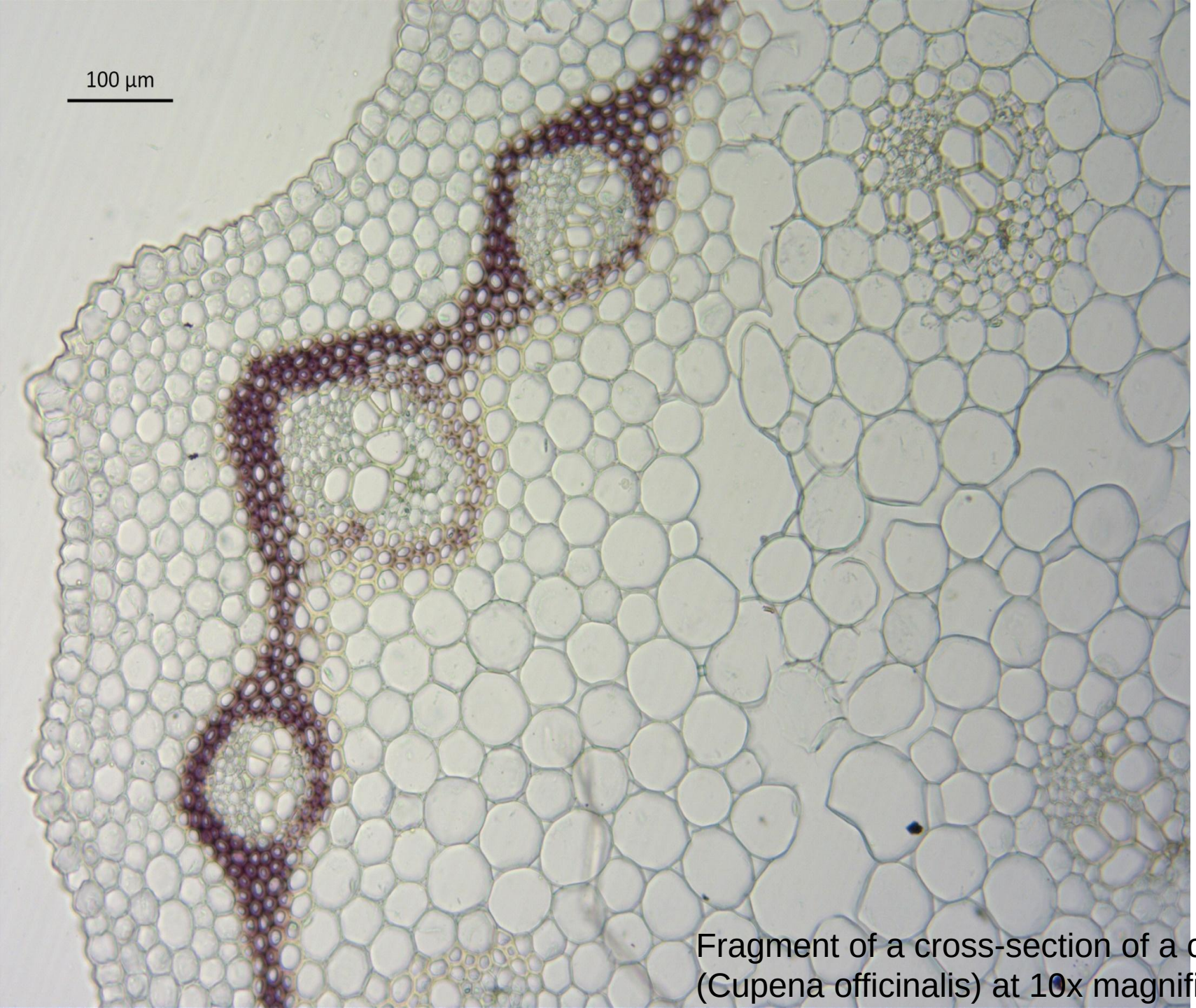
Fragments of a cross-section of the pumpkin stem at the periphery under 40x magnification



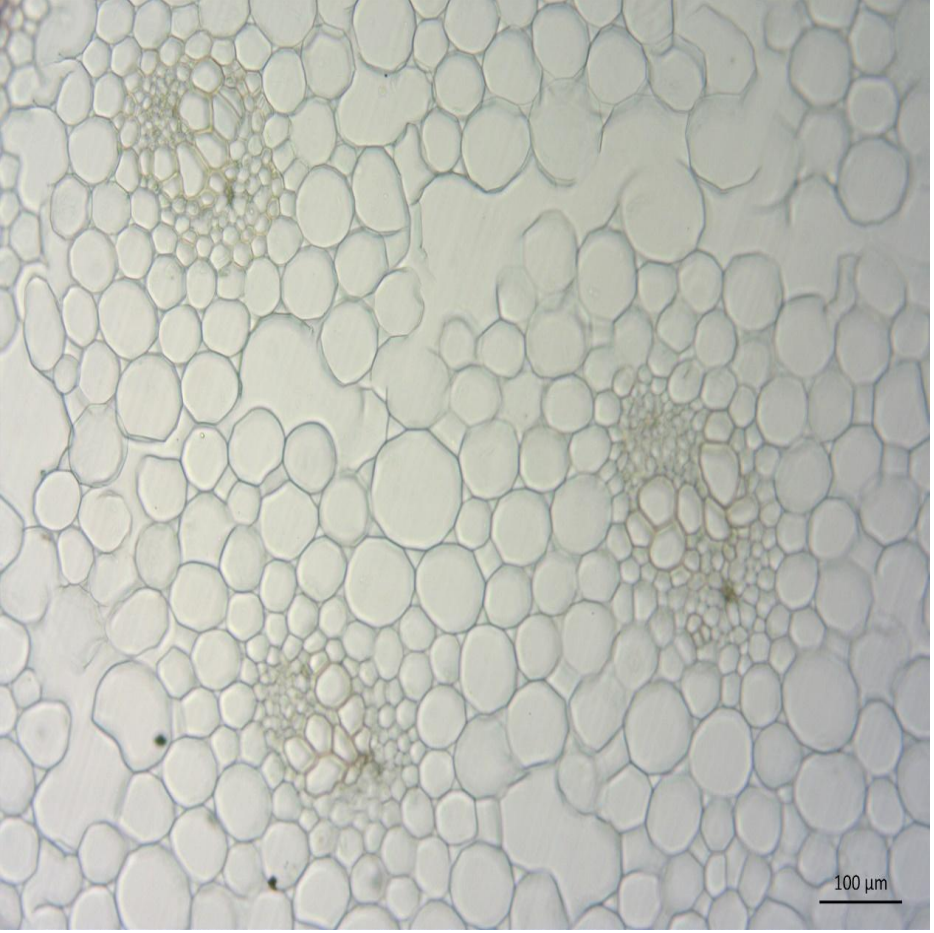
Between the bundles (collenchyma and assimilating parenchyma)



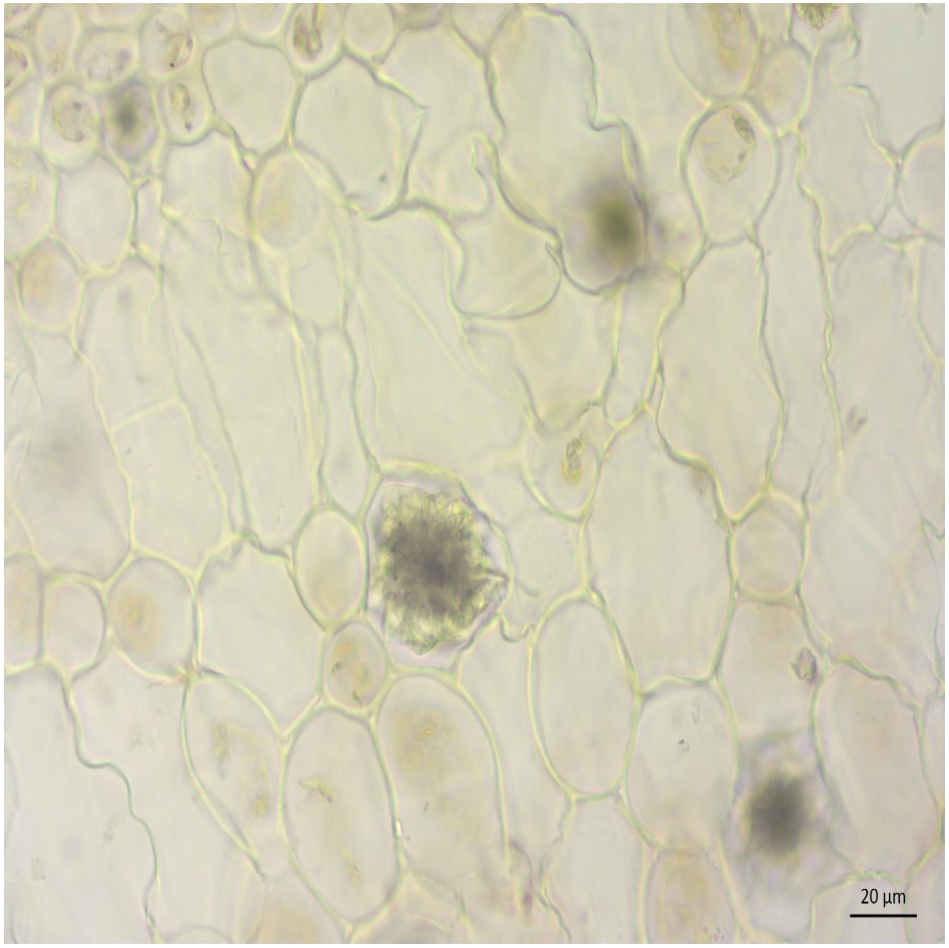
Above the bundle (collenchyma, assimilating parenchyma , endoderm and sclerenchyma of pericyclic origin)



Fragment of a cross-section of a cupua (Cupena officinalis) at 10x magnification

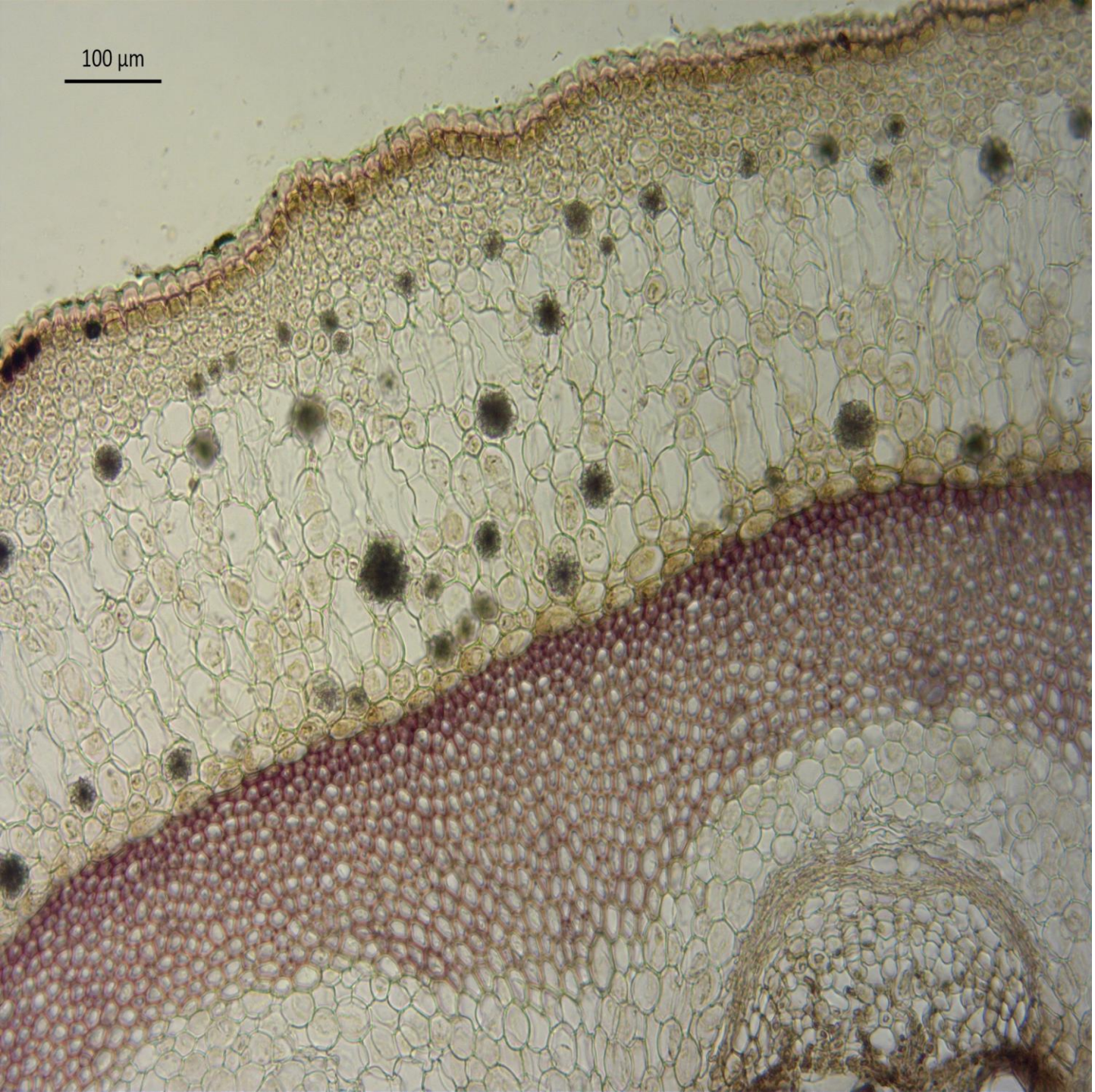


Fragment of a cross-section of a cupua stem under 10x magnification
vascular bundles



Fragment of a cross-section of a cupon stem at 40x magnification. Core parenchyma with intercellular and idioblasts

Fragment of a cross-section of a pickaxe (Aristolochia clematitis) stem at 4x magnification

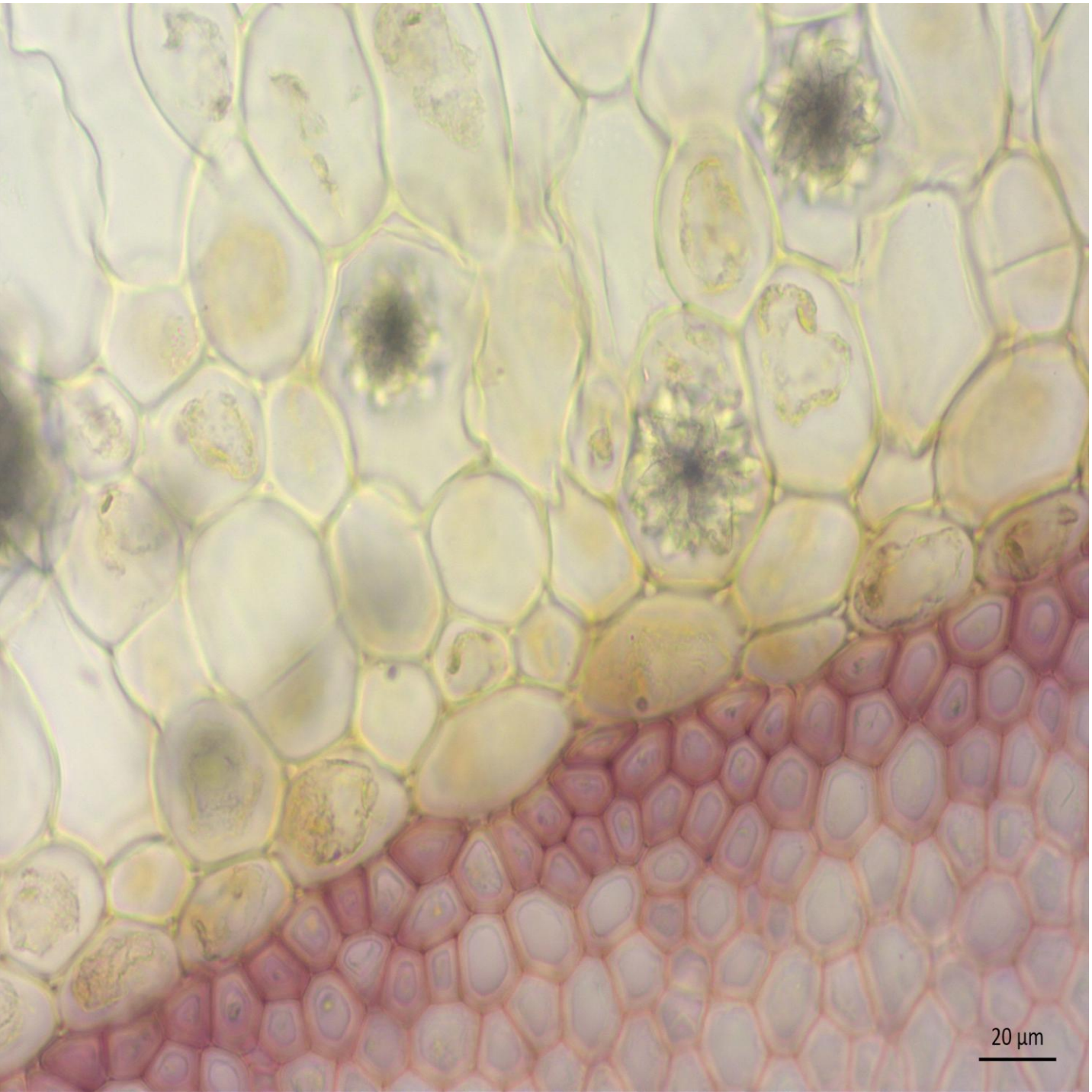


Fragment of a cross-section of a stalk of a pickaxe at 10x magnification

(primary cortex and sclerenchyma of pericyclic origin)

Fragment of a cross-section of a stalk of a pickaxe at 10x magnification

Vascular bundles

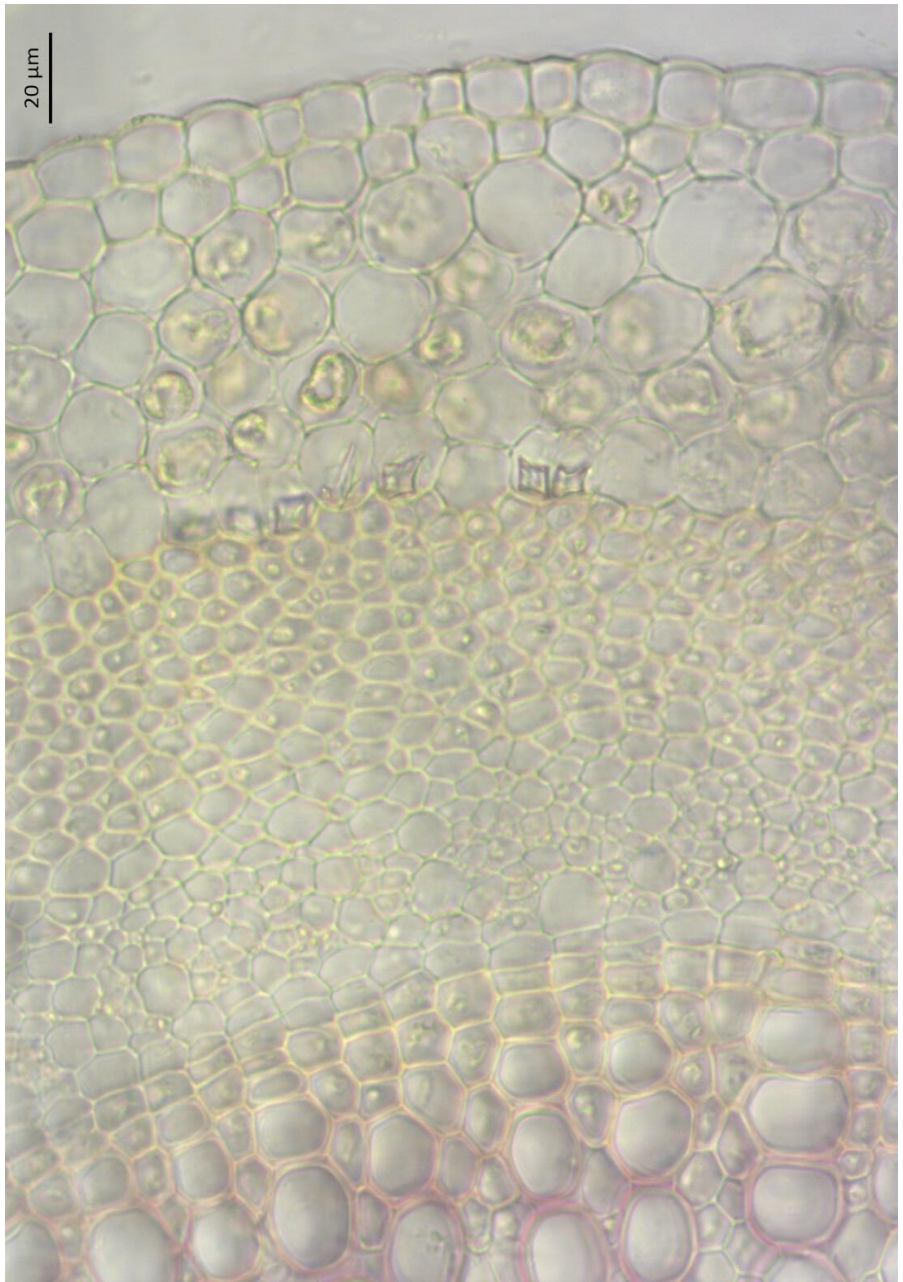


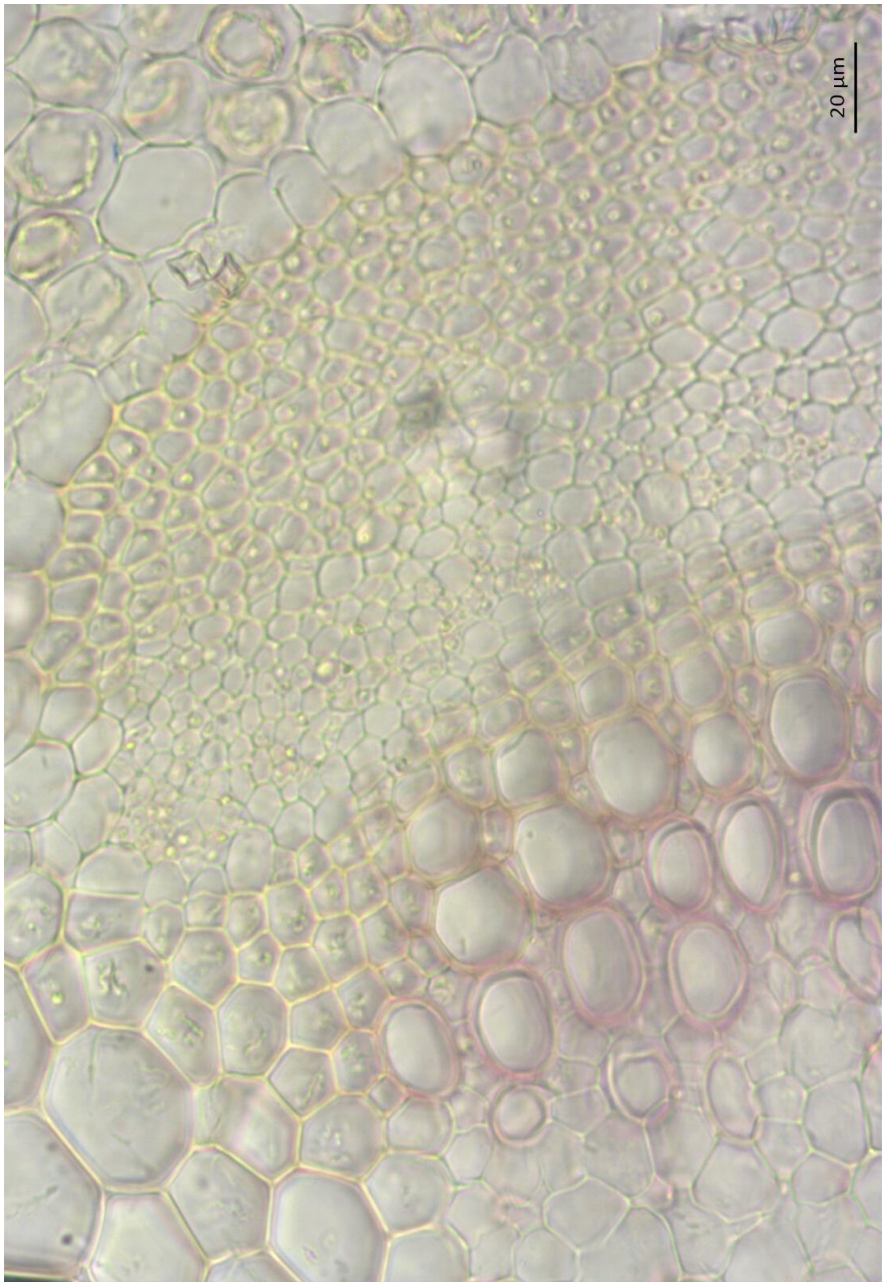
Fragment of a cross-section of the stalk of a pickaxe at 40x magnification

Assimilating parenchyma, endoderm, and sclerenchyma of pericyclic origin

Fragment of a cross-section of a clover (Tripholium repens) stem under 10x magnification

Fragments of a cross-section of a clover stem at 40x magnification



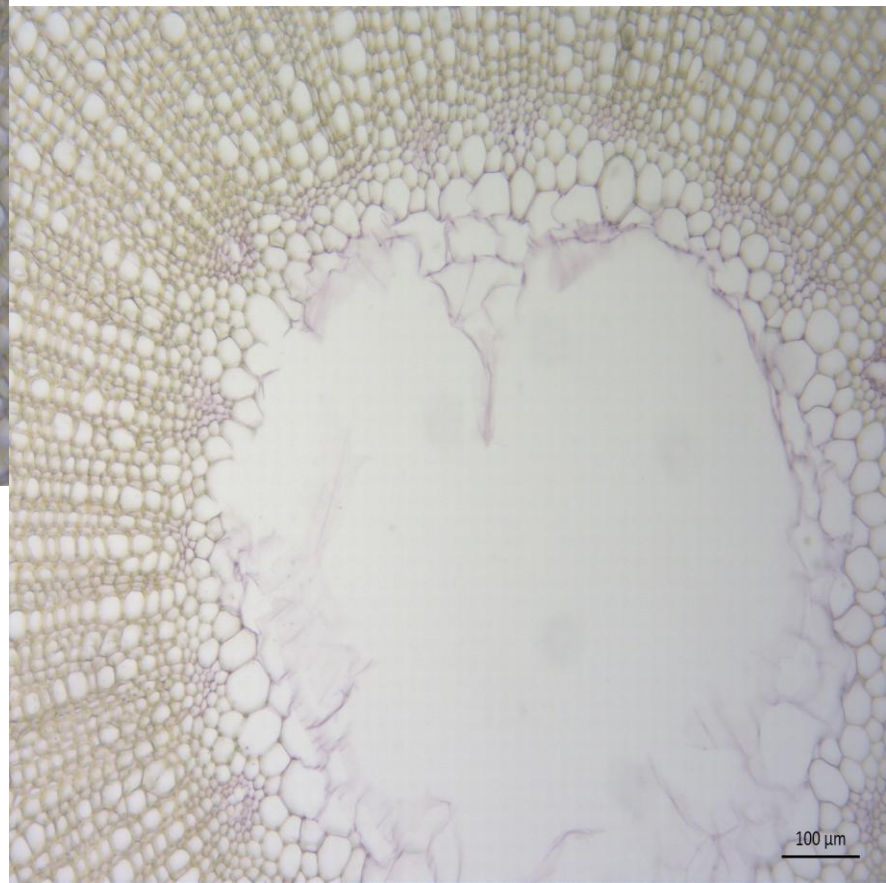



Cross-section of flax stem at 4x magnification
200 µm

Peripheral part

Fragments of a cross-section of a flax stem at 10x magnification. He has a non-ductile (annular structure)

The middle part



A fragment of a cross-section of a flax stem at 40x magnification

Epidermis

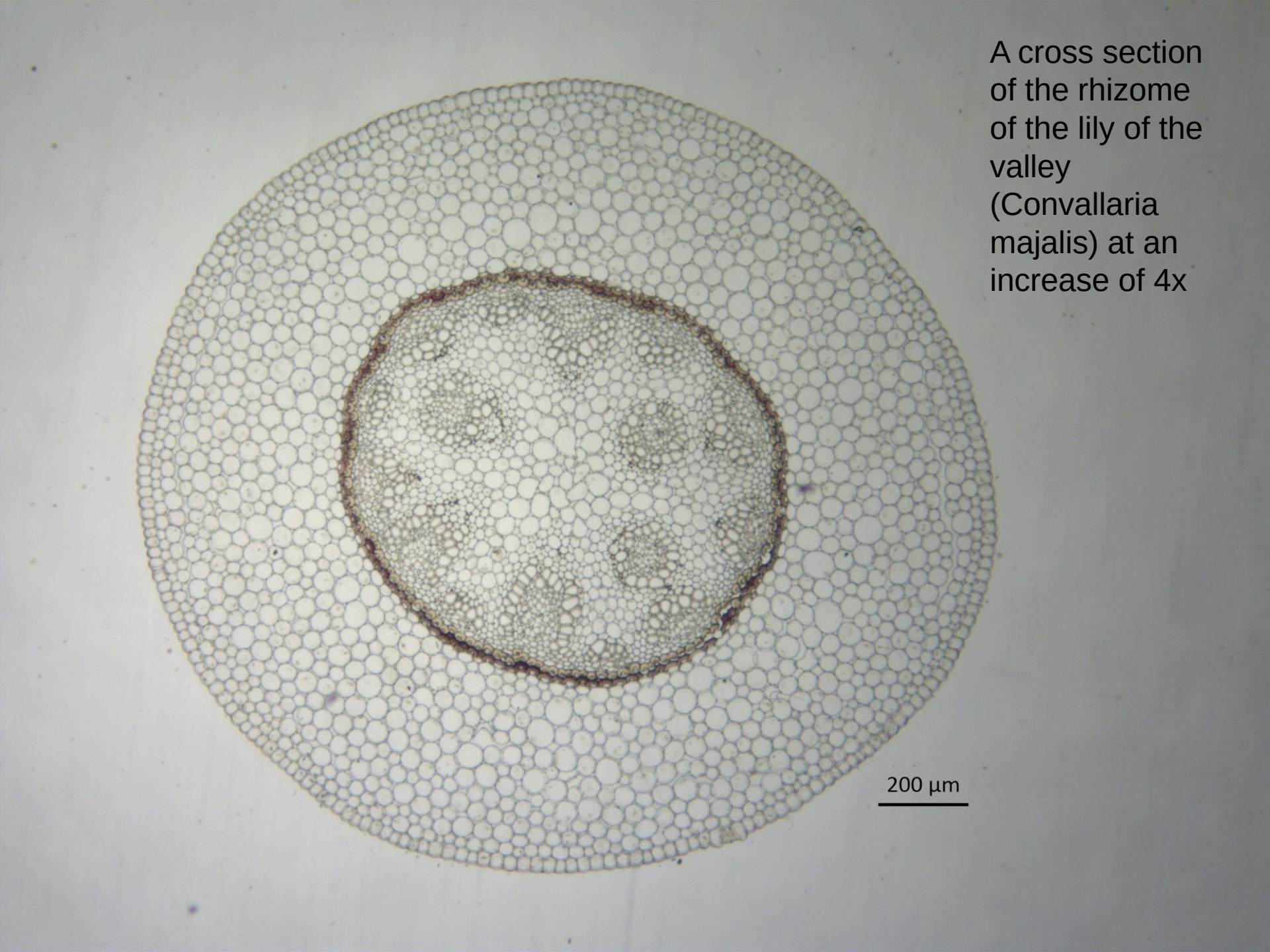
Assimilation parenchyma

Endoderm

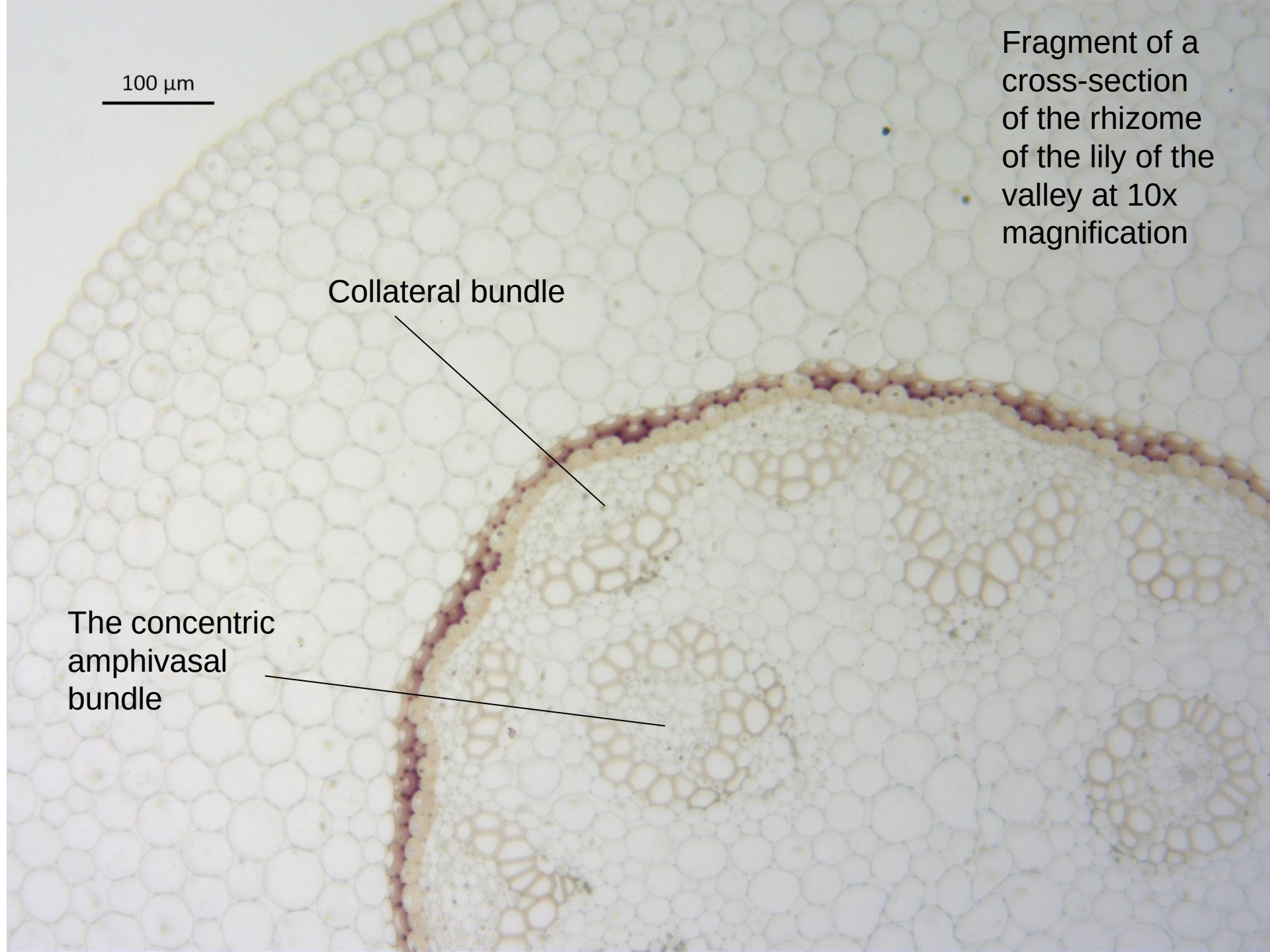
Bast sclerenchyma

Sieve tube

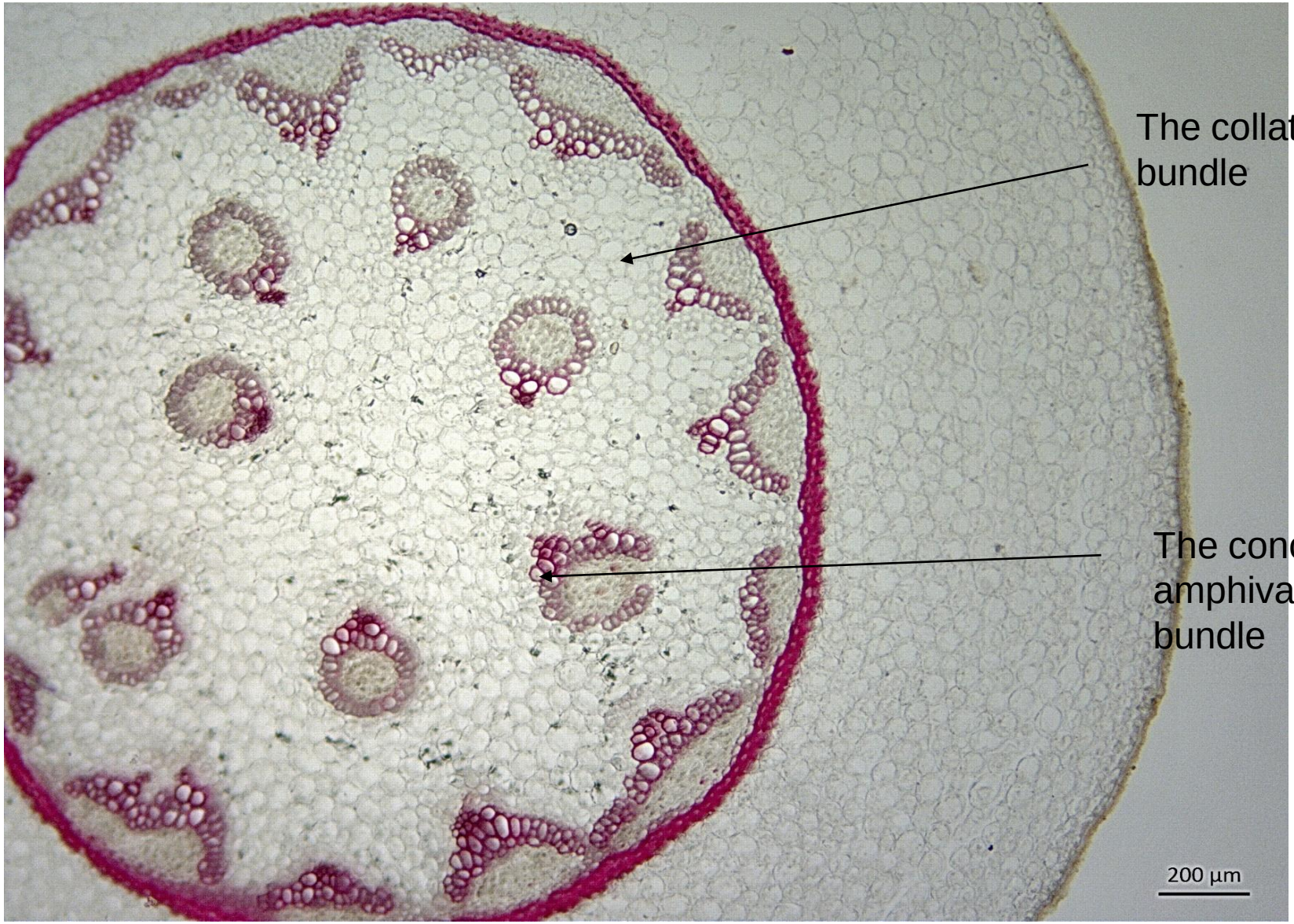
Cambium

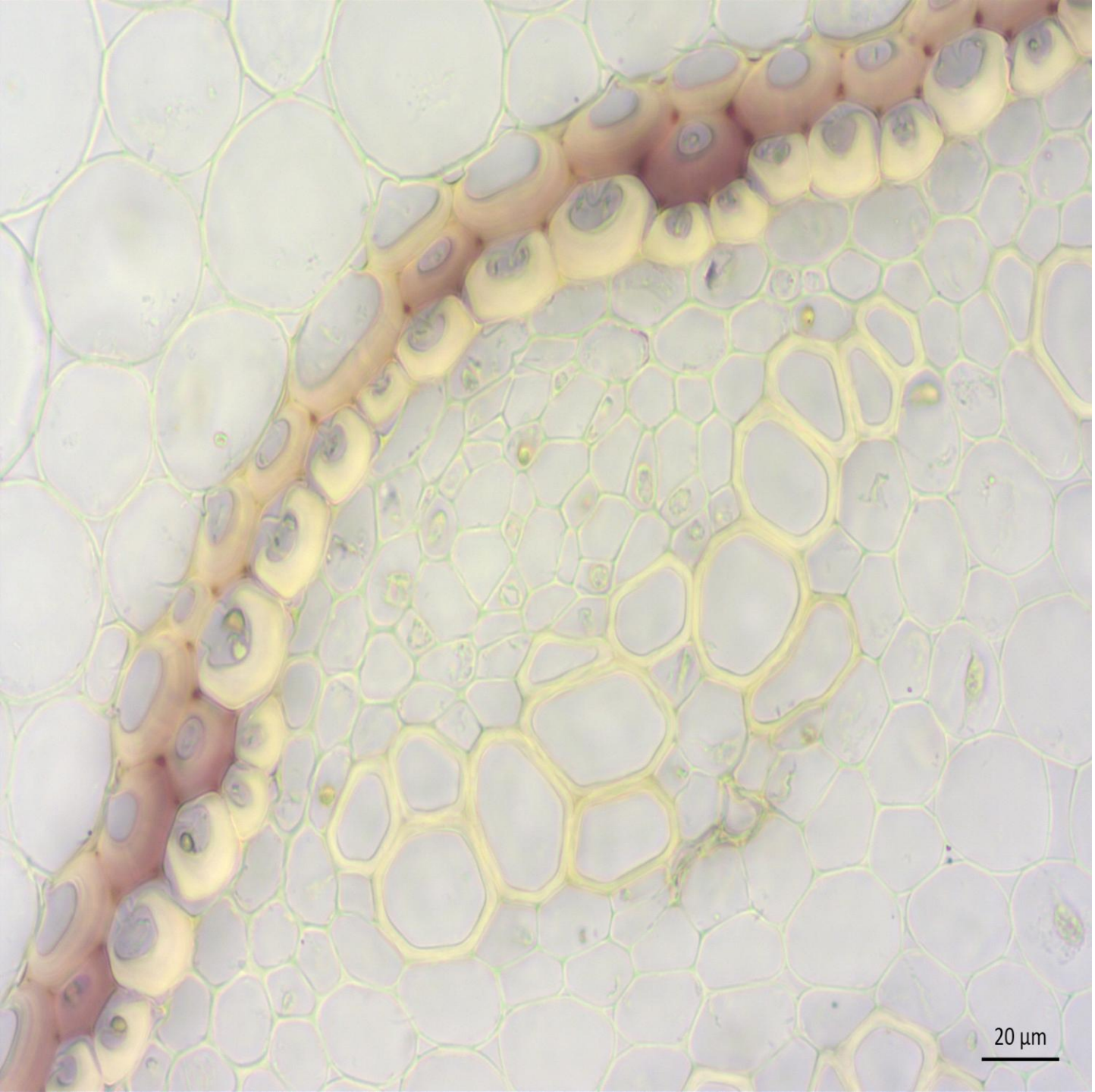


A cross section of the rhizome of the lily of the valley (Convallaria majalis) at an increase of 4x


100 µm
Fragment of a cross-section of the rhizome of the lily of the valley at 10x magnification
Collateral bundle
The concentric amphivasal bundle

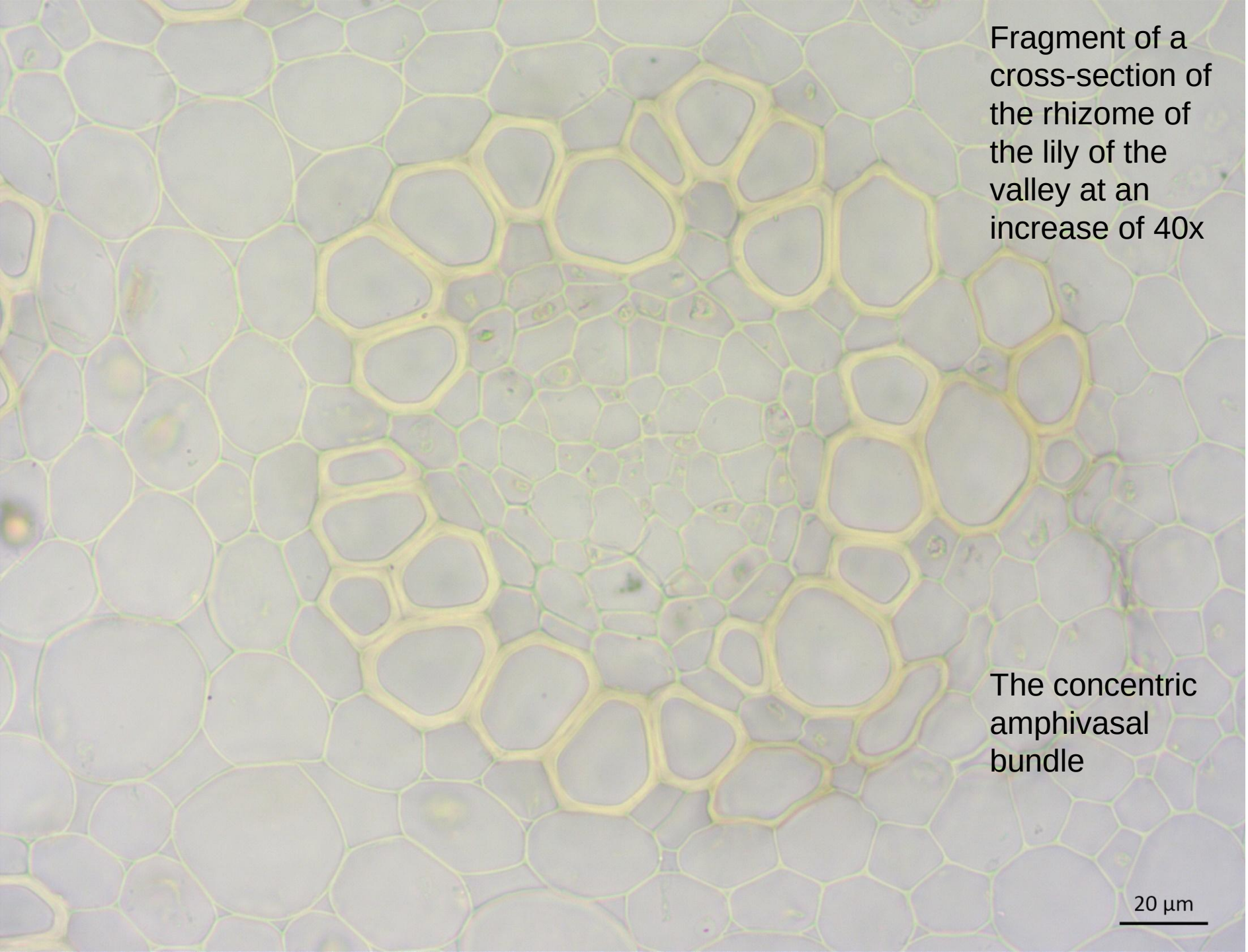
Conducting bundles in the rhizome of lily of the valley (Convallaria majalis L.).

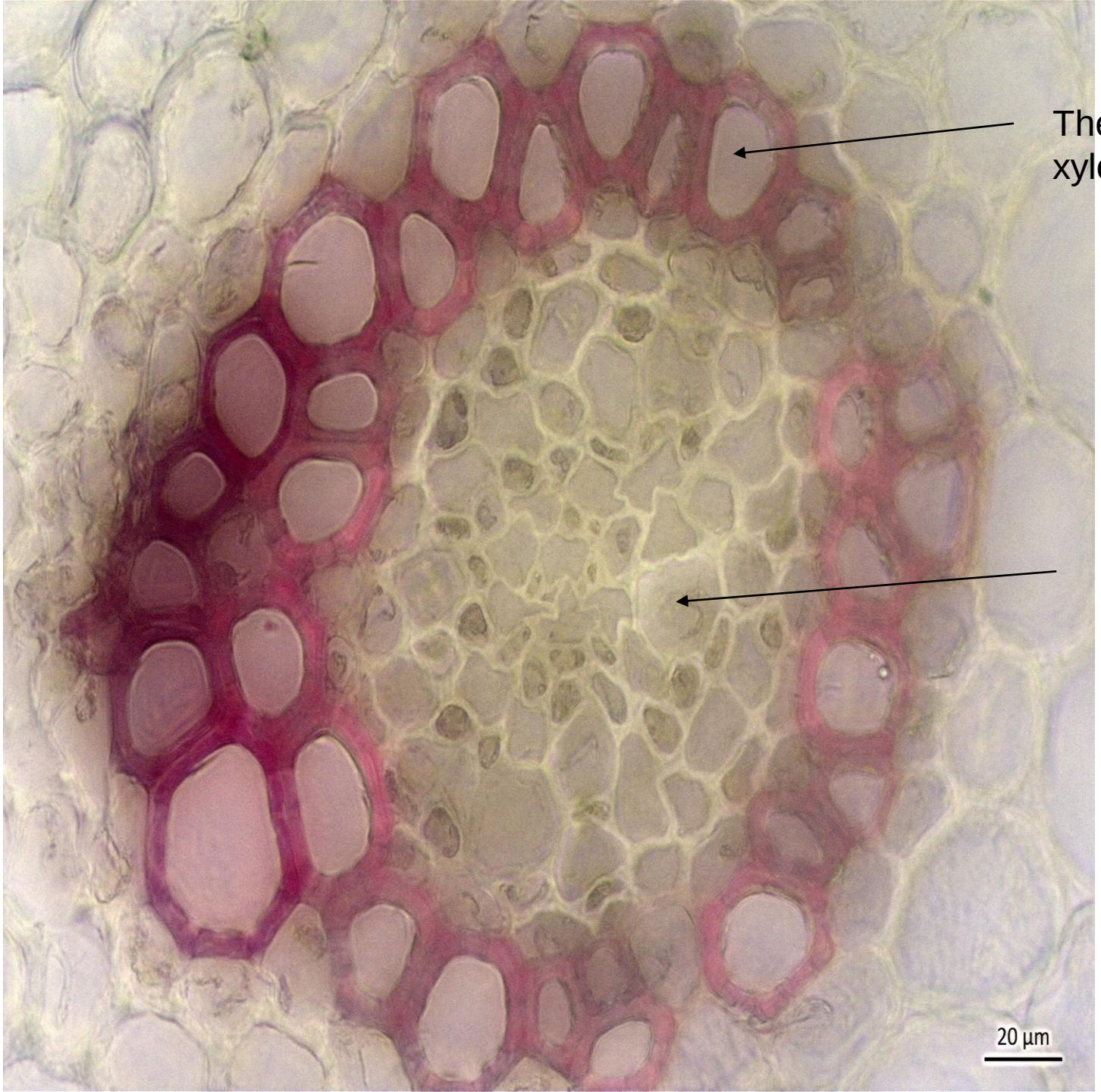




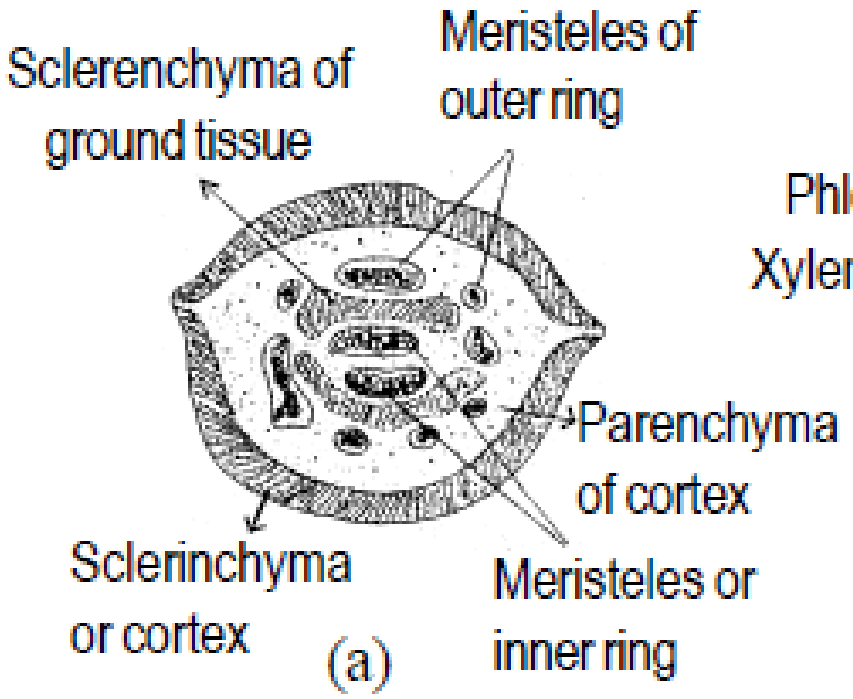
Fragment of a cross-section of the rhizome of the lily of the valley at an increase of 40x

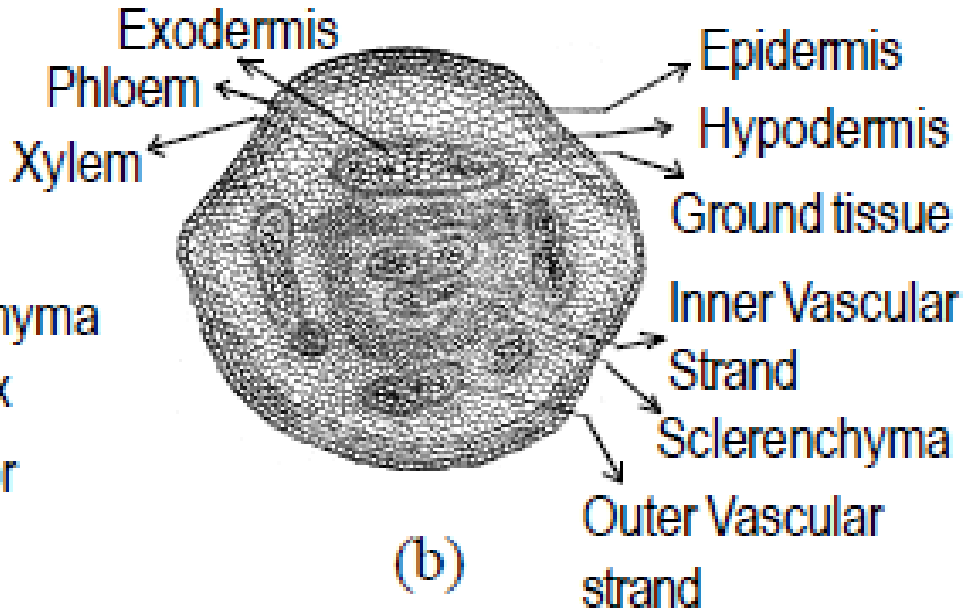
Endoderm, pericycle and collateral vascular bundle

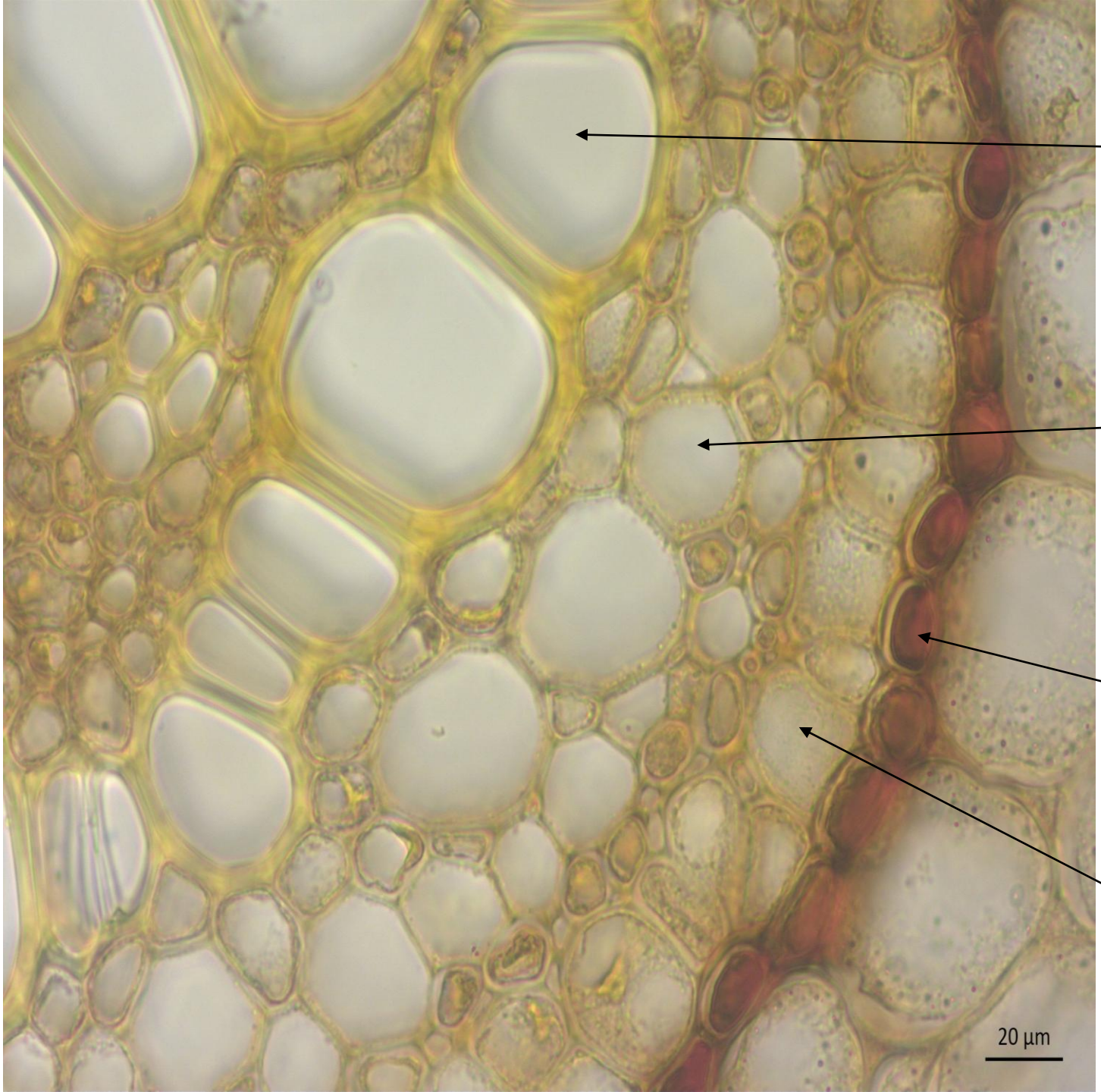

Fragment of a cross-section of the rhizome of the lily of the valley at an increase of 40x
The concentric amphivasal bundle
20 µm


The xylem
The phloem
20 µm

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

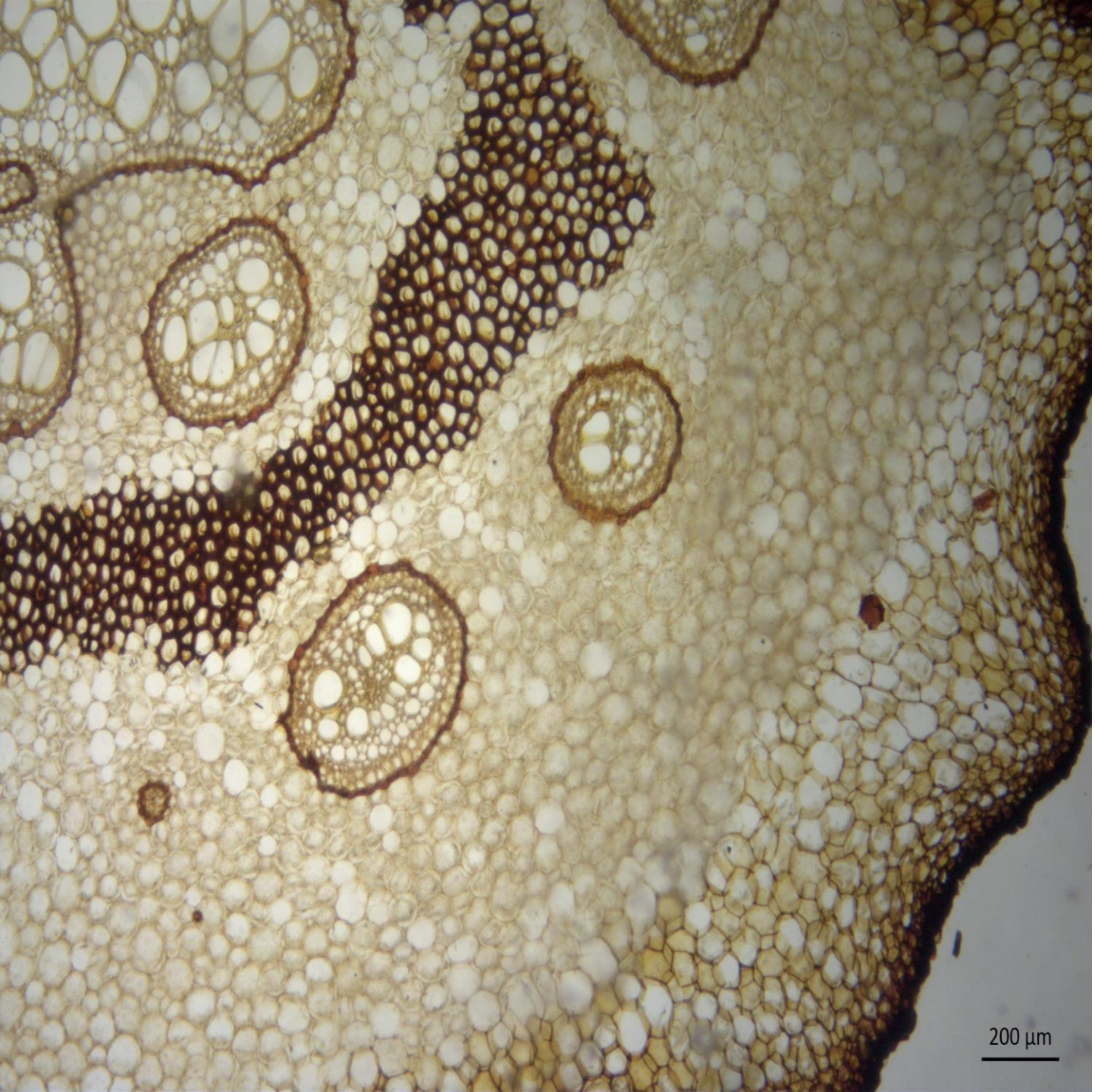

Sclerenchyma of ground tissue
Meristeles of outer ring
Parenchyma of cortex
Sclerinchyma or cortex
Meristeles or inner ring
(a)


Exodermis
Phloem
Xylem
Epidermis
Hypodermis
Ground tissue
Inner Vascular Strand
Sclerenchyma
Outer Vascular strand
(b)

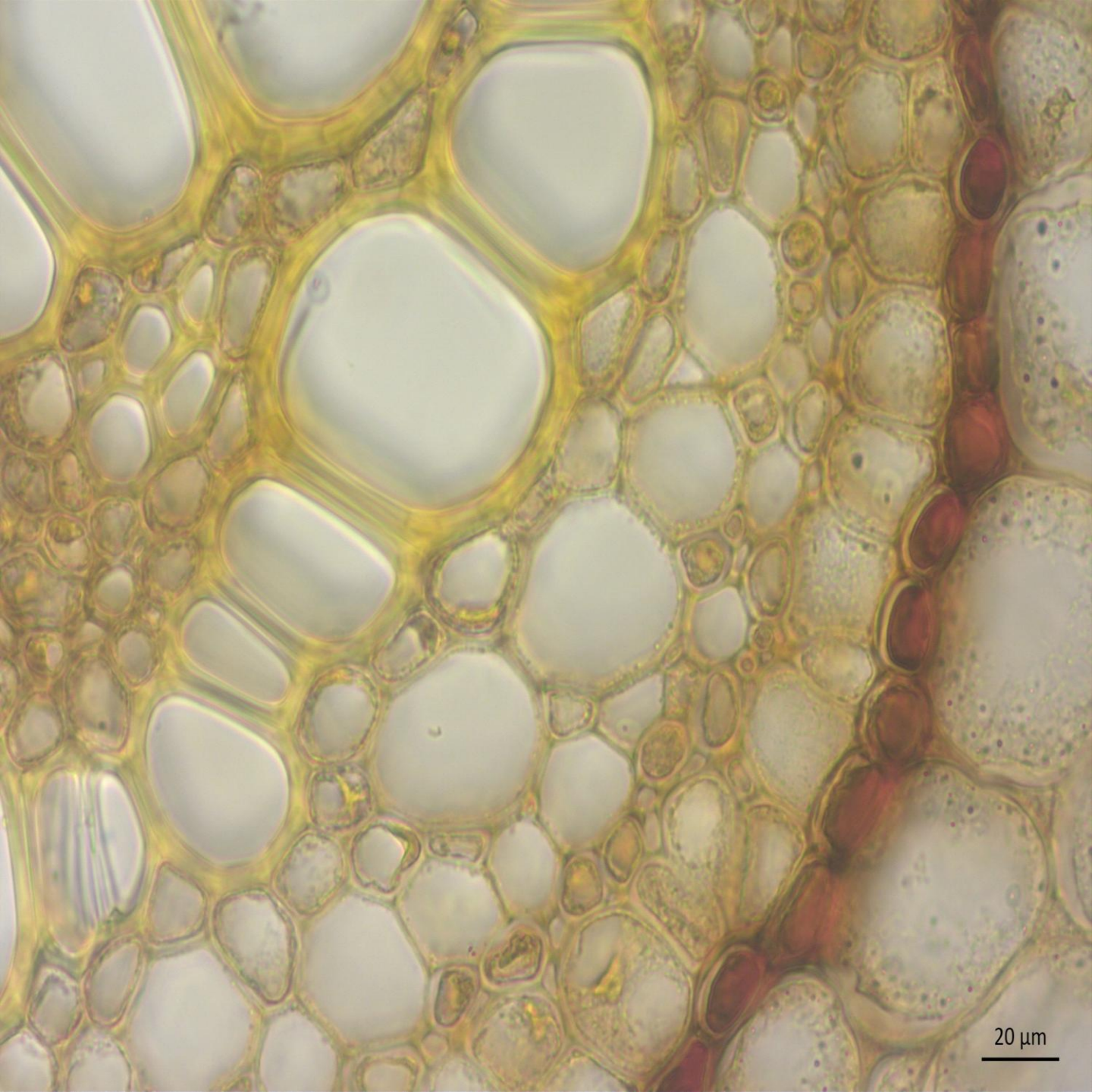

The xylem
The phloem
The endoderm
The pericycle
20 µm

Fragment of a cross-section of the rhizome of a bracken fern at an increase of 4x

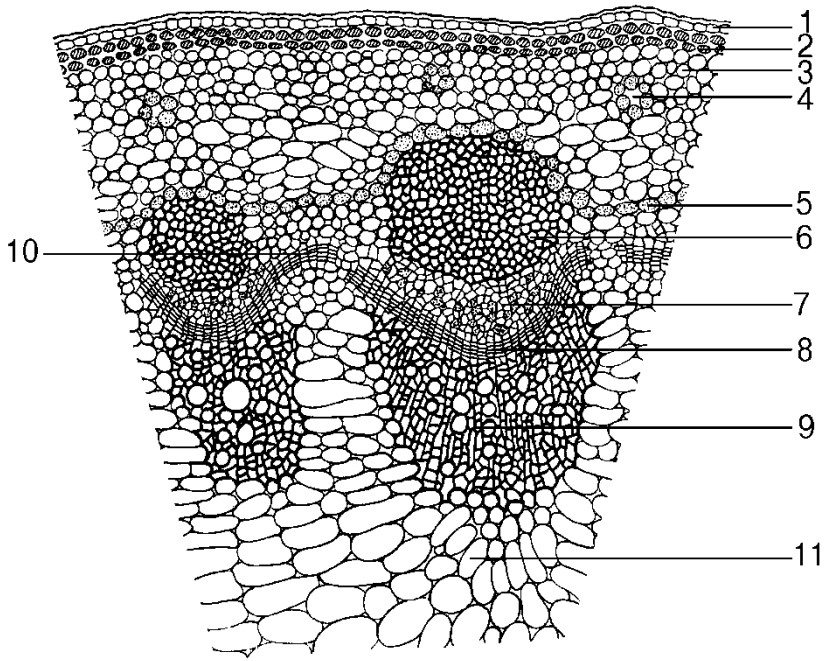
Fragment of a cross-section of the rhizome of a bracken fern at an increase of 4x



Fragment of a cross-section of the rhizome of a bracken fern at an increase of 4x



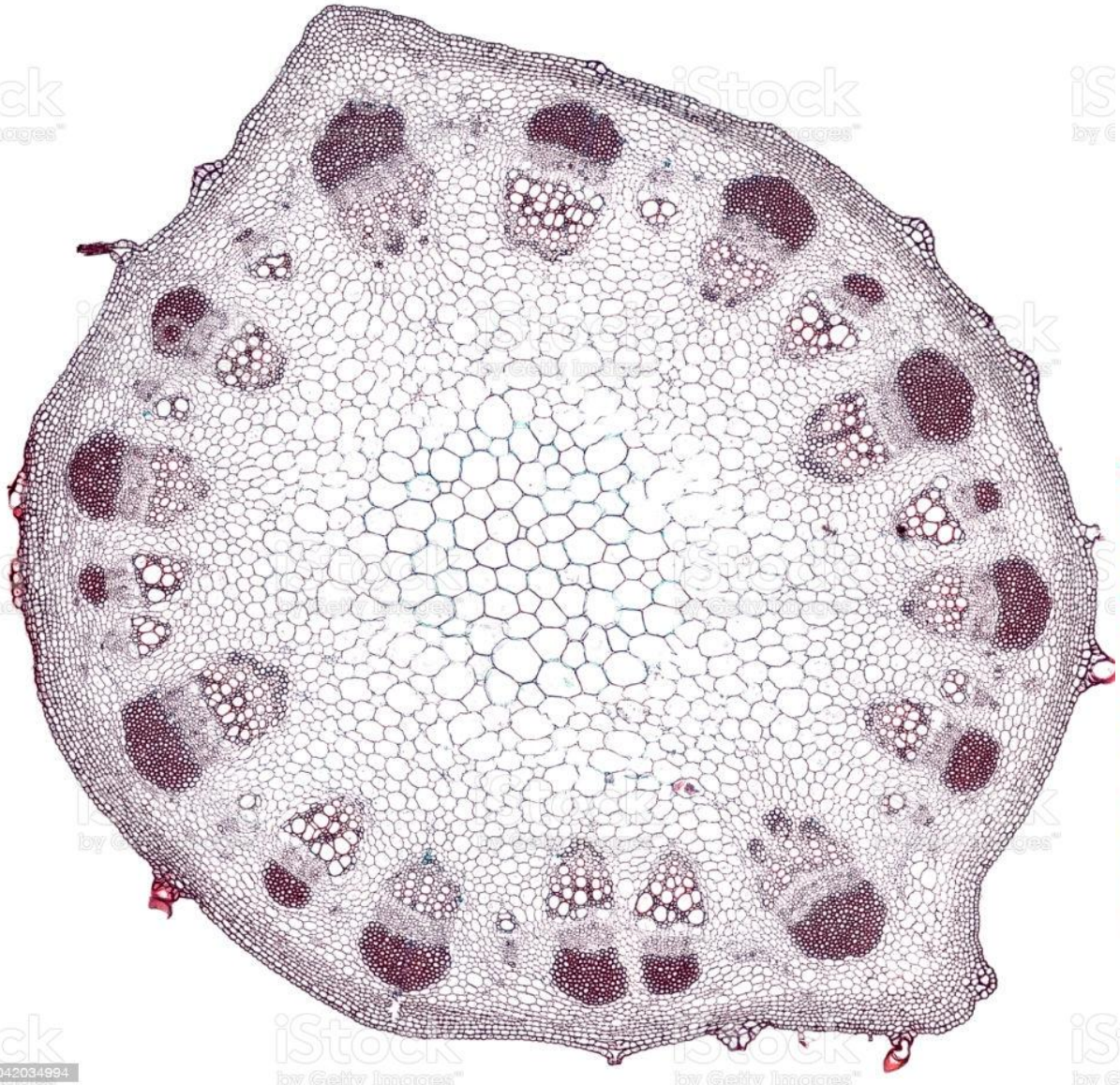
Fragment of a cross-section of the rhizome of a bracken fern at an increase of 40xConductin g beam

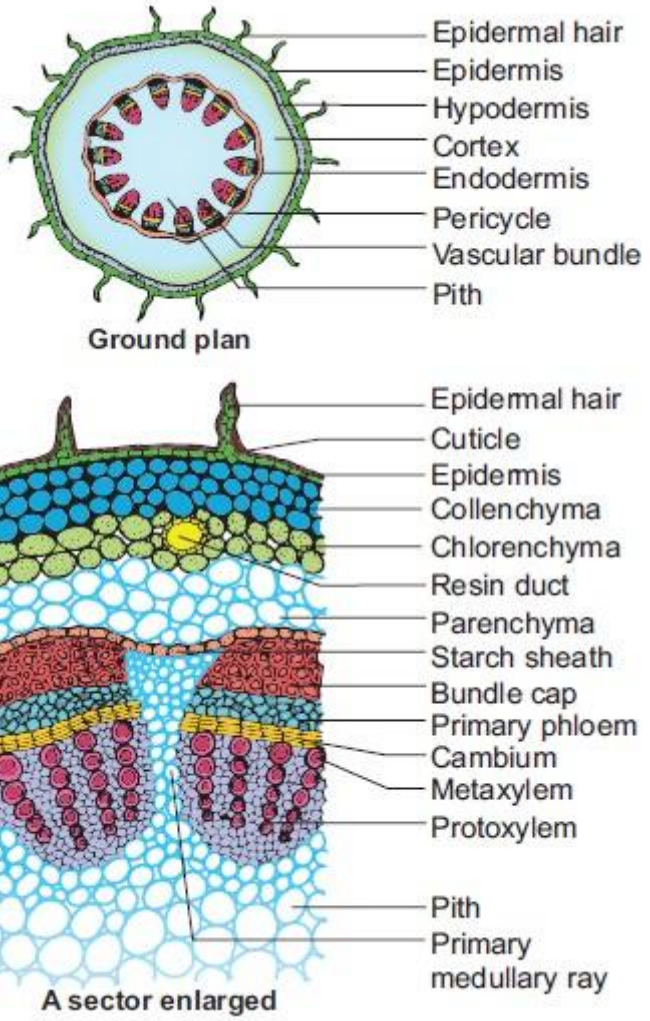


The structure of the sunflower stem on a cross section.

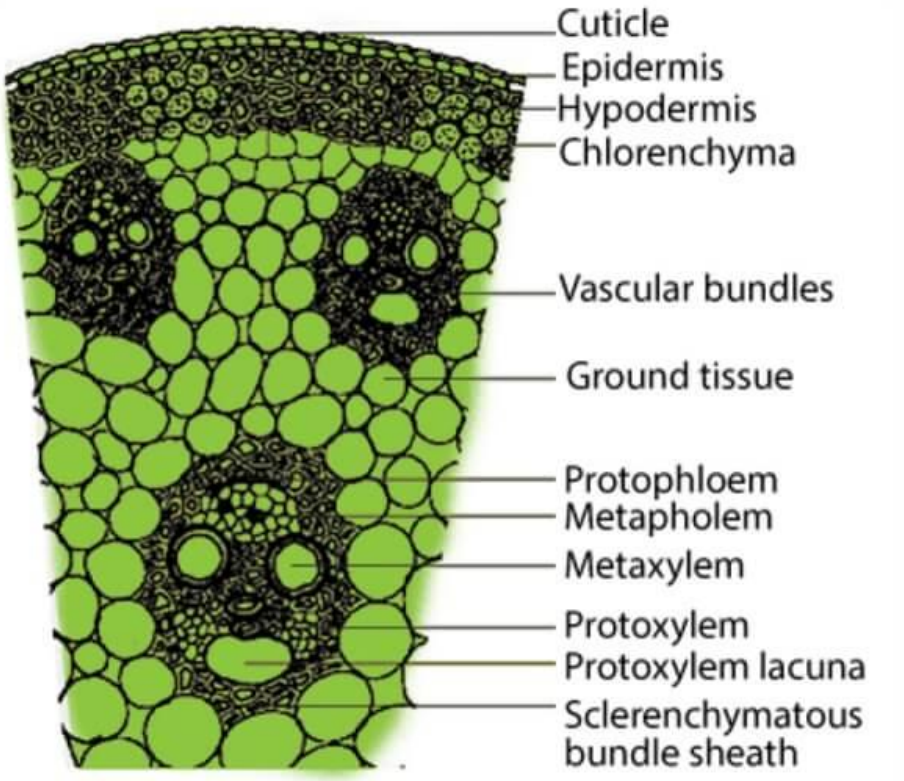
1 - epidermis, 2 - lamellar collenchyma, 3 - assimilating parenchyma, 4 - resin duct, 5 - endoderm, 6 - 9 - open collateral vascular bundle: 6 - pericyclic sclerenchyma, 7 - phloem, 8 - fascicular cambium, 9 - xylem, 10 - interfascicular cambium, 11 - pith parenchyma of the central axial cylinder.

Cross section of sunflower stem at 4x magnification

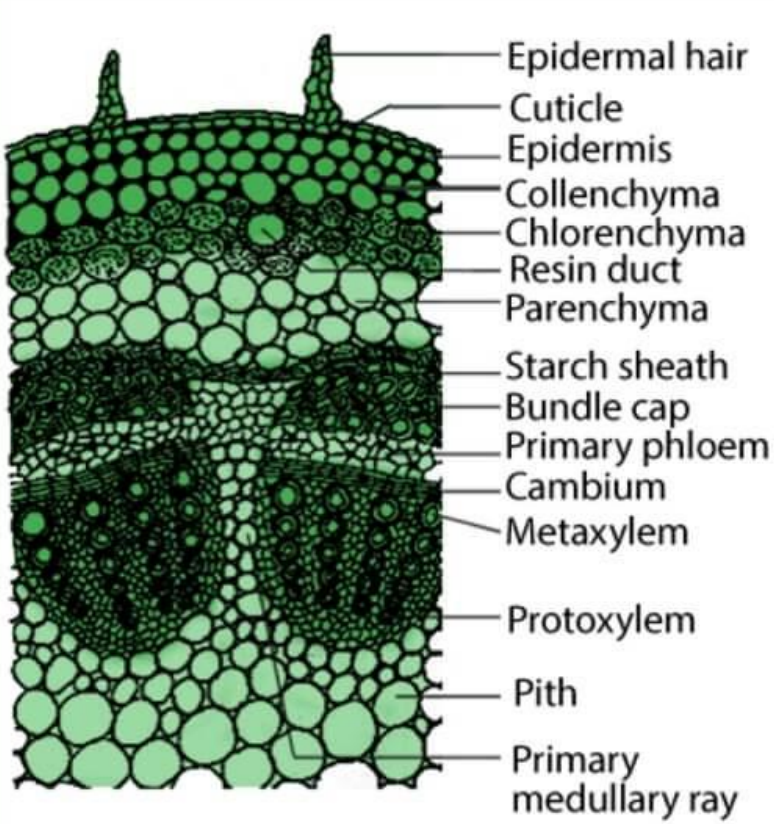




Cross section of sunflower stem at 10x magnification



T.S. of Monocot Stem



T.S. of Dicot Stem

Difference Between Monocot and Dicot Stem

Dicot	Monocot
The dicot stem is solid in most of the cases.	The monocot stem is usually hollow at the centre.
Primary cortex always well developed.	Primary cortex is poorly developed or not developed at all.
The internal tissues are arranged in concentric layers.	There is no concentric arrangement of tissues.
The ground tissue is differentiated as endodermis, cortex, pericycle, medullary rays, pith, etc.	The ground tissue is the same and is composed of a mass of similar cells.
The vascular bundles are formed as broken rings.	The vascular bundles are scattered irregularly around the ground tissue.
Phloem parenchyma is present.	Phloem parenchyma is absent.
Pith is well-developed.	Pith is not as well-developed in monocots (usually absent in most)
Epidermal hair may or may not exist.	Presence of epidermal hair.
Vascular bundles are less in number and are of uniform size.	There are numerous vascular bundles of different sizes.
The dicot stem does not have a bundle sheath on the outside of a vascular bundle.	The monocot stem has a sclerenchymatous bundle sheath on the outside of a vascular bundle.
The dicot stems have trichomes.	The monocot stems do not have trichomes.
The vascular bundles always remain open, due to the presence of cambium within phloem and xylem.	The vascular bundles are closed.
Dicot stem can feature secondary growth as a result of secondary vascular tissues and periderm formation.	No secondary growth is witnessed in case of monocots.
Vessels are of a polygonal shape and are arranged in rows or chains.	Vessels are rounded or oval and are arranged in a Y-shaped formation.
Usually, vascular tissues stop functioning when they get old. New vascular tissues replace the old ones.	Vascular tissues remain the same throughout the plant's life cycle.