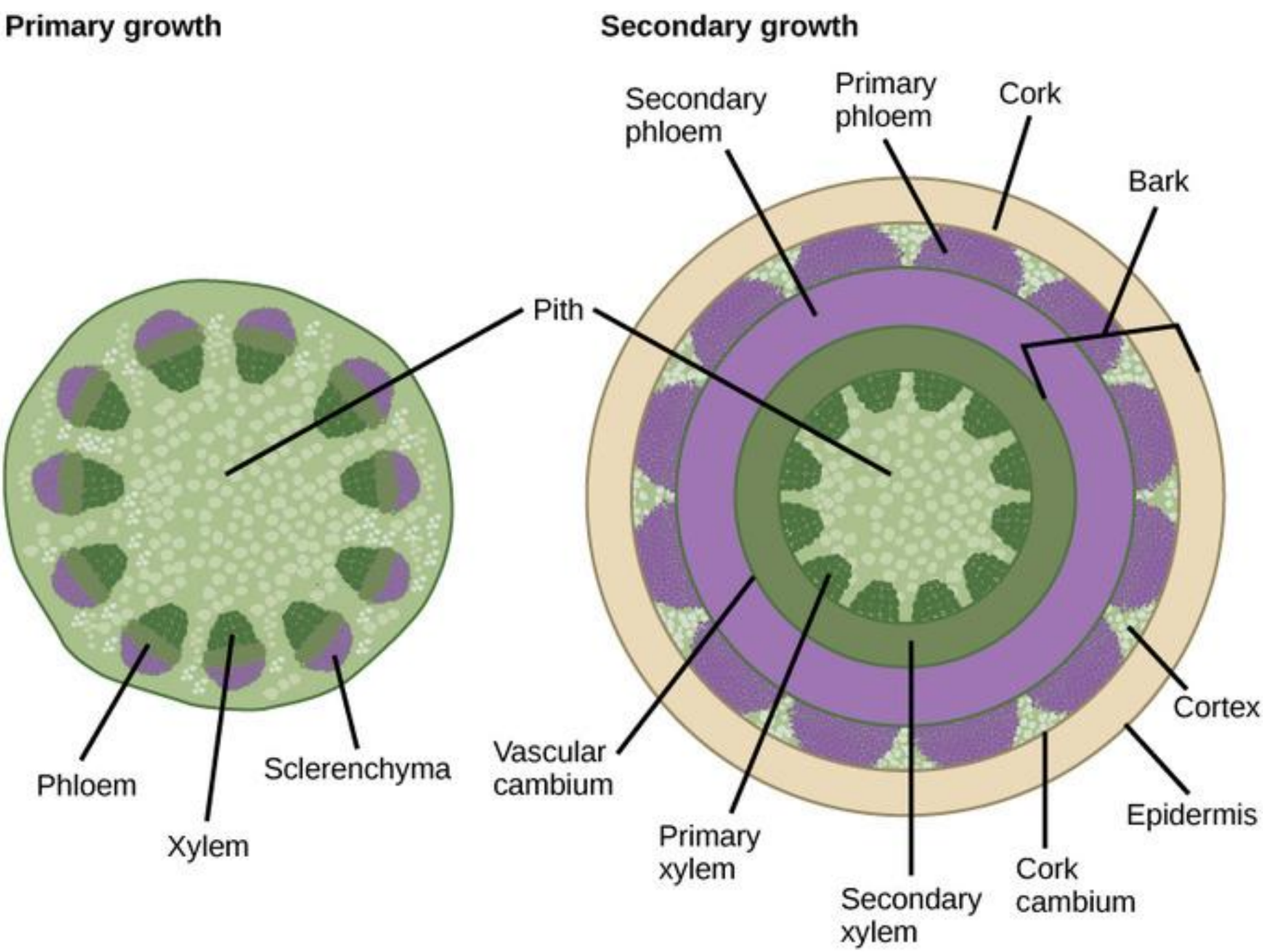
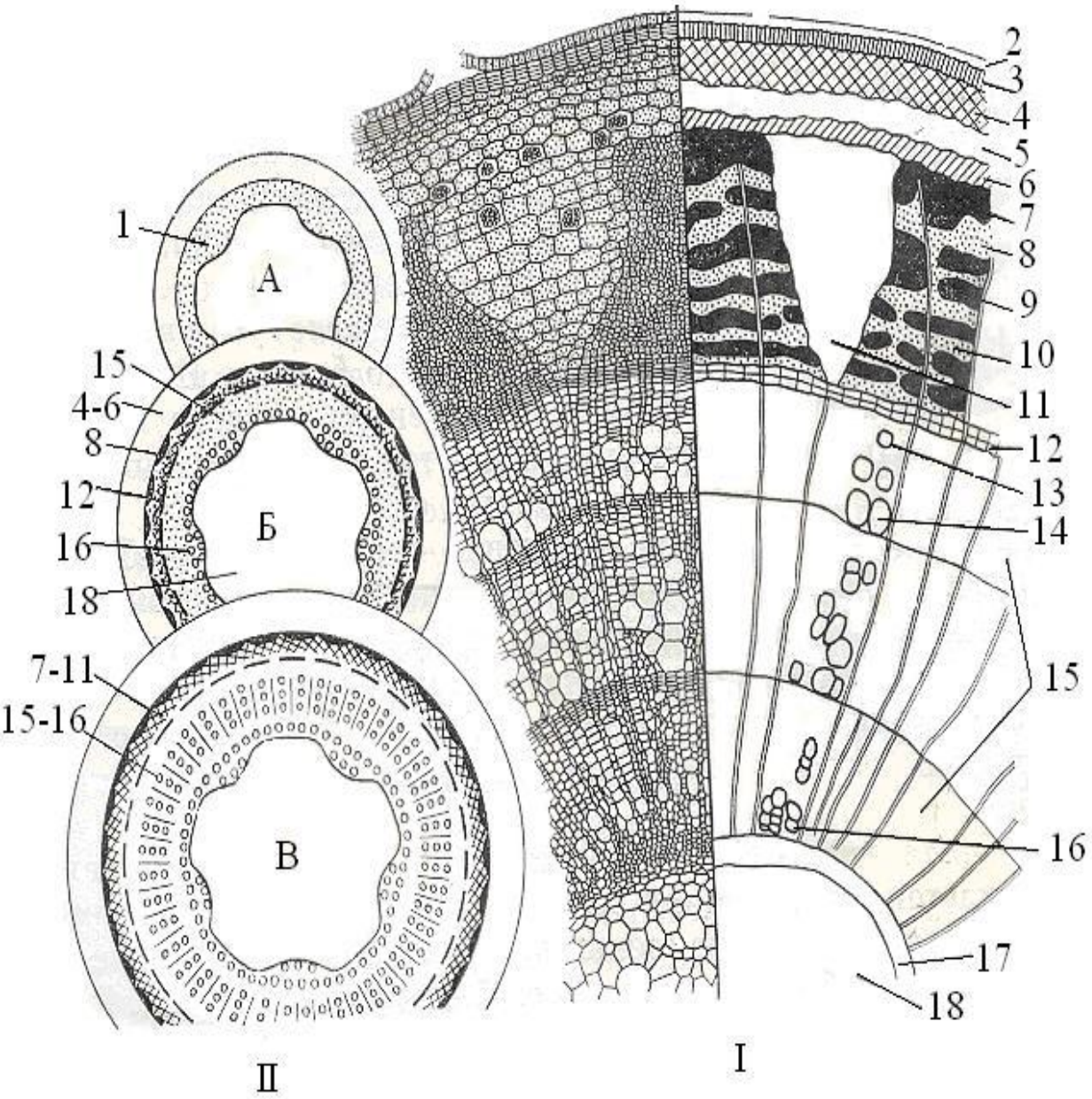
Lesson 3.3. The structure of the woody stem

The structure of the stem of woody plants.

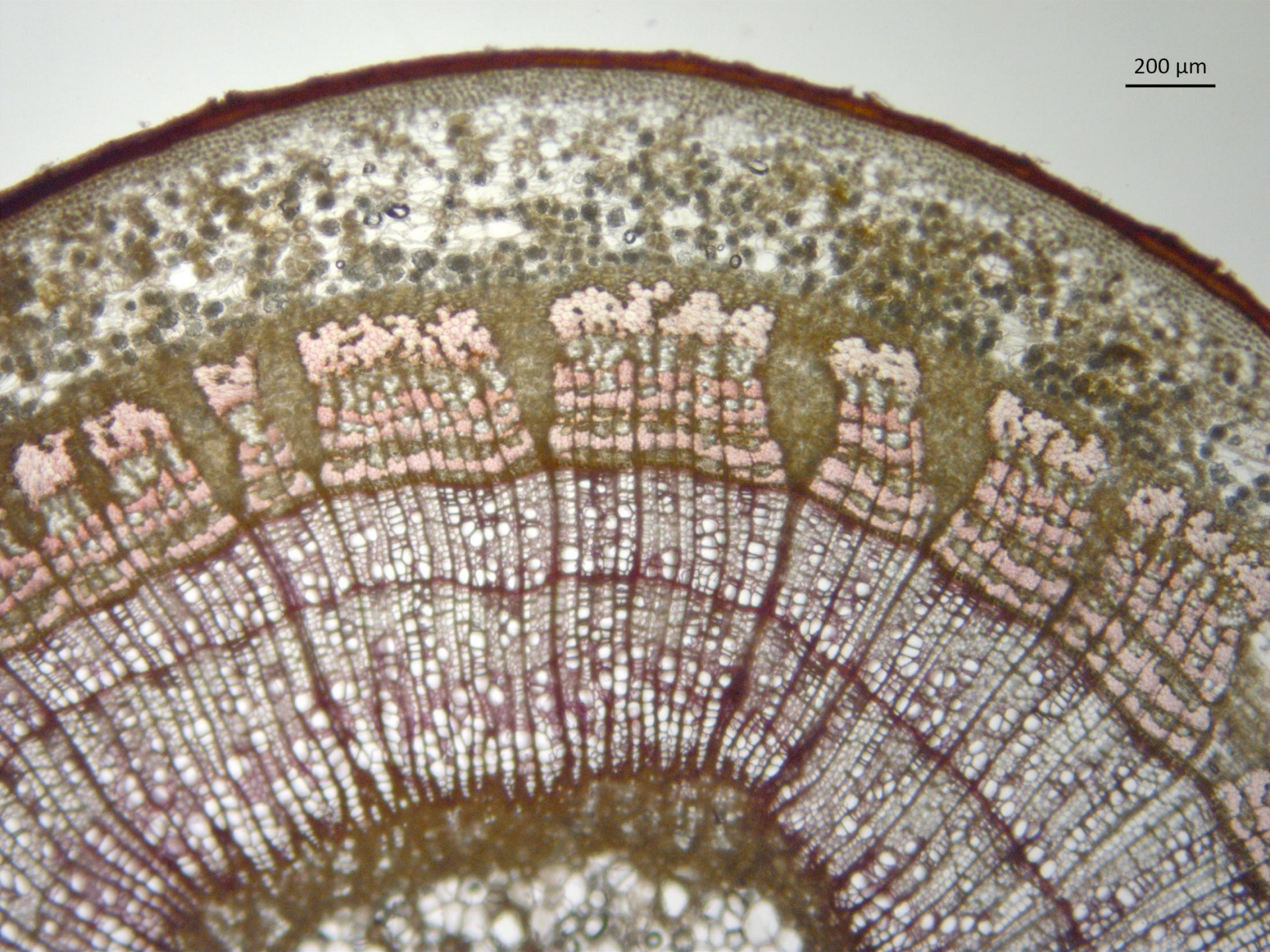
- In the stems of woody dicotyledonous plants, there are:
- **1. Dermal tissue,**
- **2. Secondary cortex**
- **3. Cambium,**
- **4. The wood,**
- **5. The pith.**


Primary growth
Secondary growth
Secondary phloem
Primary phloem
Cork
Bark
Pith
Phloem
Xylem
Sclerenchyma
Vascular cambium
Primary xylem
Secondary xylem
Cork cambium
Cortex
Epidermis



The linden stem structure in cross section (I) and the scheme of stem structure at different levels (II):A - section at the level of procambium occurrence; B - at the level of cambium appearance; C - at the level of the formed structure.

1 - procambium, 2 - remains of the epidermis, 3 - periderm, 4 - collenchyma, 5 - parenchyma of the cortex, 6 - endoderm (4-6 - primary bark), 7 - pericyclic zone, 8 - primary phloem, 9 - hard bast, 10 - soft bast (secondary phloem), 11 - pith ray (7-11 - secondary cortex), 12 - cambium, 13 - late wood, 14 - early wood (13-14 - annual ring wood), 15 - secondary wood, 16 - primary wood (15-16 - wood), 17 - perimedullary zone, 18 - pith parenchyma (17-18 - pith, 7-18 - central cylinder).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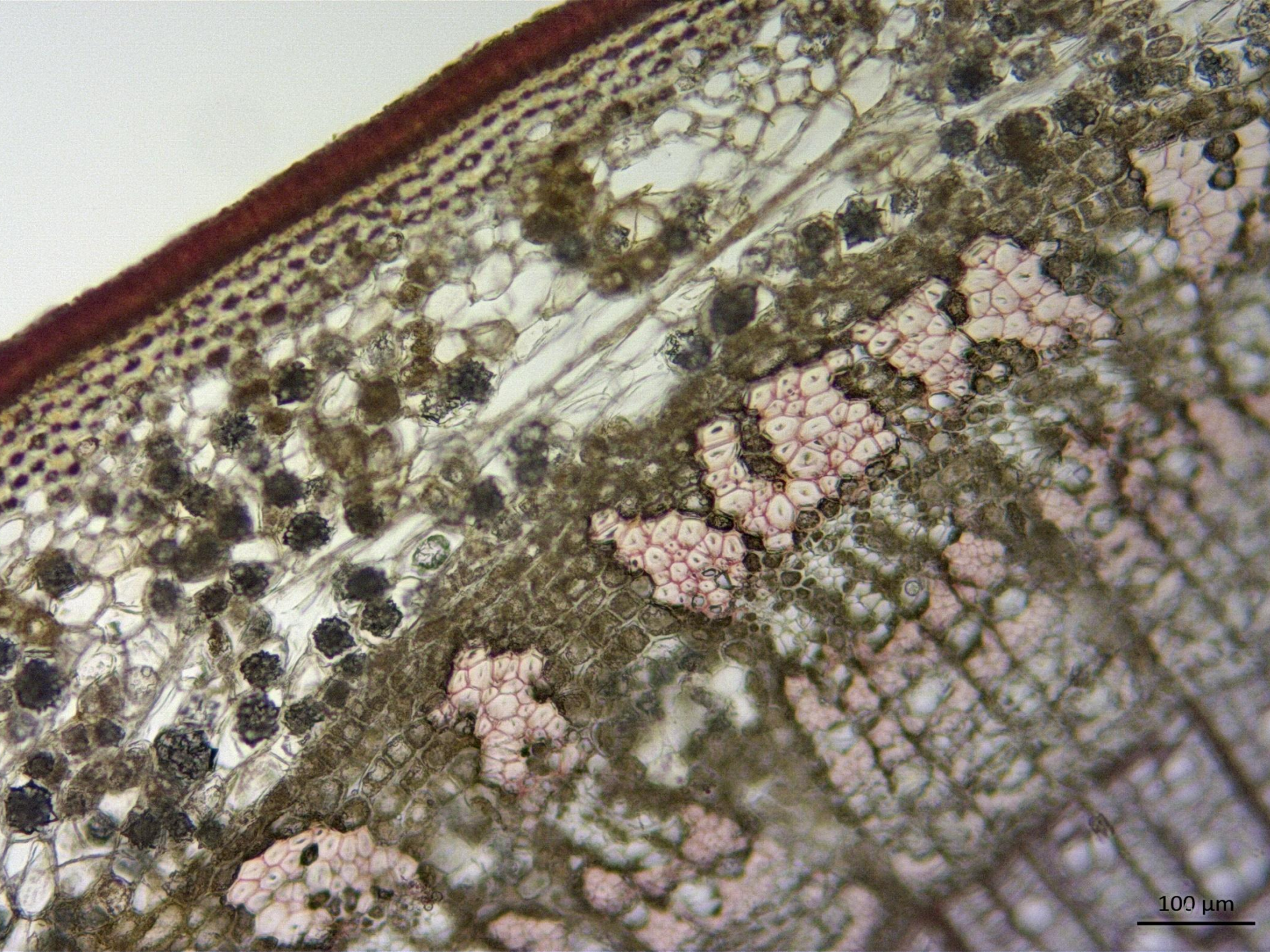
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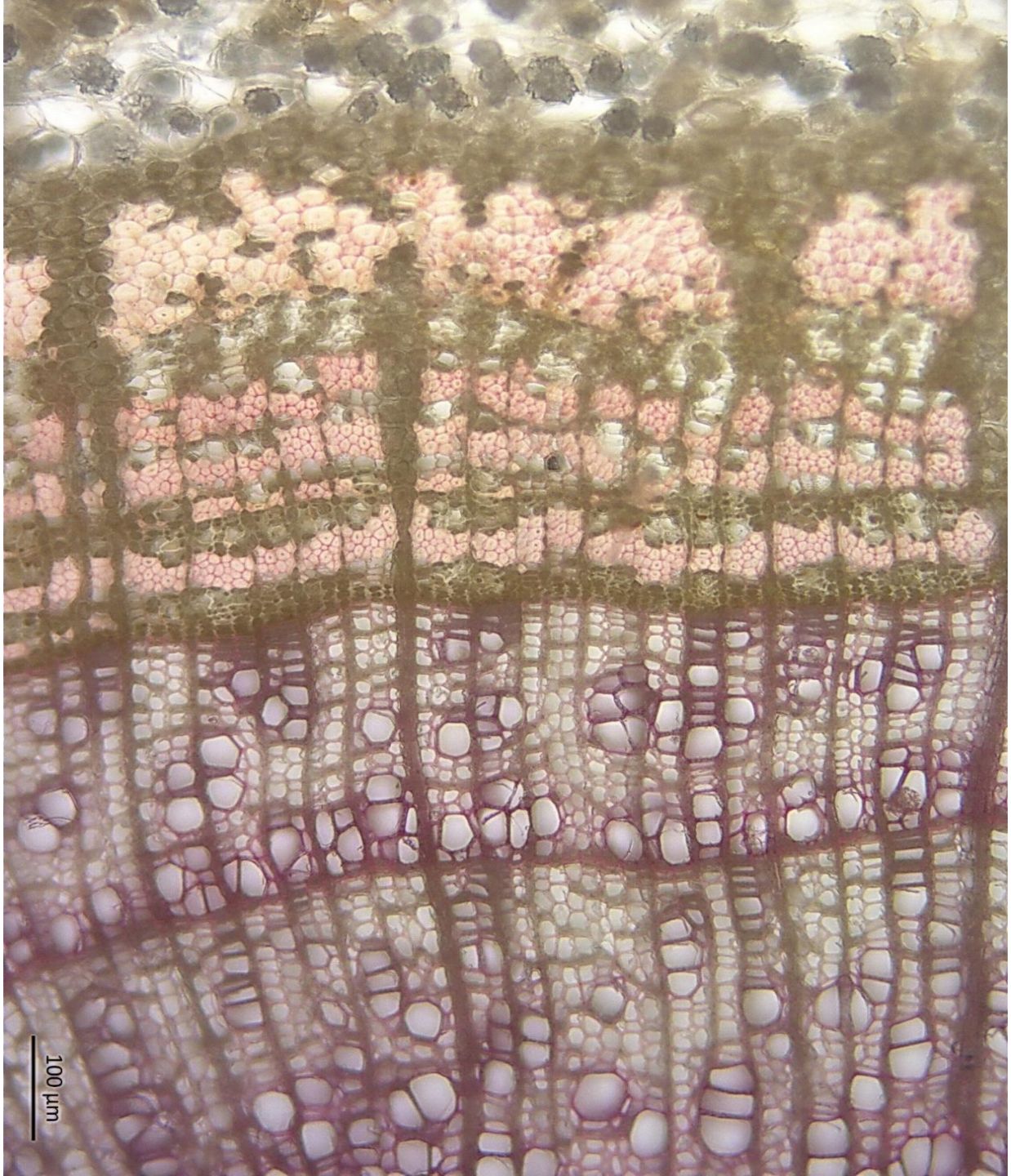
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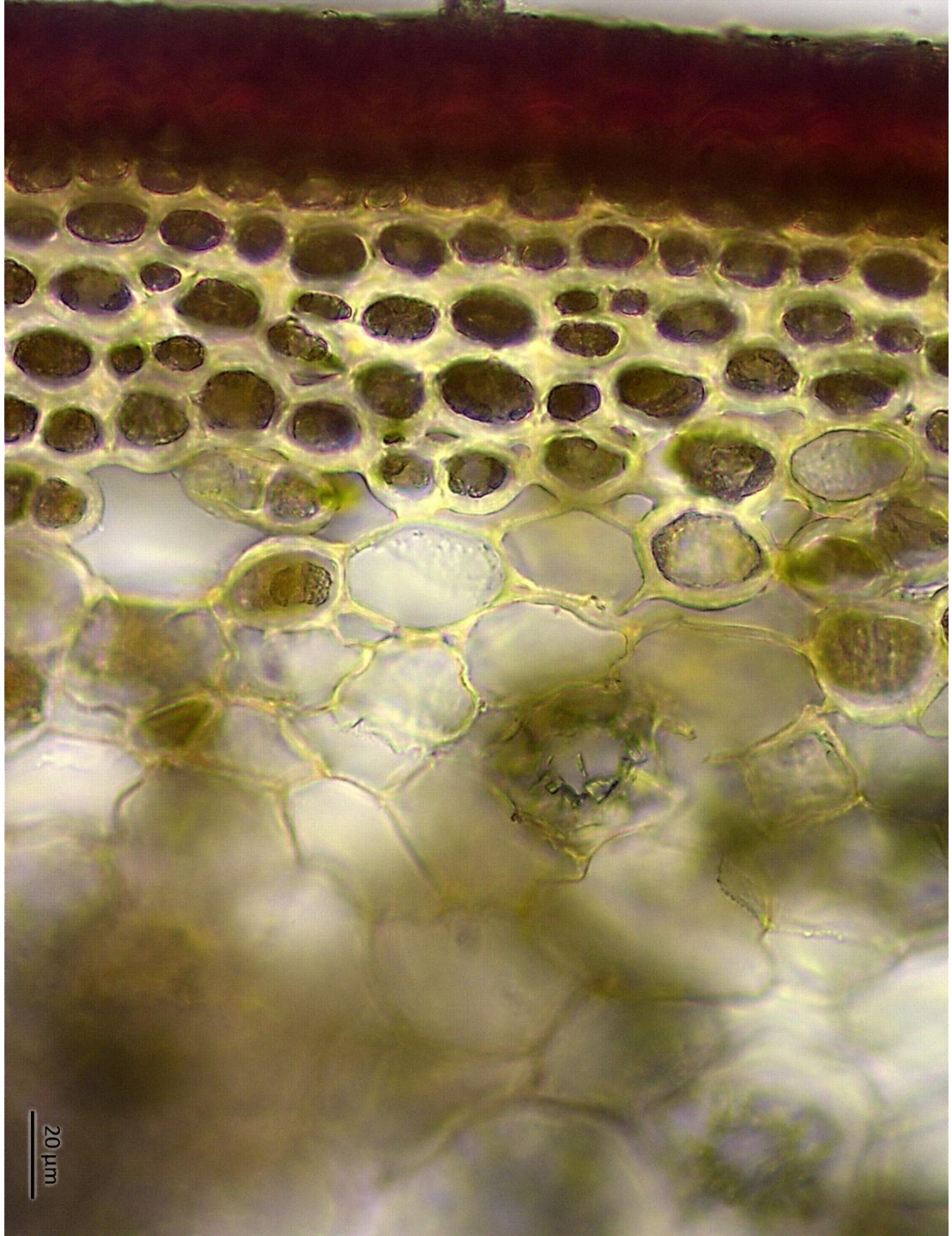
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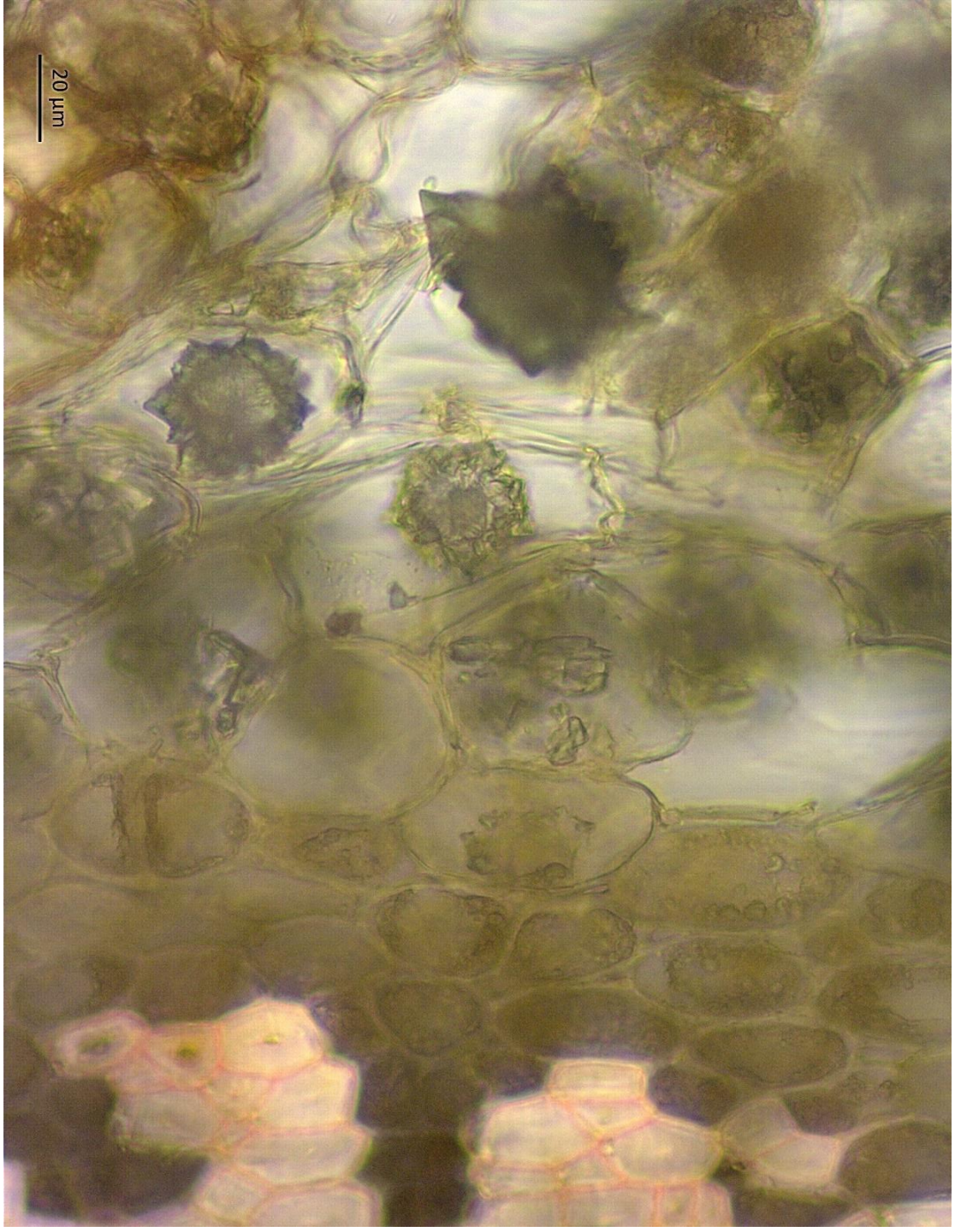
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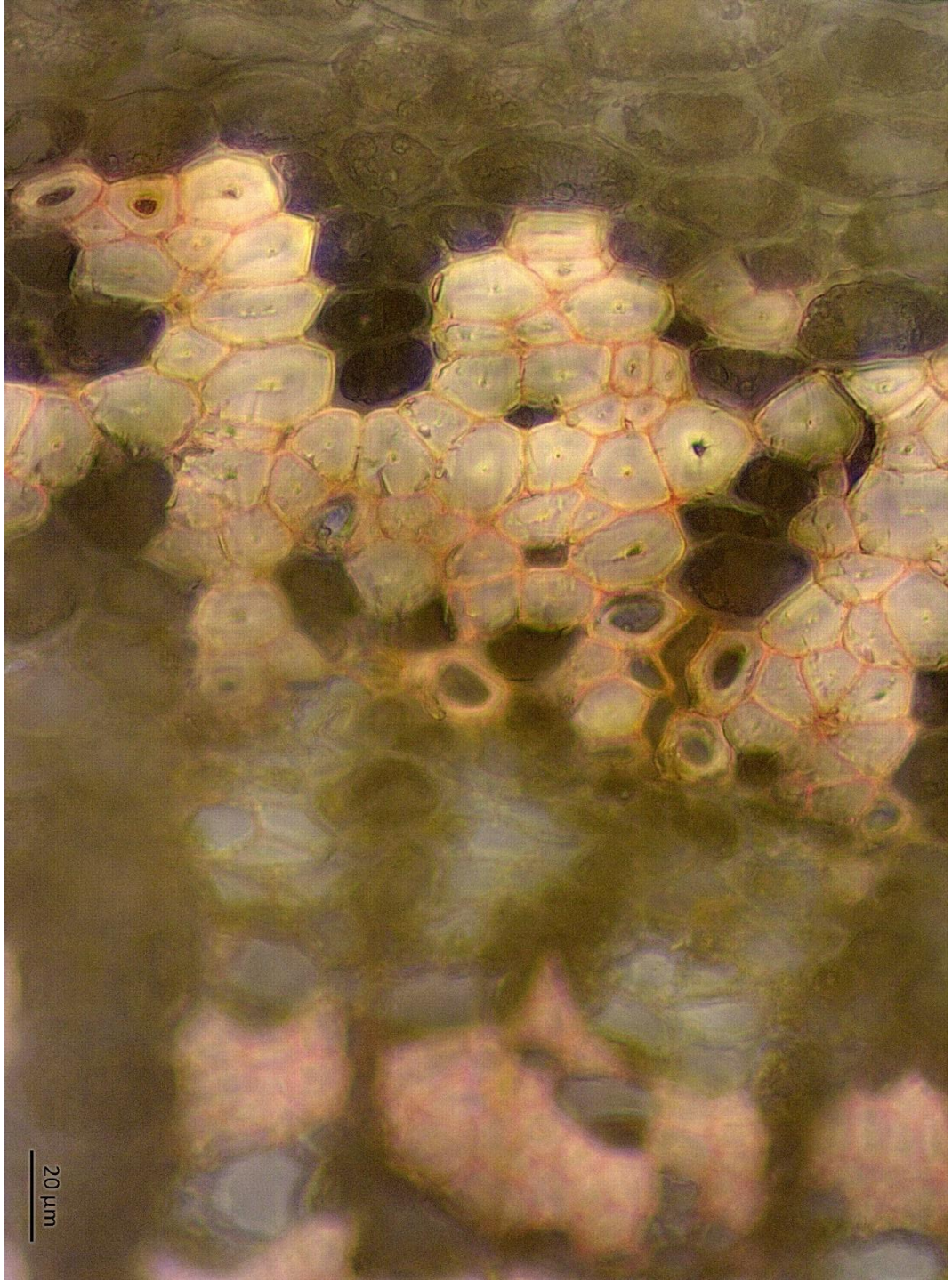
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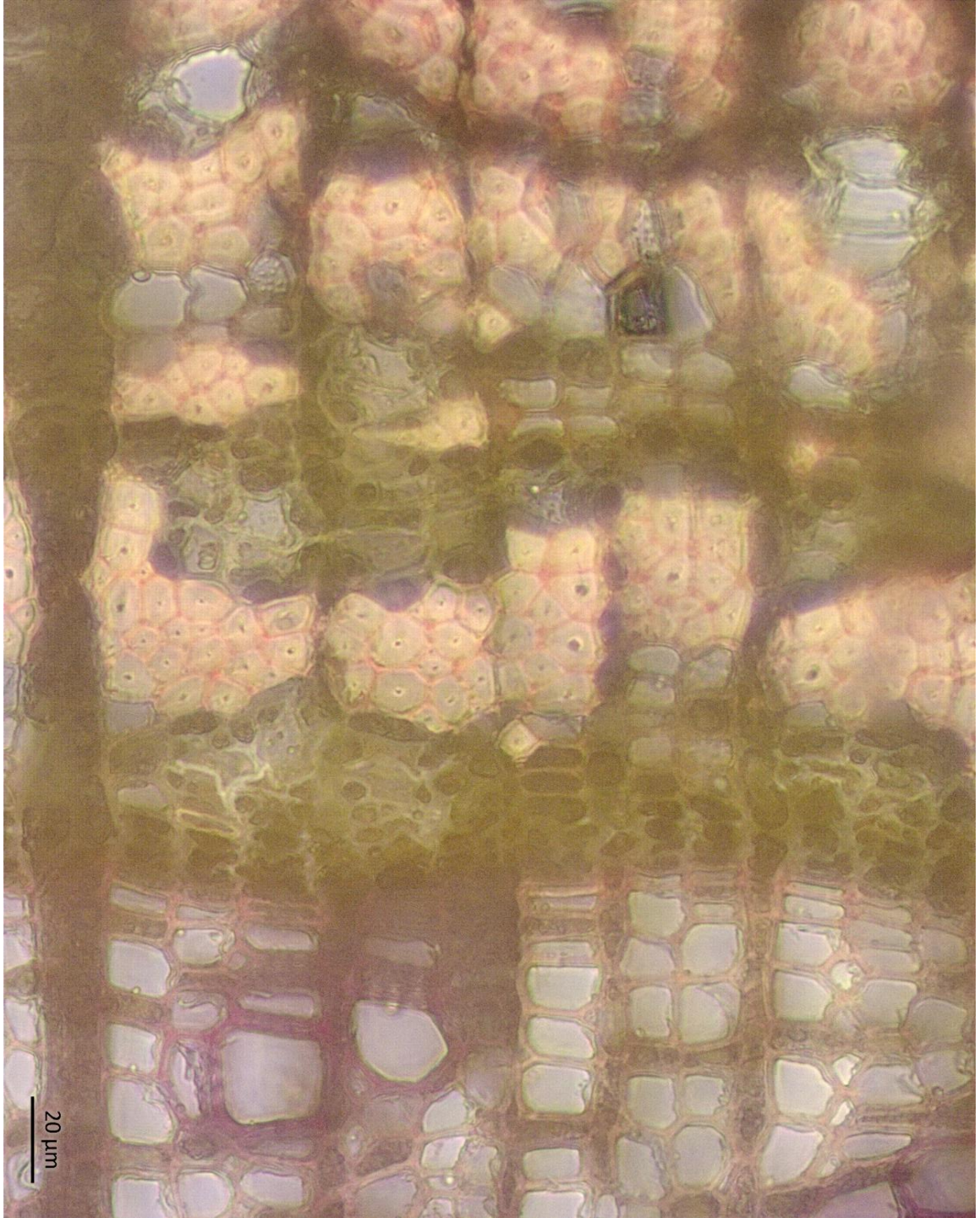
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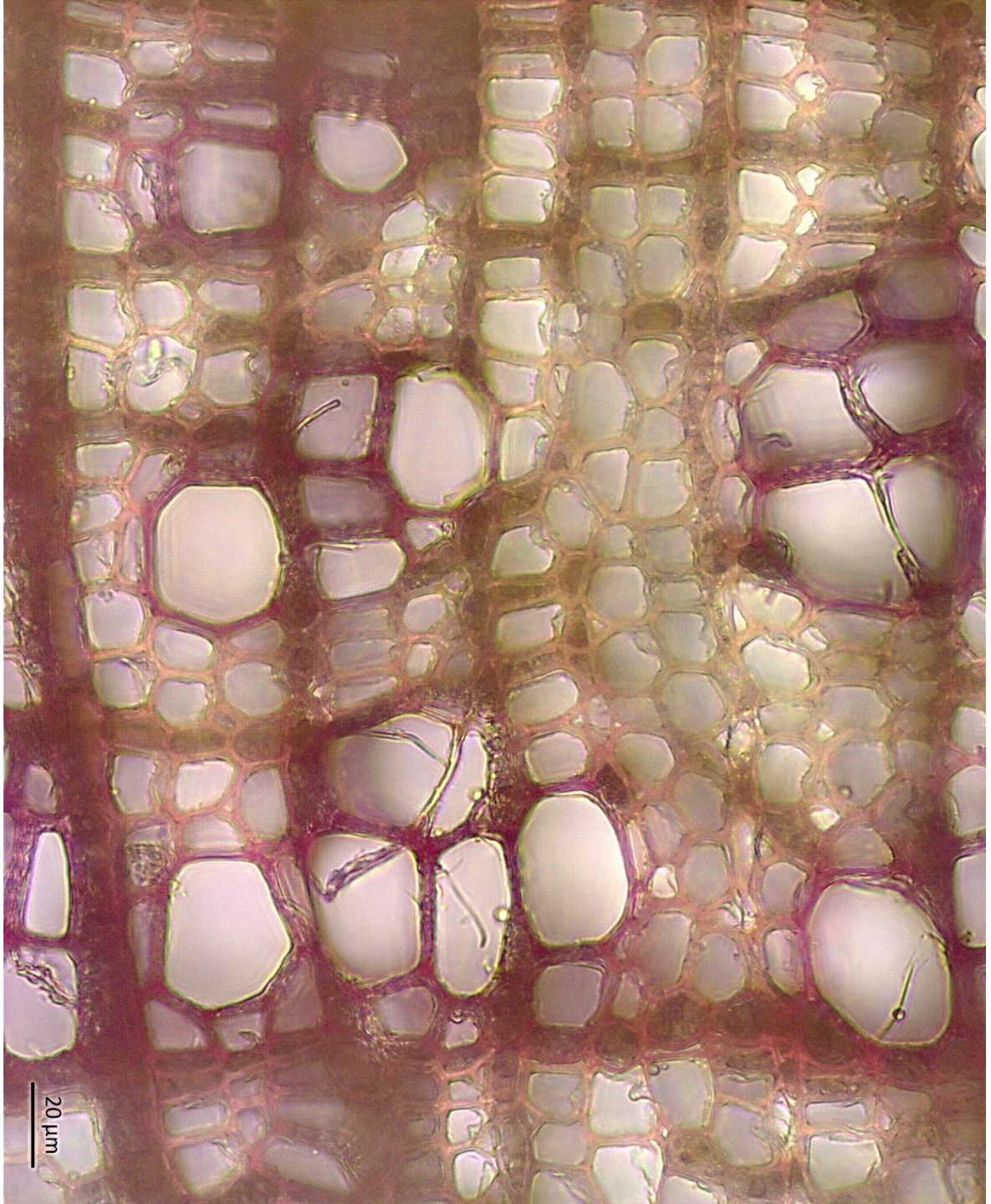
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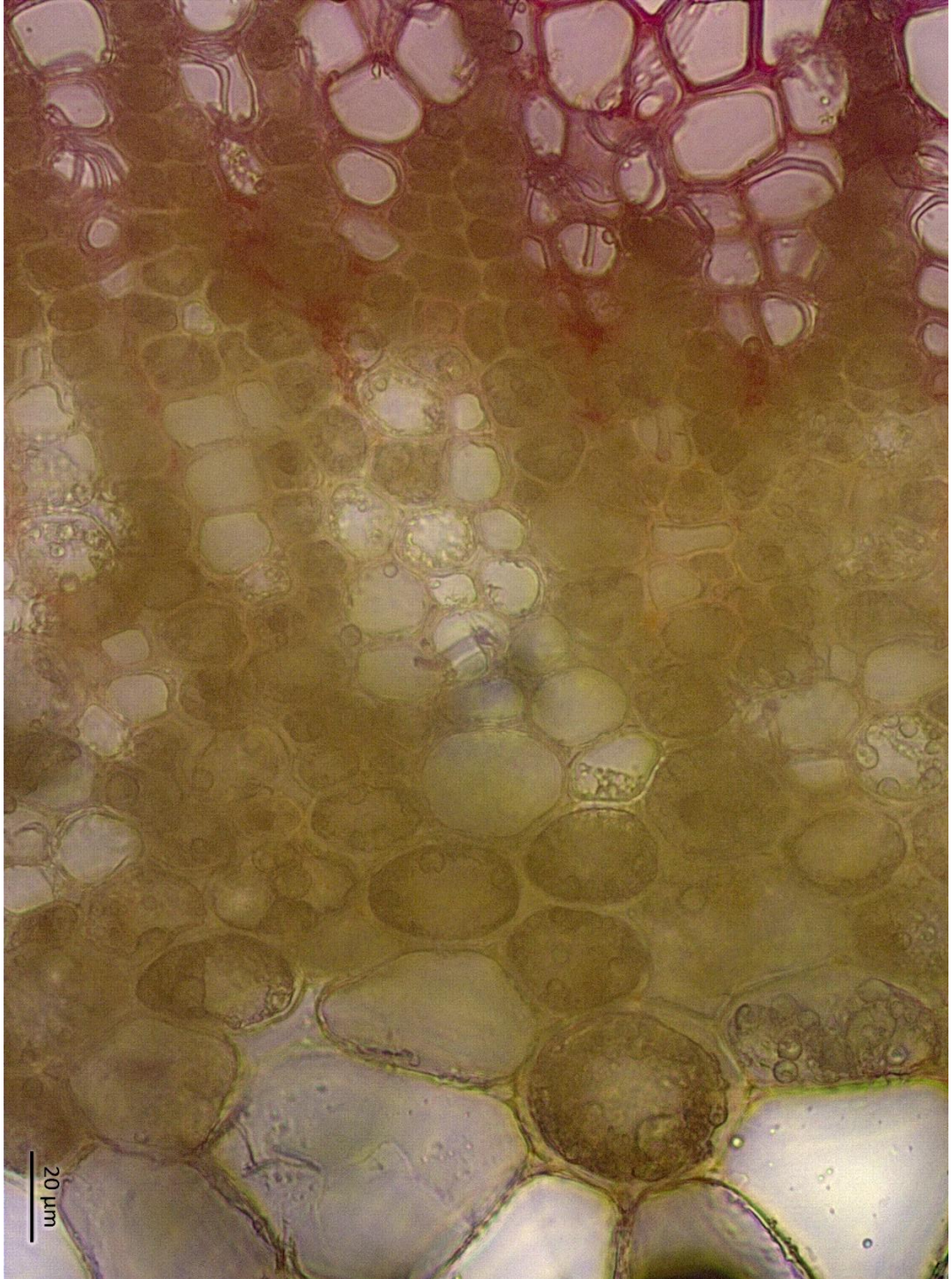
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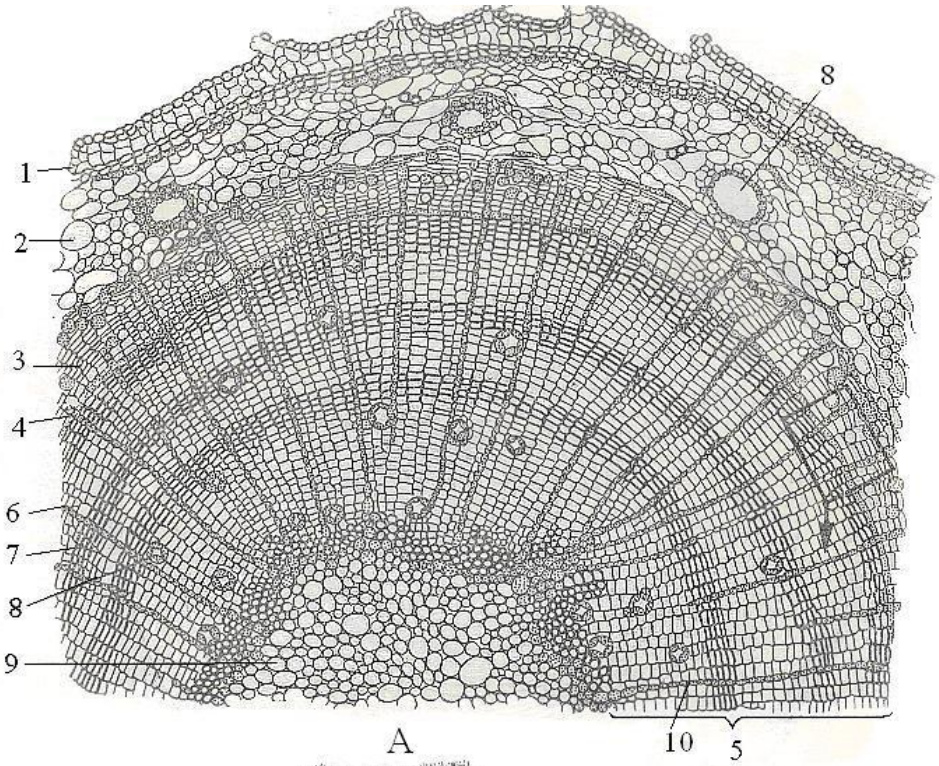
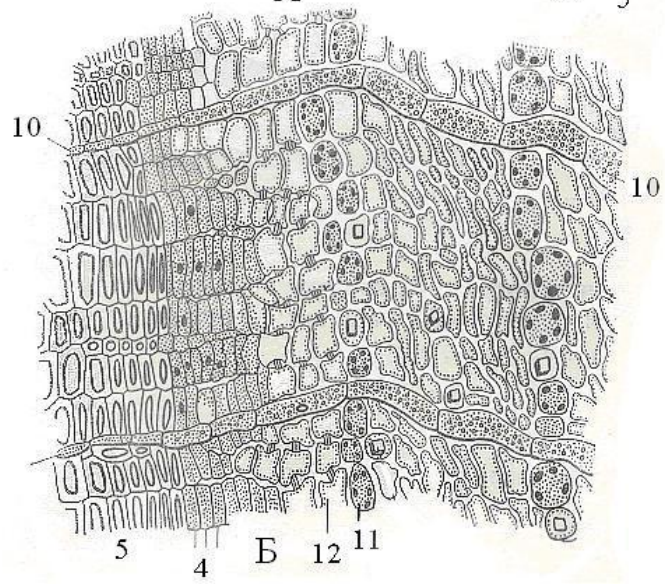
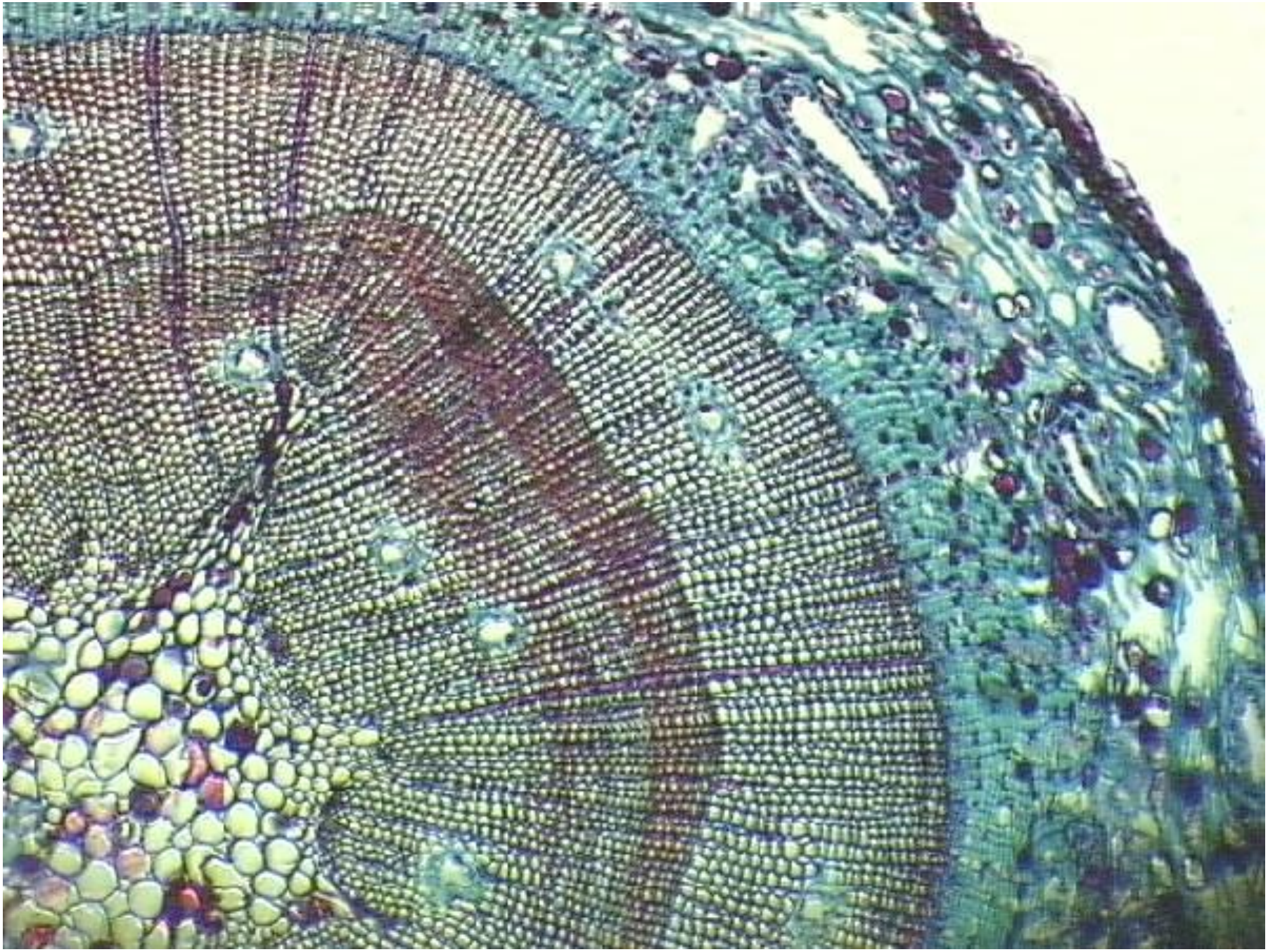
Perennial stem of pine

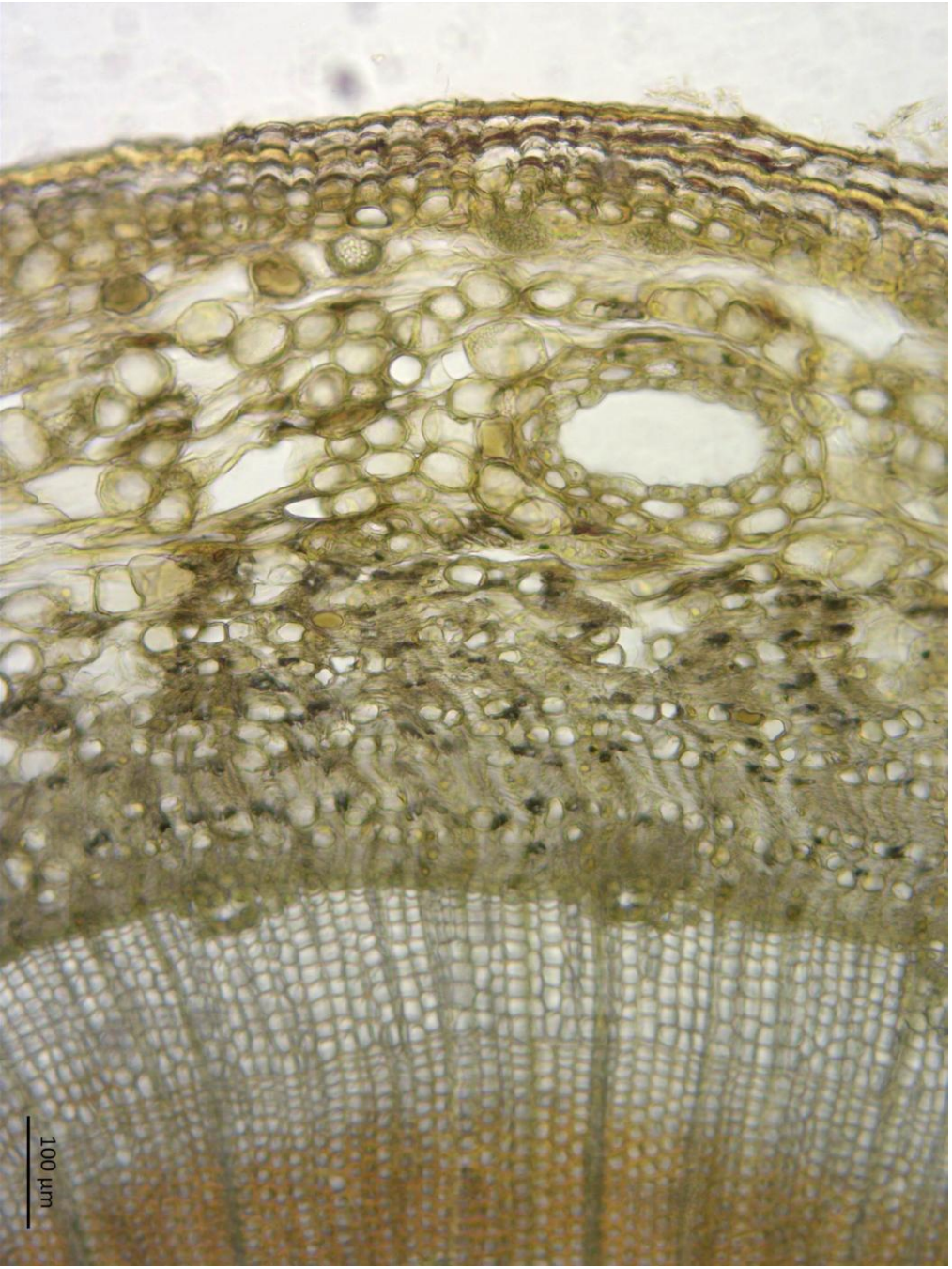




A - part of the cross section; B - phloem and cambium, with adjacent xylem tracheids.

1 - periderm, 2 - parenchyma of the primary cortex, 3 - phloem, 4 - cambium, 5 - xylem, 6 - early tracheids, 7 - late tracheids, 8 -resin duct, 9 - pith, 10 - pith ray, 11 - bast parenchyma, 12 - sieve cells.

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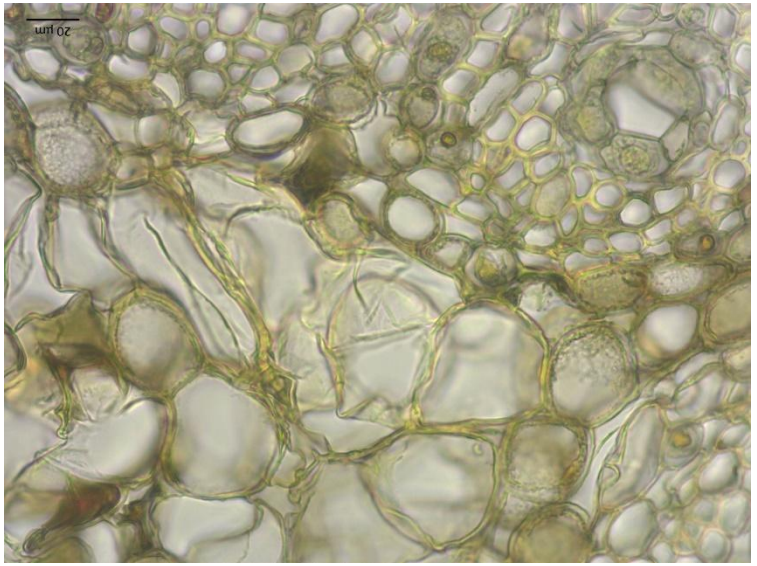
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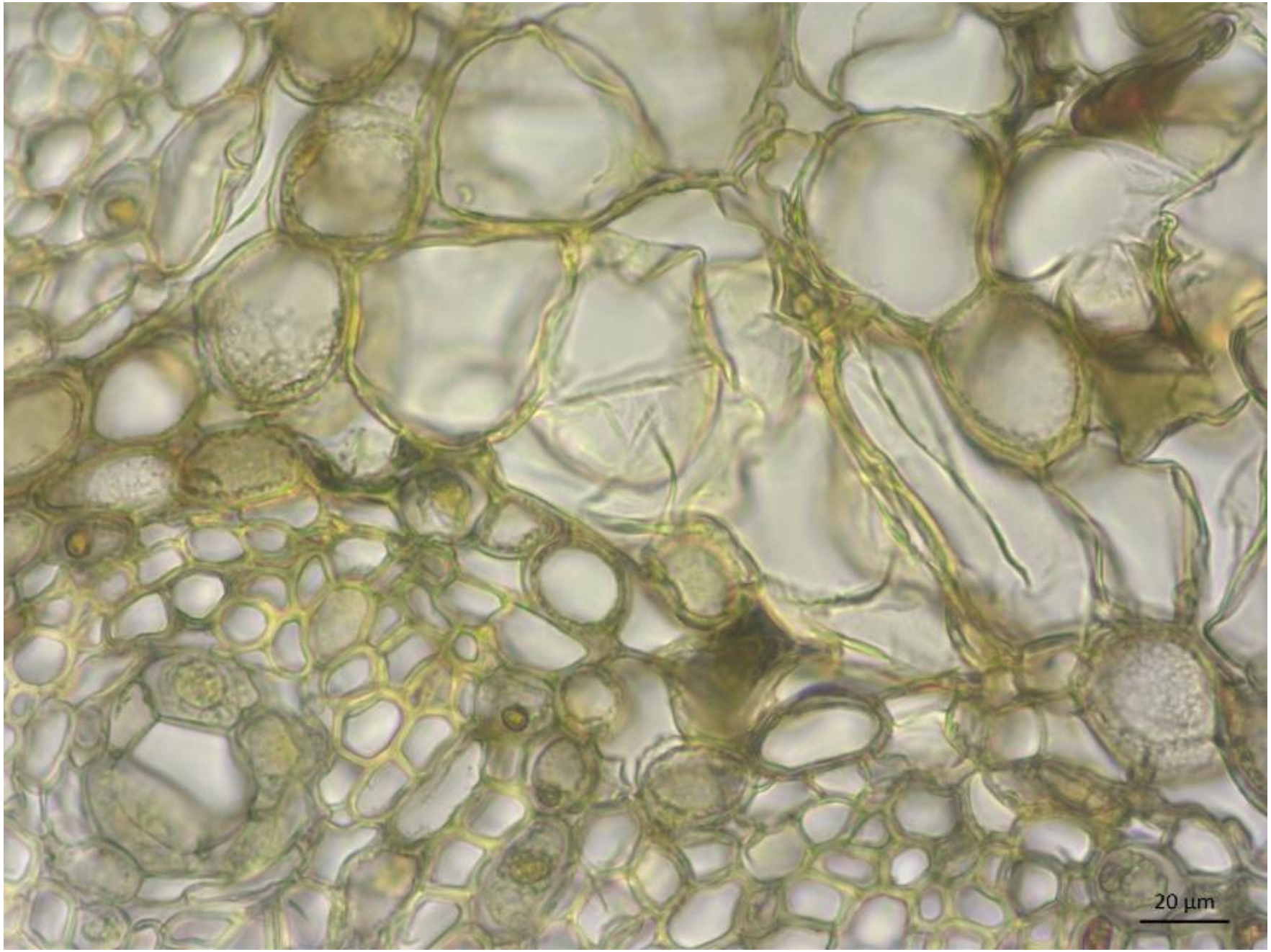
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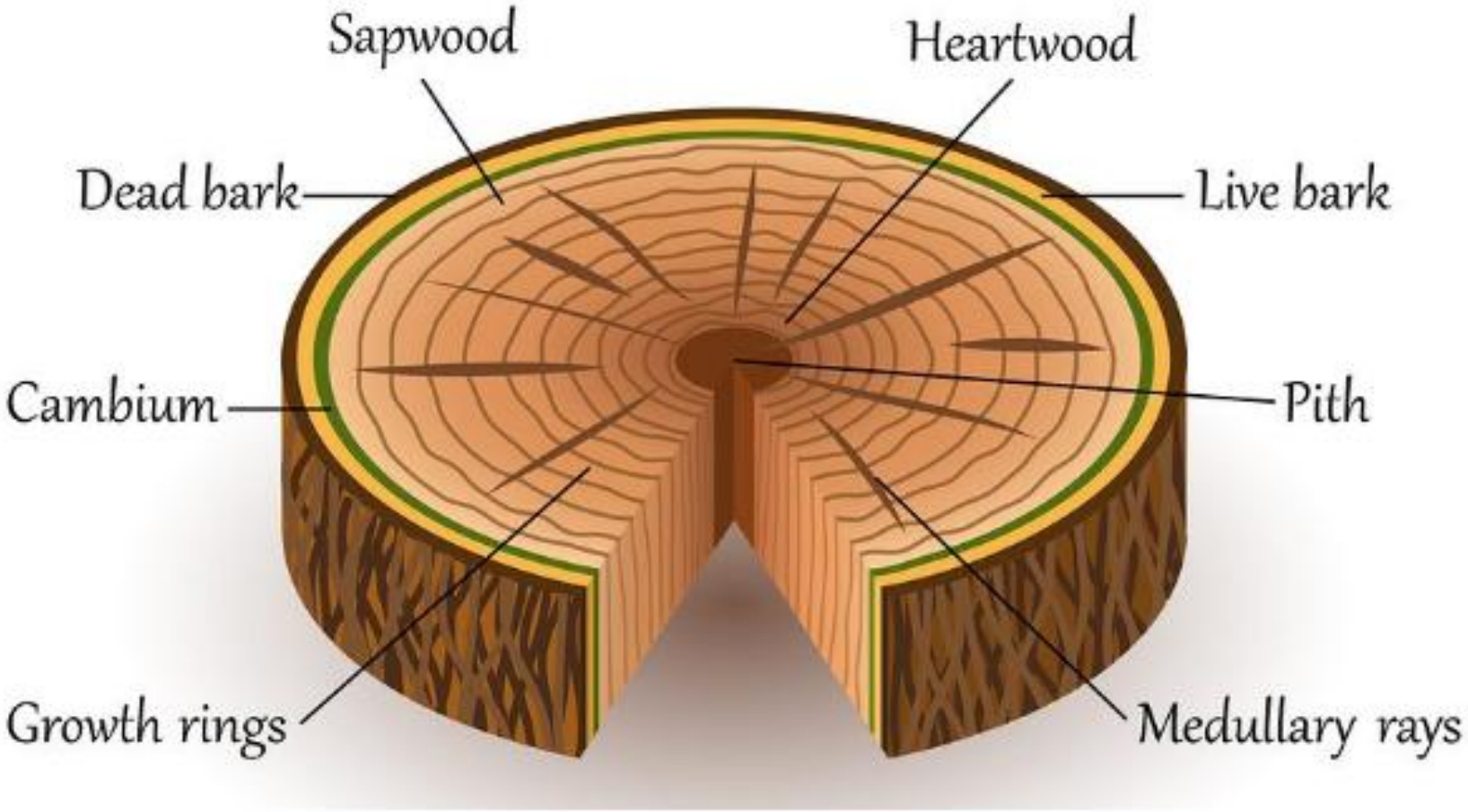
Differences in the anatomical structure of woody stems of Gymnosperms and Dicotyledonous Angiosperms

Anatomical structures and tissues	Gymnosperms Dicotyledonous Angiosperms	Dicotyledonous Angiosperms
Primary cortex	It is represented by a homogeneous assimilating parenchyma, often with resin ducts.	It is represented by assimilating parenchyma, collenchyma and endoderm.
Mechanical tissue	As a rule, they are not developed. The supporting function is performed by tracheids.	Well expresed.
а) collenchyma	Absent.	There is, in woody stems, more often lamellar.
б) sklerenchyma	Absent.	Have. Fibers and sclereids. Fibers can be in phloem (bast), xylem (woody), pericycle (perivascular).
Vascular tissue	Do not contain mechanical elements.	They must contain mechanical elements.
а) phloem	Vascular elements are represented by sieve cells	Conducting elements are represented by sieve-shaped tubes with companion cells.
б) xylem	Vascular elements are represented by tracheids	Conducting elements are represented by vessels and tracheids.
Secretory cavities (their type and location in the stem)	There are resin ducts that are located in the cortex and in the wood.	Of various types, they are located in parenchymal tissues (cortex and pith), but not in wood.


Sapwood
Heartwood
Dead bark
Live bark
Cambium
Pith
Growth rings
Medullary rays


Sapwood
Heartwood