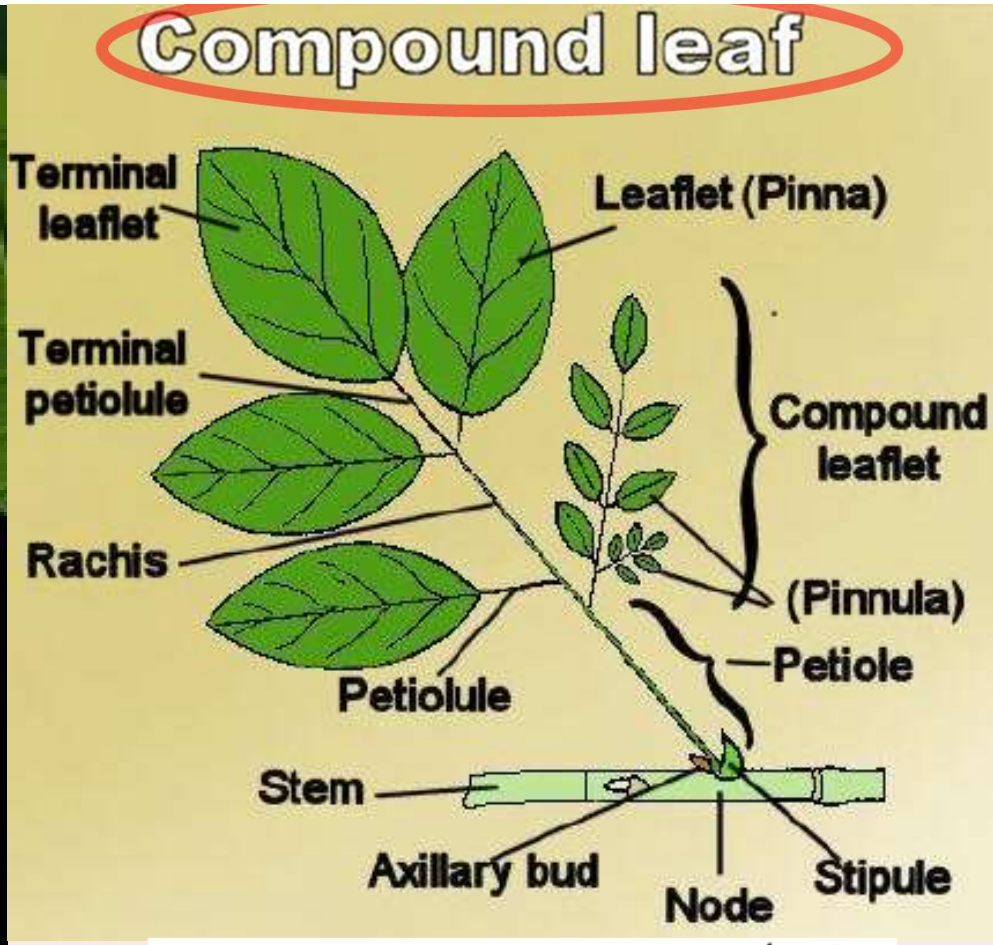
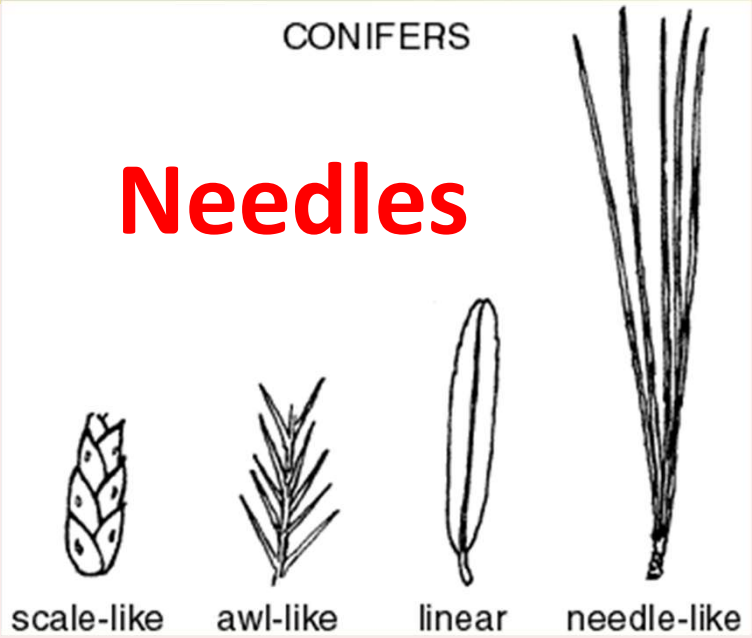
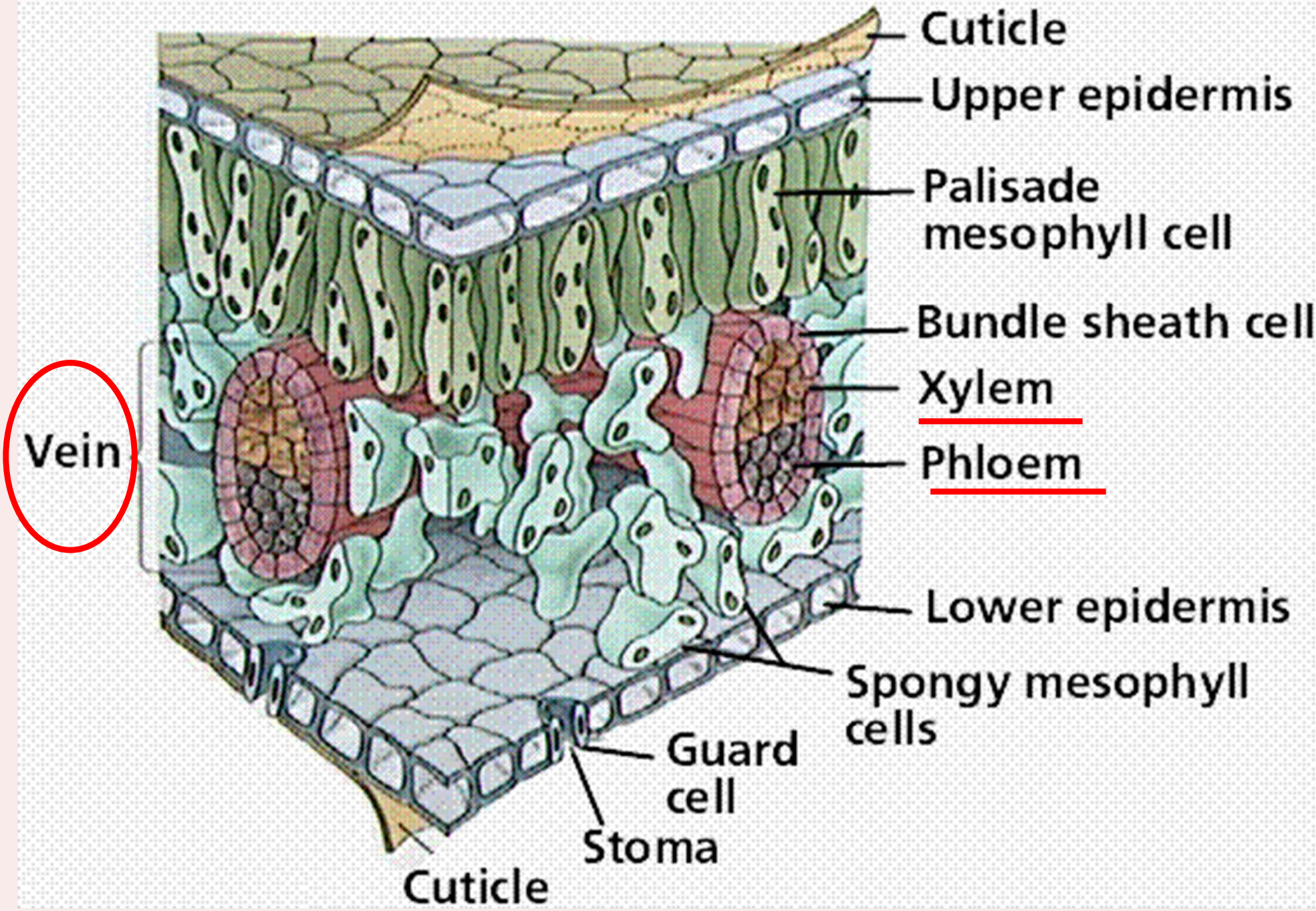
Part Two: Tree Anatomy

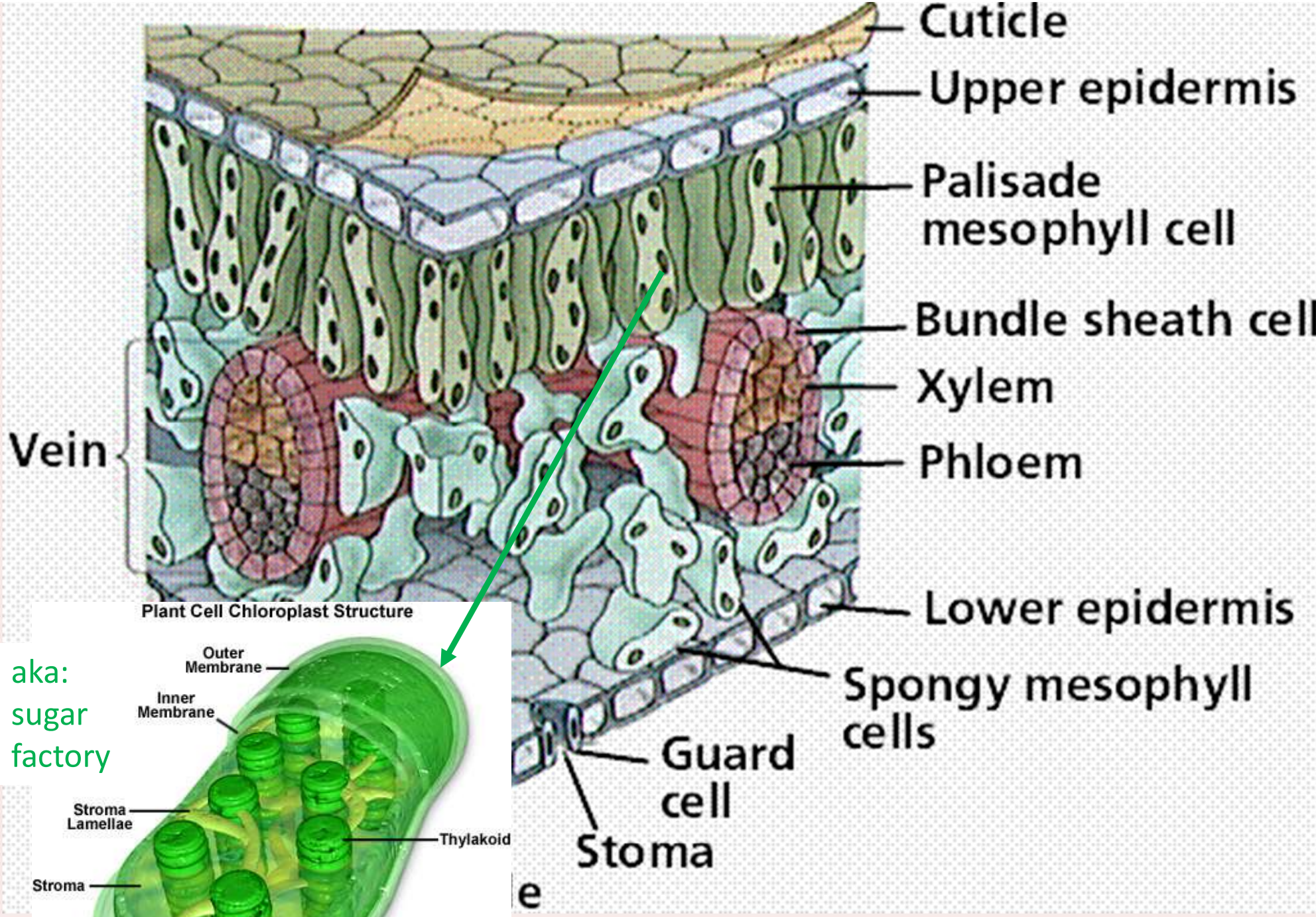

Leaf stalk or petiole
θ
Leaf Axil
Simple Leaf
Leaf Margin
Main Vein
Lateral Vein


Compound leaf
Terminal leaflet
Leaflet (Pinna)
Terminal petiolule
Compound leaflet
Rachis
(Pinnula)
Petiole
Petiolule
Stem
Axillary bud
Node
Stipule


CONIFERS
Needles
scale-like
awl-like
linear
needle-like

Leaf Cross Section





aka: sugar factory

Plant Cell Chloroplast Structure

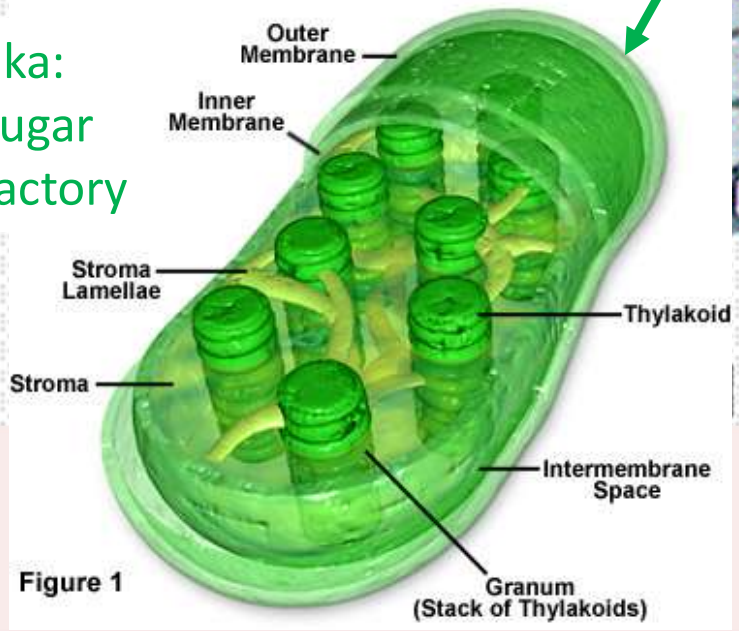
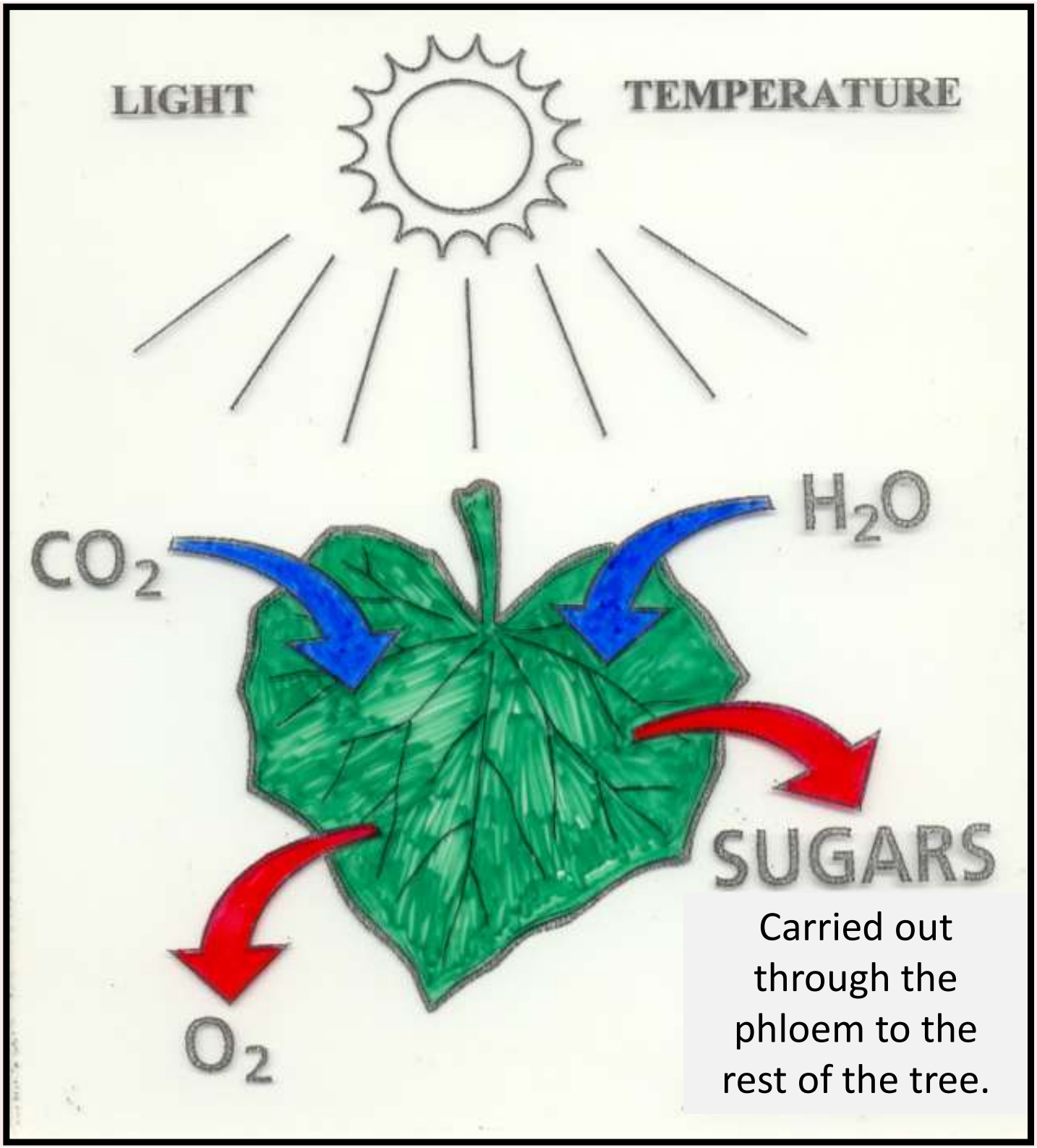
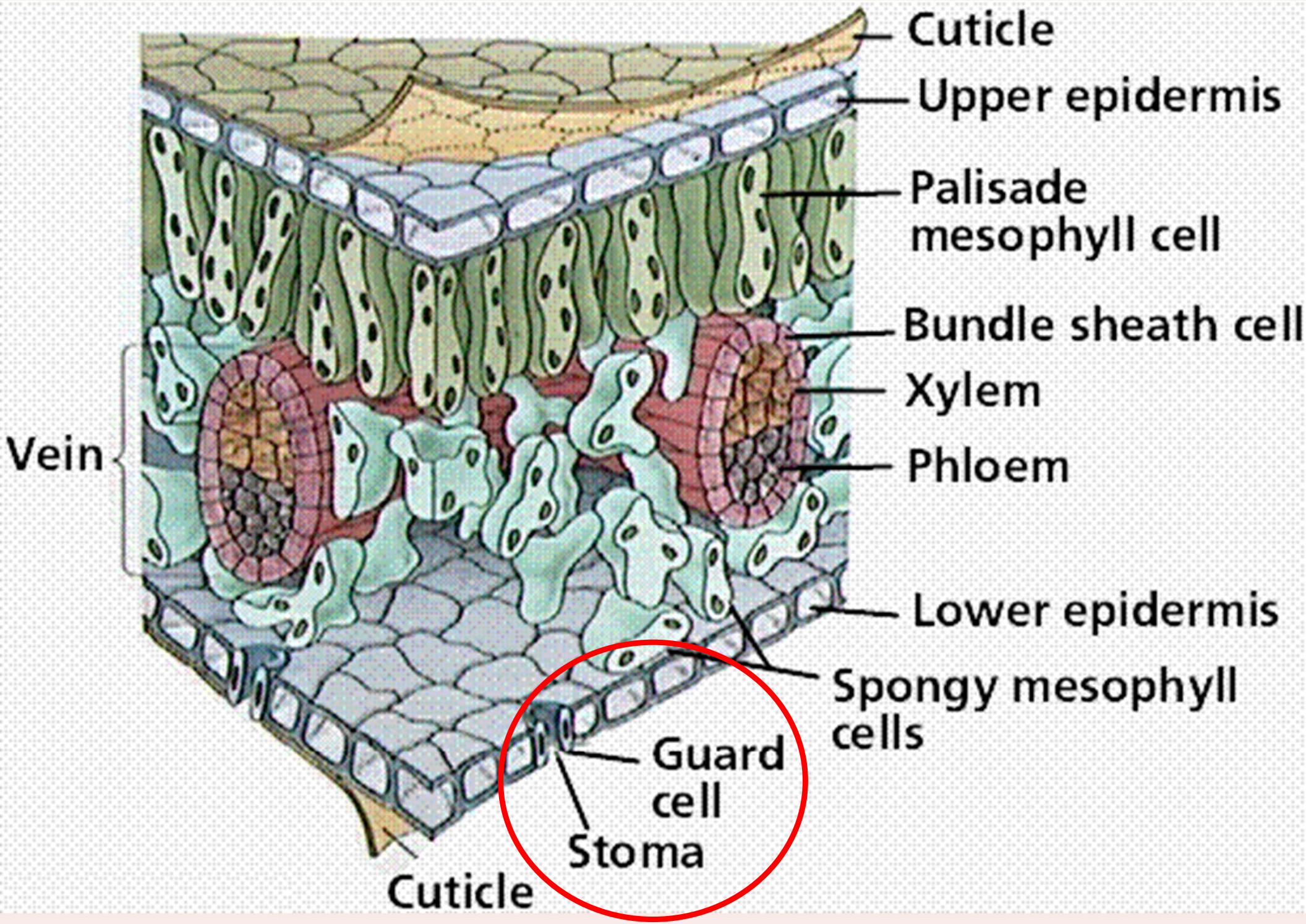


Figure 1



Carried out through the phloem to the rest of the tree.


Cuticle
Upper epidermis
Palisade mesophyll cell
Bundle sheath cell
Xylem
Phloem
Vein
Lower epidermis
Spongy mesophyll cells
Guard cell
Stoma
Cuticle

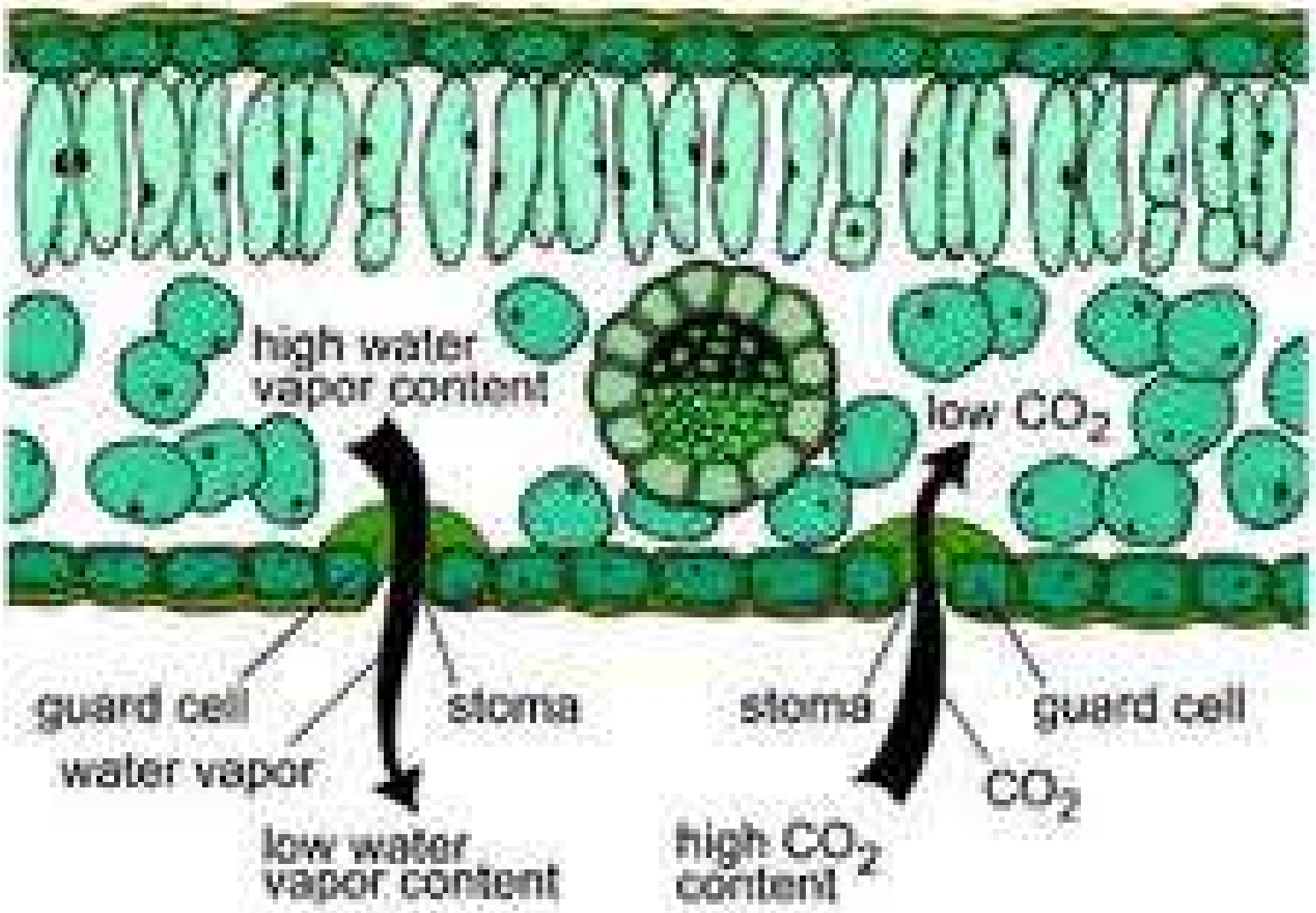
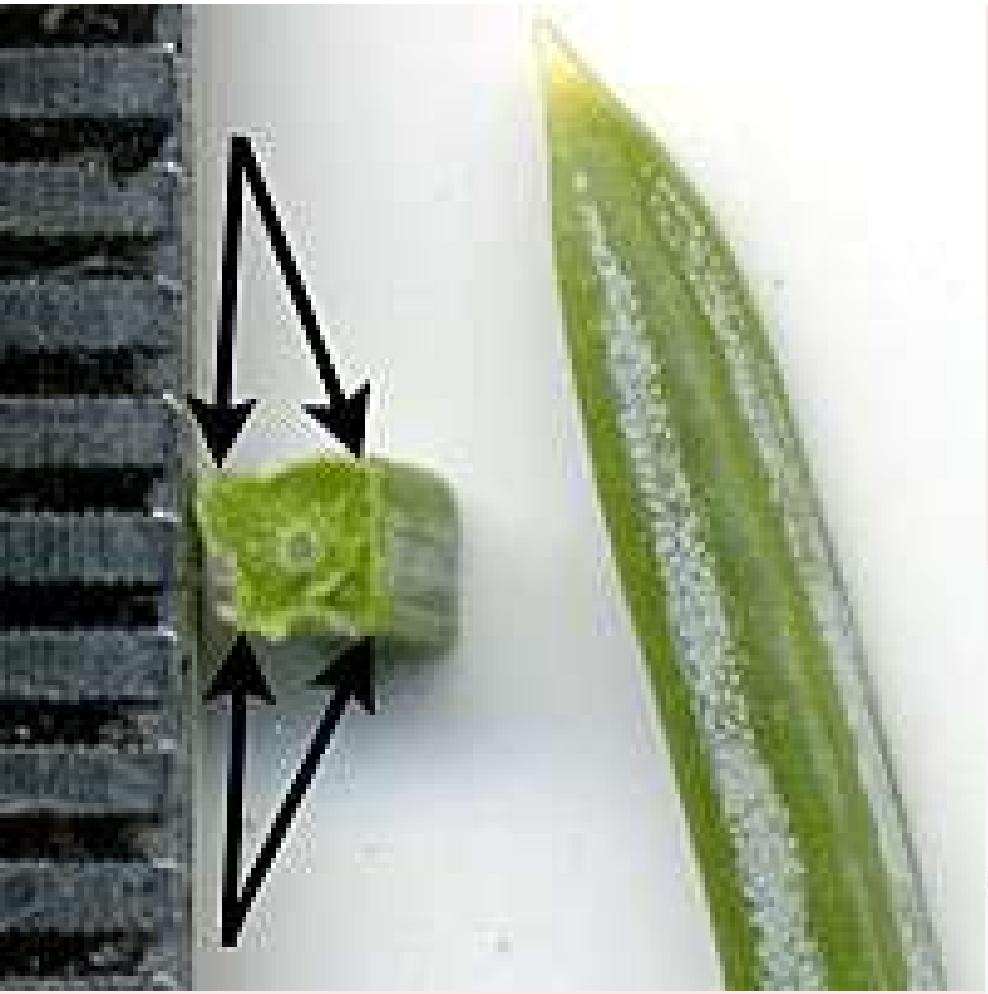
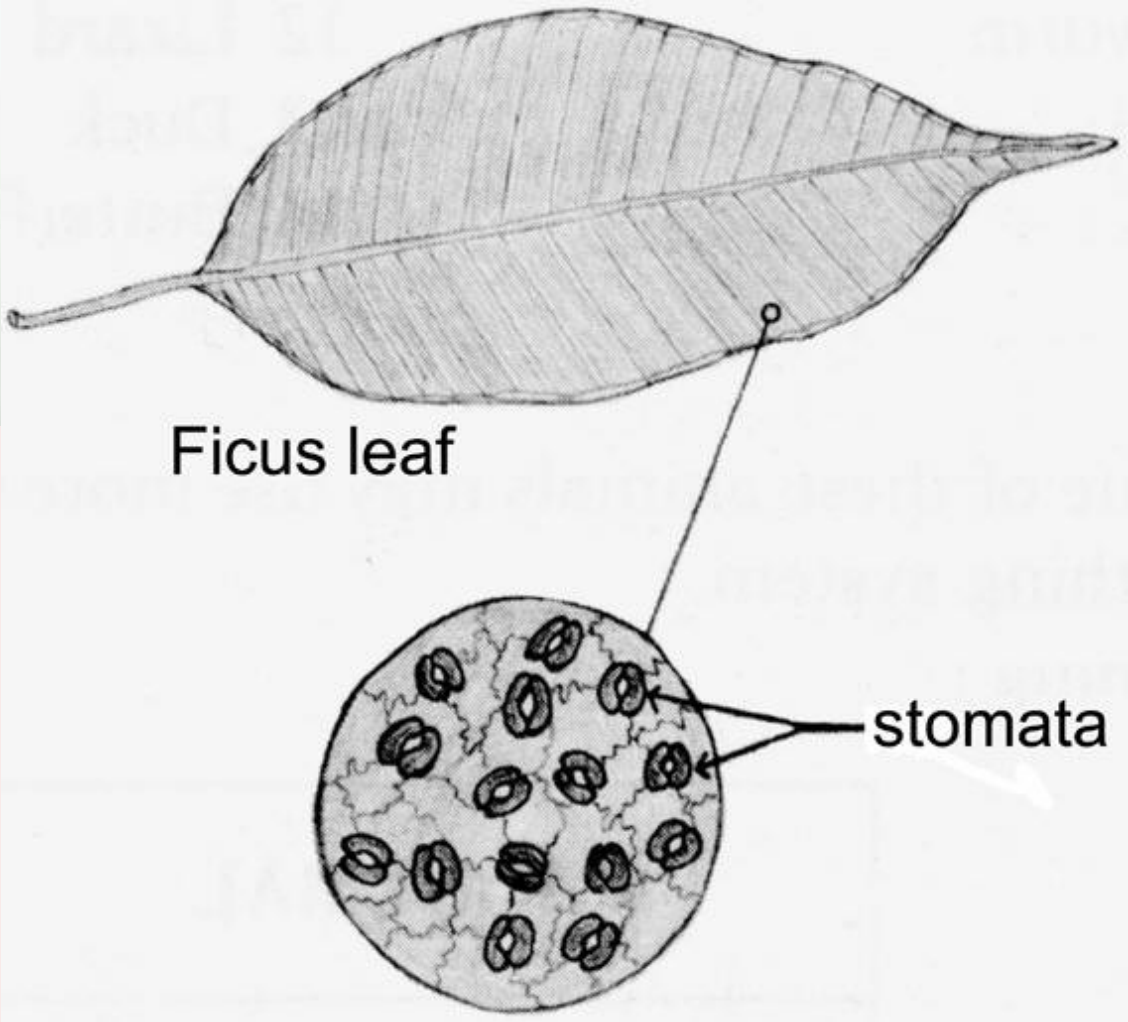


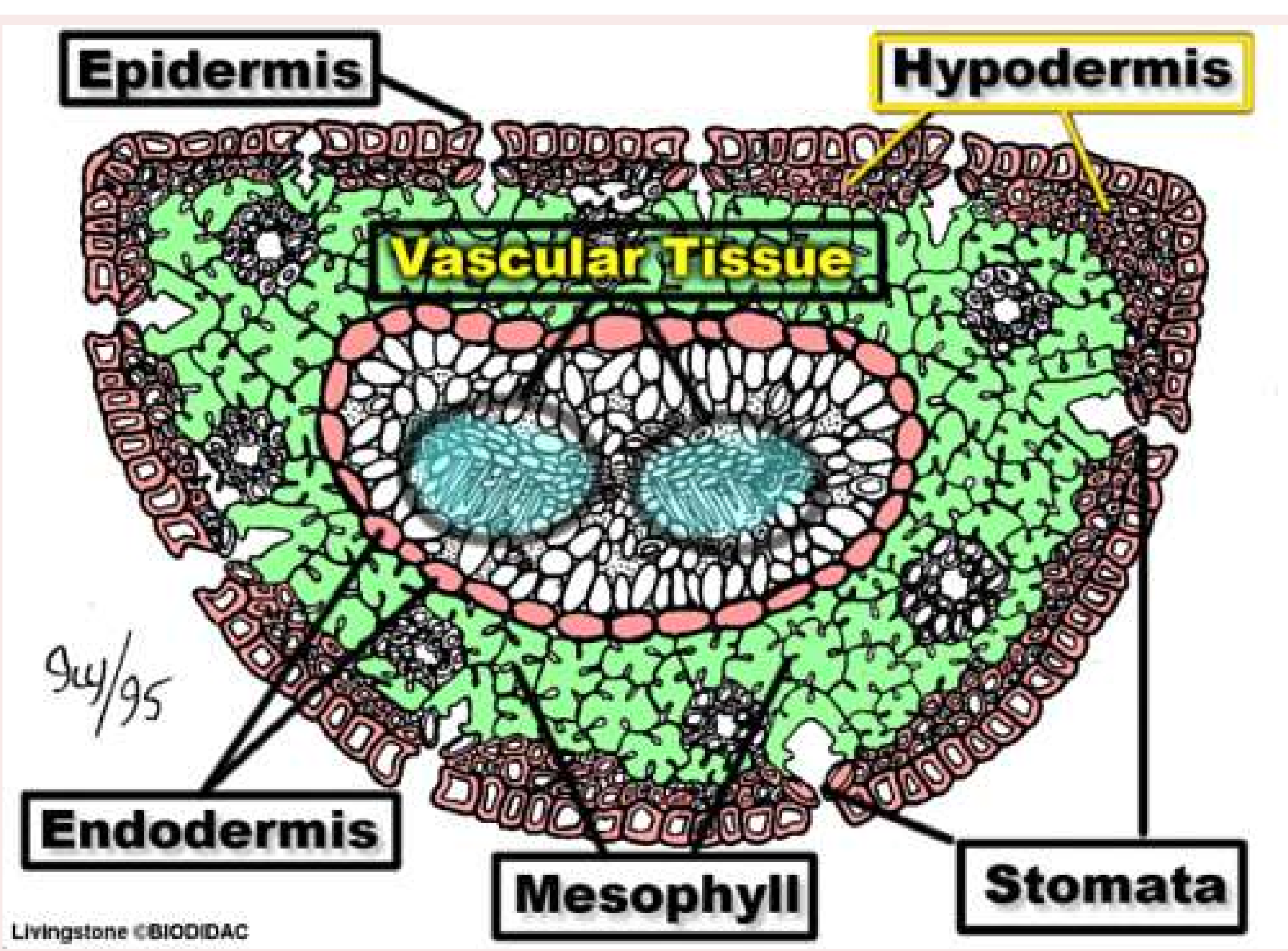
Figure 25. Stomata open to allow carbon dioxide (CO_2) to enter a leaf and water vapor to leave.

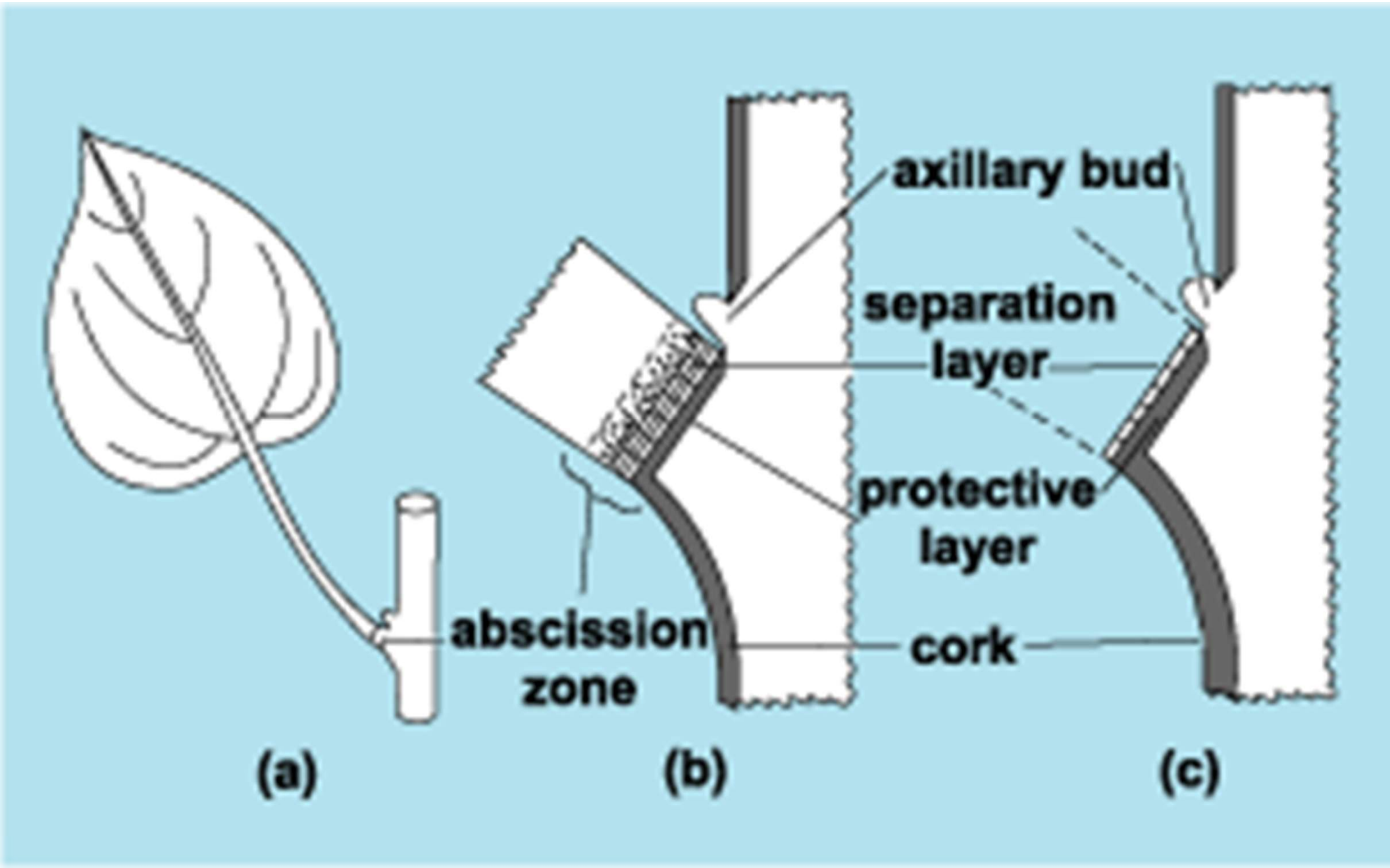


Strictly speaking, the stomates (aka, stomata or stoma) are the openings and the two cells around the openings are called the guard cells. Often, though, the word ‘stomates’ (or stoma or stomata) is used to refer to both together – the stomate and the pair of guard cells.



Leaf stomates often shut down on a hot day to avoid moisture stress.
It is one reason why a tree has leaves in the interior of its crown


Epidermis
Hypodermis
Vascular Tissue
9/4/95
Endodermis
Mesophyll
Stomata
Livingstone ©BIODIDAC


axillary bud
separation layer
protective layer
abscission zone
cork
(a)
(b)
(c)

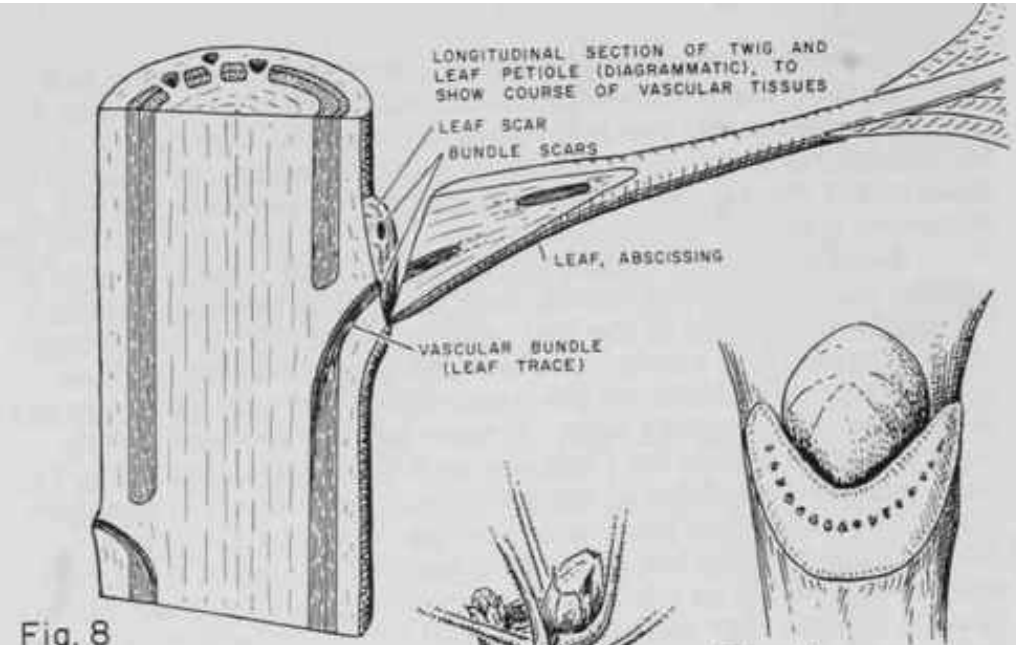


Fig. 8

Fig. 11
LEAF SCAR OF ASH

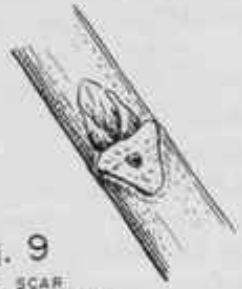


Fig. 9
LEAF SCAR OF PRIVET

Fig. 14
SPUR SHOOT OF APPLE

Fig. 12
LEAF SCAR OF OAK

Fig. 10
LEAF SCAR OF MAPLE

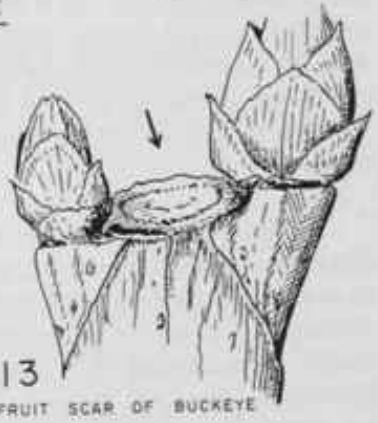
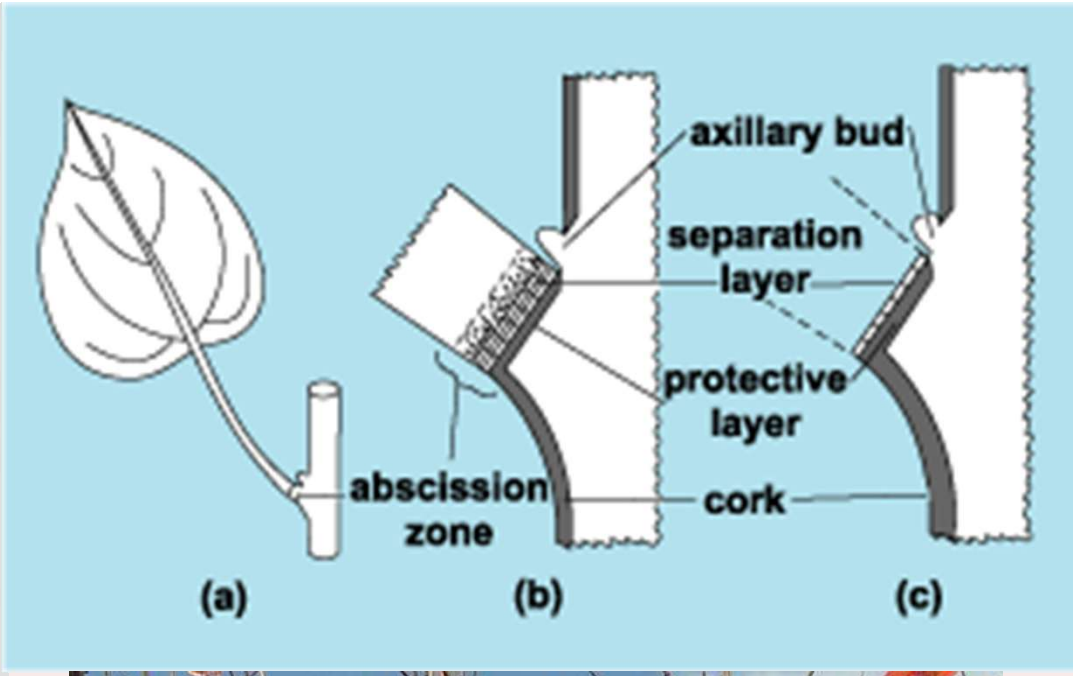
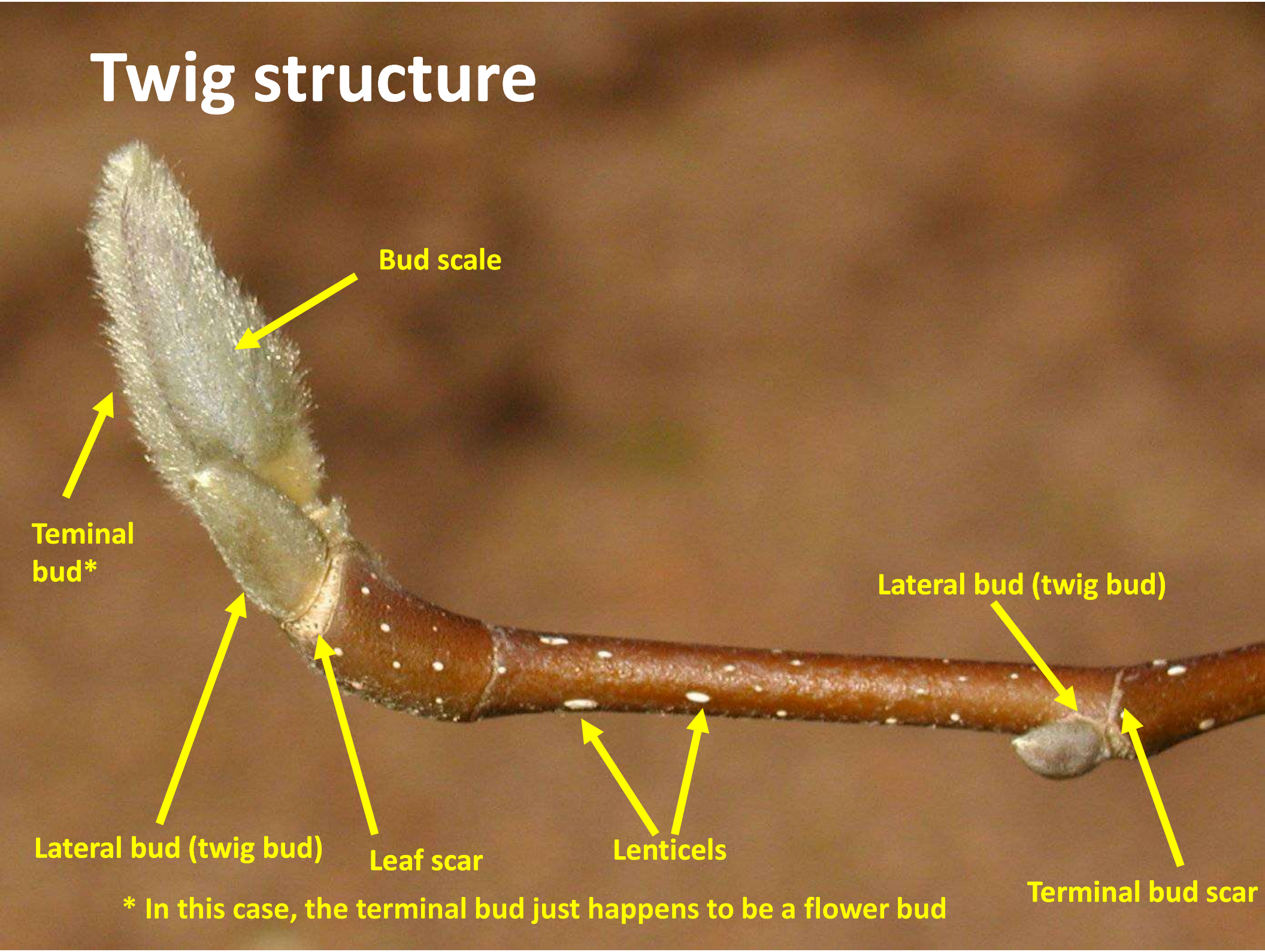


Fig. 13
FRUIT SCAR OF BUCKEYE

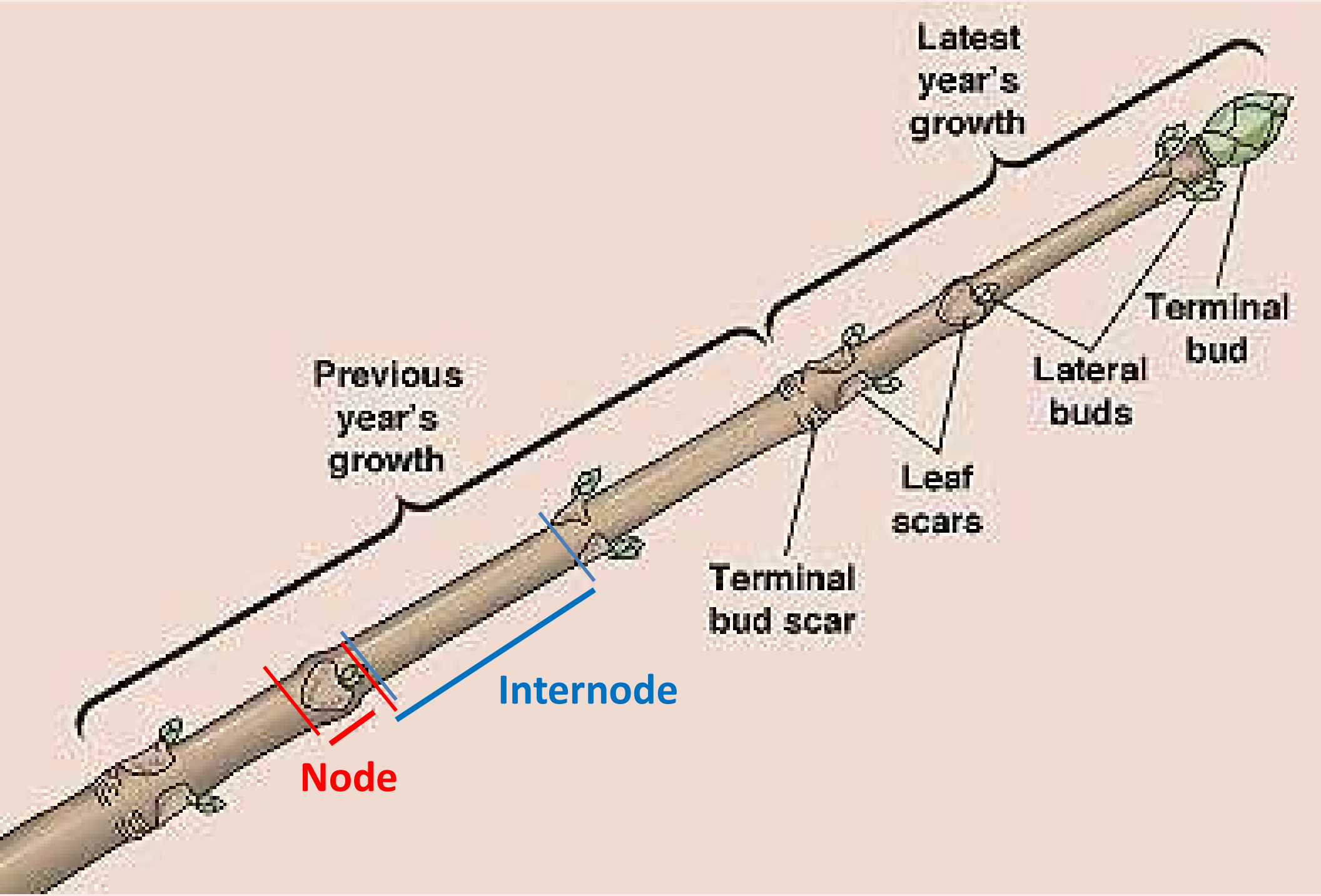



Leaf scars are useful for
species identification

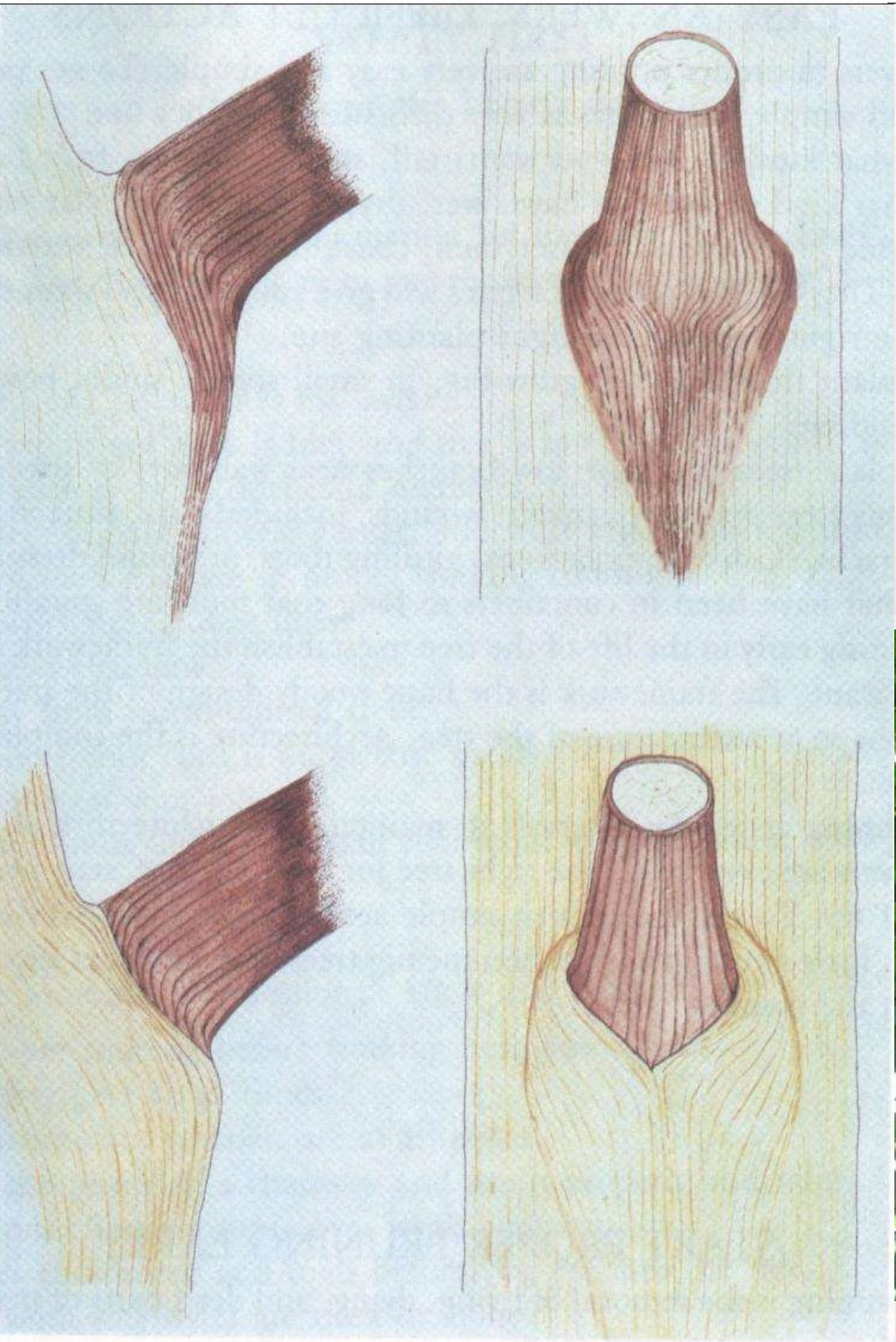
Twig structure



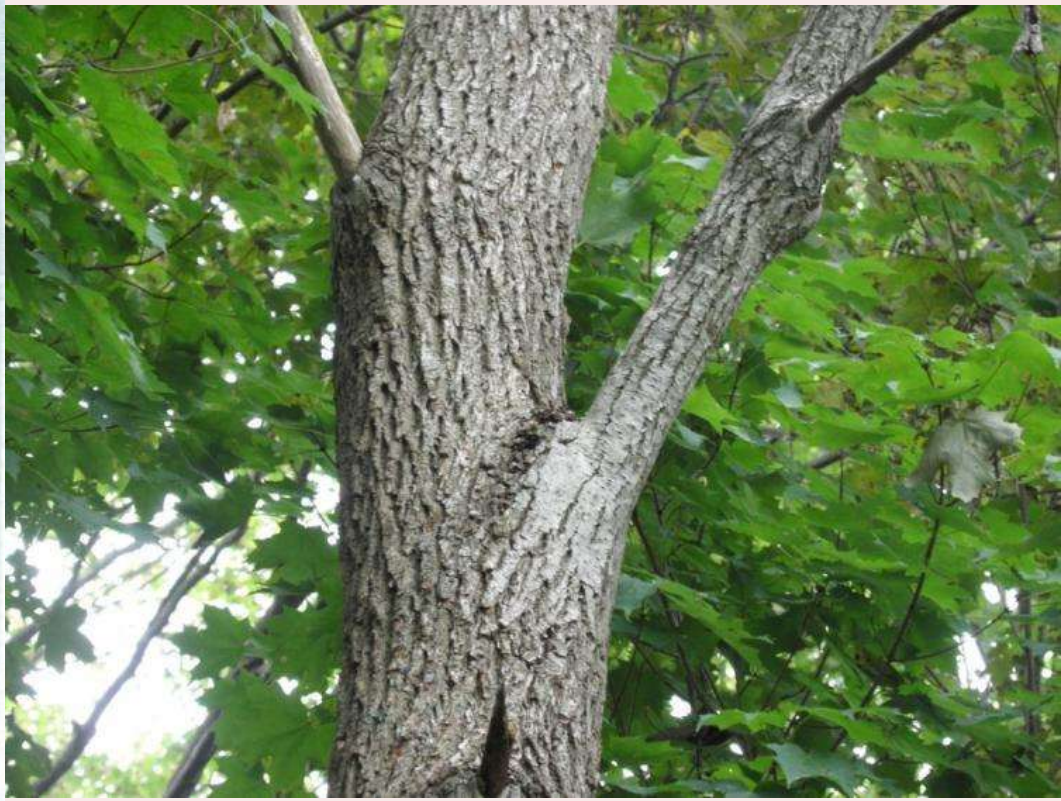
* In this case, the terminal bud just happens to be a flower bud

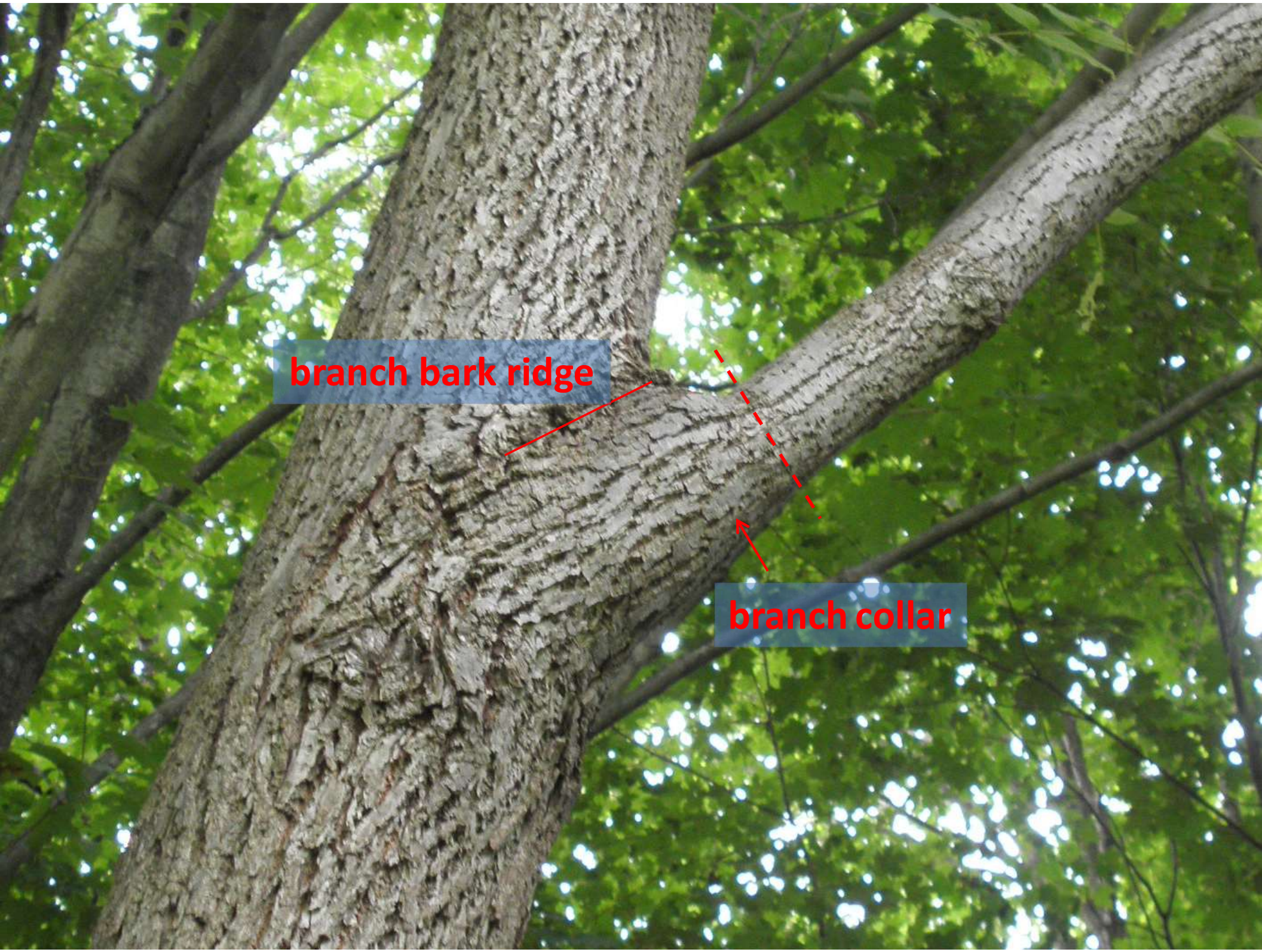

Latest year's growth
Terminal bud
Lateral buds
Leaf scars
Previous year's growth
Terminal bud scar
Internode
Node

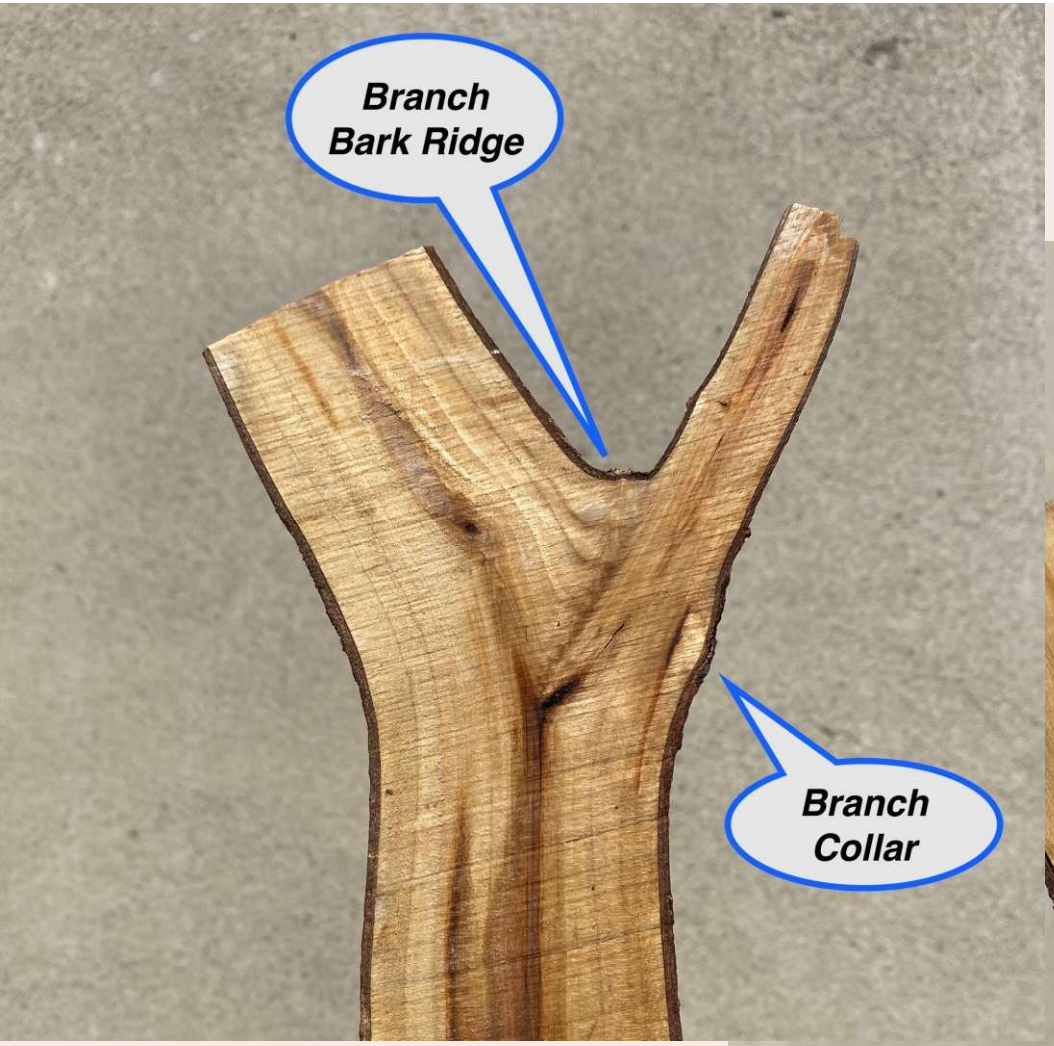
Sculpture by Artist Giuseppe Penone




Yellow = trunk wood
Brown = branch wood




branch bark ridge
branch collar



The **Branch Protection Zone** is described as a mixture of structural and chemical elements that serve as barriers to the spread of decay into the tree. This zone is better developed in situations in which the branch is small relative to the trunk.



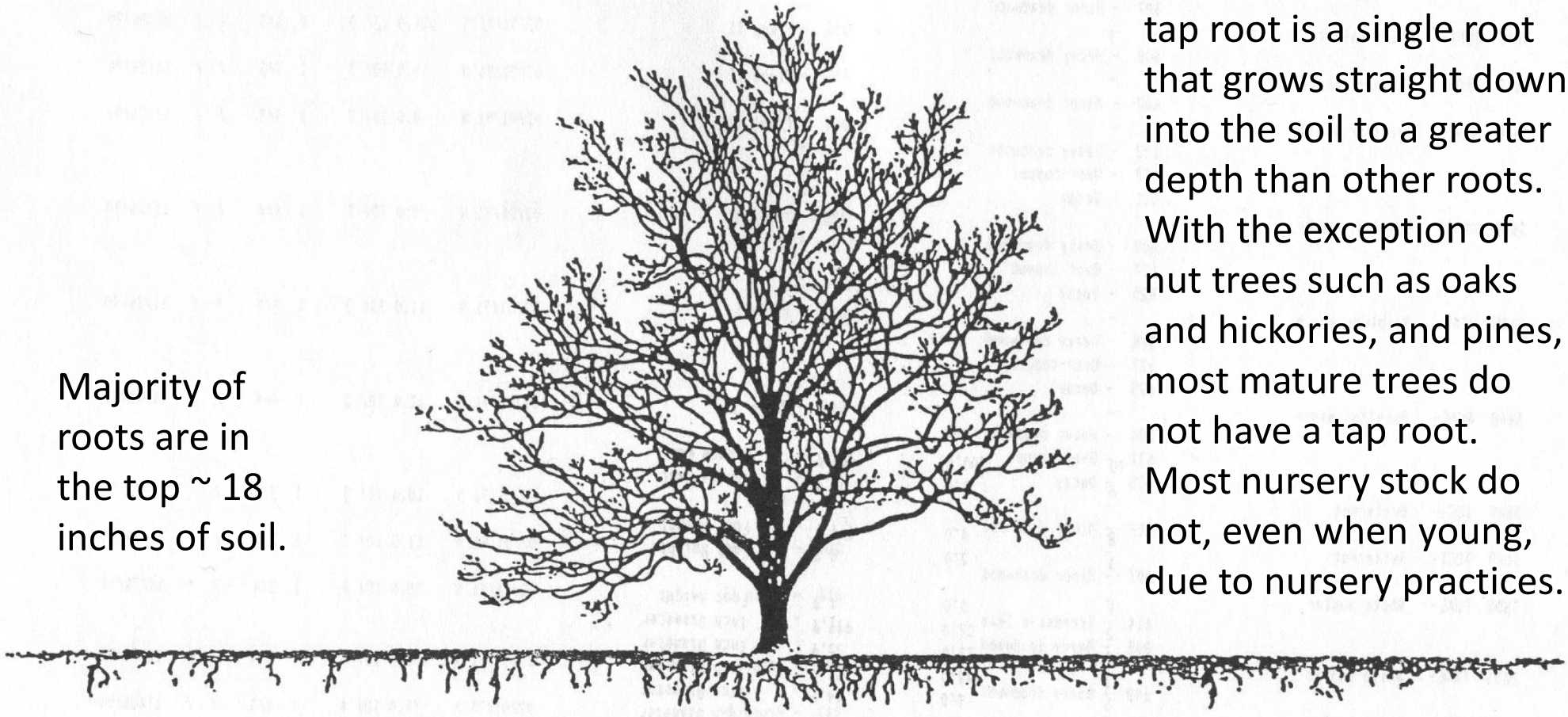


NOW LEASING
Arrangements
CHURCH PARKING ONLY


CATERING

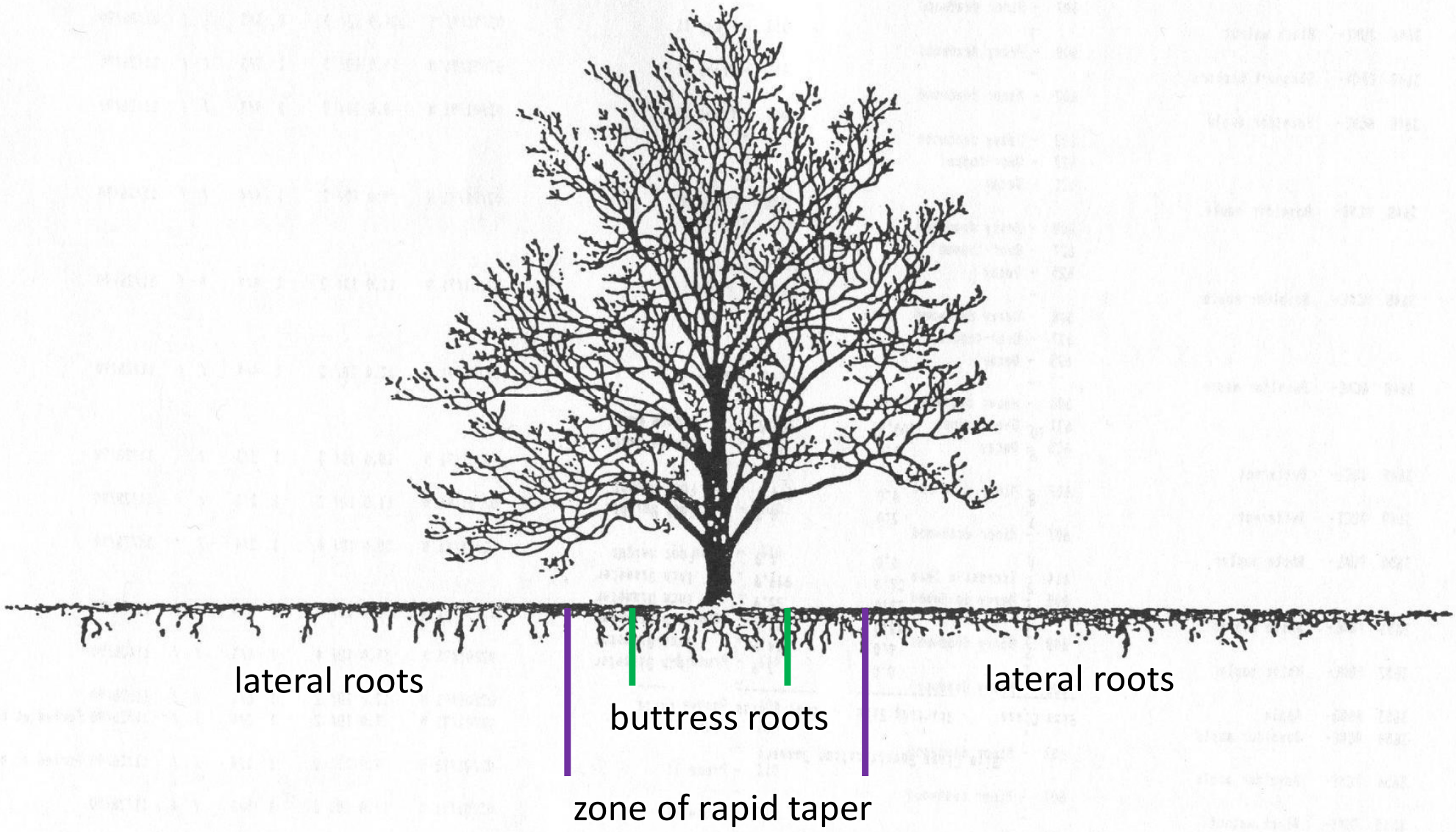
A Note on Tap Roots – a tap root is a single root that grows straight down into the soil to a greater depth than other roots. With the exception of nut trees such as oaks and hickories, and pines, most mature trees do not have a tap root. Most nursery stock do not, even when young, due to nursery practices.

Majority of roots are in the top ~ 18 inches of soil.



Occasional “sinker roots” penetrate deeper into the soil

The Root Plate



The Root Plate

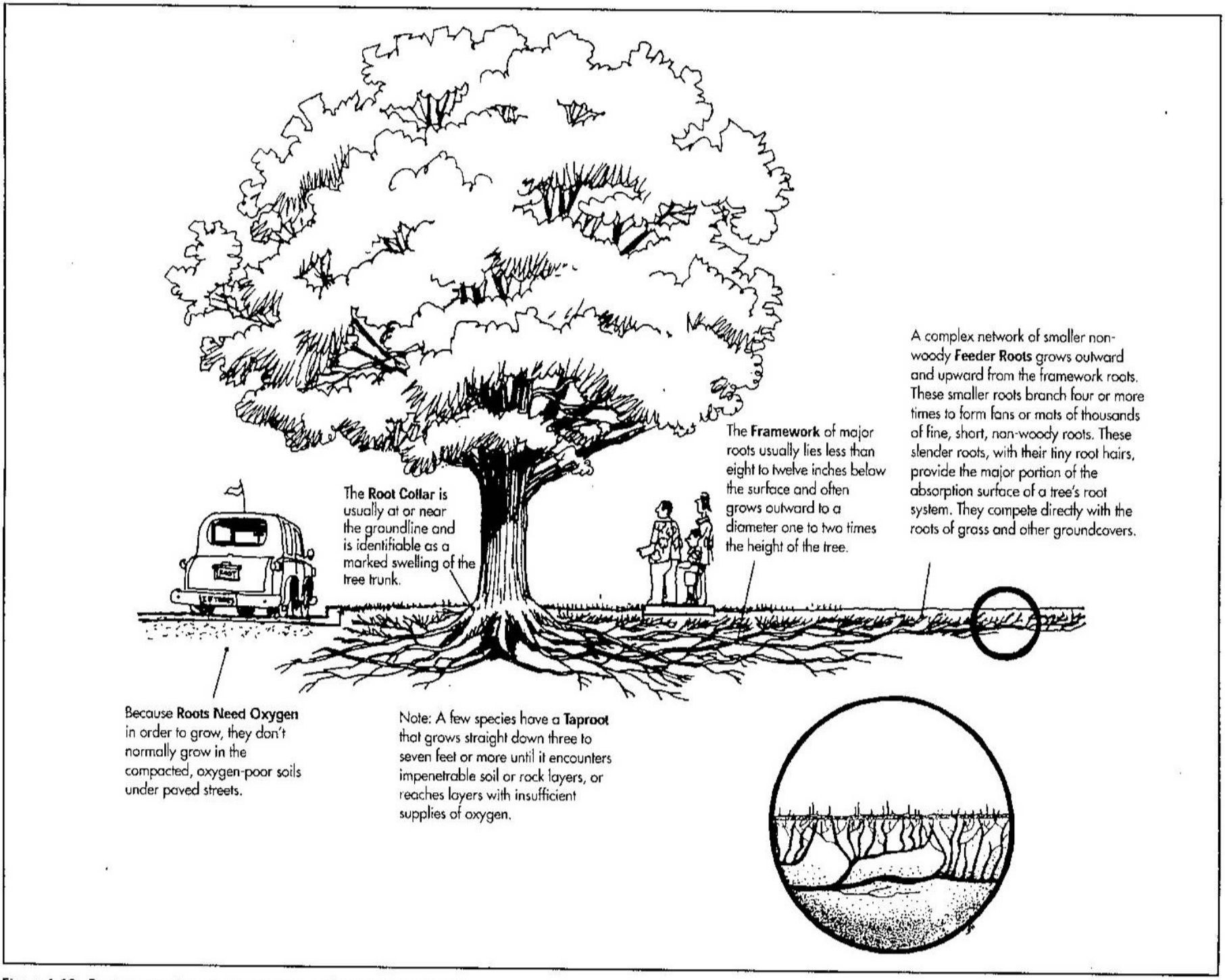
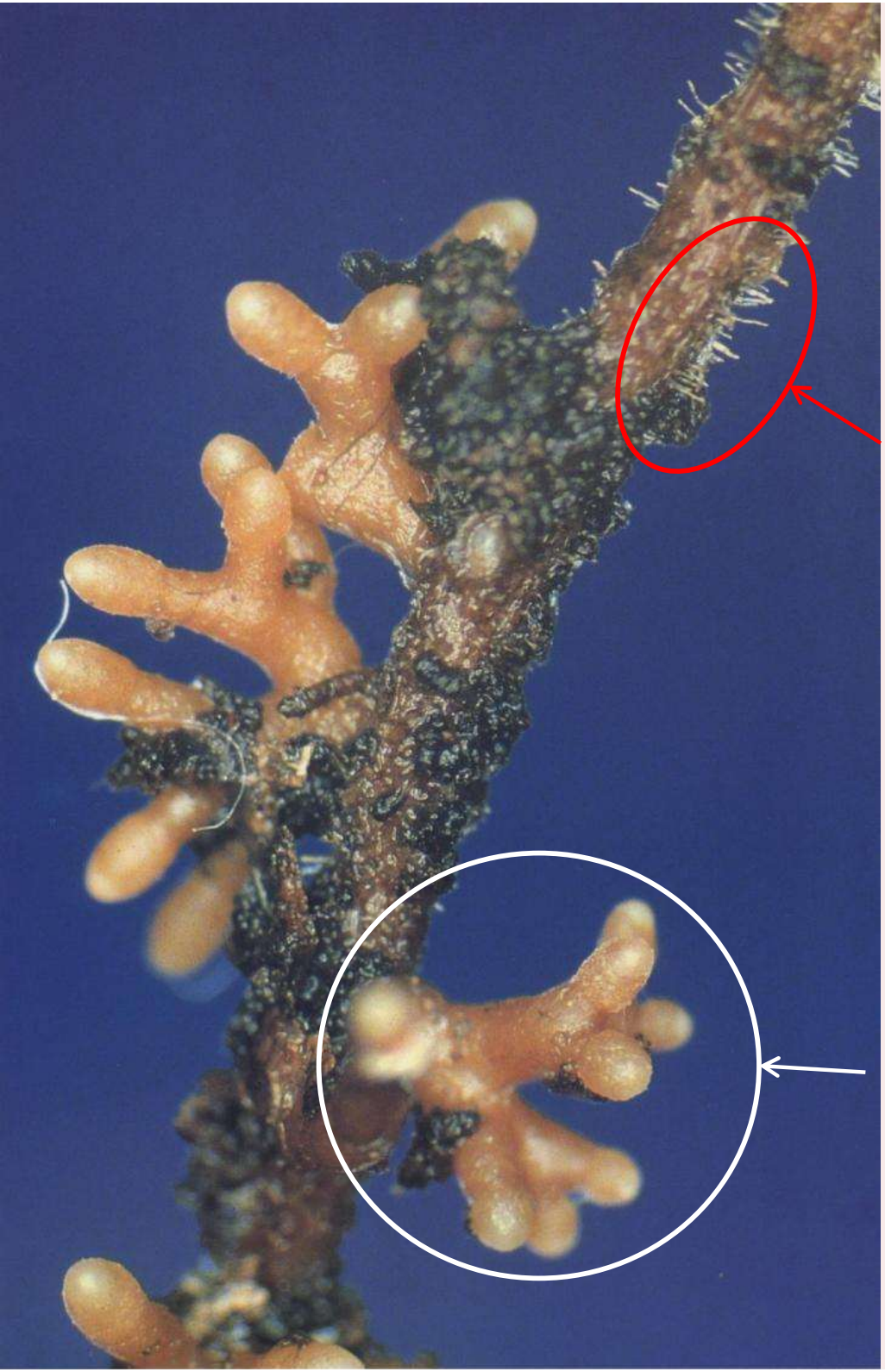


Figure 1.12 Roots grow where water, oxygen, and space are available.



Alex Shigo
Photo Micrograph
of a non-woody root
(sometimes called a
fine root or a feeder
root)

Mycorrhiza is the name given to the mutually beneficial relationship between plant roots and fungi. The structure is a combination of both – in this case, tree and fungus. The fungus helps the tree find soil nutrients and, in turn, gets food (sugars) from the tree.
Plural: mycorrhizae

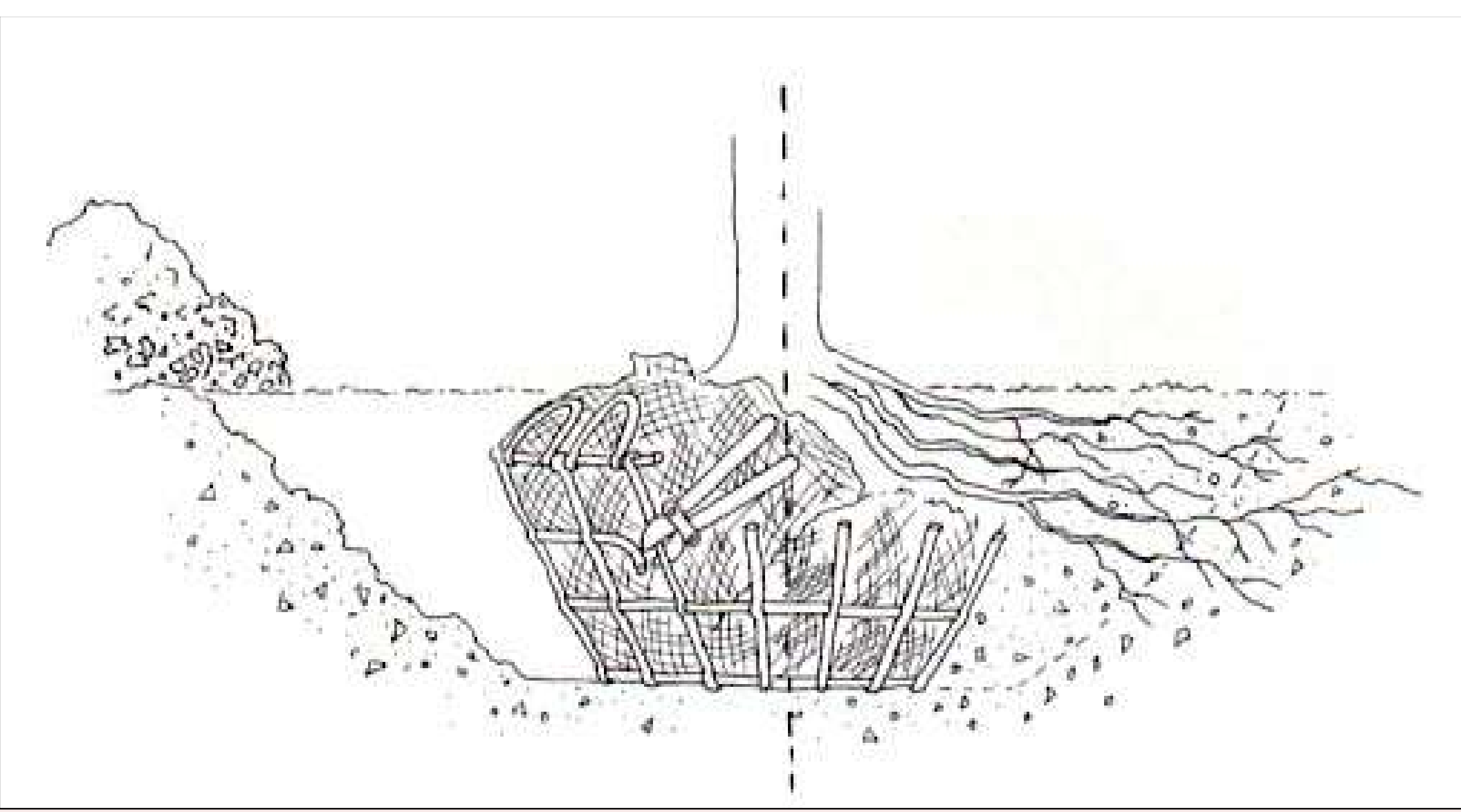
Soil nutrients

Macro - nitrogen, phosphorus, potassium

Minor – calcium, iron, sulfur, magnesium

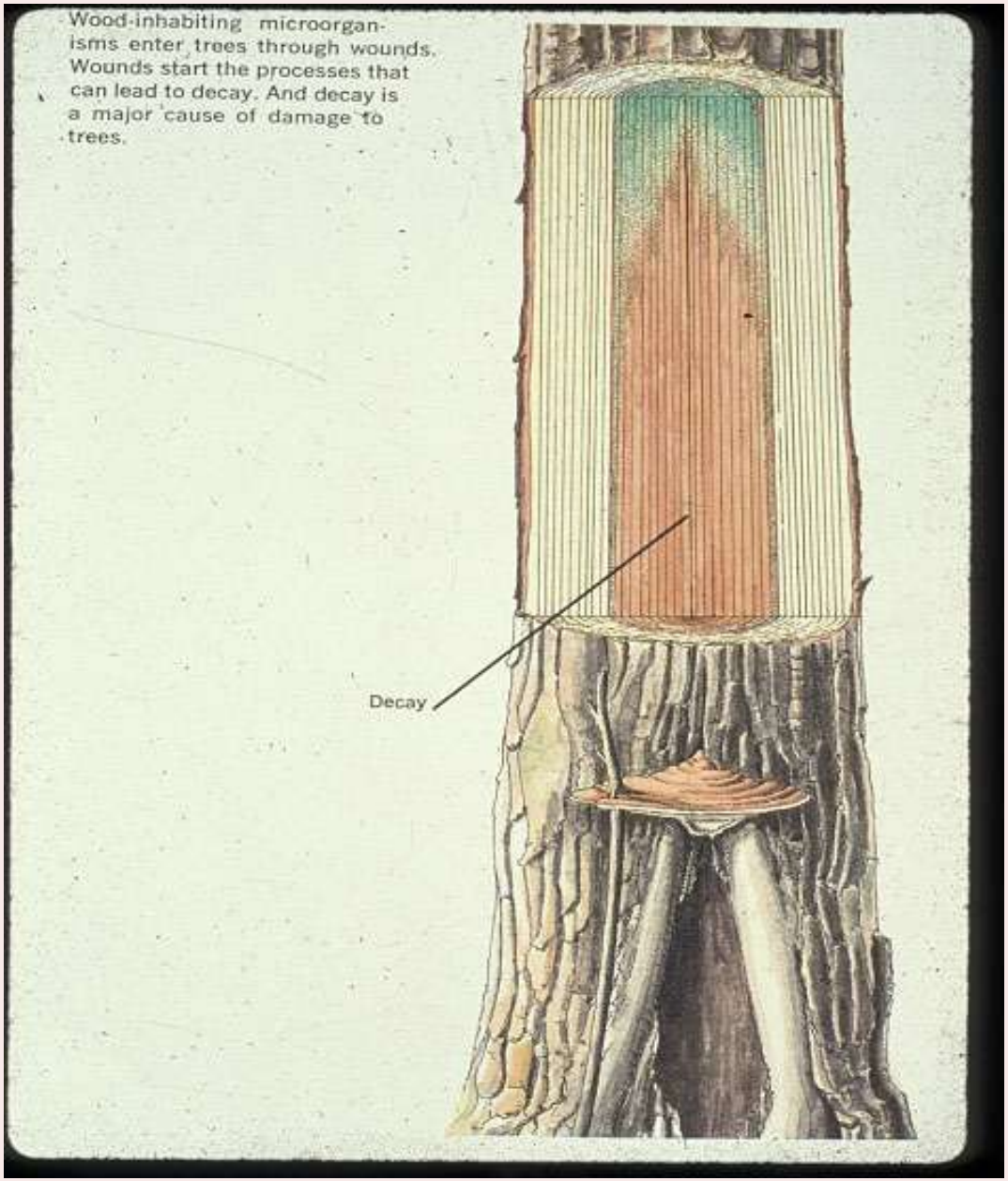
Trace minerals

C HOPKN’S CaFe Mg B Mn CuZn Mo

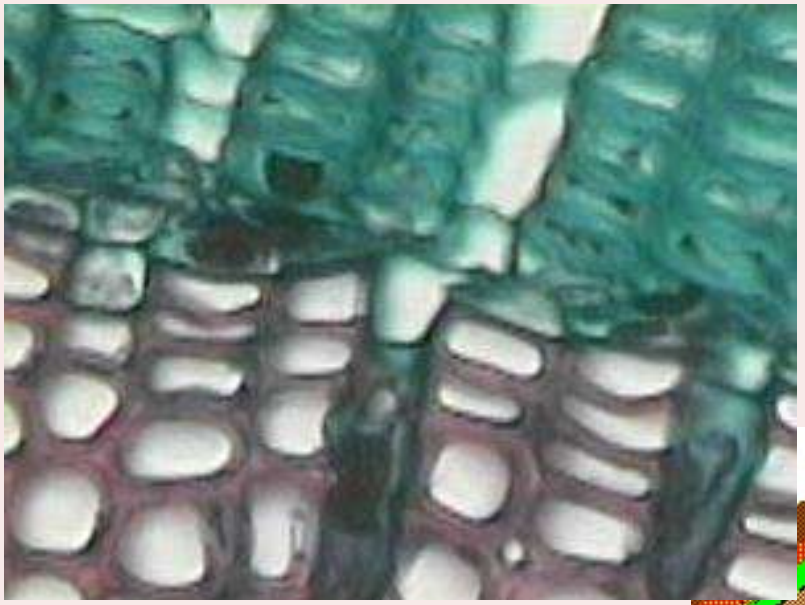


Tree roots grow from the tips, in the top 18 inches or so of the soil. When planting a tree, it is important to remove the burlap and wire from the root ball from the upper 18 inches of the root ball, after the root ball has been placed in the hole!

COMPARTMENTALIZATION OF DECAY

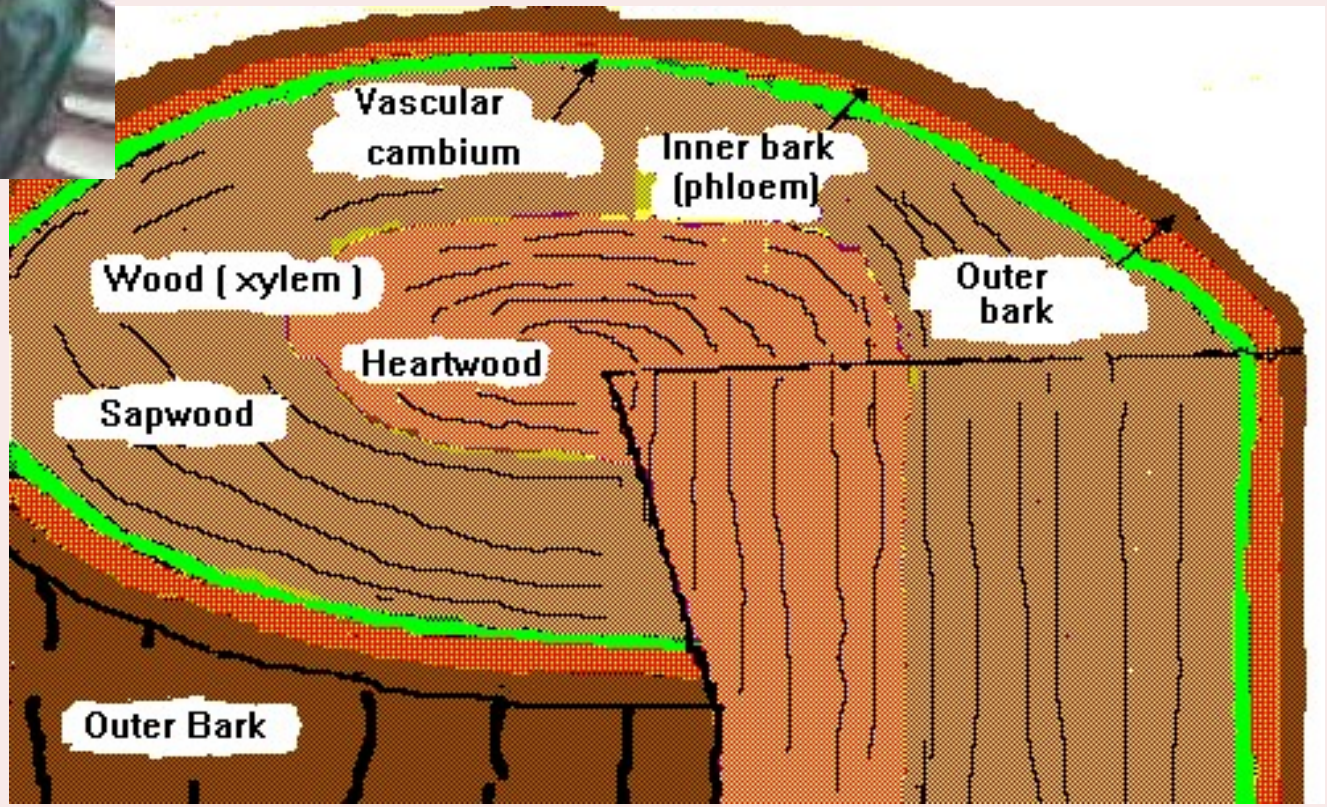


Stem Anatomy



Phloem

Xylem



White rot in aspen (left) and brown rot in oak (right)

Photo © Mel Baughman

White rots degrade lignins or lignins and cellulose and leave light-colored, stringy decayed wood.

Brown rots degrade cellulose and tend to leave brown, blocky cubes behind.

Compartmentalization Of Decay In Trees - CODIT

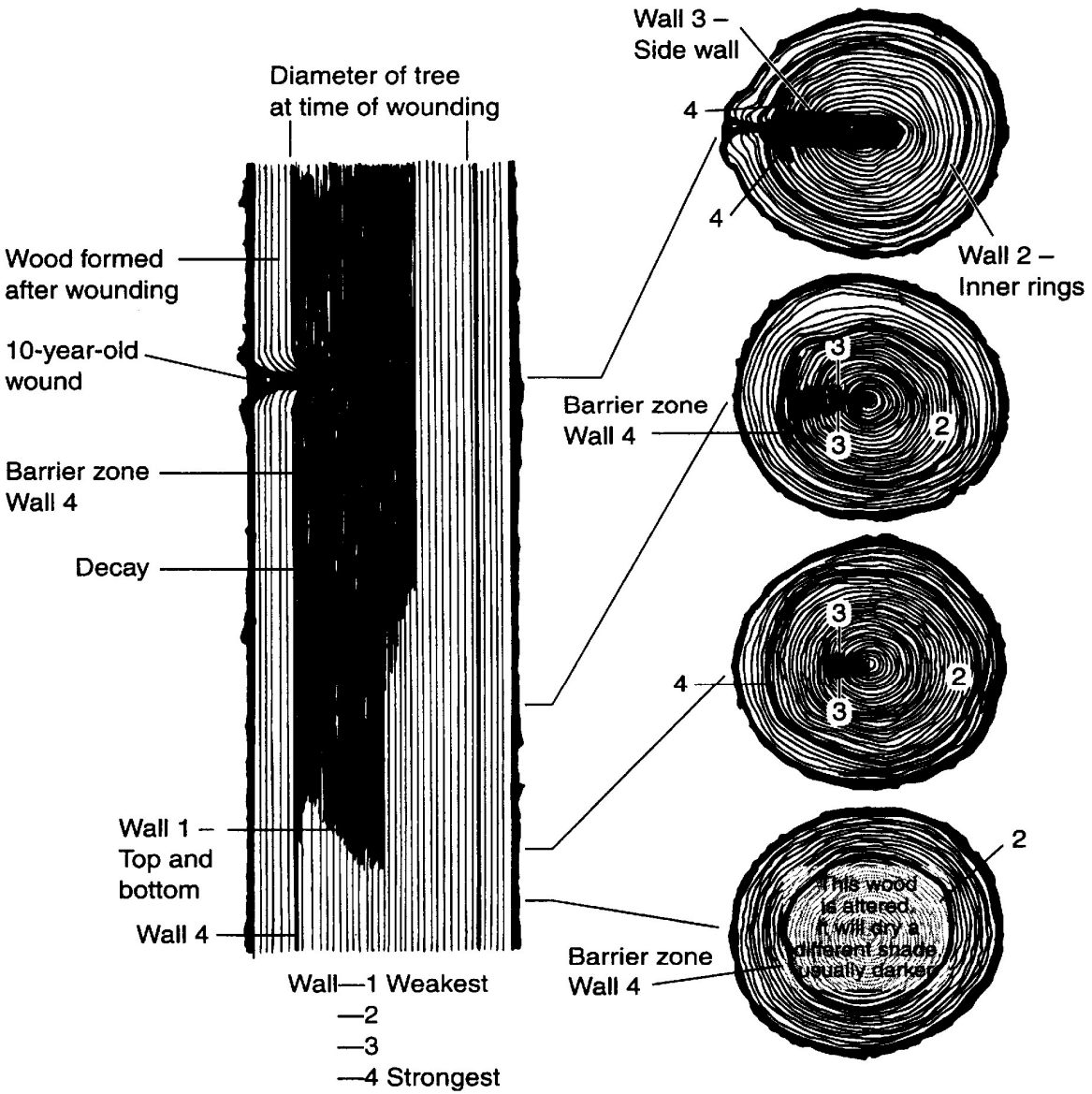
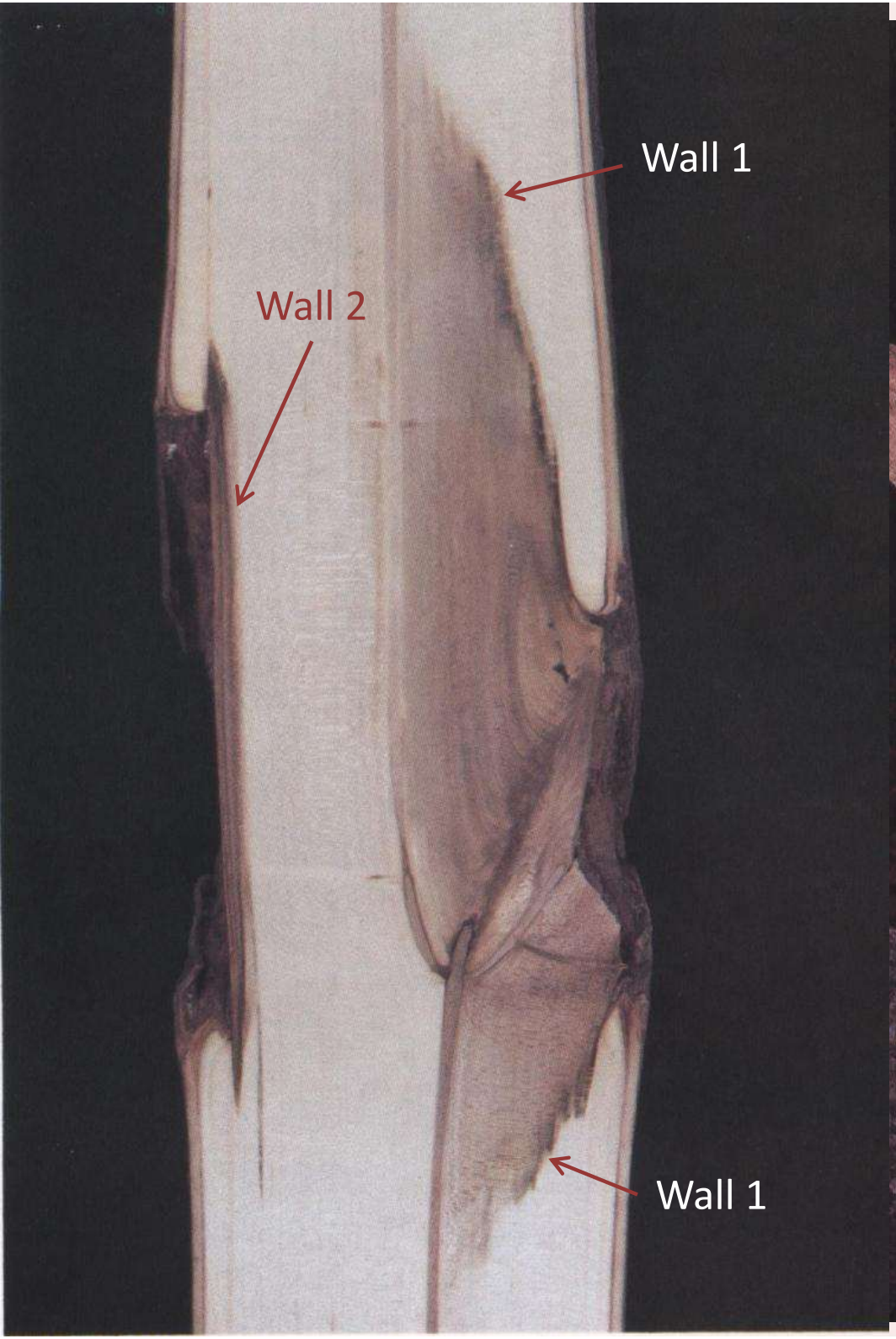


Figure 14.13
The concept of compartmentalization in trees.
(Source: From Shigo and Marx 1977.)


Wall 1
Wall 2
Wall 1


rays
The rays are wall 3

Wall 4

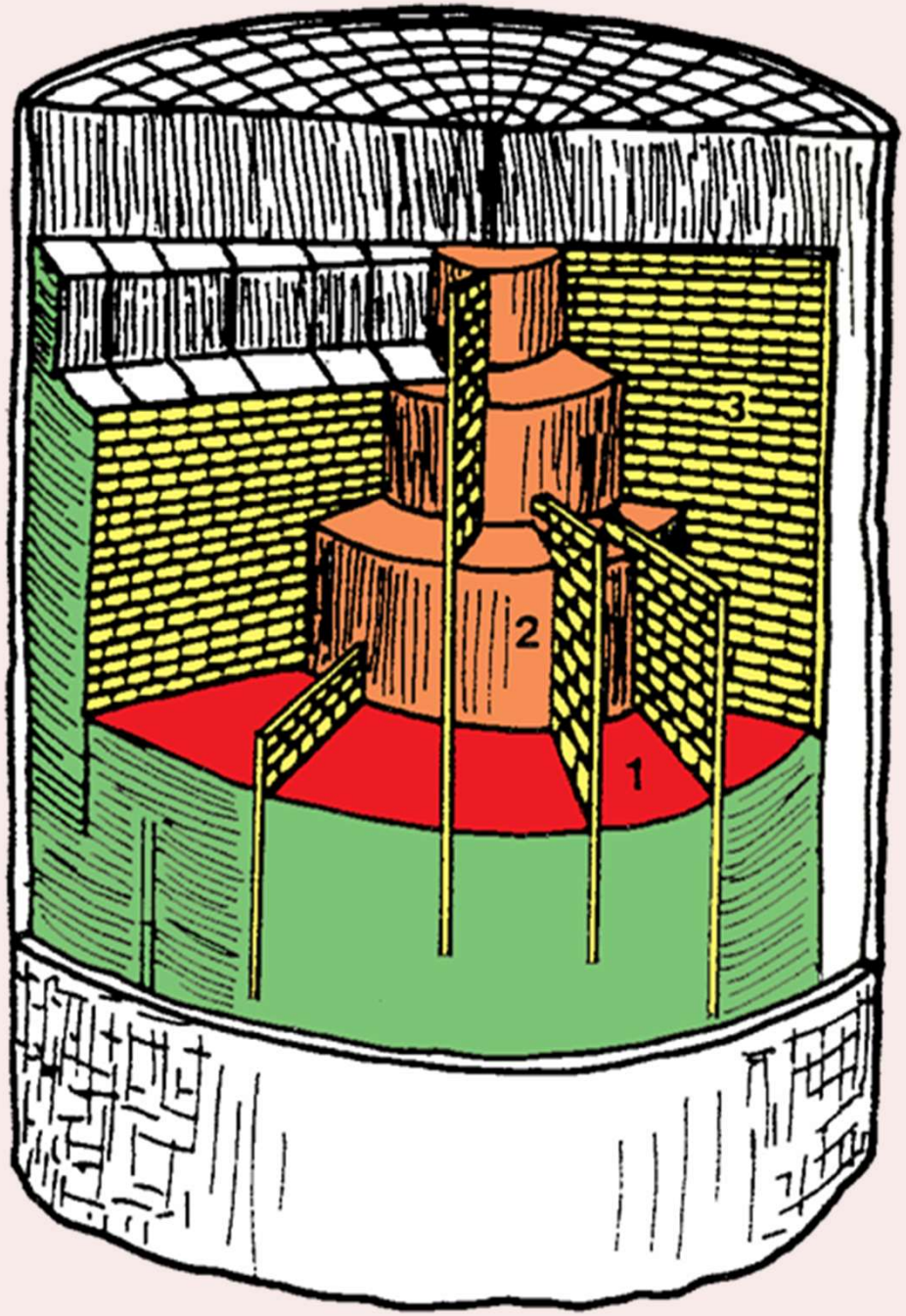


Illustration from Lilly et al. 1991.

Tree Decay

- Wall 1 – up and down
  (plugged vessels)
- Wall 2 – back wall
  (annual rings)
- Wall 3 – side to side
  (ray cells)
- Wall 4 – outside wall
  (new growth)

Trees will respond to wounds differently depending upon size and type of wound, vigor and health of the tree, species and genetics of the individual tree.


May you find your own pot of gold in arboriculture!
Questions?