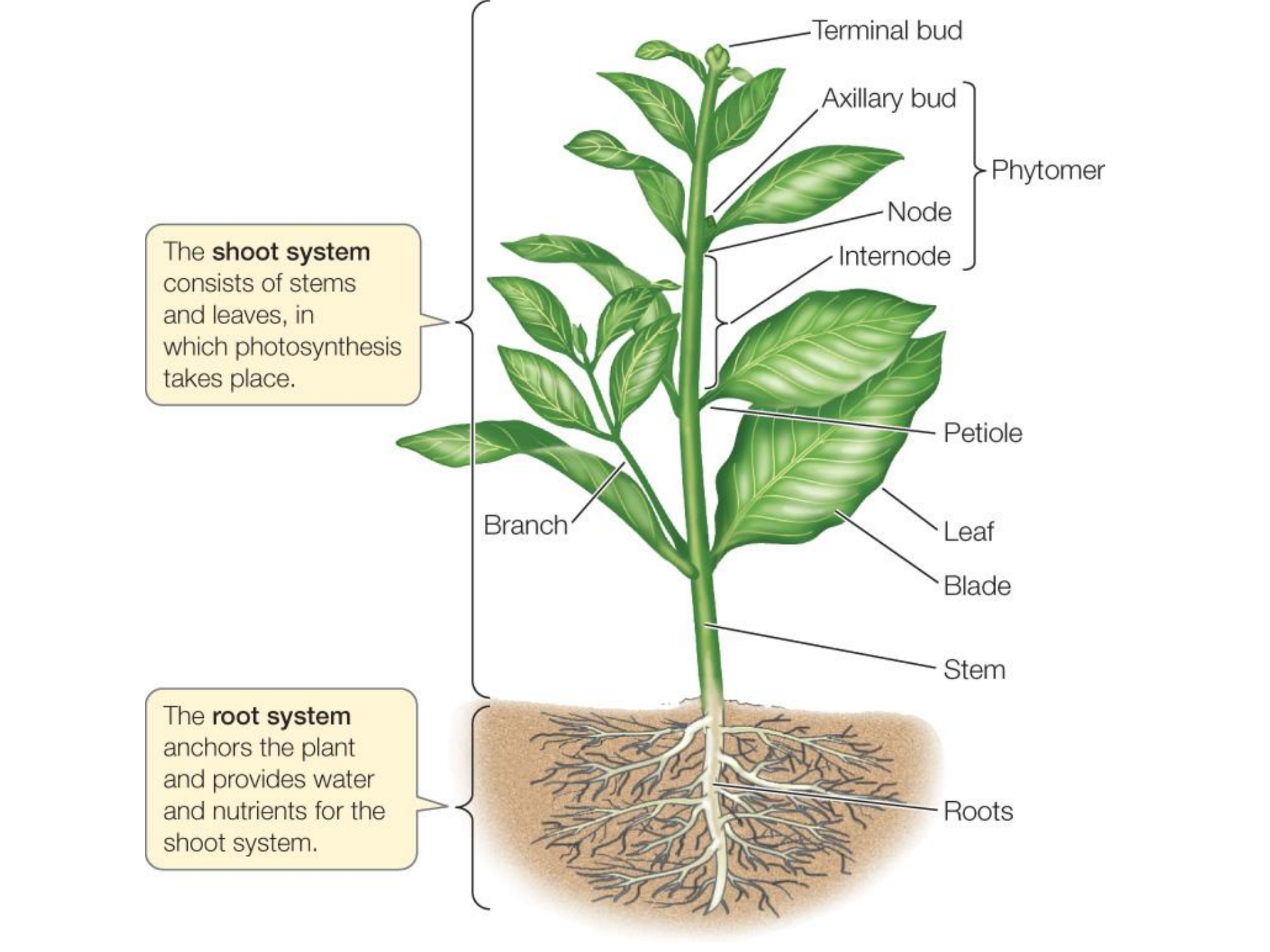
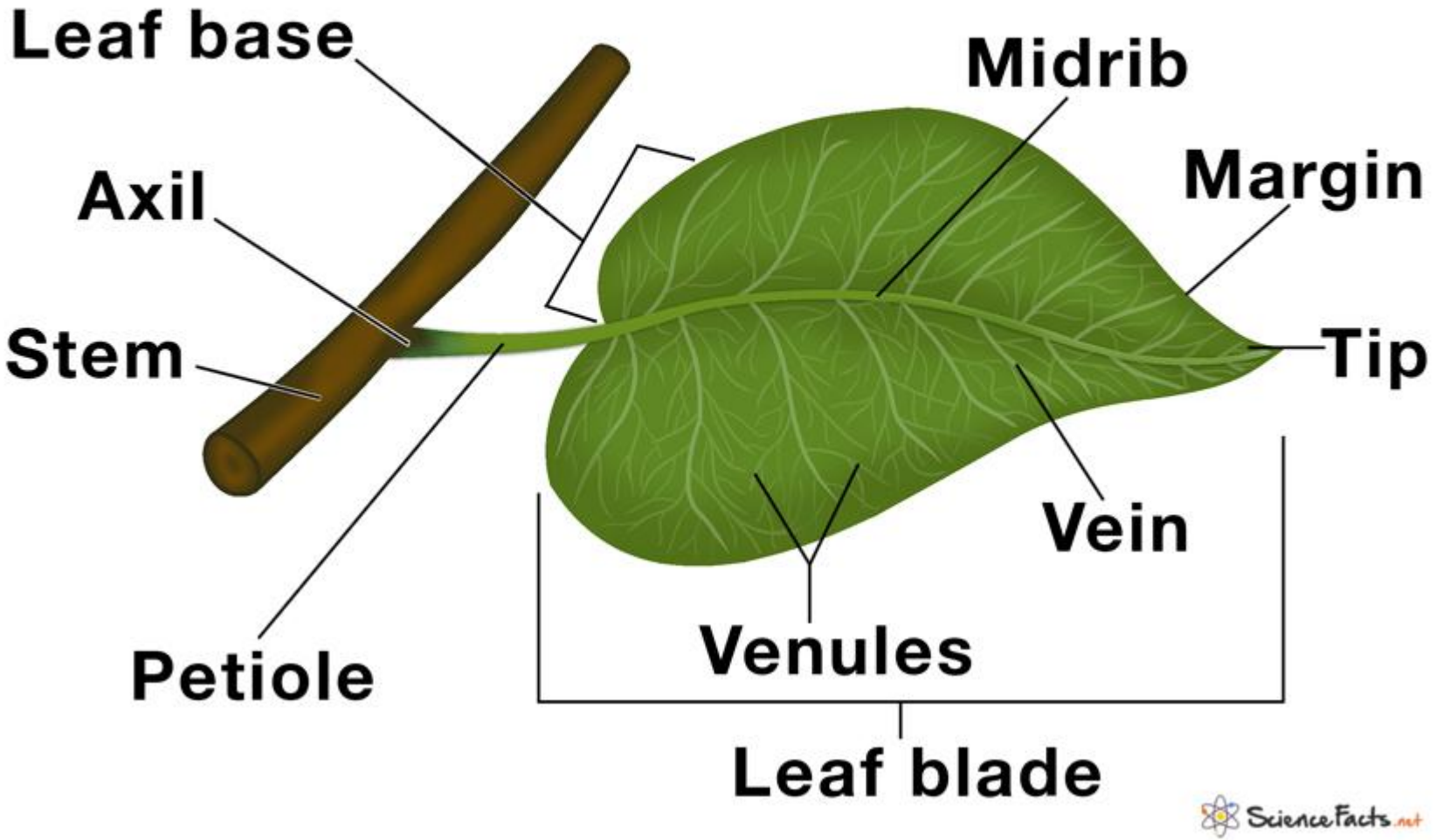
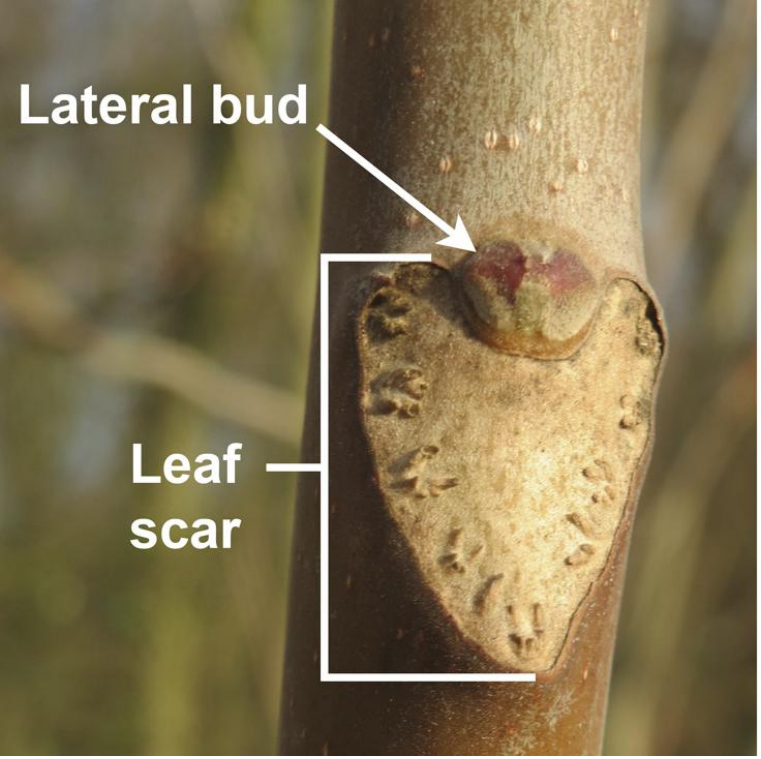
Thematic block: Vegetative organs of plants.

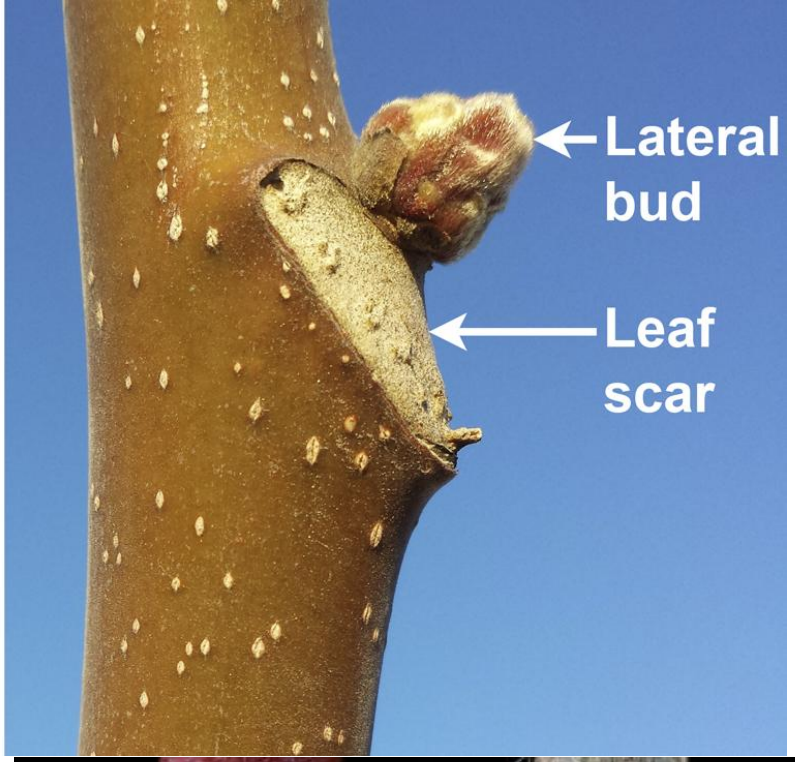
Lesson 3.4. Morphology and anatomical structure of the leaf

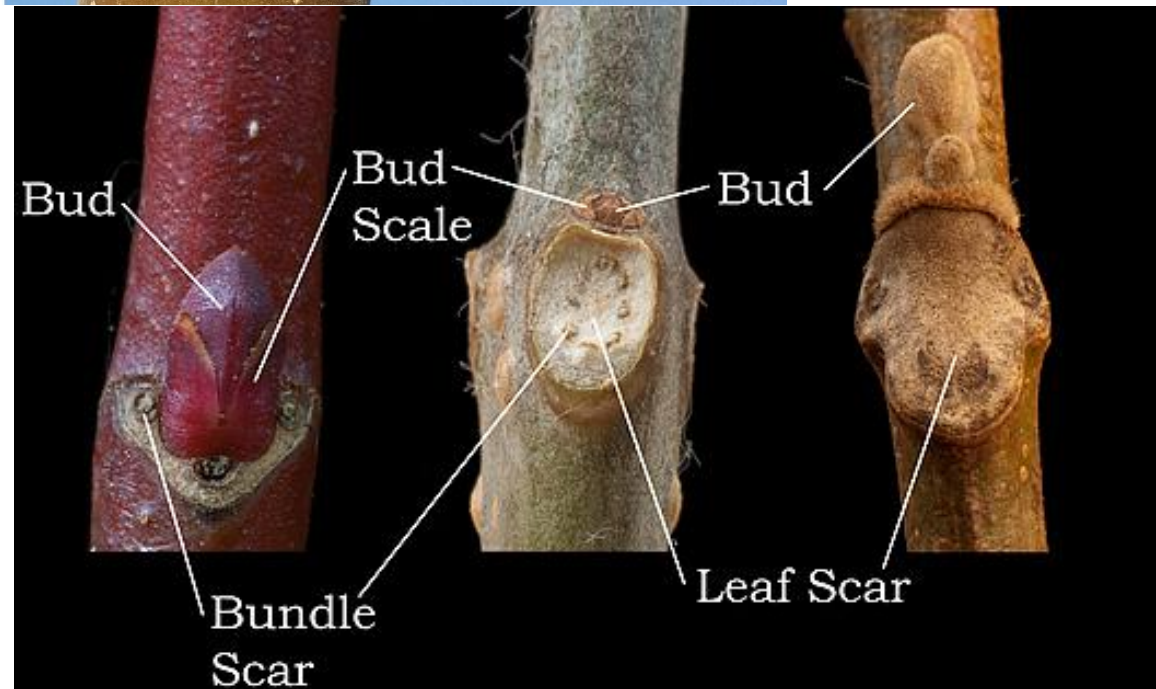

Terminal bud
Axillary bud
Phytomer
Node
Internode
The **shoot system** consists of stems and leaves, in which photosynthesis takes place.
Petiole
Branch
Leaf
Blade
Stem
The **root system** anchors the plant and provides water and nutrients for the shoot system.
Roots

Parts of a Leaf

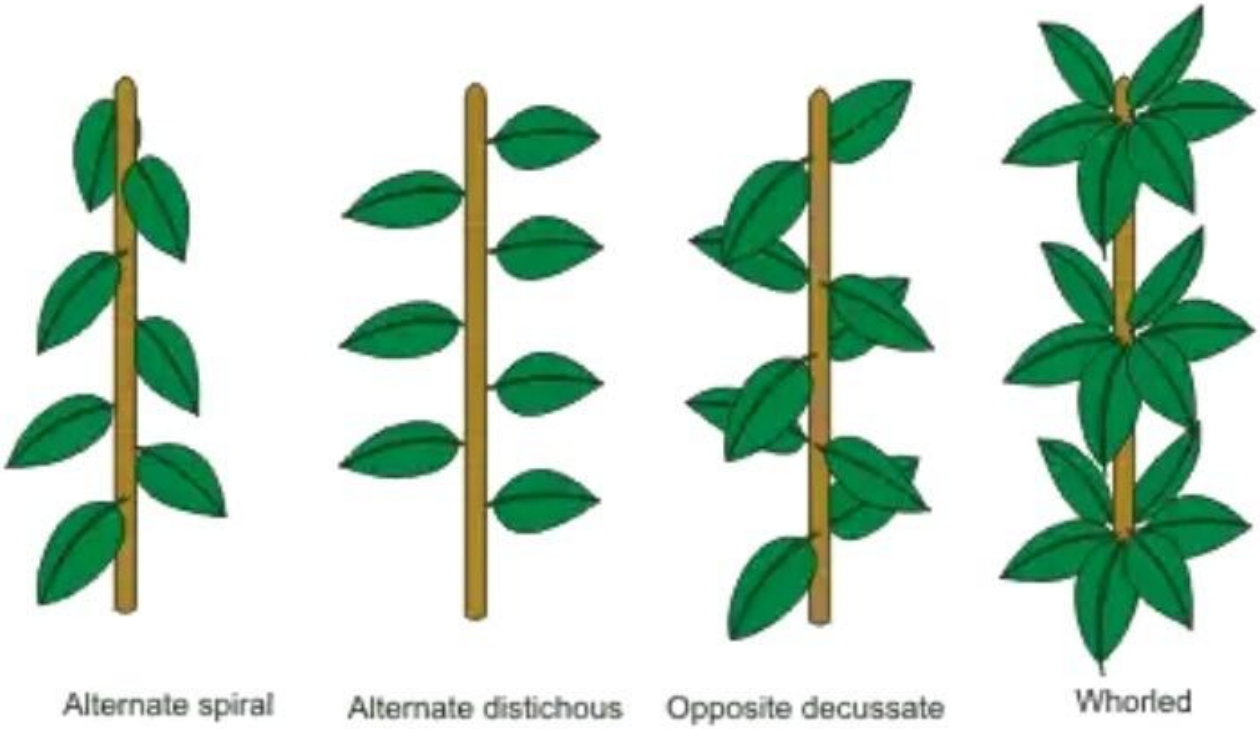


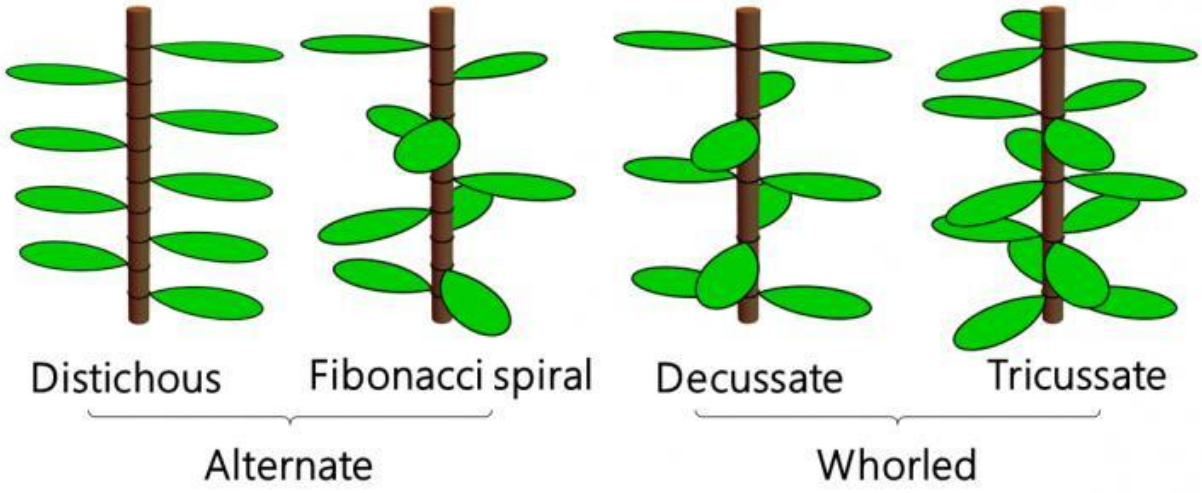

Lateral bud
Leaf scar


Lateral bud
Leaf scar

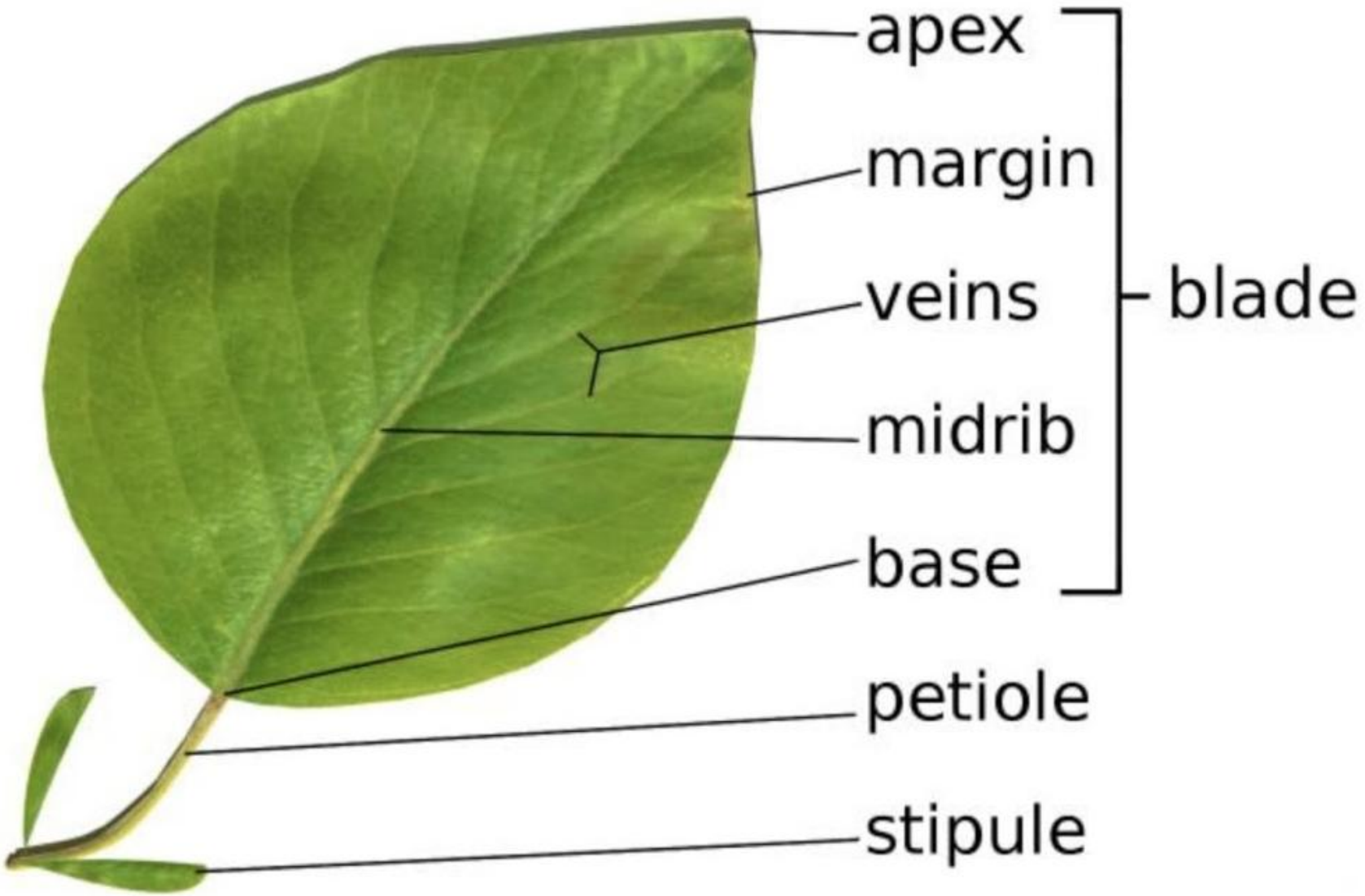

Bud
Bud Scale
Bud
Bundle Scar
Leaf Scar

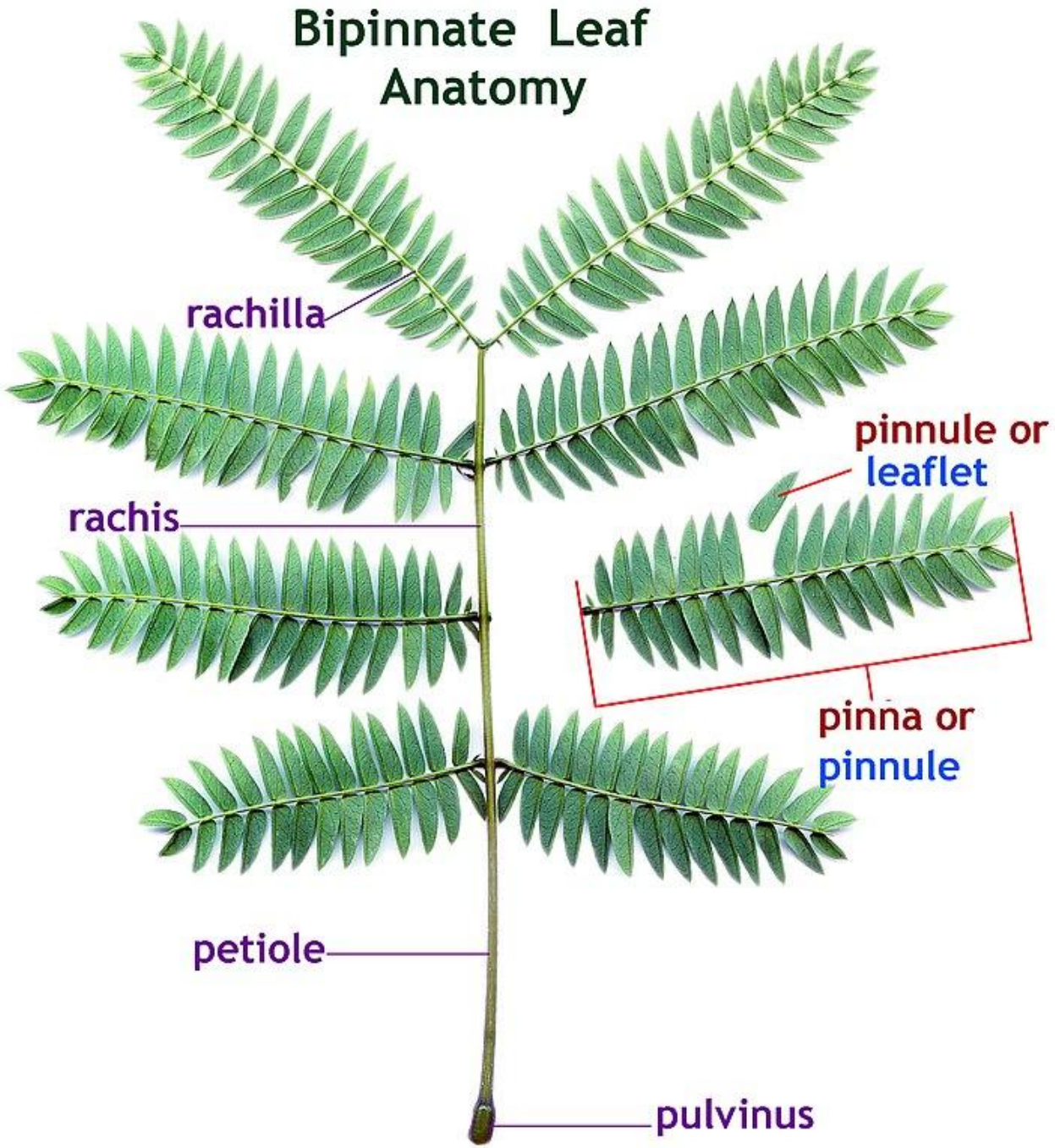
The arrangement of leaves



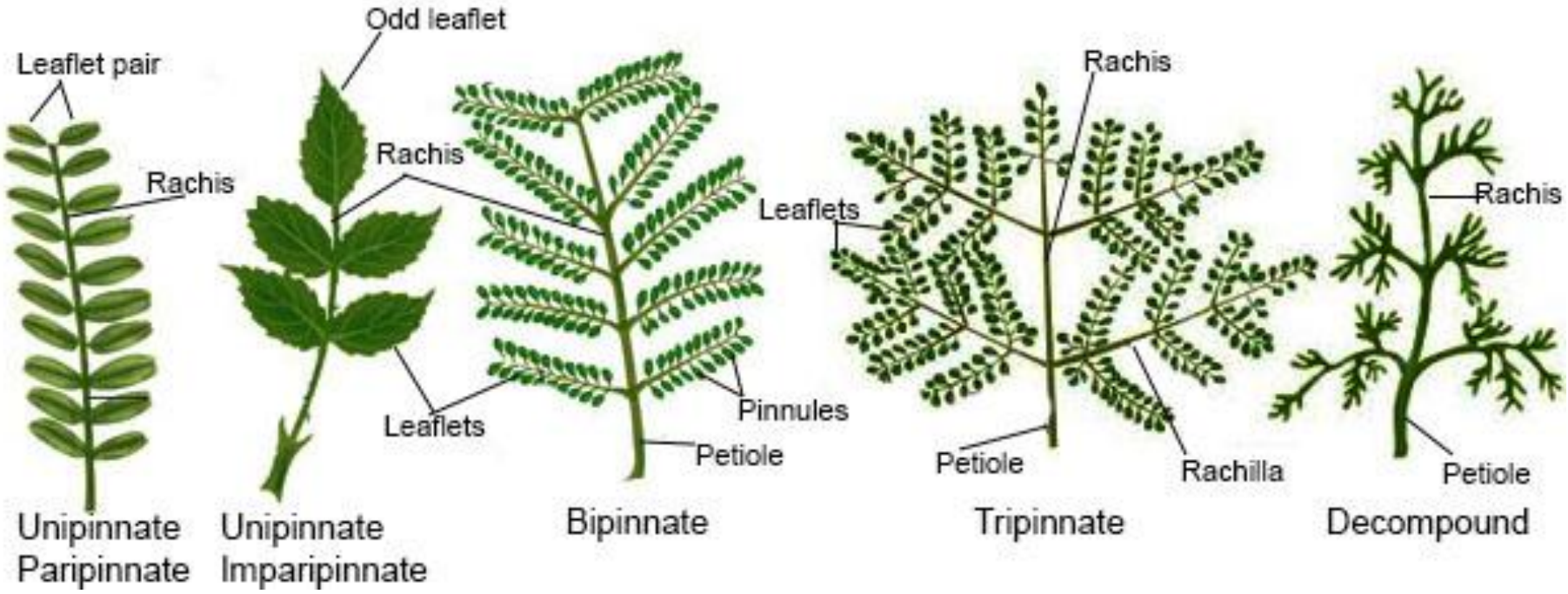


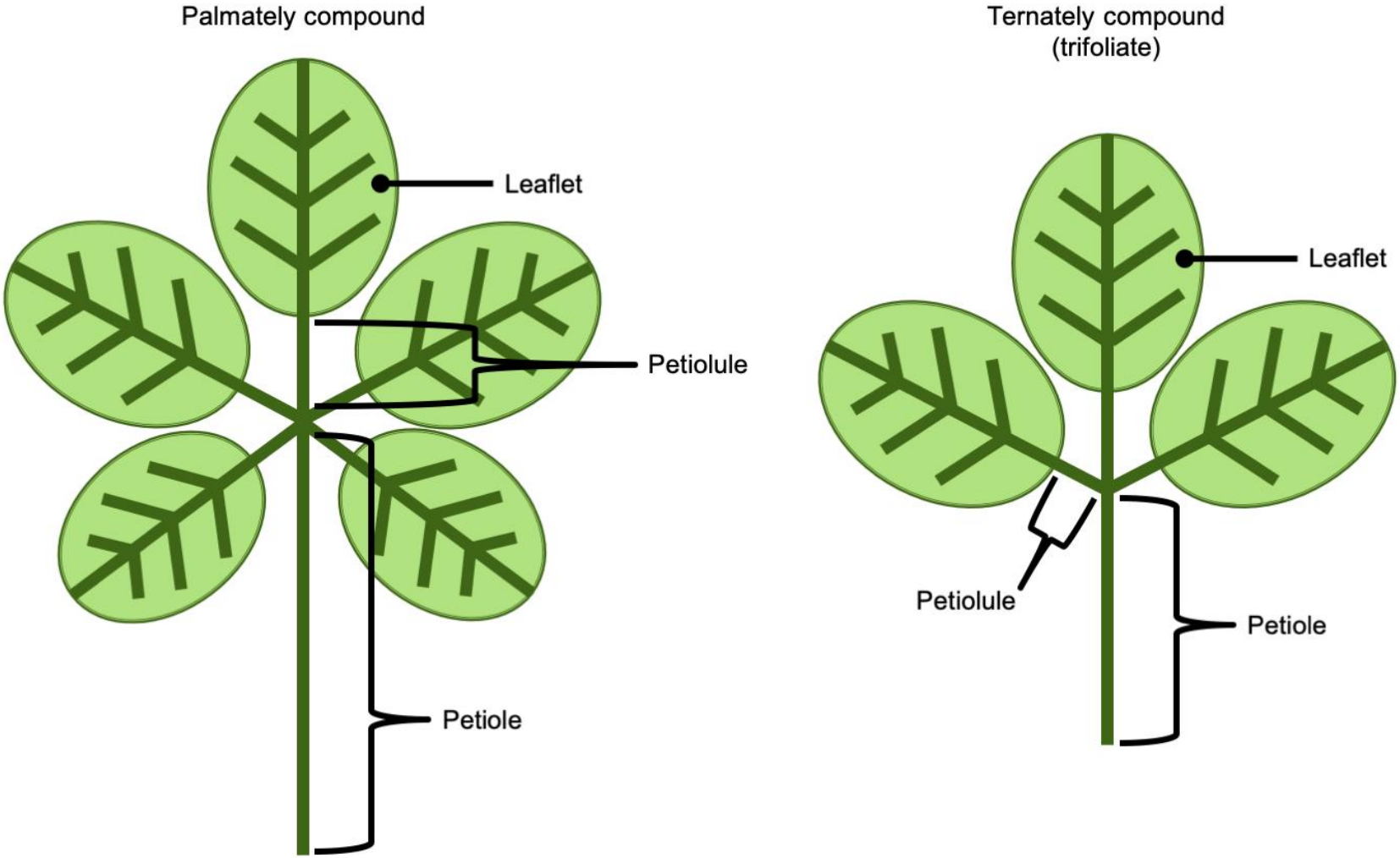

normophylls
cataphylls
hypsophylls


apex
margin
veins
midrib
base
petiole
stipule
blade

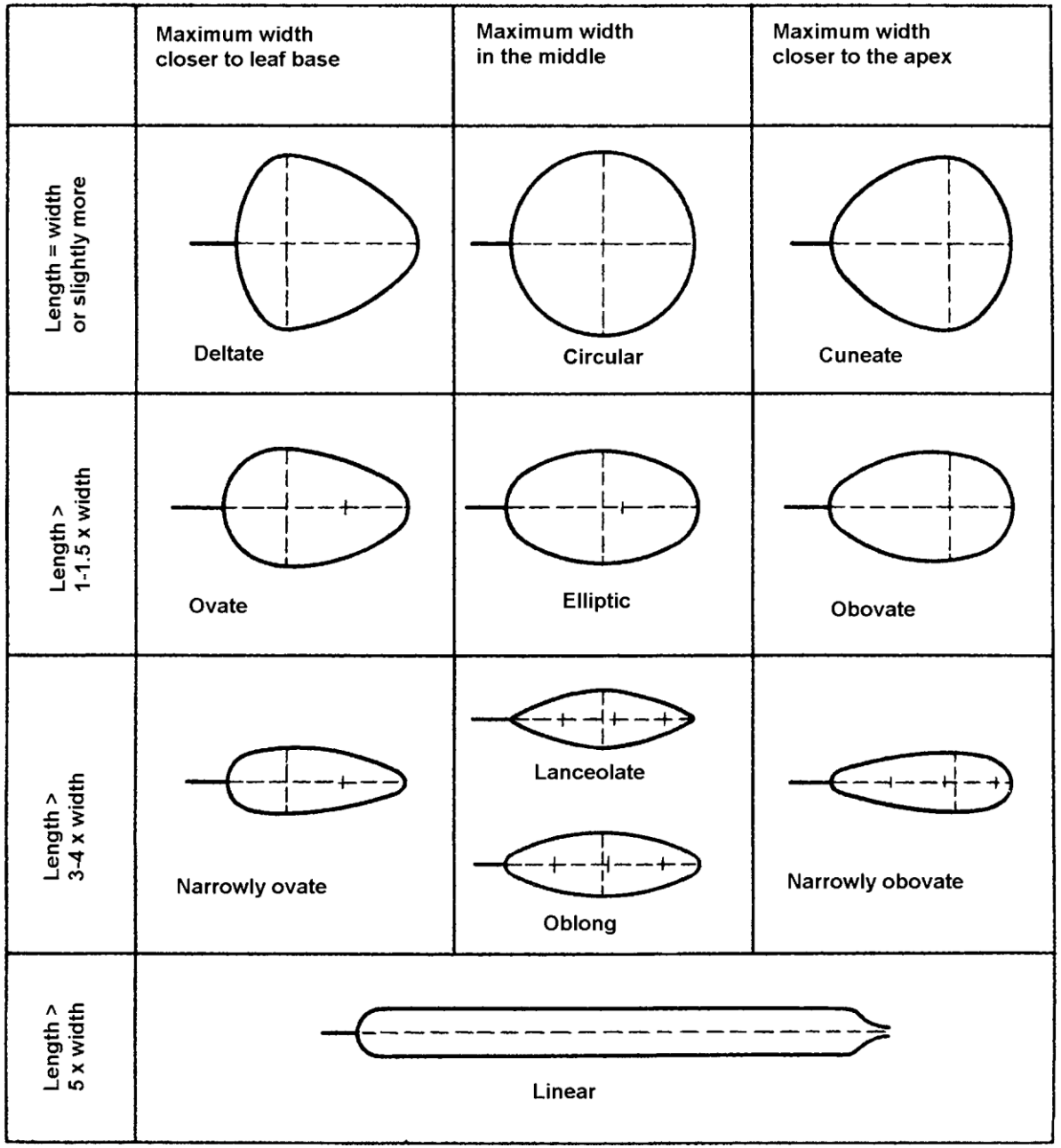

Bipinnate Leaf
Anatomy
rachilla
pinnule or
leaflet
rachis
pinna or
pinnule
petiole
pulvinus

Pinnately compound leaf

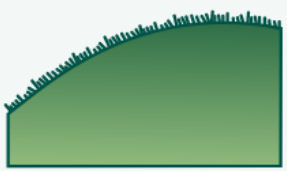



Palmately compound
Leaflet
Petiolule
Petiole
Ternately compound
(trifoliate)
Leaflet
Petiolule
Petiole

Leaf shapes.


Maximum width closer to leaf base
Maximum width in the middle
Maximum width closer to the apex
Length = width or slightly more
Length > 1-1.5 x width
Length > 3-4 x width
Length > 5 x width
Deltate
Circular
Cuneate
Ovate
Elliptic
Obovate
Lanceolate
Narrowly ovate
Oblong
Narrowly obovate
Linear

MARGIN

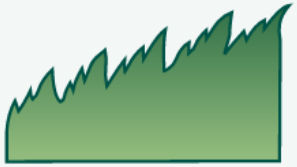


Ciliate
with fine hairs

Crenate
with rounded teeth

Dentate
with symmetrical teeth

Denticulate
with fine dentition



Doubly Serrate
serrate with sub-teeth

Entire
even, smooth throughout

Lobate
indented, but not to midline

Serrate
teeth forward-pointing

Serrulate
with fine serration

Sinuate
with wave-like indentations

Spiny
with sharp stiff points

Undulate
widely wavy

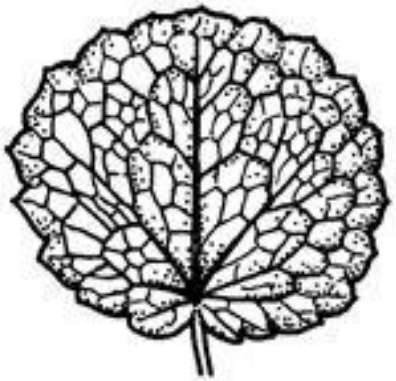
VENATION

ARCUATE

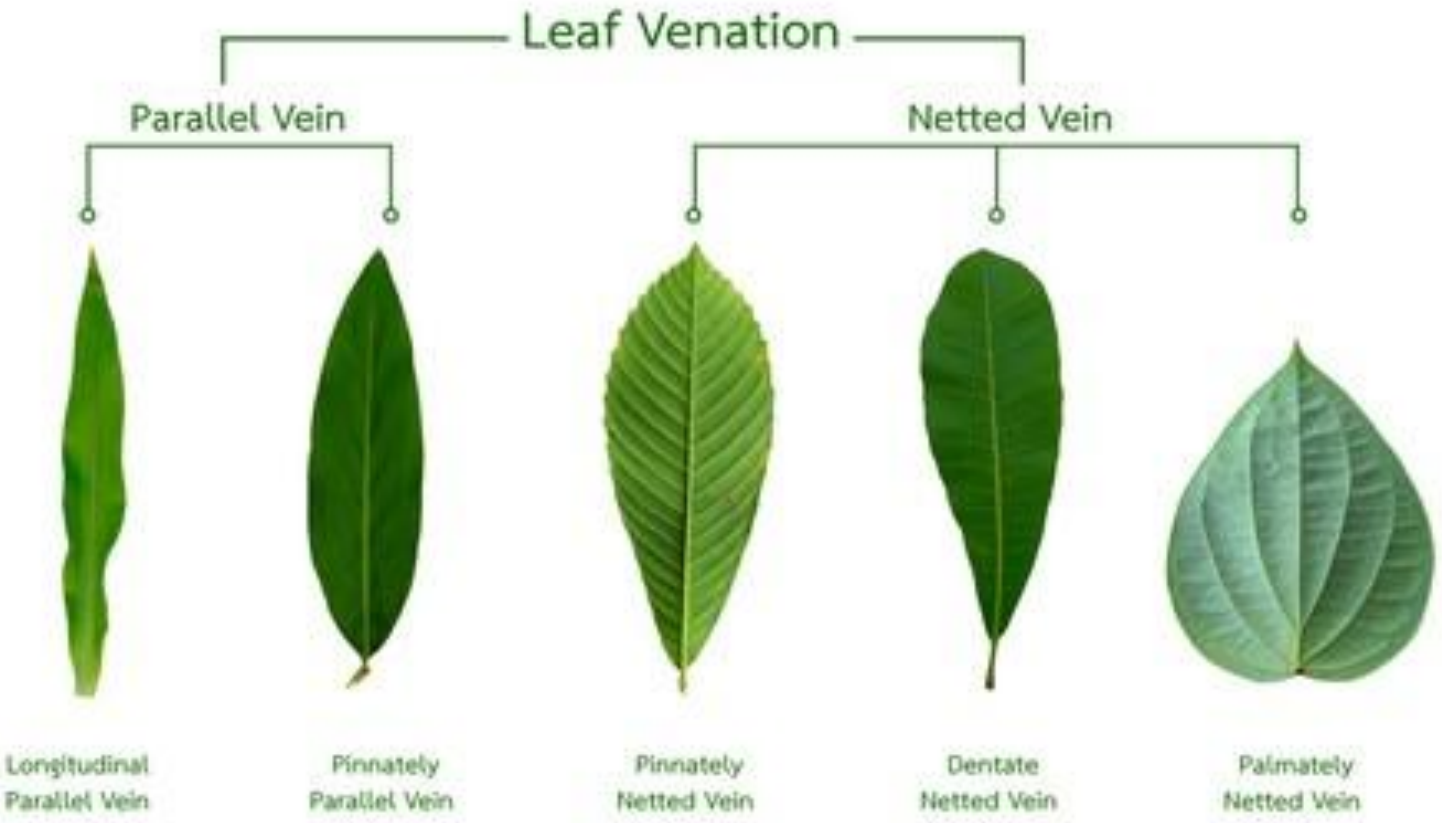
PALMATE

PARALLEL

PINNATE



RETICULATE


Leaf Venation
Parallel Vein
Netted Vein
Longitudinal Parallel Vein
Pinnately Parallel Vein
Pinnately Netted Vein
Dentate Netted Vein
Palmately Netted Vein

Identify the types of leaves, describe and draw all the leaves in the individual set.

Leaf description plan

1. A simple leaf (with a solid or excised blade) or a compound leaf (pinnate, palmate, ternate).
2. Shape of leaf blade (lamina) (for simple leaf) or leaflet (for compound leaf).
3. Shape and degree of dissection of the leaf blade.
4. Shape of apex (tip) of leaf blade.
5. Shape of base of leaf blade.
6. Shape of margin (edge) of leaf blade.
7. Type of veining.
8. Presence and shape of petiole.
9. Shape of leaf base (presence of sheath, stipules, ocrea, their shape), degree of its delimitation.

Береза повислая
Betula pendula

Скумпия кожевенная
Cotinus coggygria

Тутовое дерево
Morus

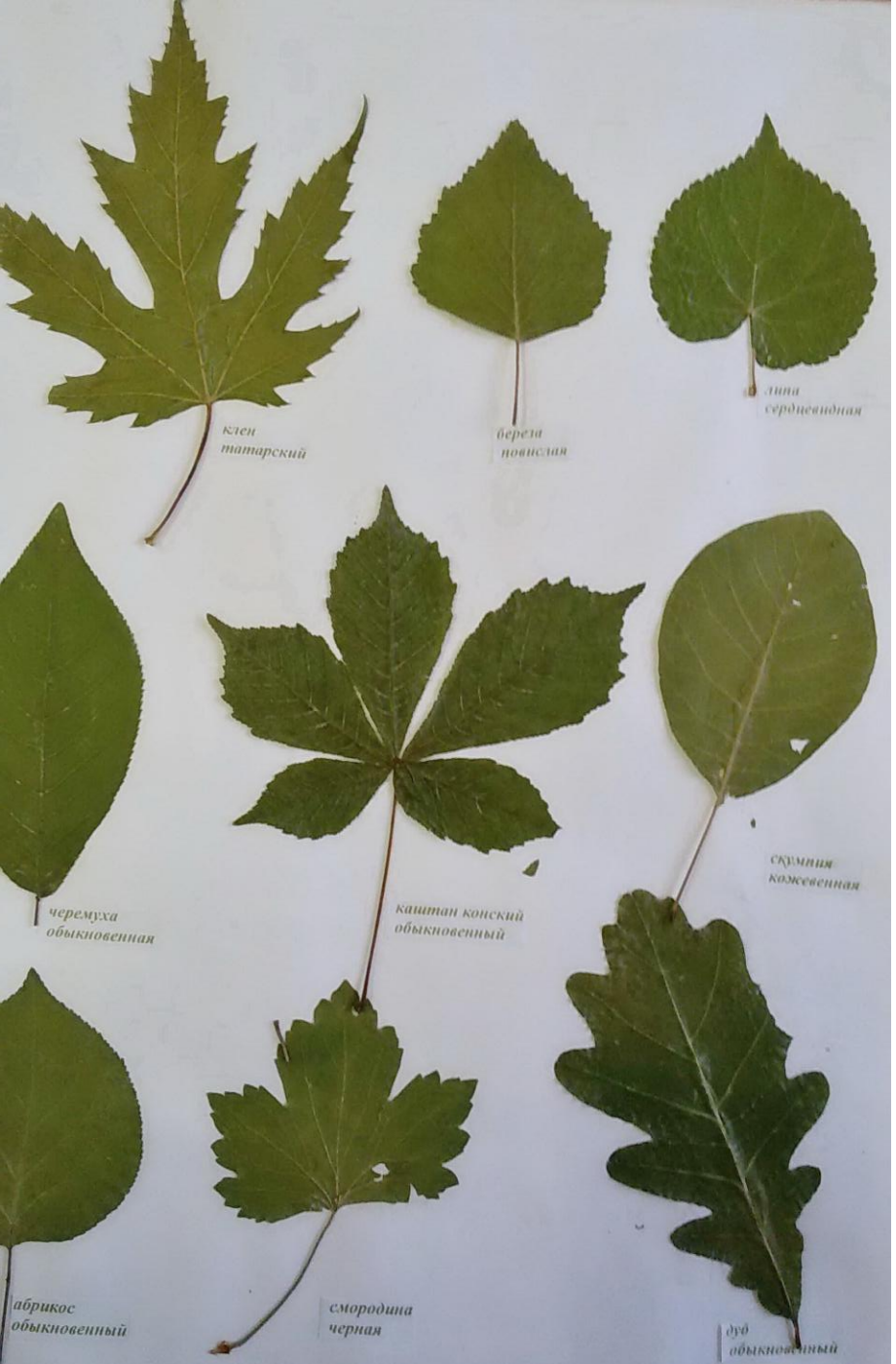
Клен татарский
Acer tataricum

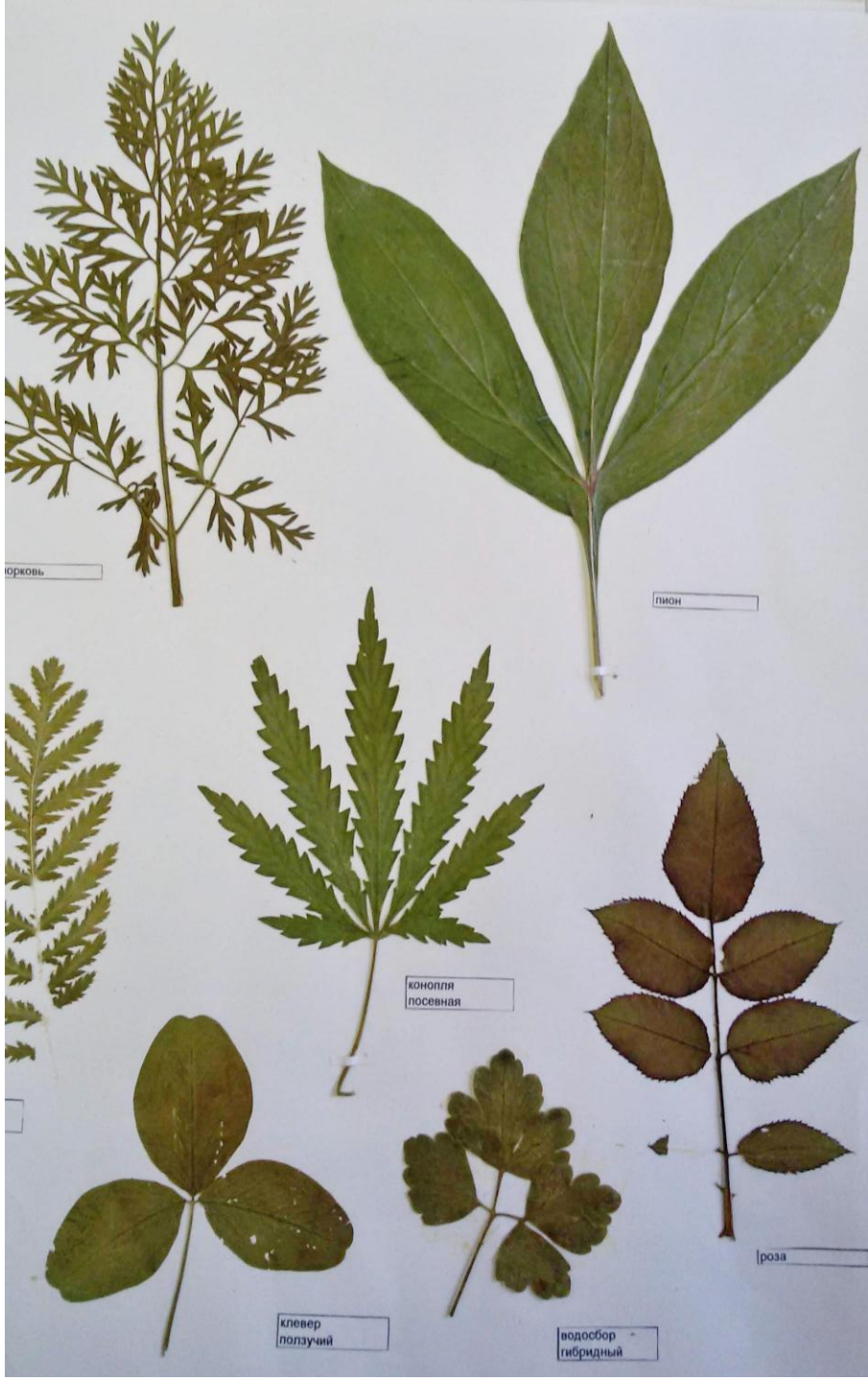
Яблоня
Malus

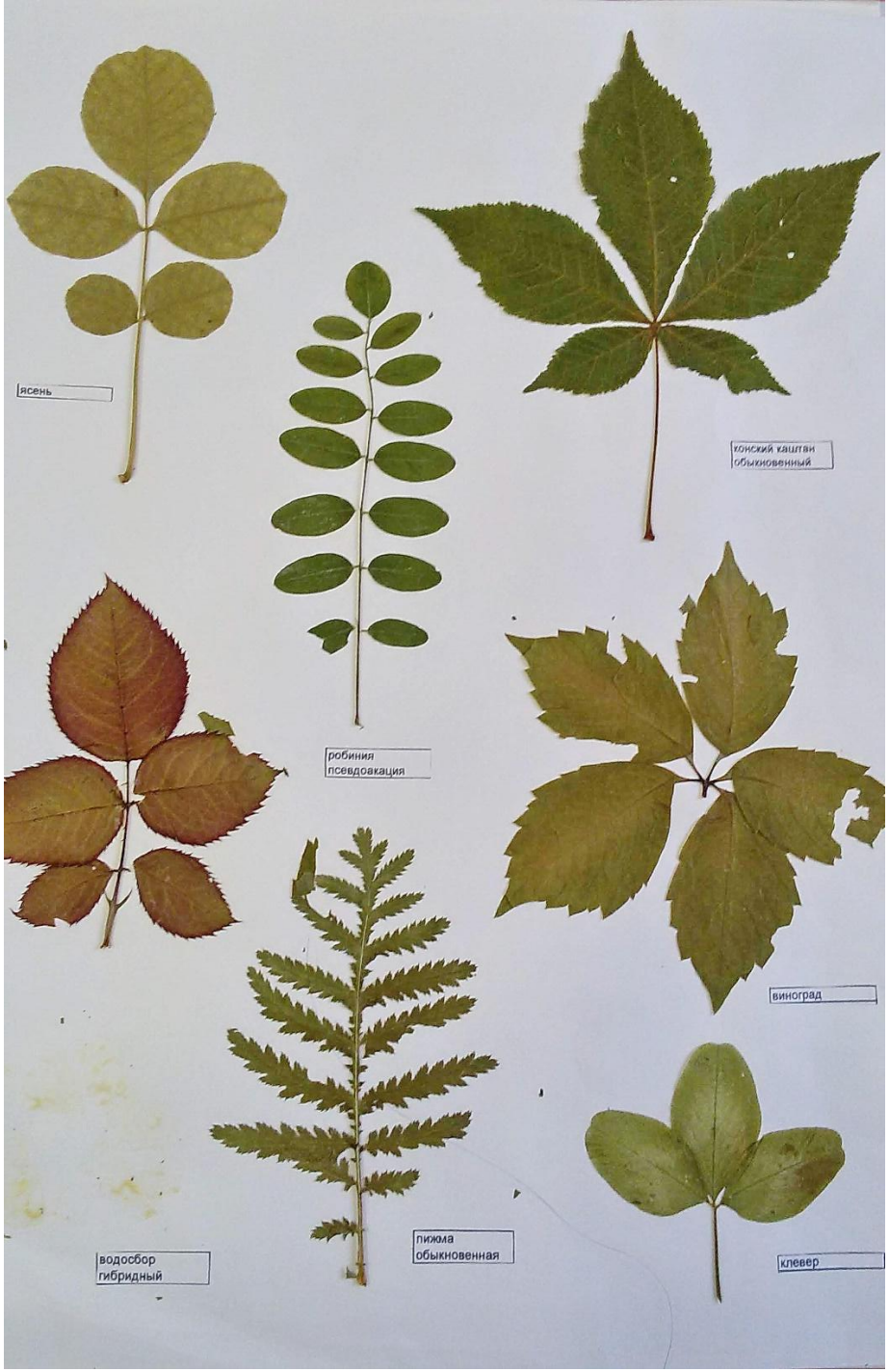
Смородина черная
Ribes nigrum

Груша обыкновенная
Pyrus communis

Дуб черешчатый
Quercus robur

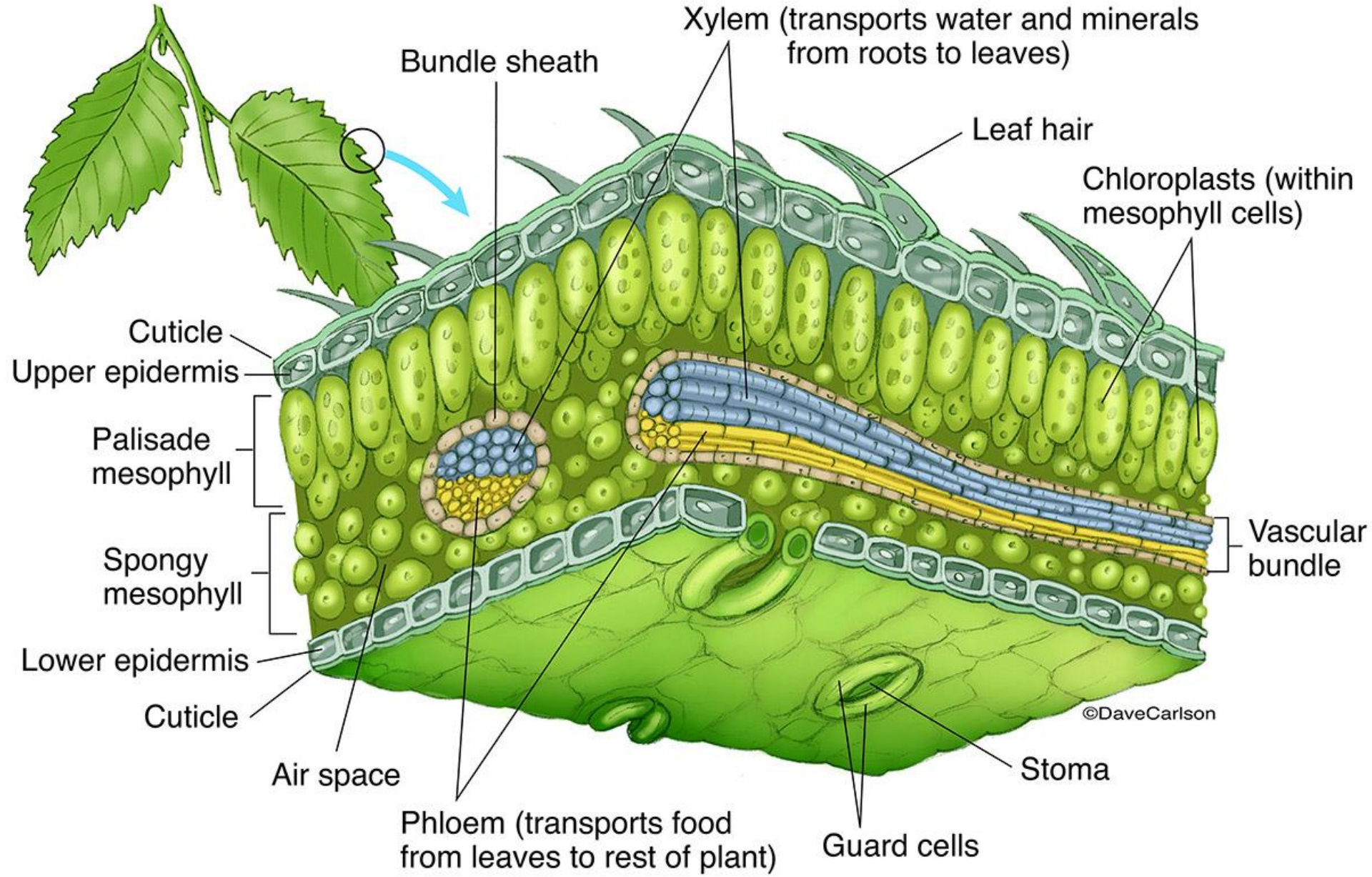

клен
татарский
береза
повислая
липа
сердцевидная
черемуха
обыкновенная
каштан конский
обыкновенный
скумпия
кожевенная
абрикос
обыкновенный
смородина
черная
дуб
обыкновенный


морковь
пион
конопля
посевная
клевер
ползучий
водосбор
гибридный
роза

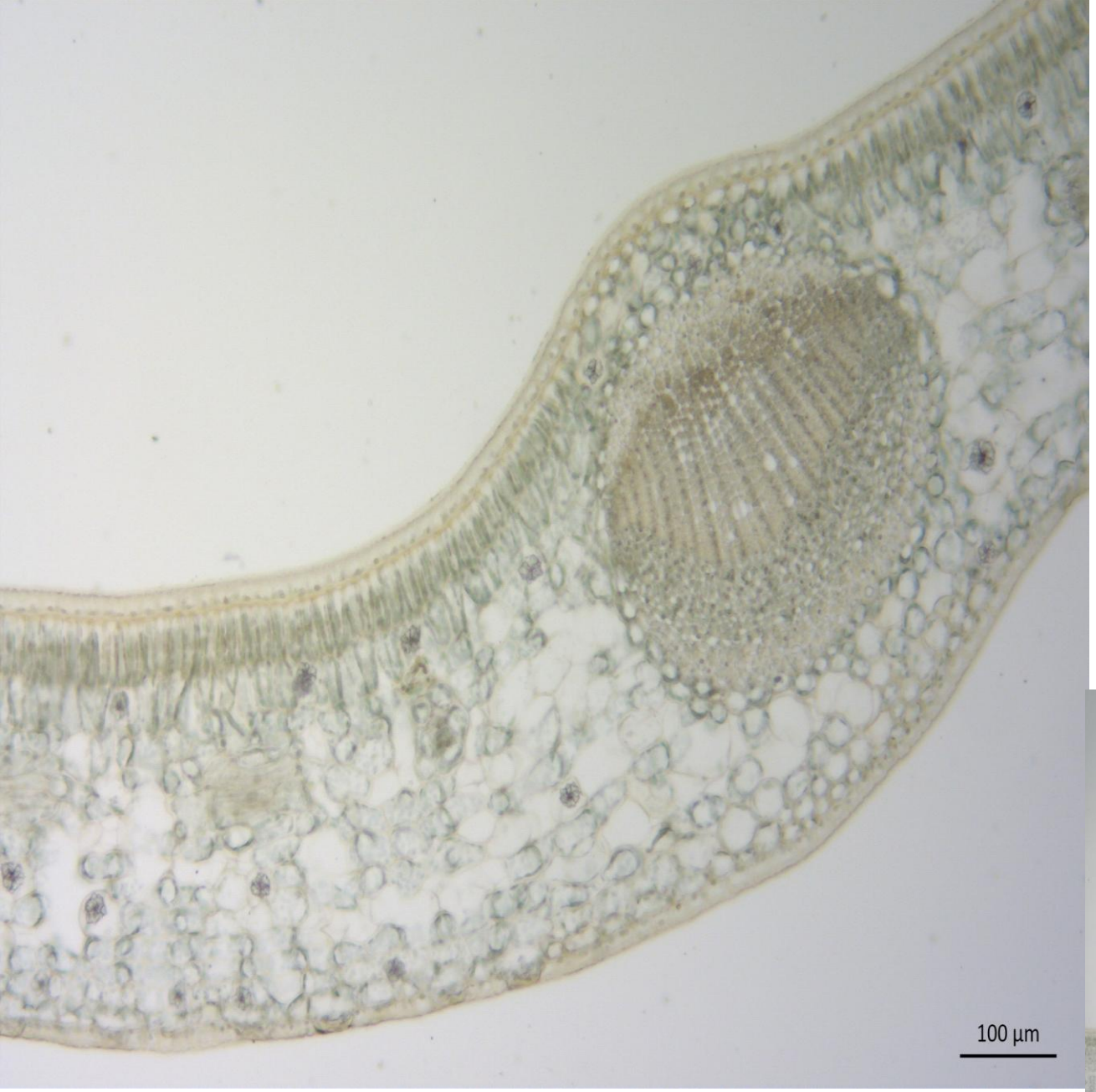

ясень
конский каштан обыкновенный
робиния псевдоакация
виноград
водосбор гибридный
пижма обыкновенная
клевер

Dorsoventral leaf

Anatomical structure of the dorsoventral leaf.



Fragments of a cross-section of a camellia leaf

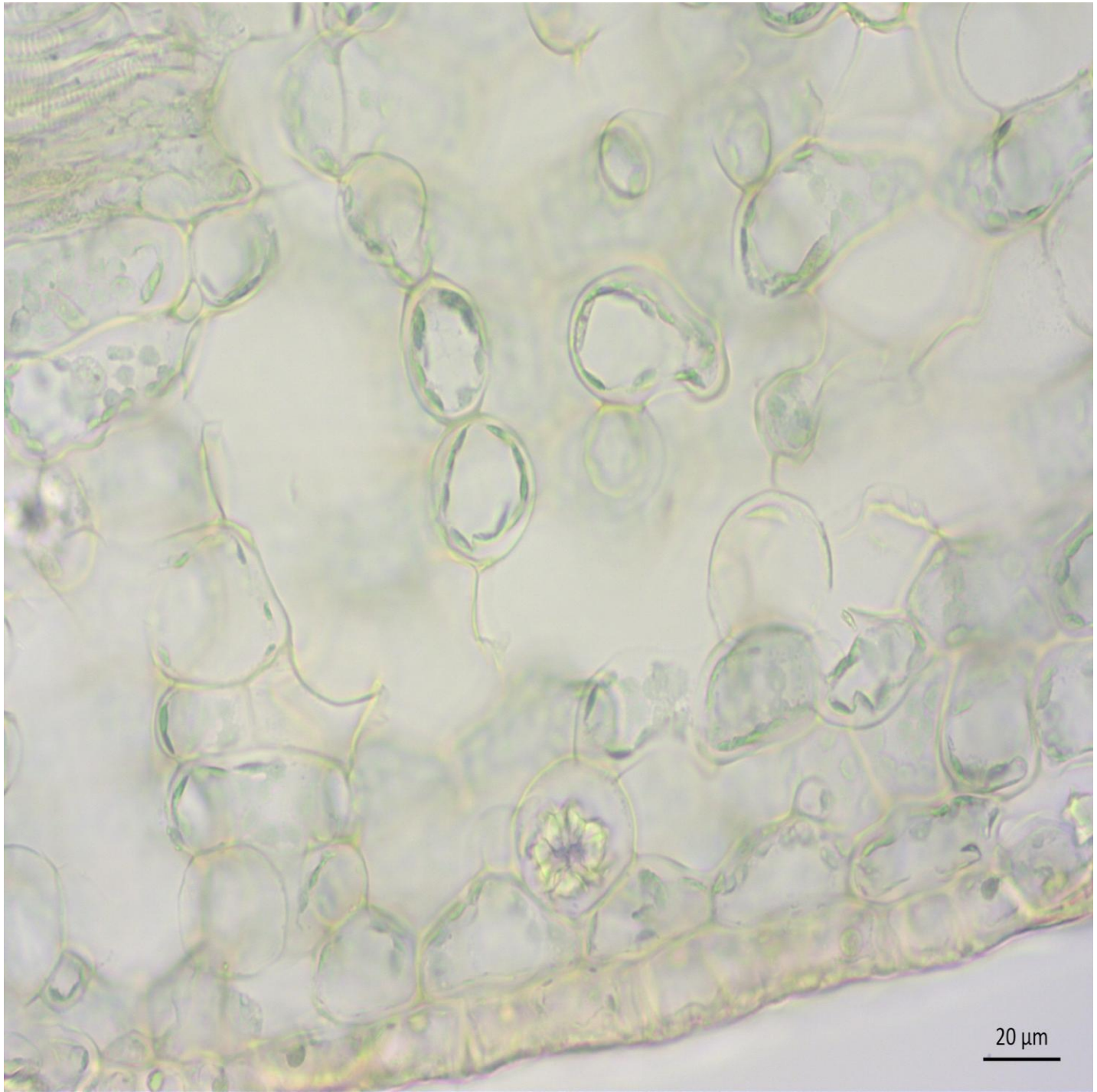


magnification 10X

magnification 4x

A fragment of a cross-section of a camellia leaf at 40x magnificati on

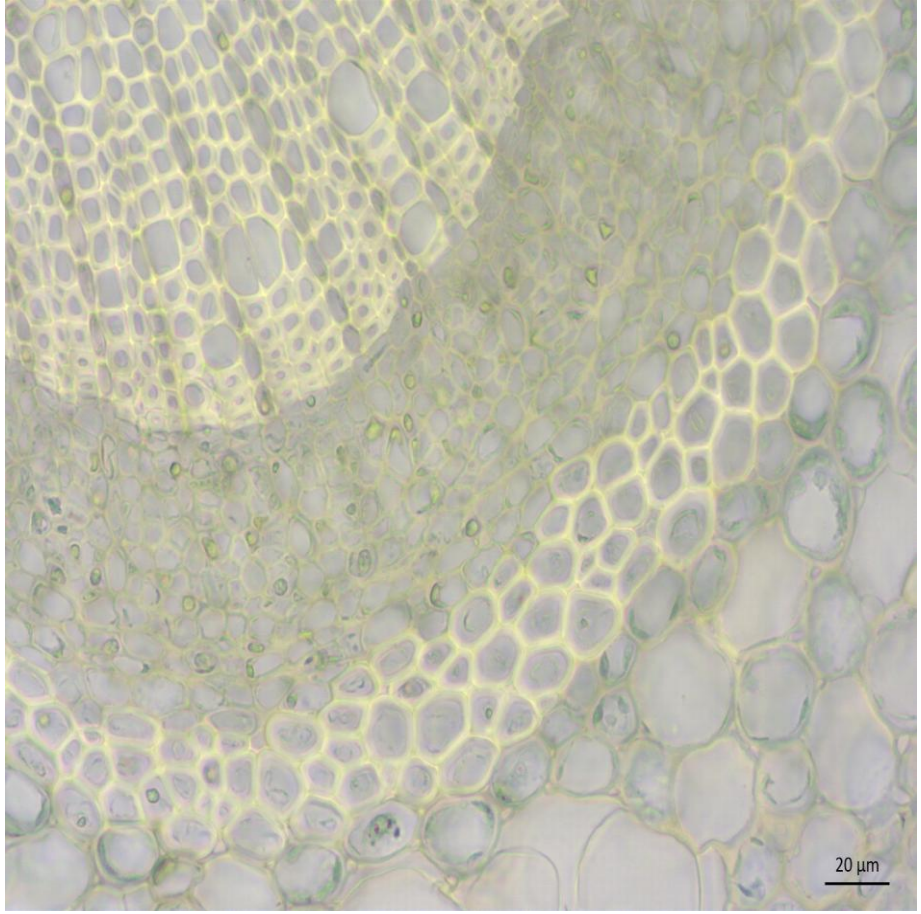
Upper epidermis, palisade and spongy parenchyma



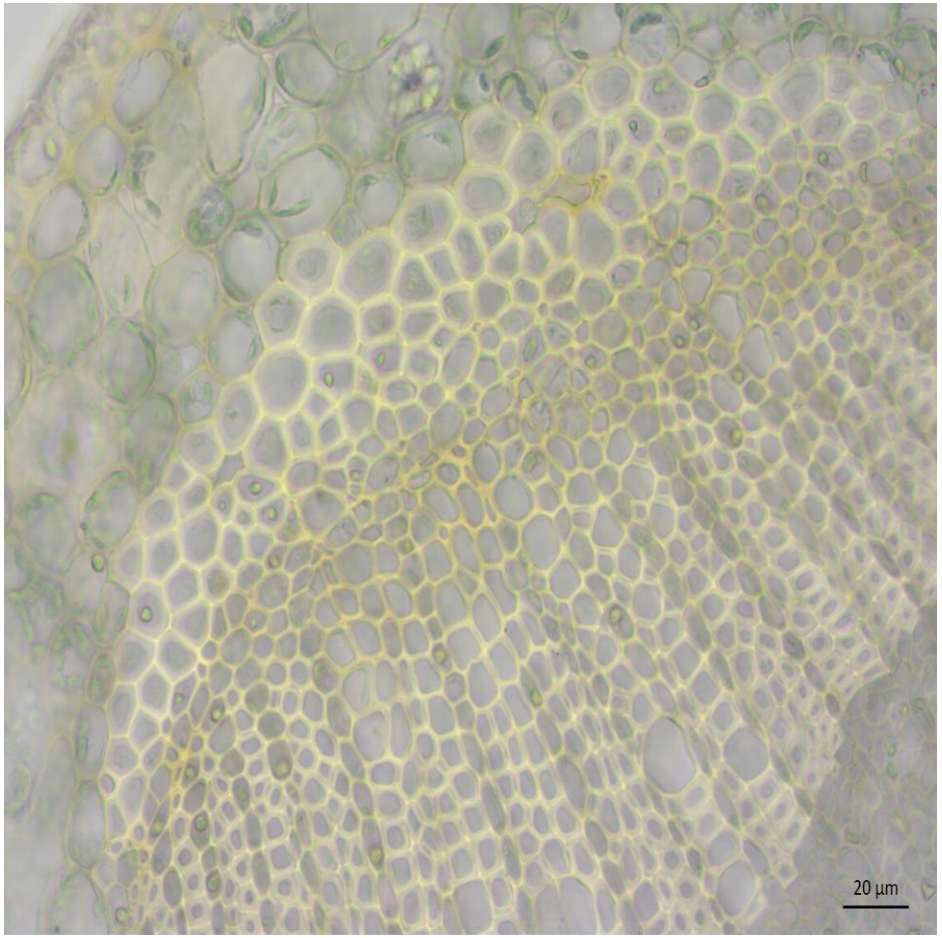
A fragment of a cross-section of a camellia leaf at 40x magnification

Lower epidermis and spongy mesophyll

Fragments of a cross-section of a camellia leaf at 40x magnification
Проводящий пучок

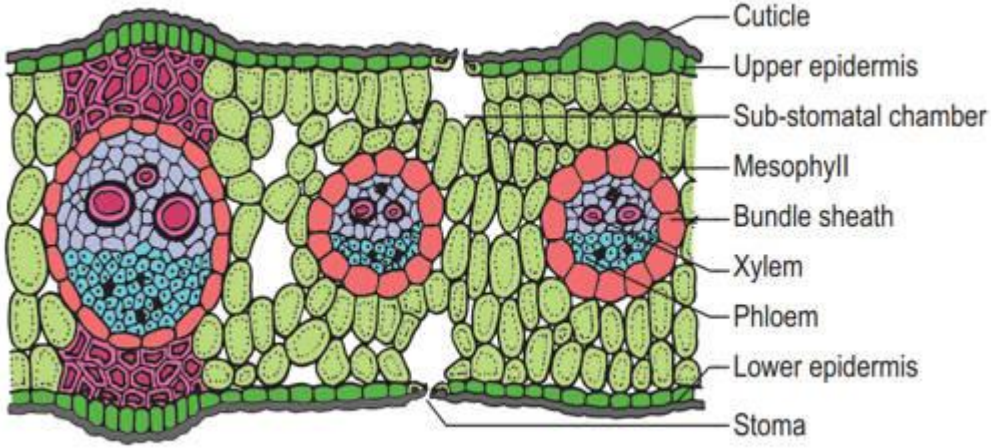


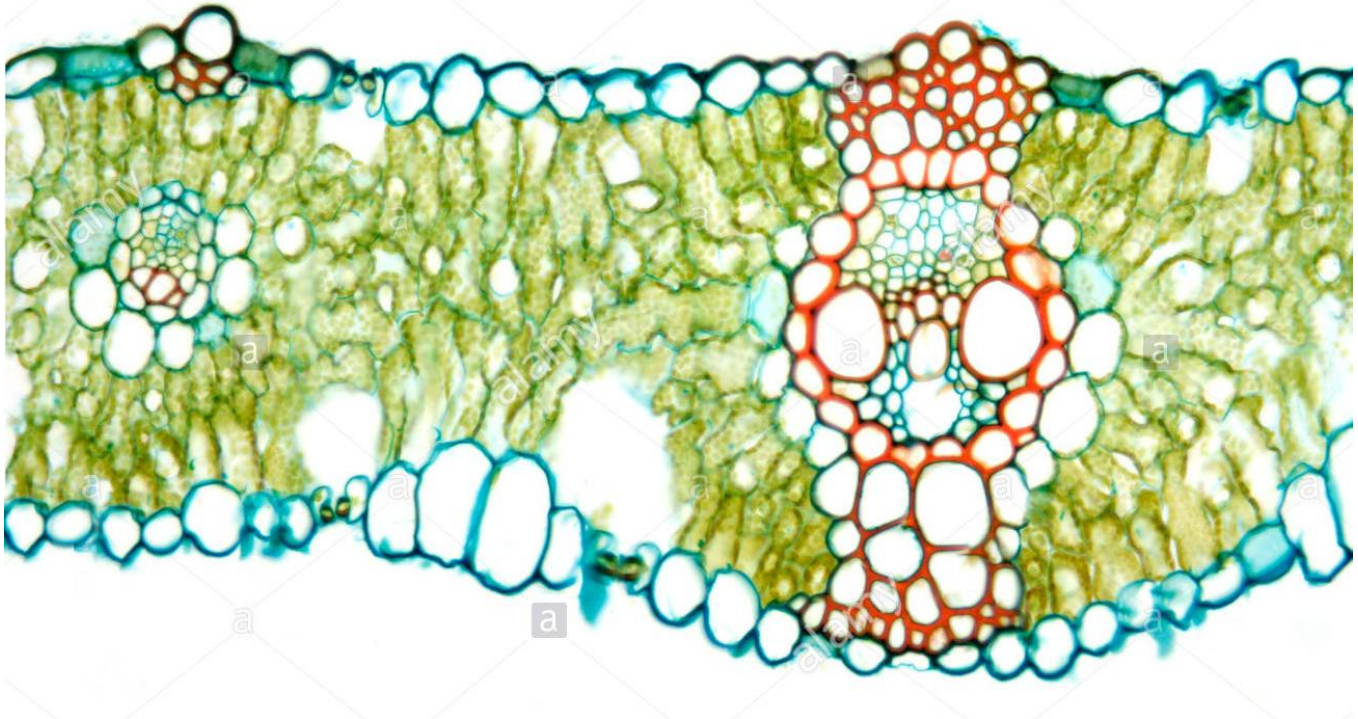
Xylem, phloem, lower mechanical sheath of the vascular bundle



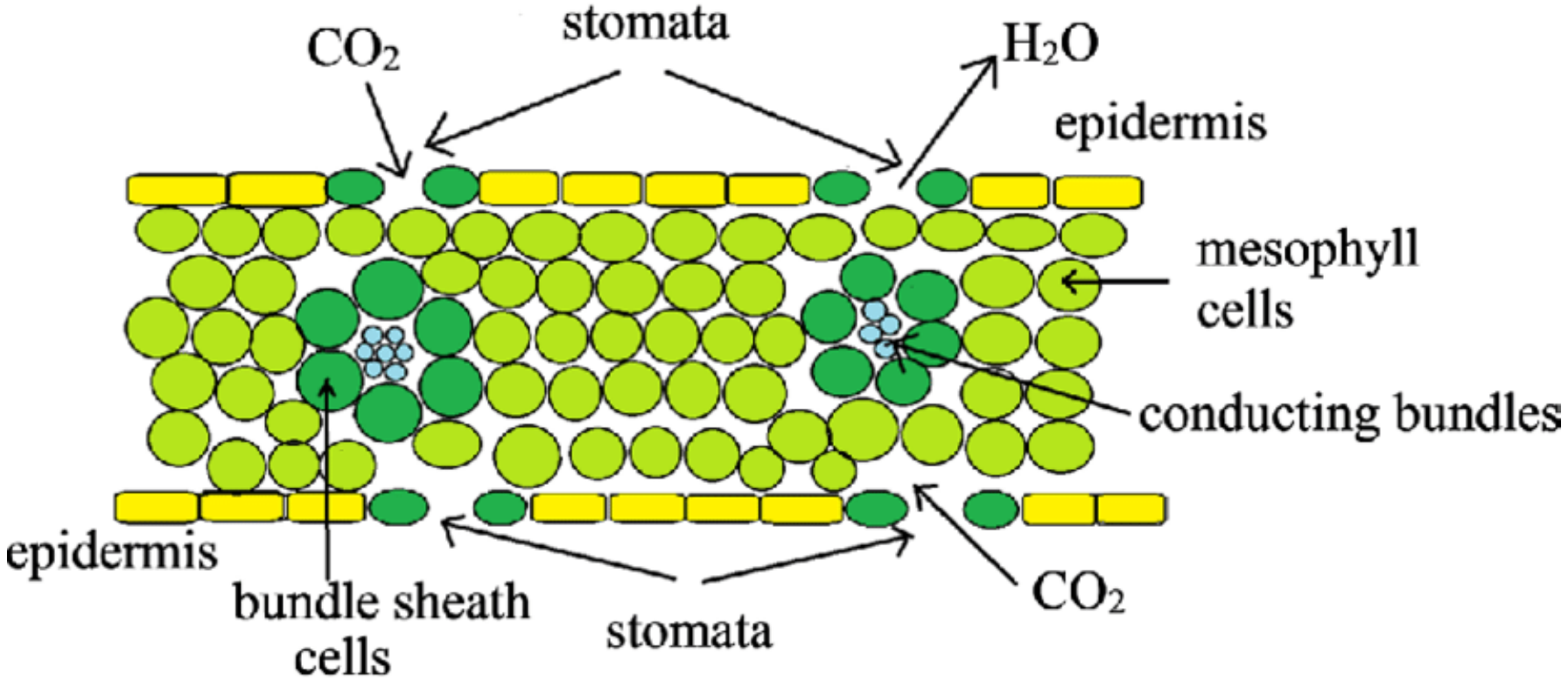
Upper mechanical lining of the vascular bundle and xylem

Isolateral leaves

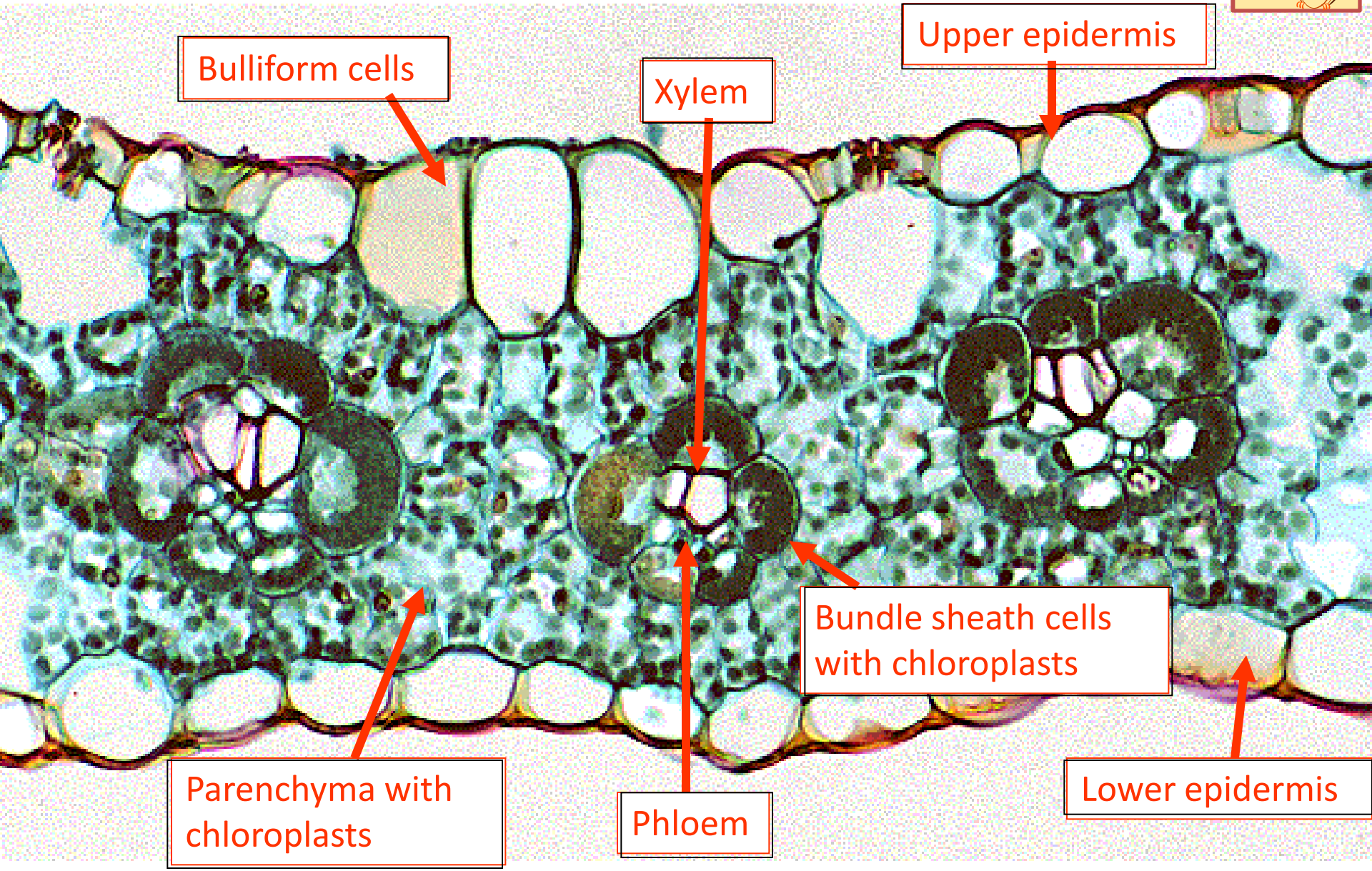

Cuticle
Upper epidermis
Sub-stomatal chamber
Mesophyll
Bundle sheath
Xylem
Phloem
Lower epidermis
Stoma

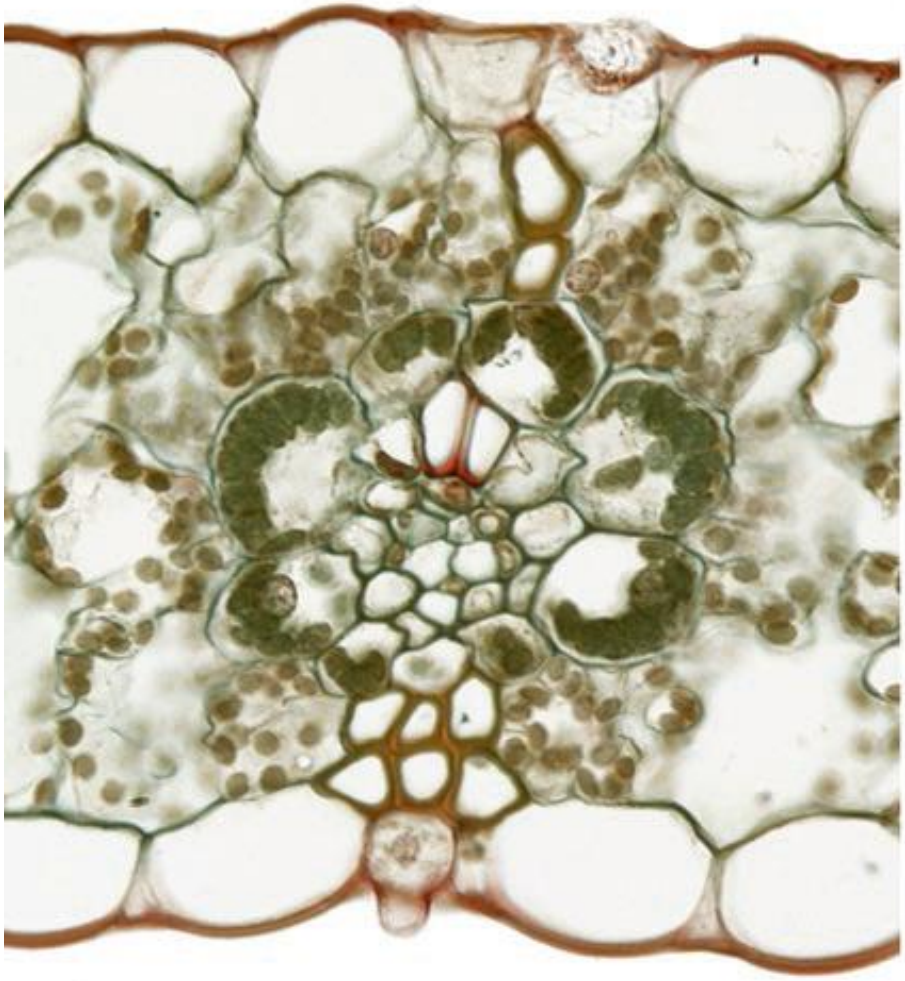


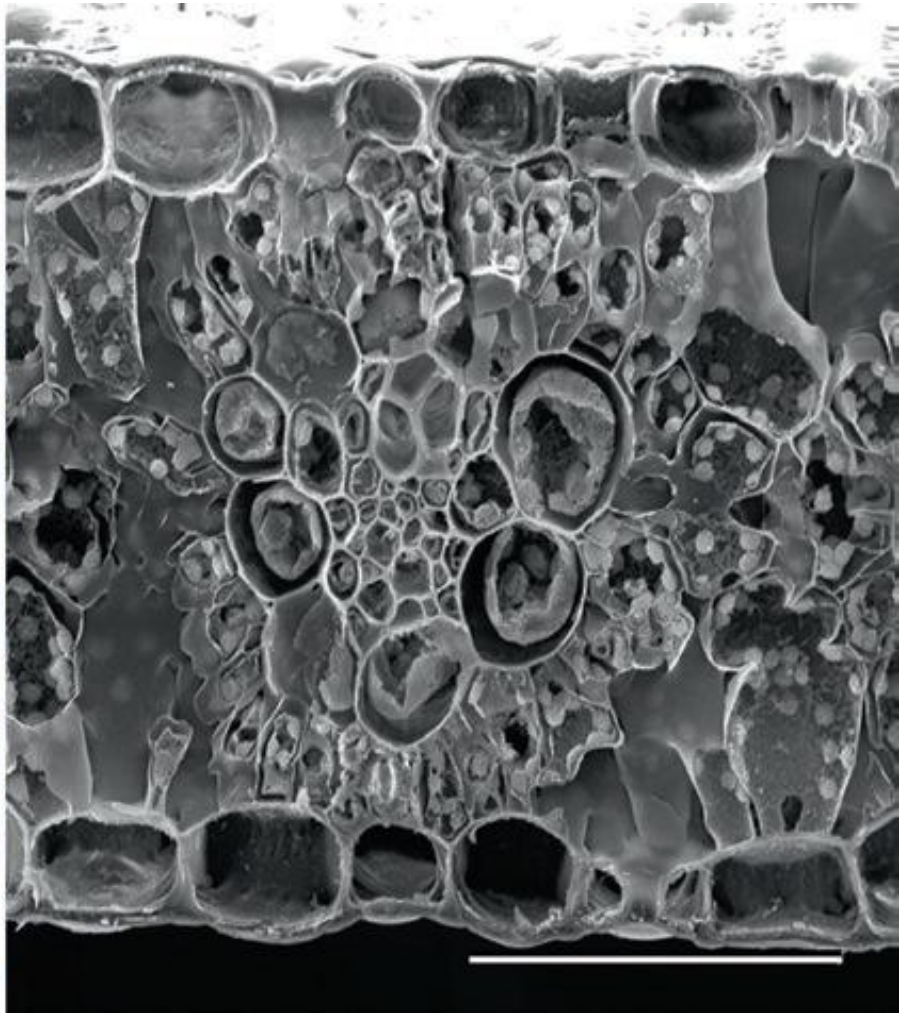
Leaf with Kranz anatomy structure



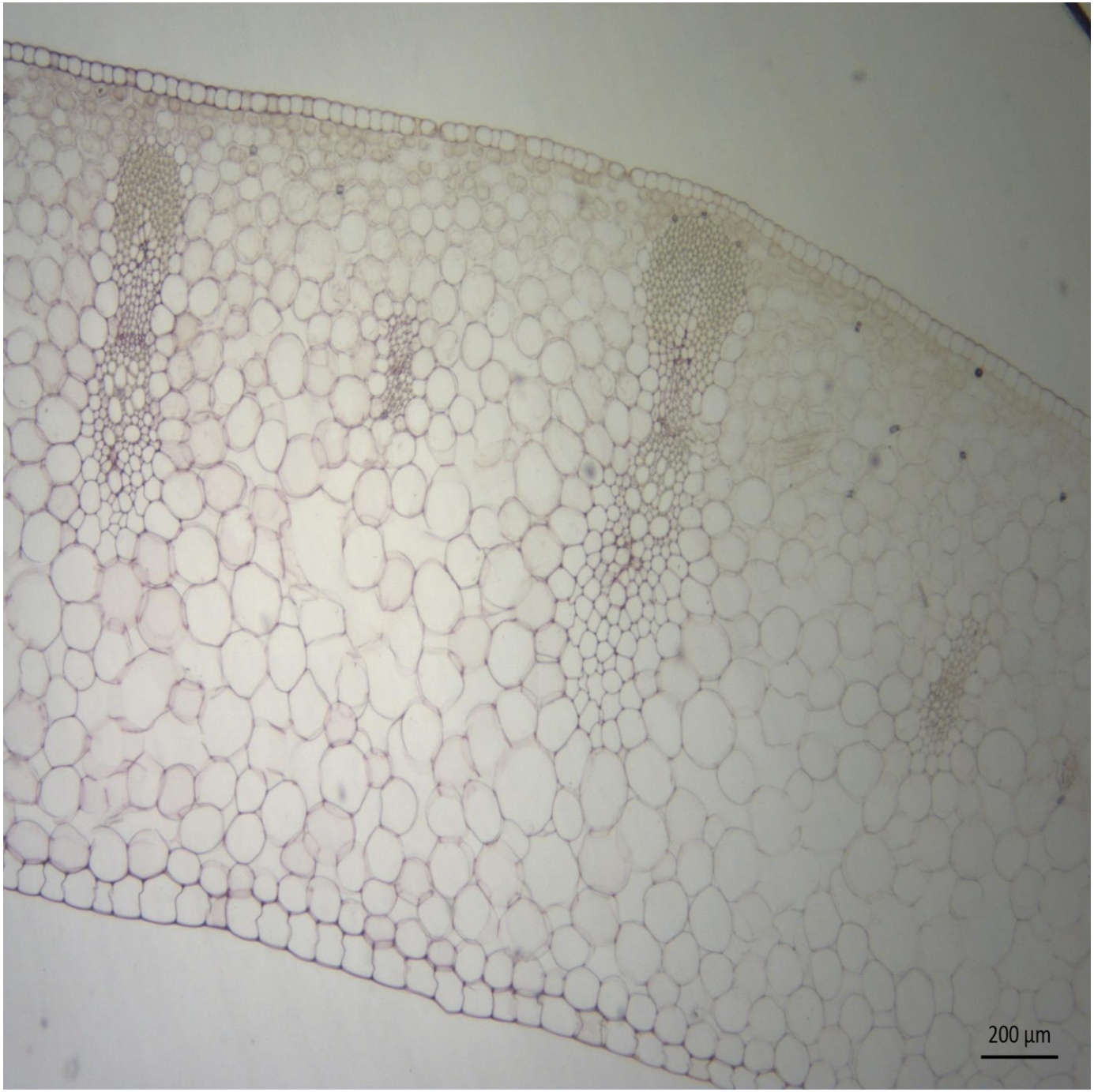
Leaf cross section of *Zea mays* (corn), monocotyledon, C4 plant



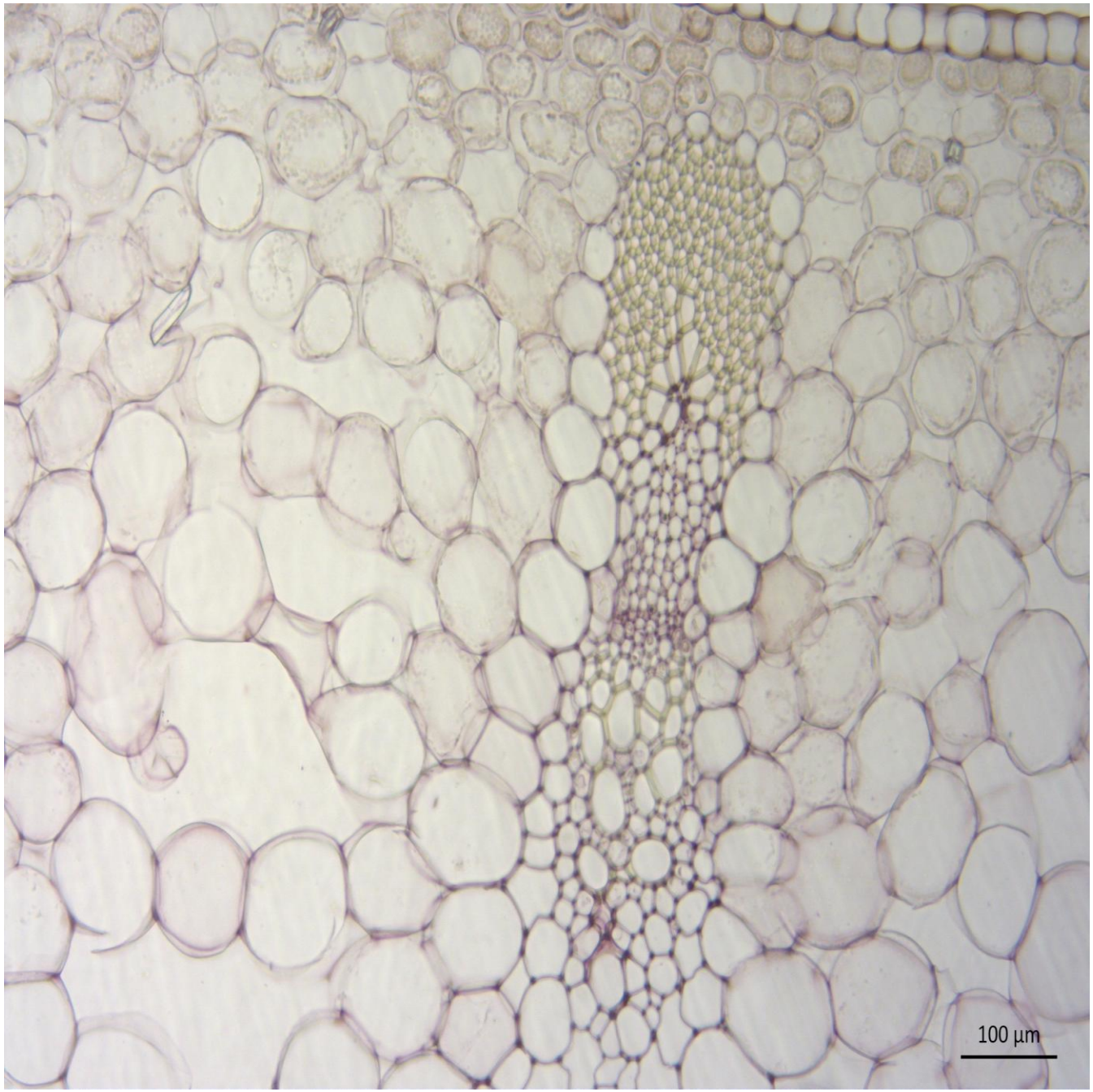




Leaf cross section of *Zea mays*

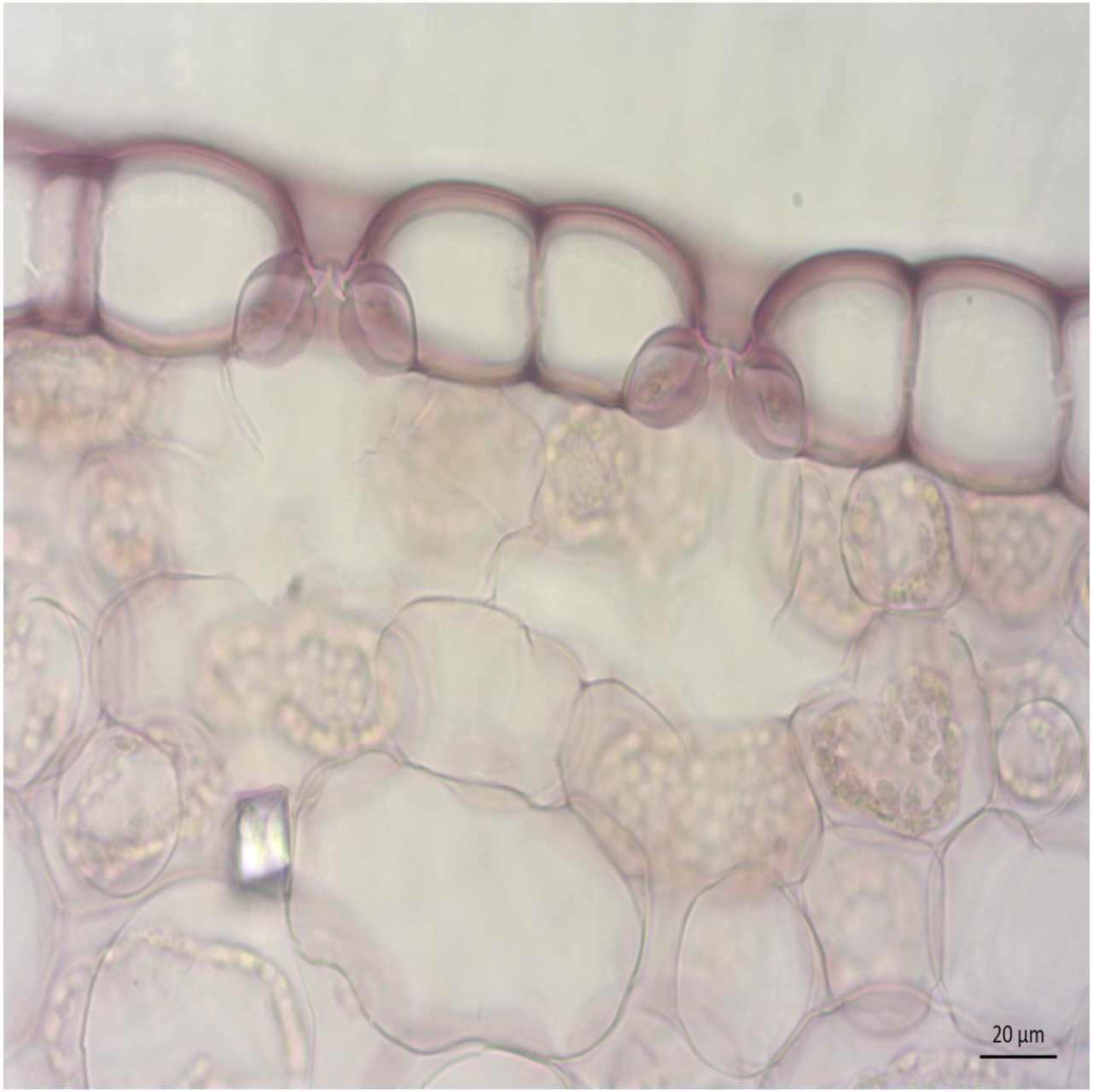


Fragment of a cross-section of an iris leaf at 4x magnification



Fragment of a cross-section of an iris leaf at 10x magnification

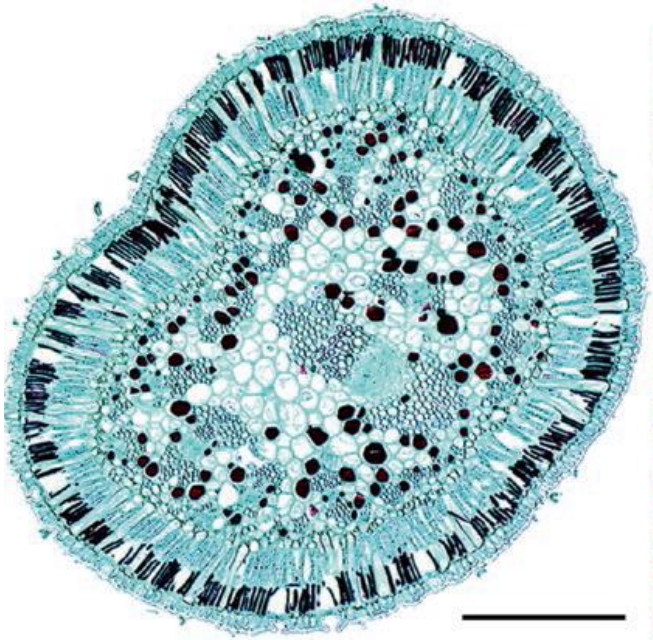
Vascular bundle

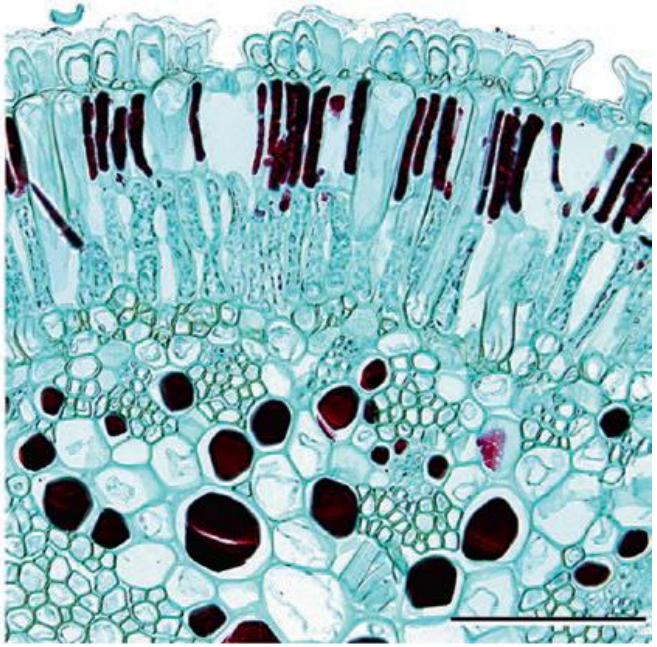


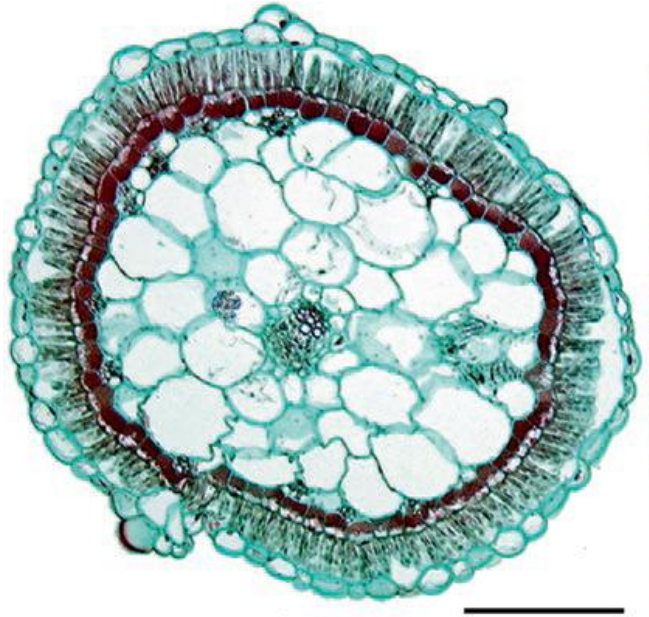
Fragment of a cross-section of an iris leaf at 40x magnification

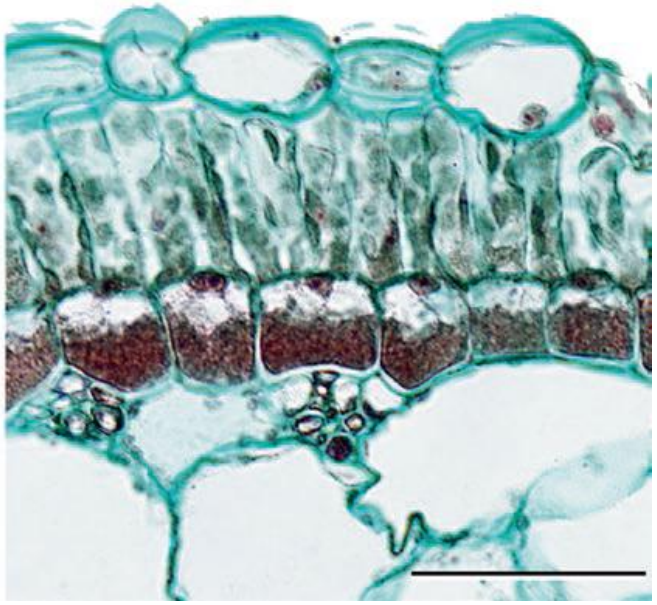
Epidermis and stomata in section

Radial leaves

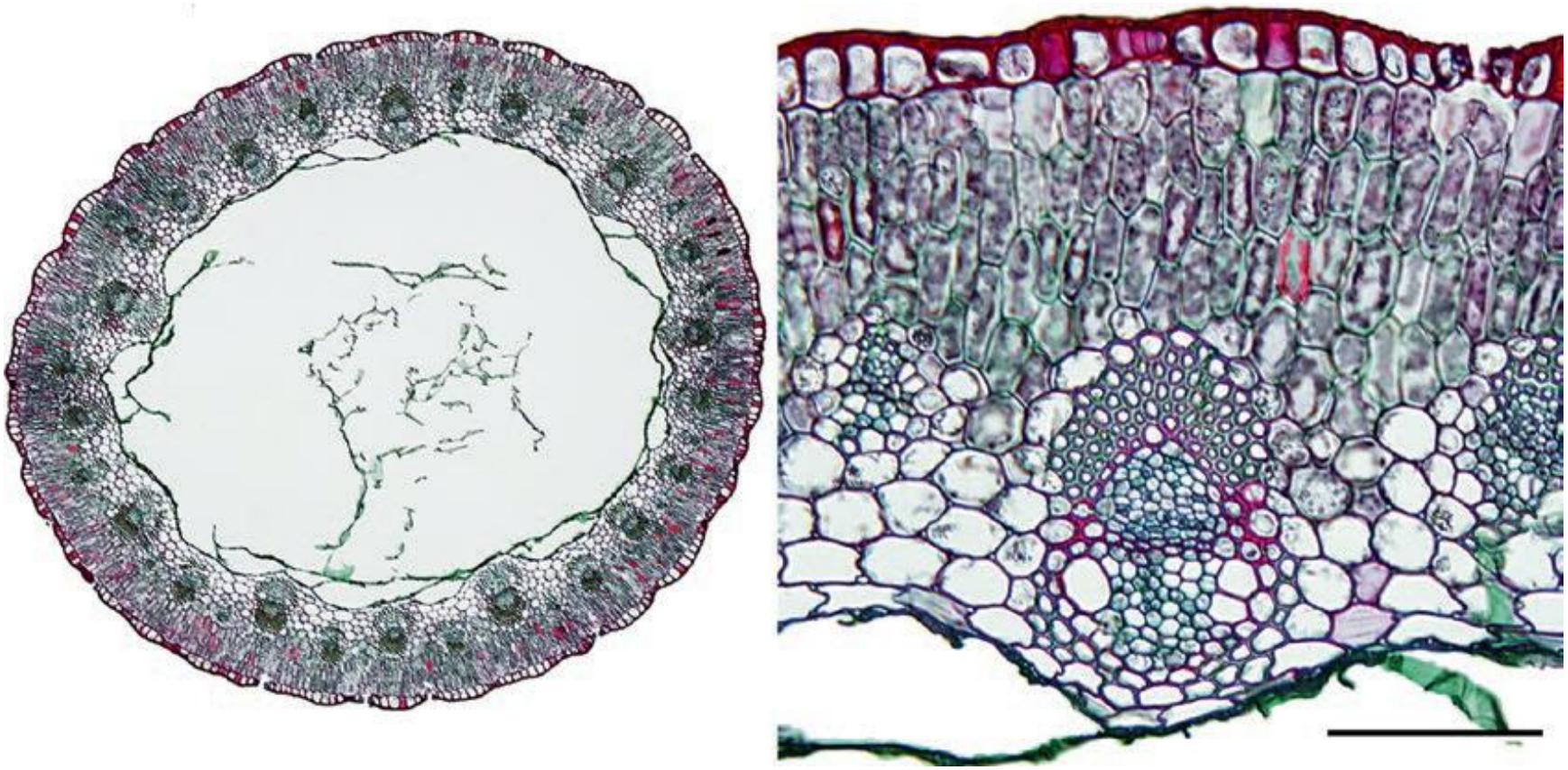






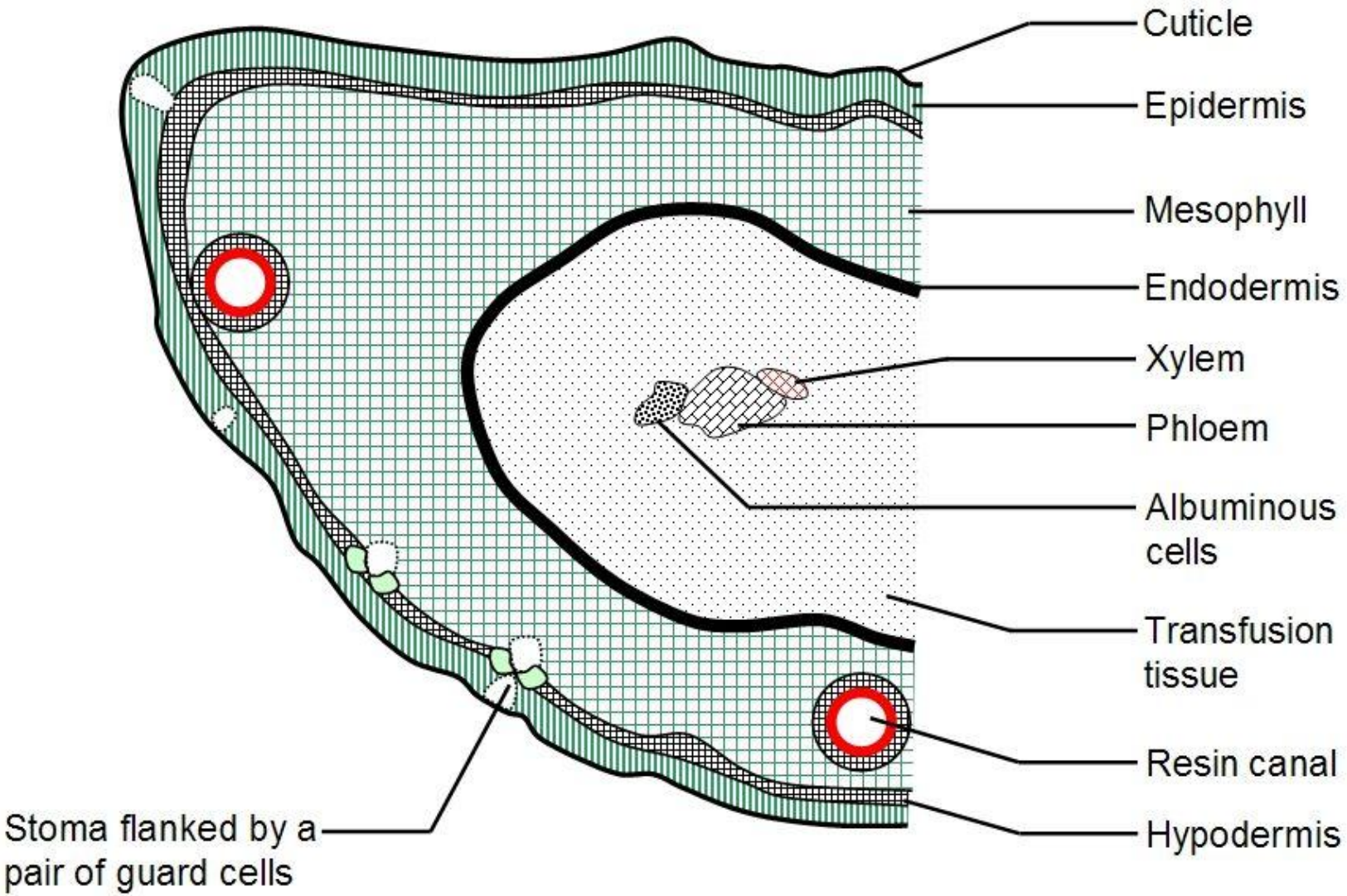


Eudicot centric leaves. m, n Sweet hakea (*Hakea drupacea*) has a double layer of palisade parenchyma surrounding a central core of parenchyma with small vascular bundles scattered throughout. o, p The saltwort (*Salsola* sp.) centric leaf has a single layer of palisade cells to the exterior of a dense bundle sheath. Scattered minor bundles lie just inside the bundle sheath. A larger major bundle sits at the center of the water-storing parenchyma.
Scale bars = 250 µm in m, 100 µm in n and o, and 25 µm in p (m–p RR Wise)

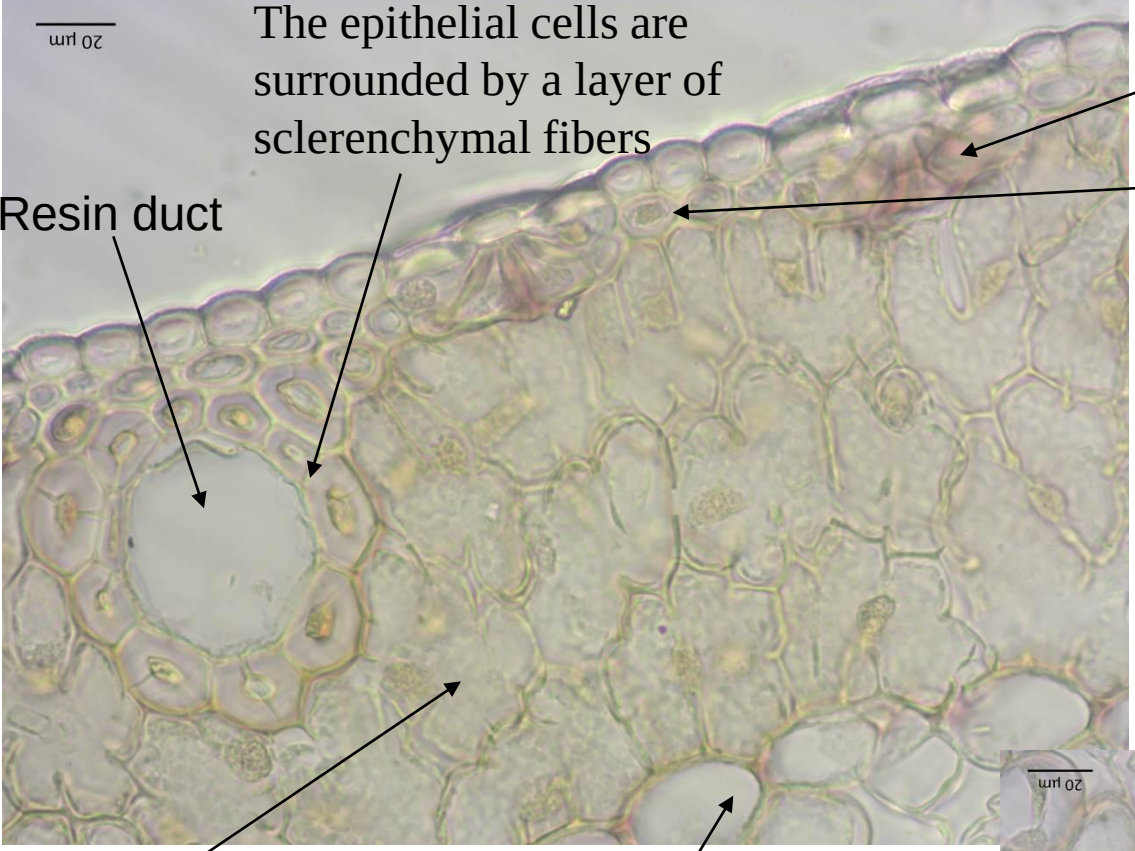


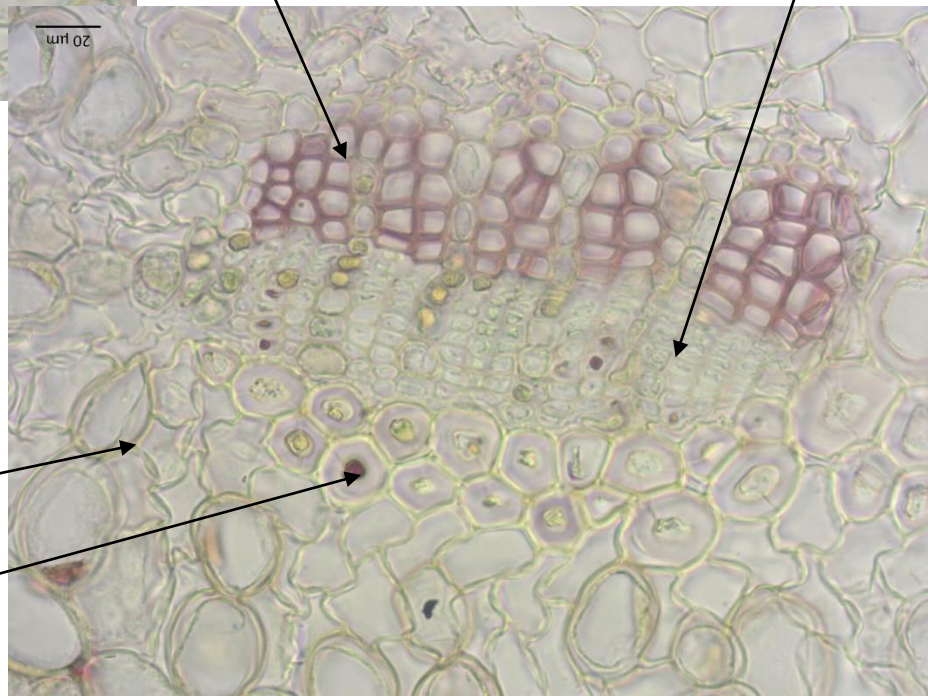
q, r Tubular leaf of bulrush (*Juncus* sp.). Scale bars = 250 μm in q and 50 μm in r (q, r RR Wise)

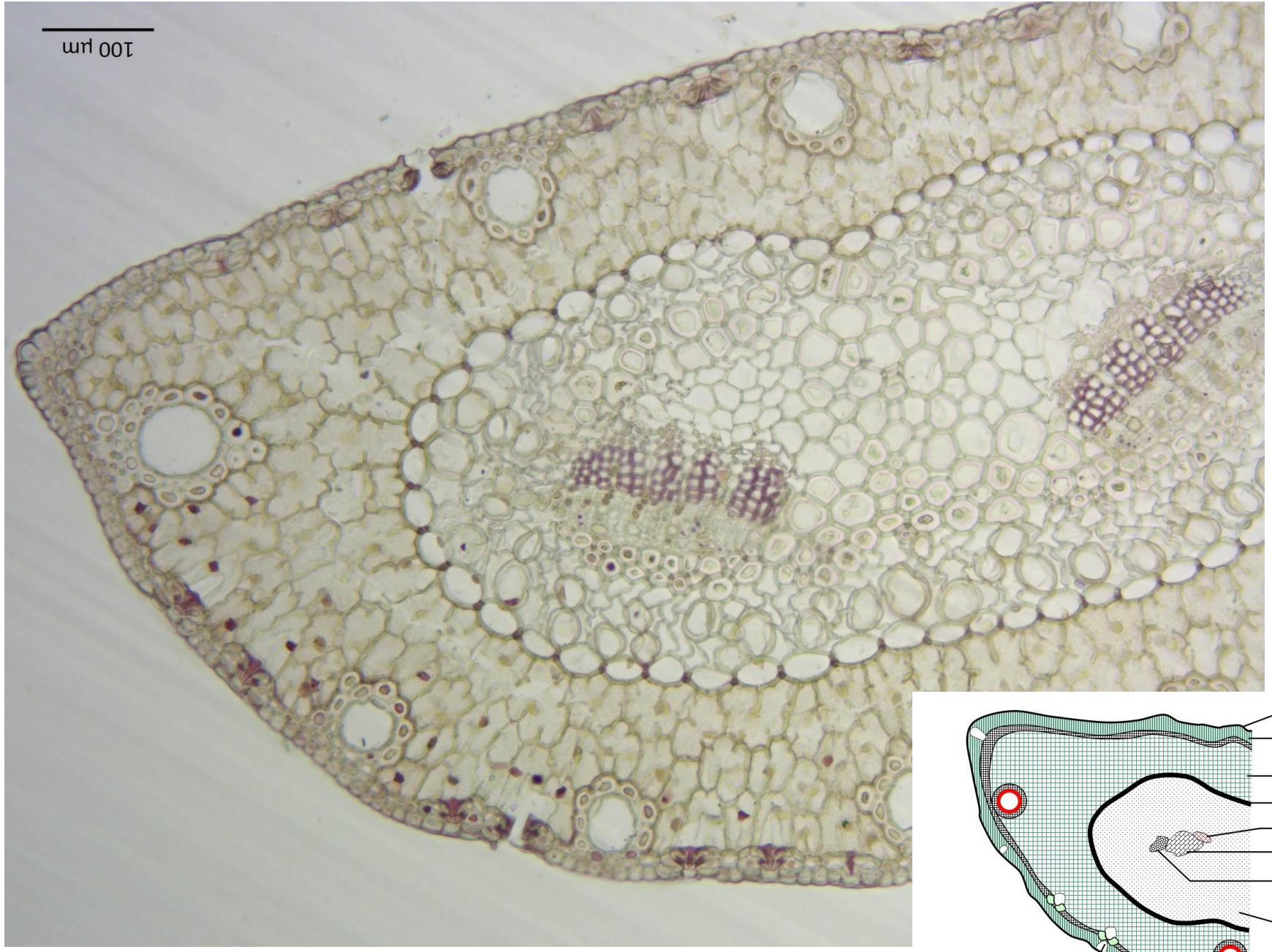
The structure of the leaf of conifers

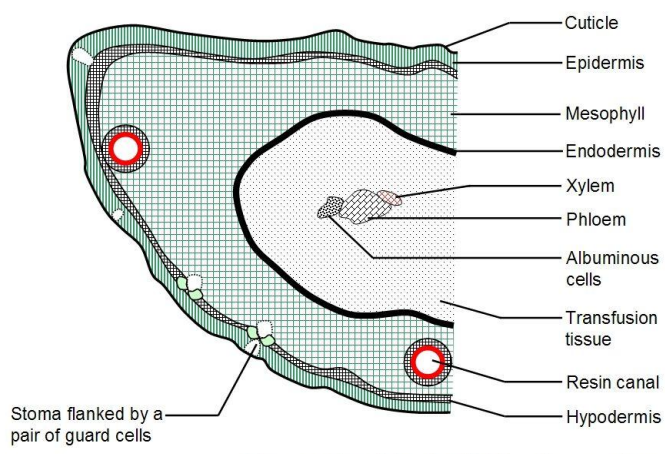


Pinus sylvestris – leaf T.S. – tissue plan


20 µm
The epithelial cells are surrounded by a layer of sclerenchymal fibers
Stomata
Hypodermis
Resin duct
The folded parenchyma
Endoderm with Caspari spots


20 µm
Xylem
Phloem
Transfusion tissue
Sclerenchyma bands





Pinus sylvestris – leaf T.S. – tissue plan