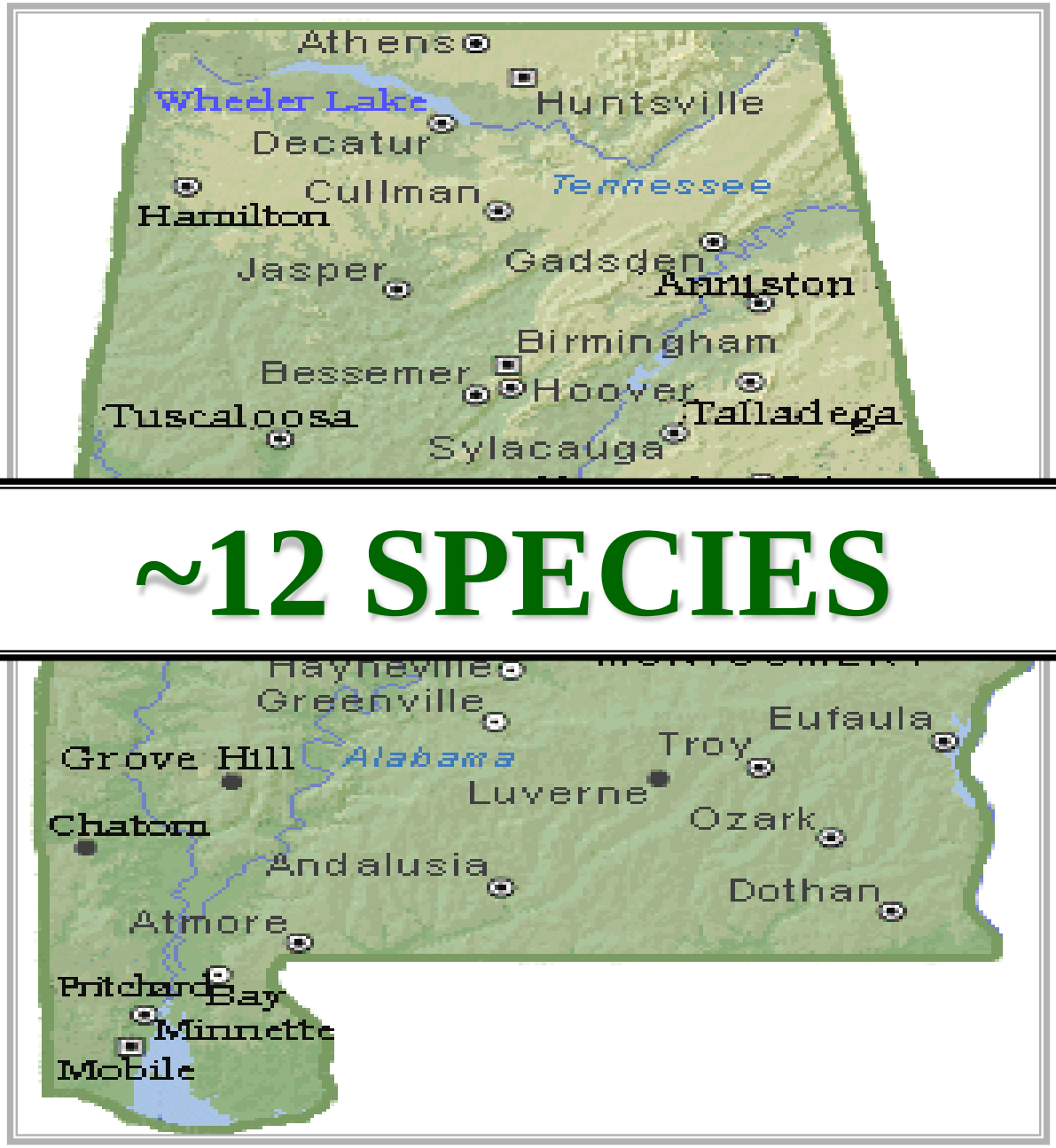
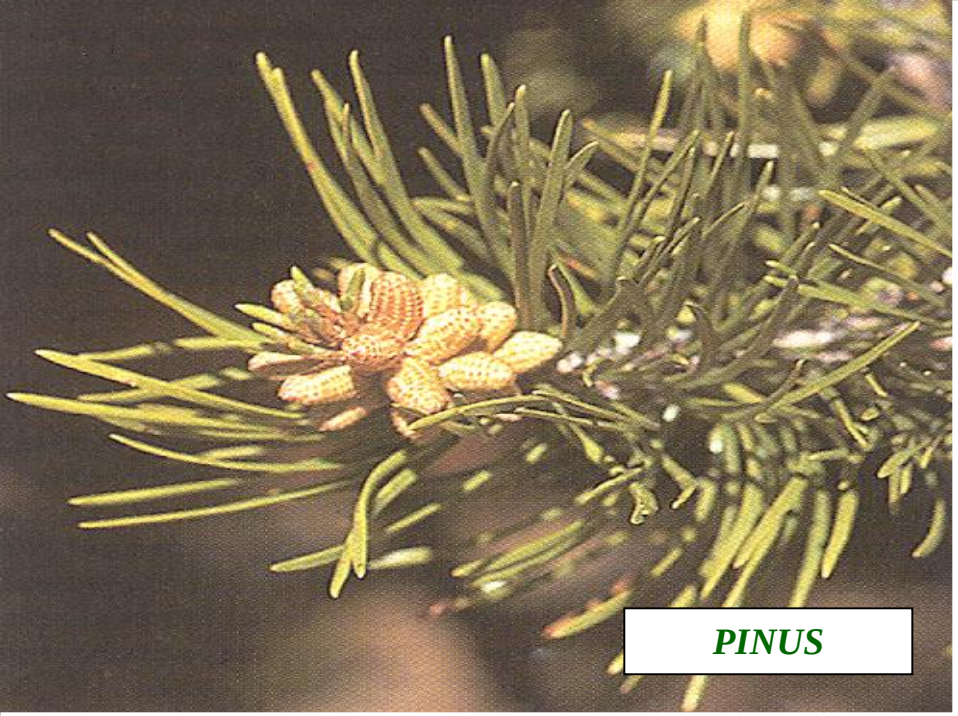

Athens
Huntsville
Wheeler Lake
Decatur
Cullman
Tennessee
Hamilton
Jasper
Gadsden
Anniston
Birmingham
Bessemer
Hoover
Talladega
Tuscaloosa
Sylacauga
Hayneville
Greenville
Eufaula
Troy
Grove Hill
Alabama
Luverne
Ozark
Chatom
Andalusia
Dothan
Atmore
Pritchard
Bay
Minnette
Mobile

~12 SPECIES

PINOPHYTA
MINOR
COMPONENT
ALABAMA FLORA

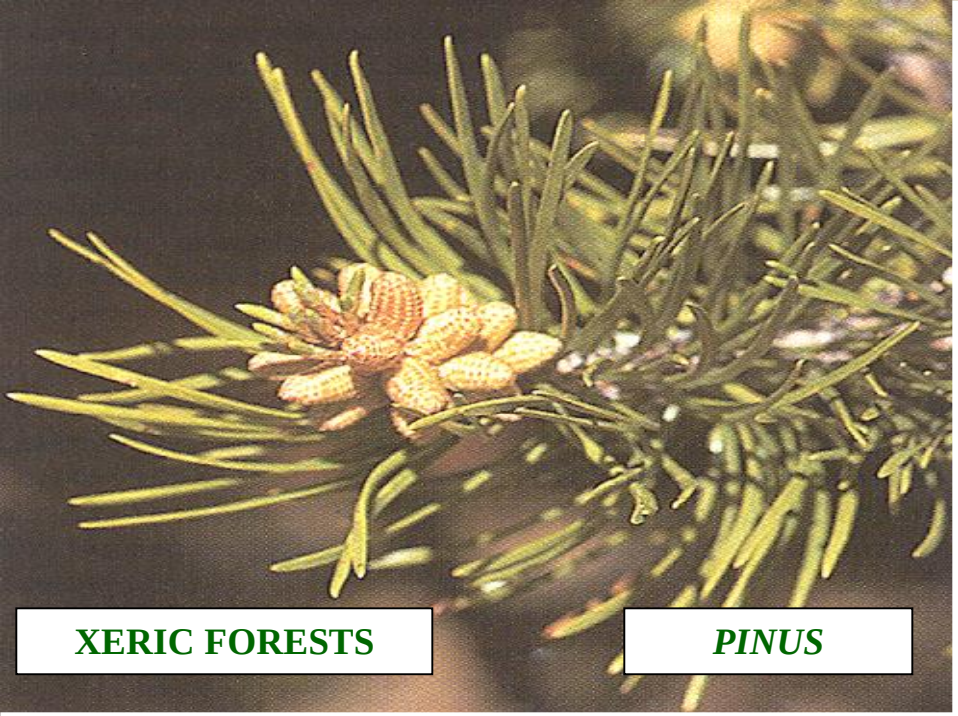
REPRESENTATIVE GENERA


PINUS

JUNIPERUS

TSUGA

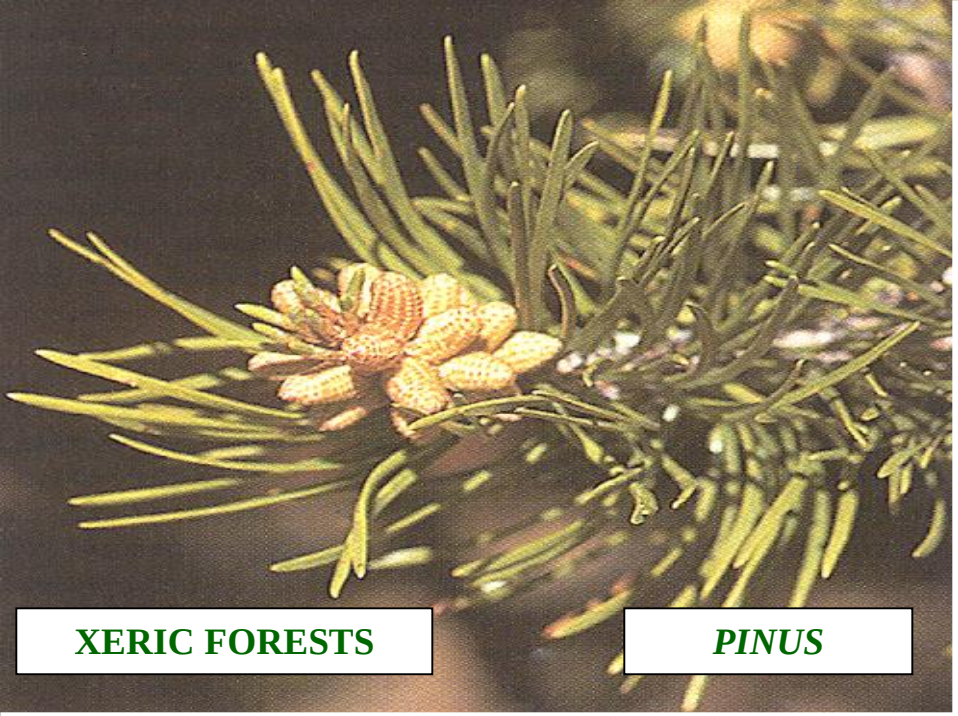
TAXODIUM


XERIC FORESTS
PINUS

JUNIPERUS

TSUGA

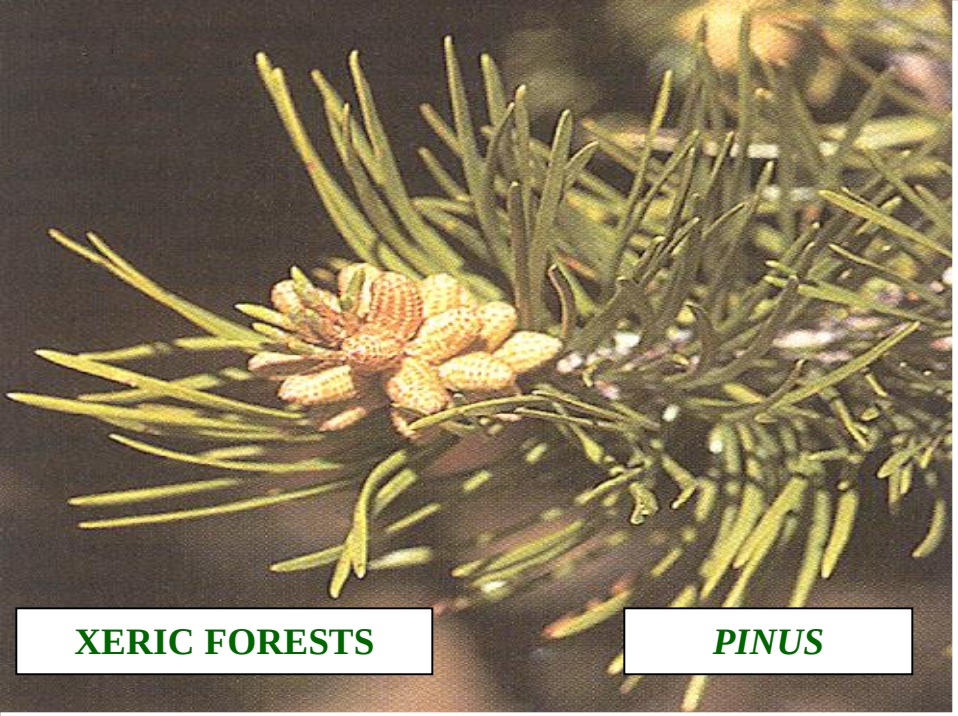
TAXODIUM


XERIC FORESTS
PINUS

XERIC GLADES
JUNIPERUS

TSUGA

TAXODIUM



XERIC FORESTS

PINUS

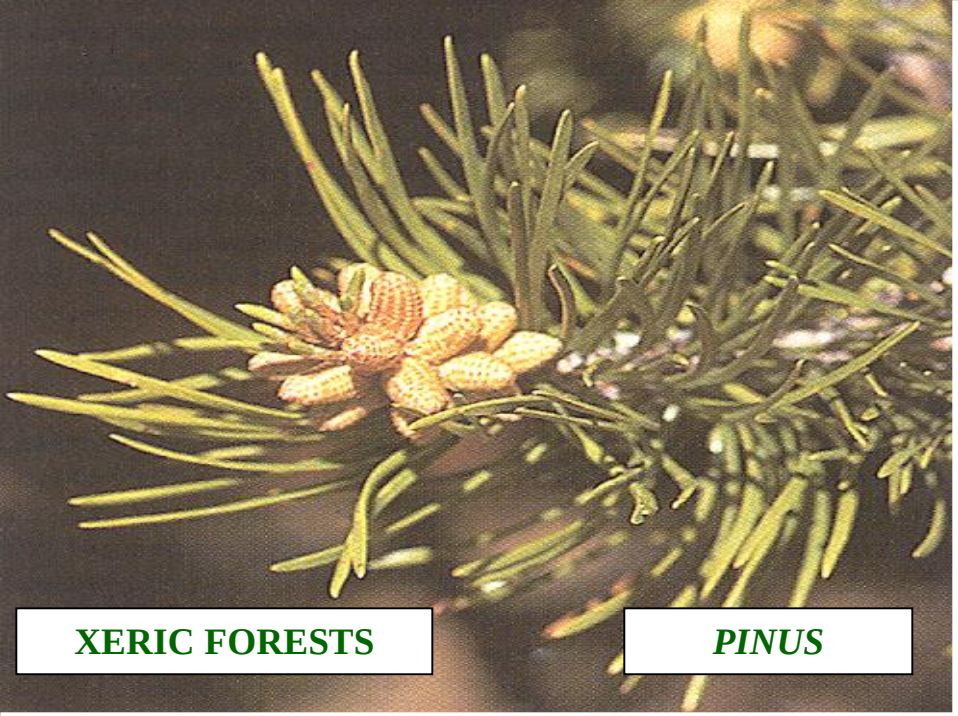
XERIC GLADES

JUNIPERUS

MESIC FORESTS

TSUGA

TAXODIUM



XERIC FORESTS

PINUS

XERIC GLADES

JUNIPERUS

MESIC FORESTS

TSUGA

CYPRESS SWAMPS

TAXODIUM

S

SOUTHERN PINE FOREST

SOUTHERN PINE FOREST

PINOPHYTA
SOUTHERN PINE FOREST

DOMINANT ARBORESCENT LONGLEAF PINE

PINOPHYTA
SOUTHERN PINE FOREST

SOUTHERN PINE FOREST

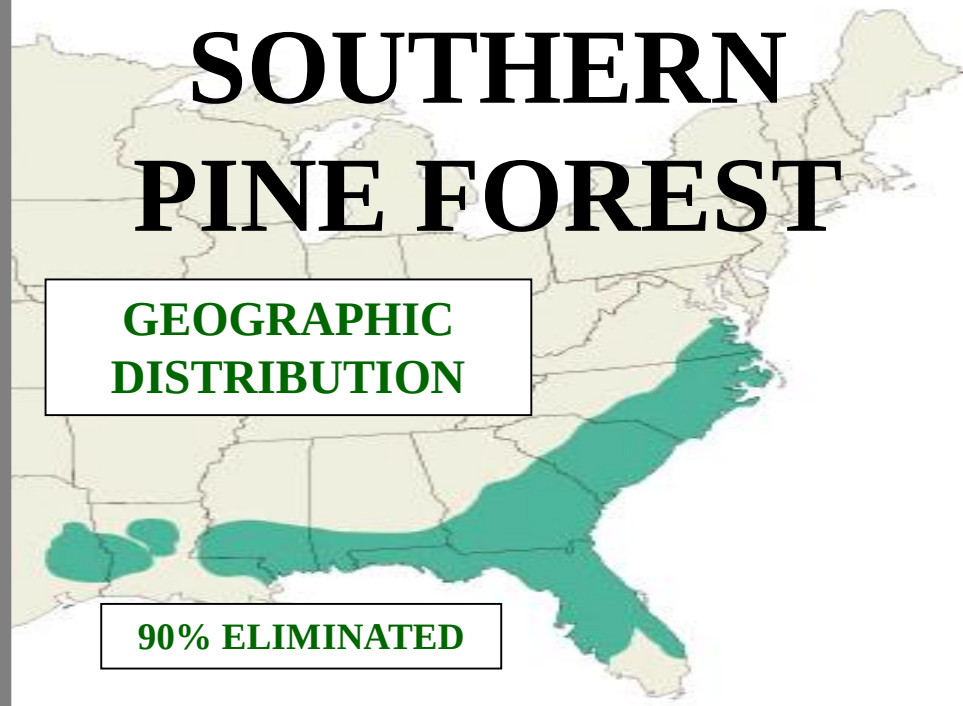
LONGLEAF PINE

SOUTHERN PINE FOREST

LONGLEAF PINE

SOUTHERN PINE FOREST

GEOGRAPHIC DISTRIBUTION



90% ELIMINATED

SOUTHERN PINE FOREST

LONGLEAF PINE

SOUTHERN PINE FOREST

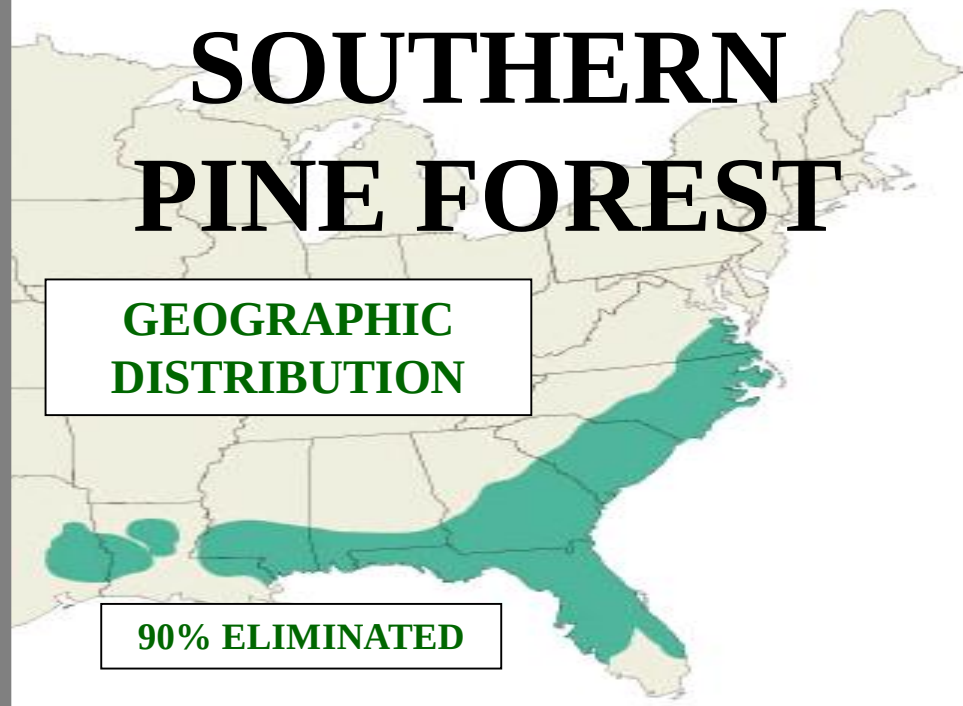
>

LONGLEAF PINE

RED-COCKADED WOODPECKER
ENDANGERED

SOUTHERN PINE FOREST

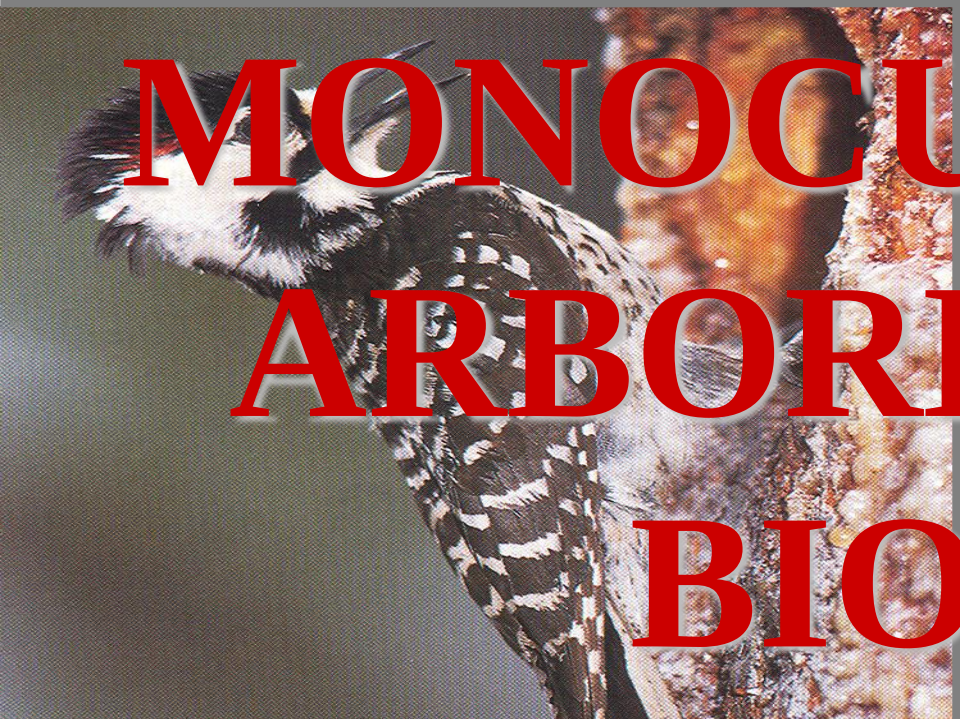
GEOGRAPHIC DISTRIBUTION



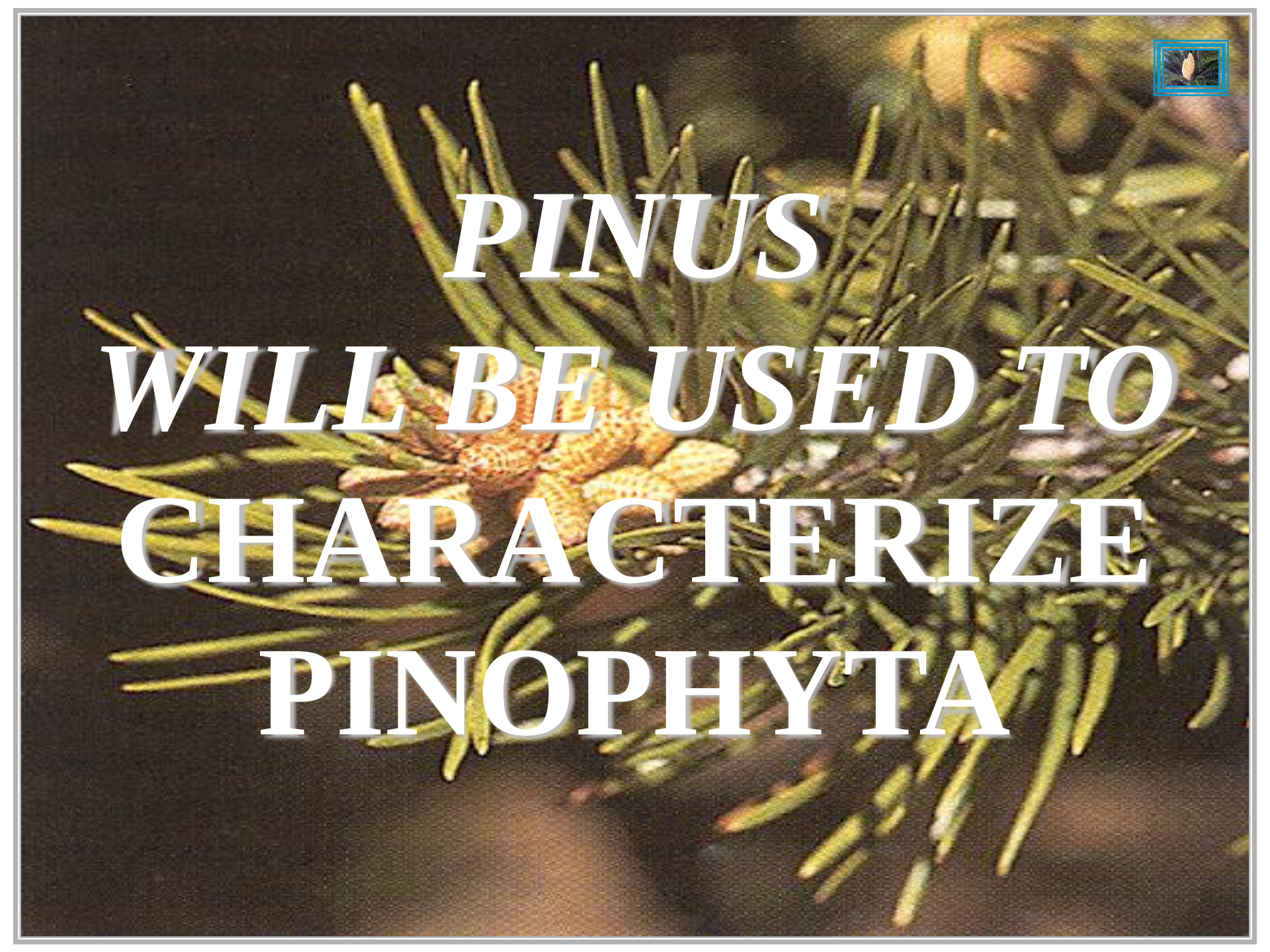
90% ELIMINATED

SOUTHERN PINE FOREST

LARGEST MONOCULTURED ARBORESCENT BIOME



GENERAL CHARACTERS



PINUS
WILL BE USED TO
CHARACTERIZE
PINOPHYTA

PINOPHYTA
LIFE CYCLE

MITOSIS

ZYGOTE 2N

SYNGAMY

GAMETE SPERM 1N

GAMETE EGG 1N

MITOSIS

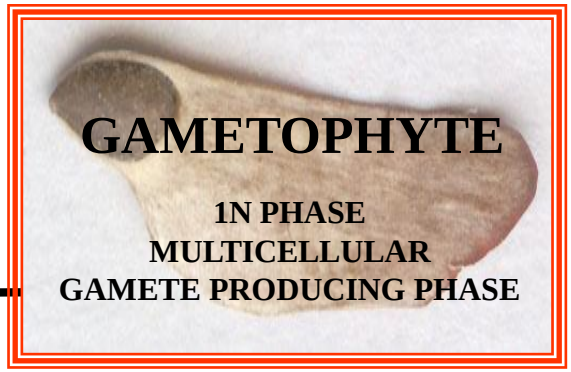
GAMETOCYTES 1N

SPOROCYTES 2N

MEIOSIS

SPORES 1N

MITOSIS



SPOROPHYTE CHARACTERS

VASCULAR TISSUE

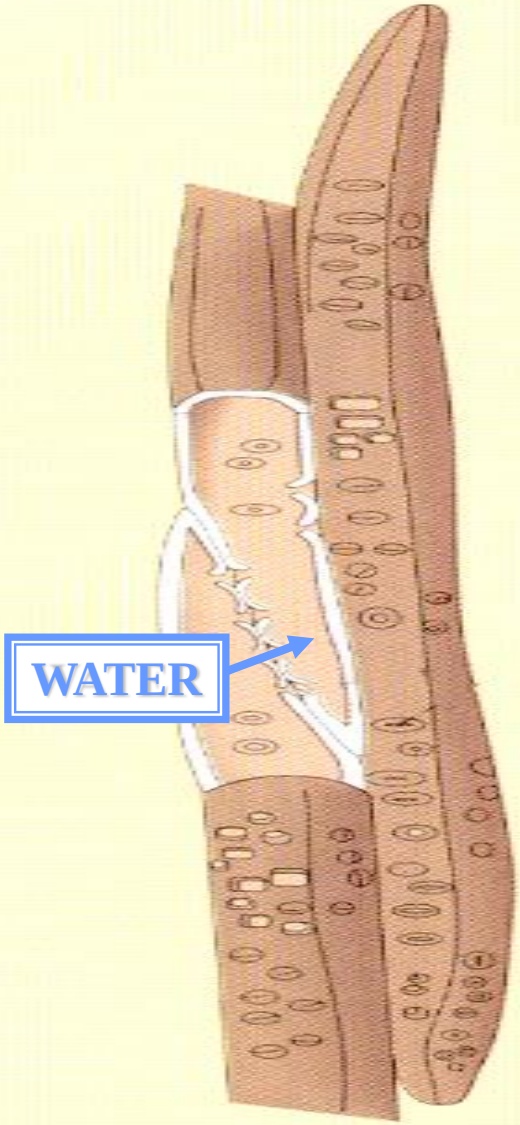
XYLEM

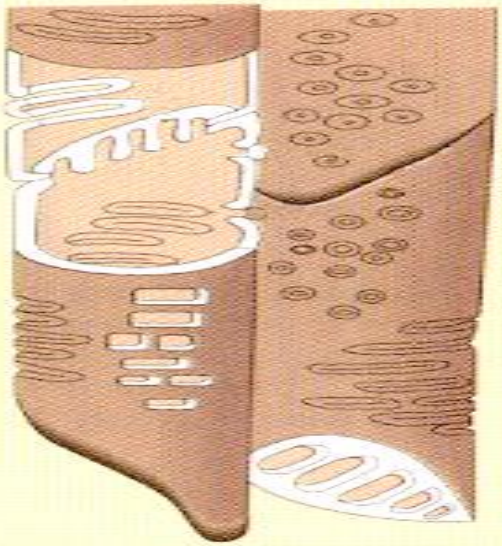
TE

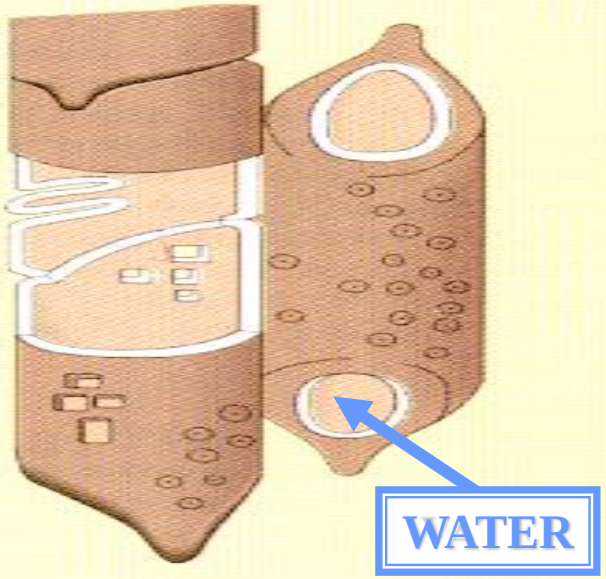
XYLEM CELLS

T

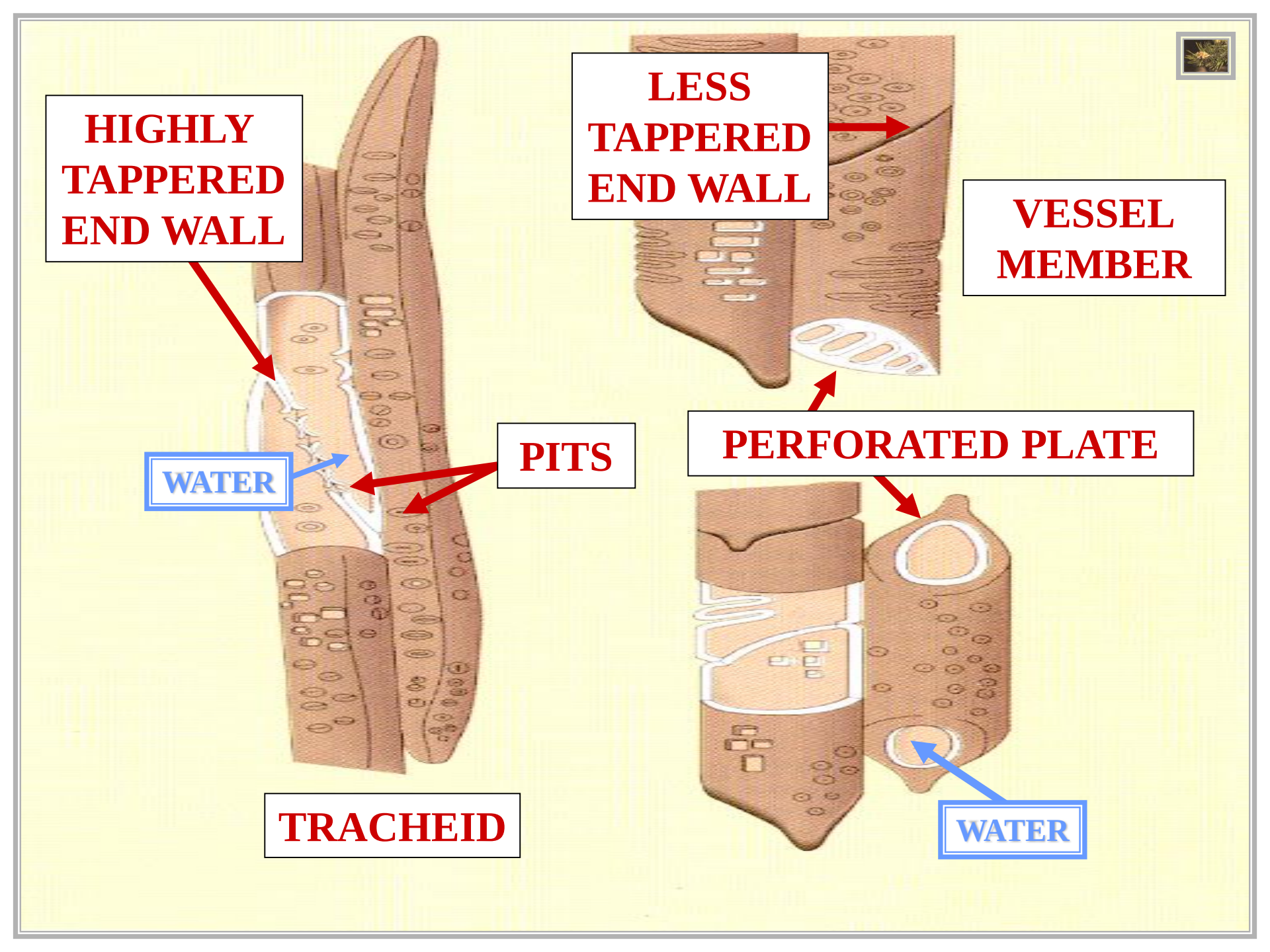
V

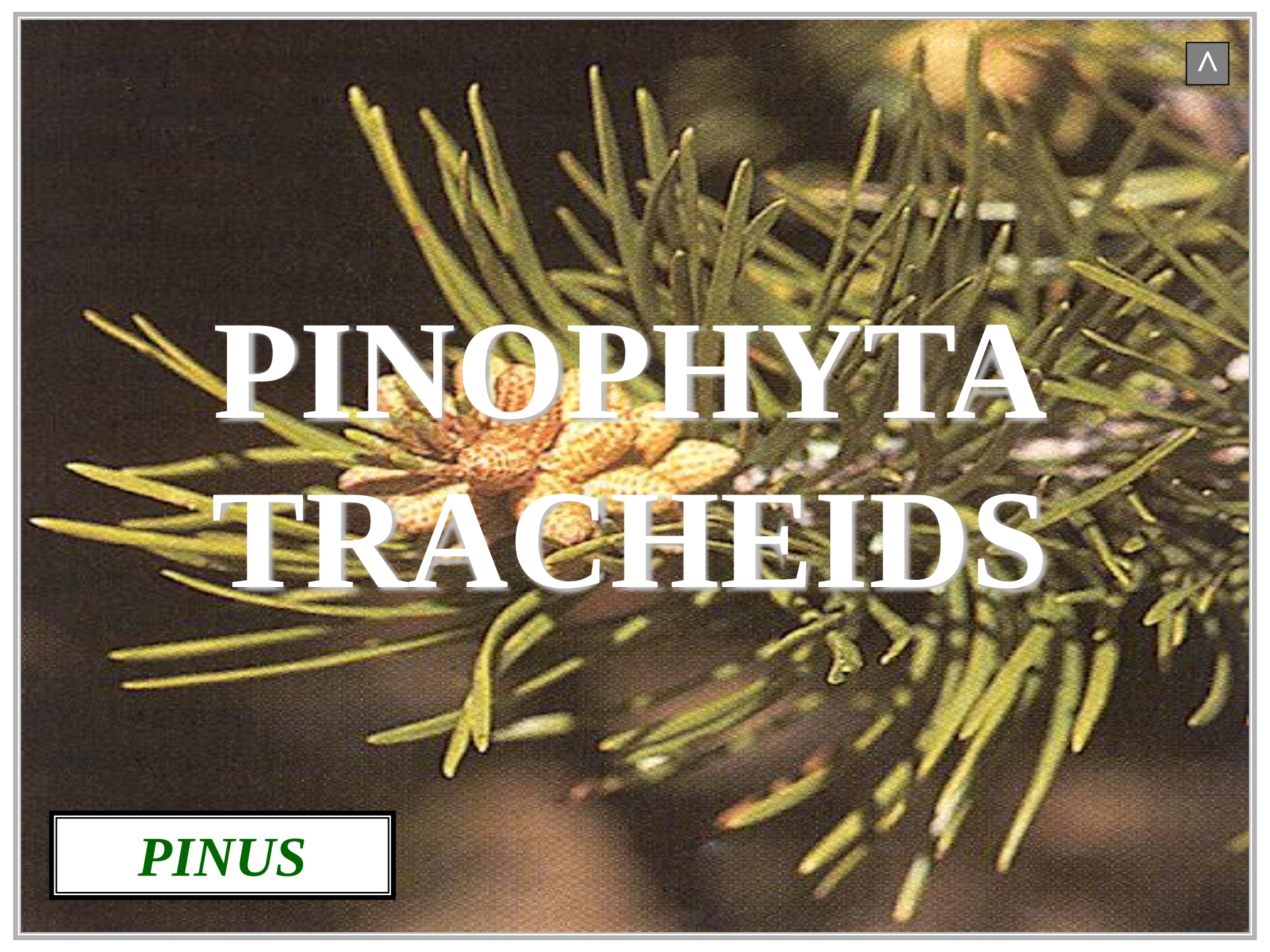




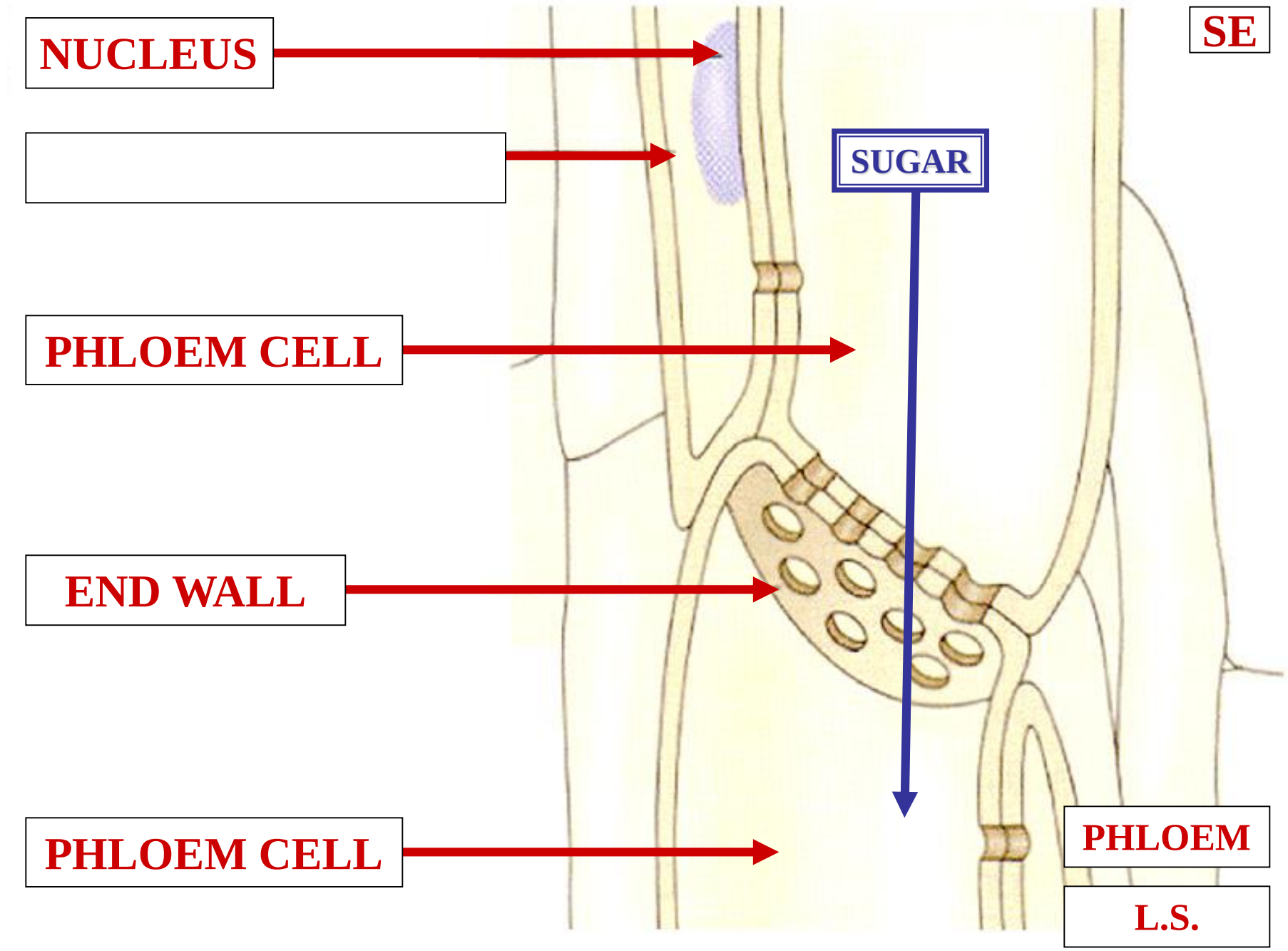


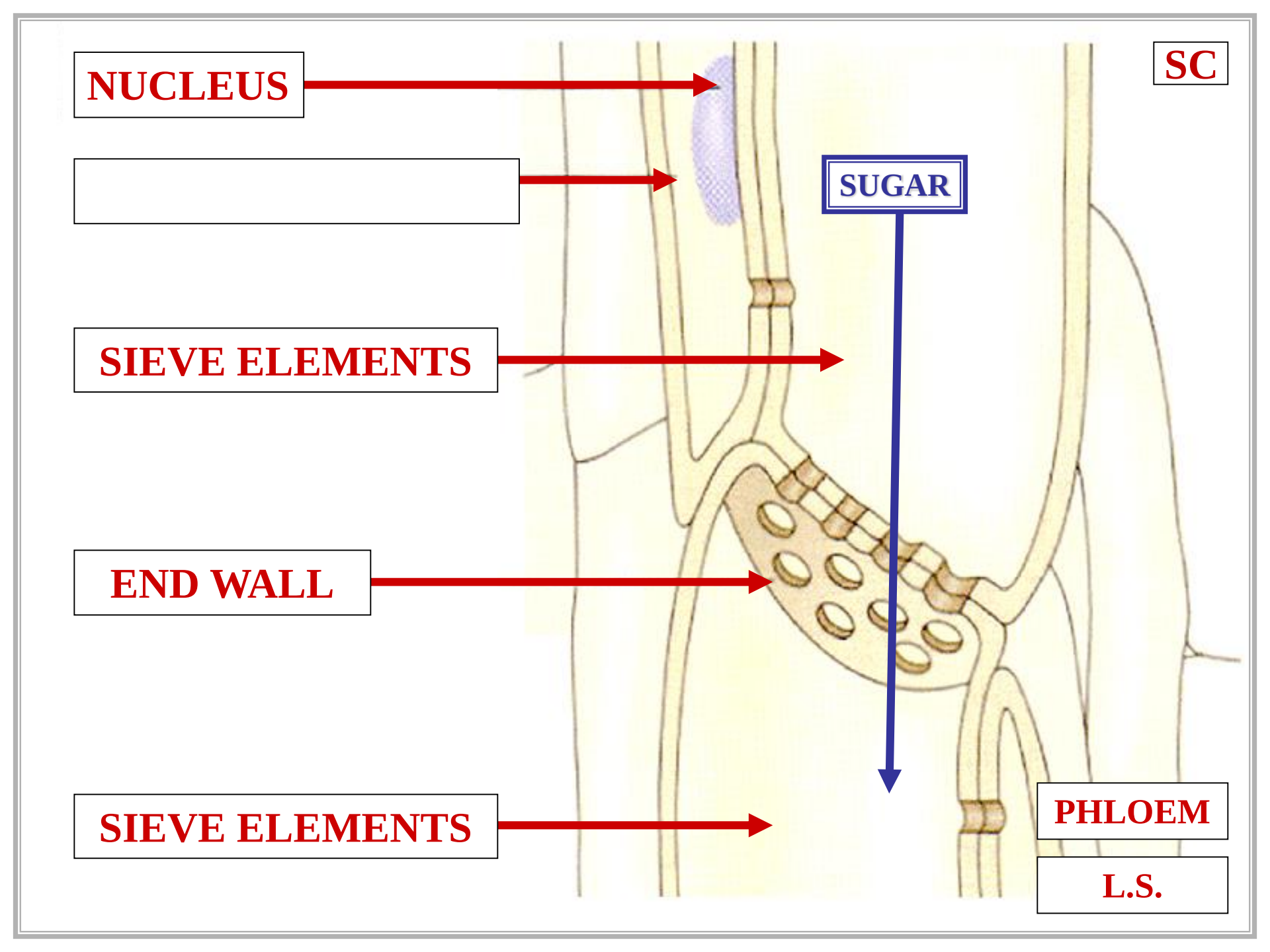
TRACHEARY ELEMENTS

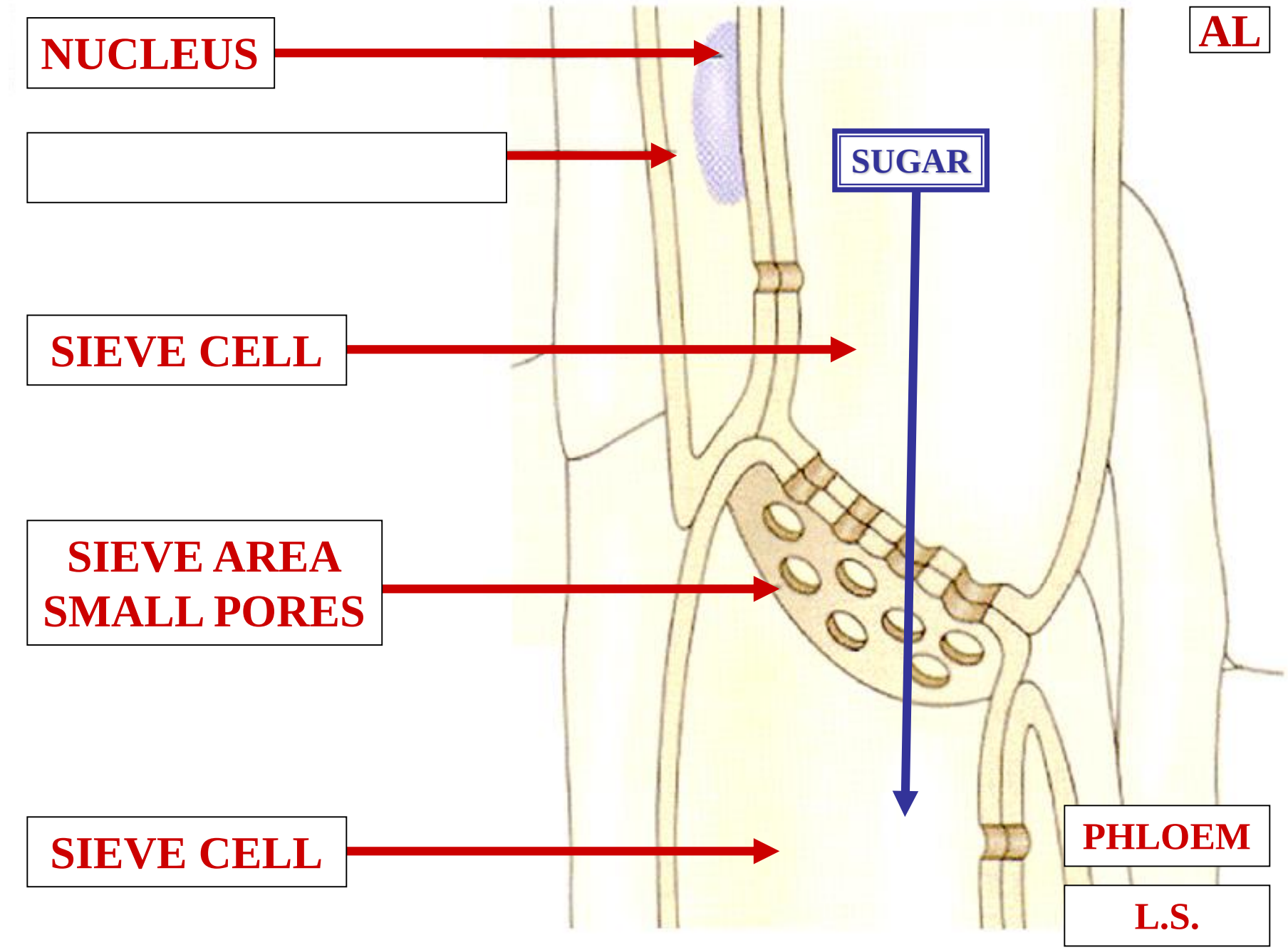

HIGHLY TAPPERED END WALL
LESS TAPPERED END WALL
VESSEL MEMBER
PERFORATED PLATE
WATER
PITS
TRACHEID
WATER

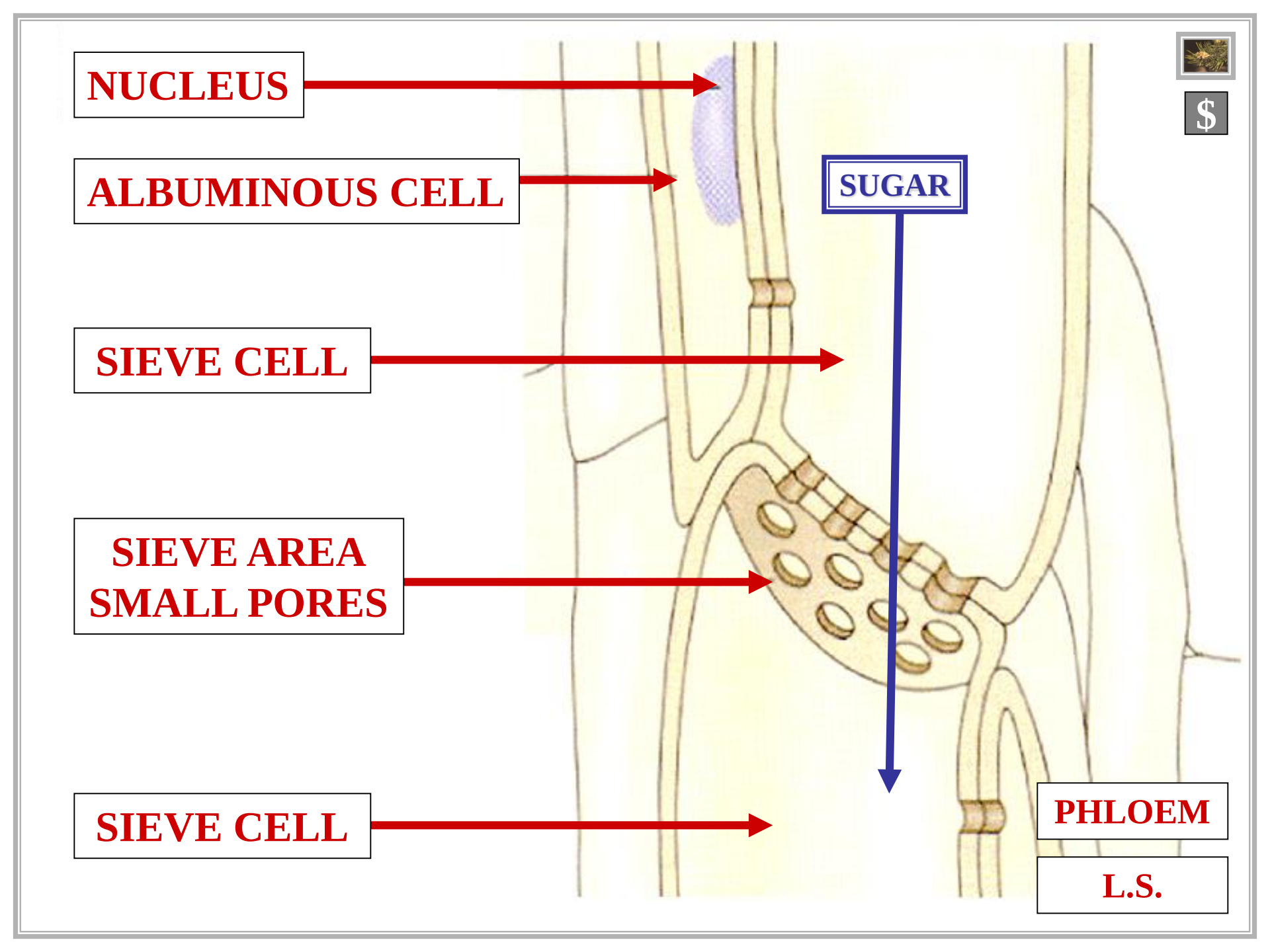

PINOPHYTA
TRACHEIDS
PINUS

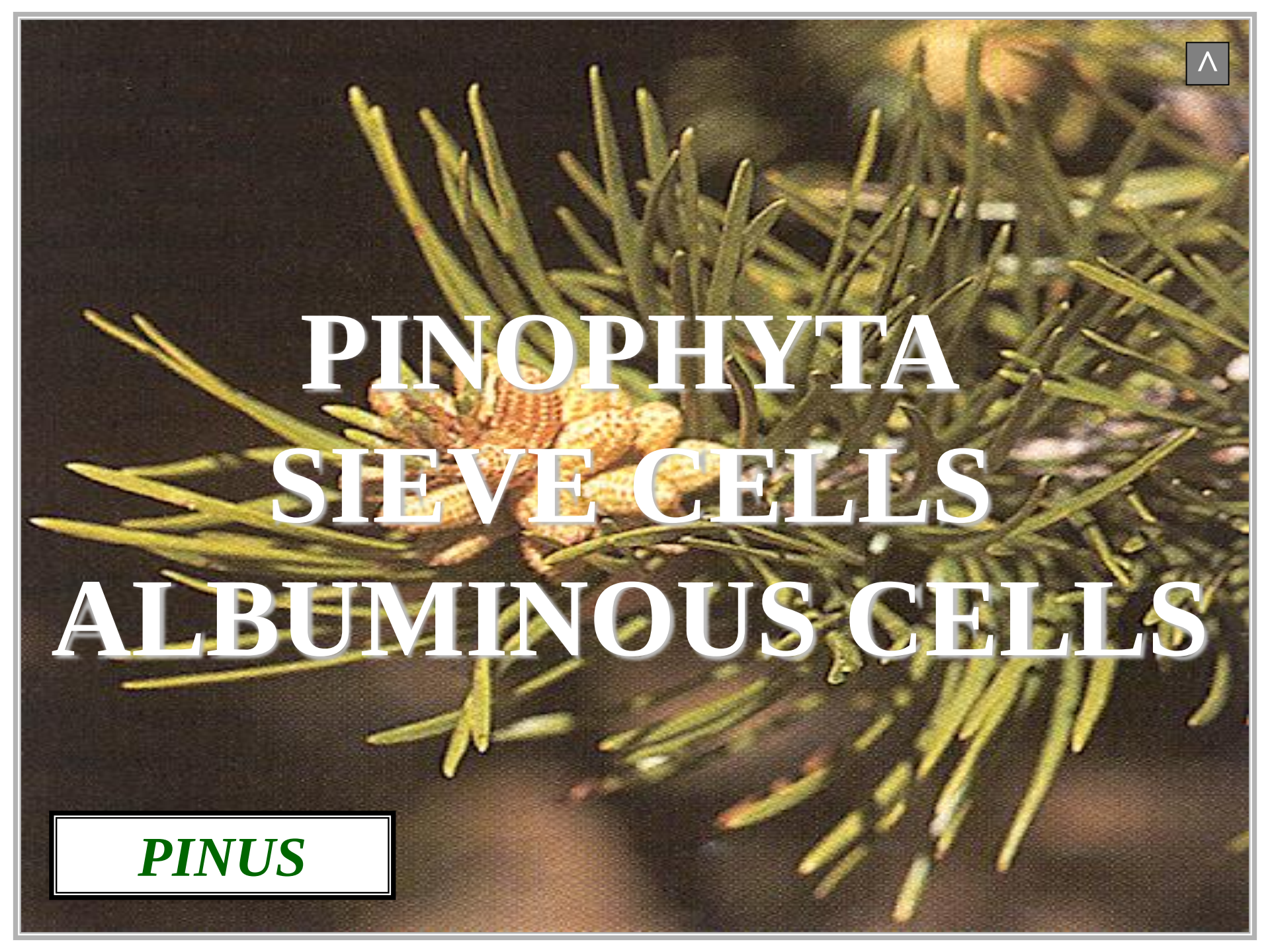
PHLOEM


NUCLEUS
SE
SUGAR
PHLOEM CELL
END WALL
PHLOEM CELL
PHLOEM
L.S.


NUCLEUS
SC
SUGAR
SIEVE ELEMENTS
END WALL
SIEVE ELEMENTS
PHLOEM
L.S.


NUCLEUS
SUGAR
SIEVE CELL
SIEVE AREA
SMALL PORES
SIEVE CELL
PHLOEM
L.S.
AL


NUCLEUS
ALBUMINOUS CELL
SIEVE CELL
SIEVE AREA
SMALL PORES
SIEVE CELL
SUGAR
PHLOEM
L.S.
$


PINOPHYTA
SIEVE CELLS
ALBUMINOUS CELLS
PINUS

EX

GROWTH FORM

A

EXCURRENT GROWTH FORM

PINUS

H

APICAL DOMINANCE INDUCED

PLANT HORMONE
AUXIN
INHIBITS
LATERAL STEM GROWTH

PLANT HORMONE
AUXIN
INHIBITS
LATERAL STEM GROWTH

PINUS

M

HIGH
AUXIN
CONTENT

APICAL DOMINANCE INDUCED

PLANT HORMONE
AUXIN
INHIBITS
LATERAL STEM GROWTH

PINUS

L

APICAL DOMINANCE INDUCED

HIGH AUXIN CONTENT

MODERATE AUXIN CONTENT

PLANT HORMONE
AUXIN
INHIBITS
LATERAL STEM GROWTH

PINUS

APICAL DOMINANCE INDUCED

HIGH AUXIN CONTENT

MODERATE AUXIN CONTENT

LOW AUXIN CONTENT

PLANT HORMONE
AUXIN
INHIBITS
LATERAL STEM GROWTH

PINUS

E

HIGH AUXIN CONTENT

MODERATE AUXIN CONTENT

LOW AUXIN CONTENT

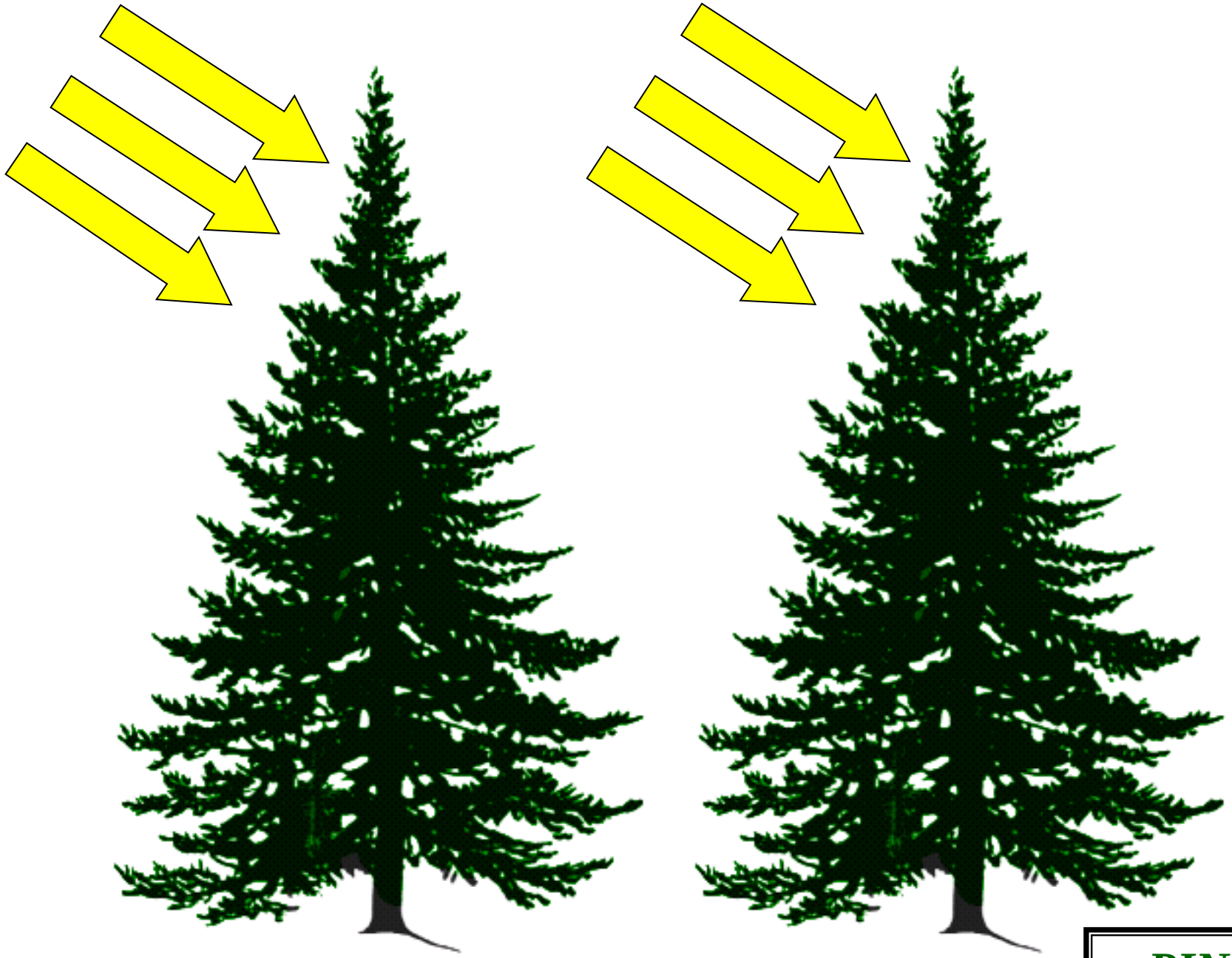
LOW STEM GROWTH

MODERATE STEM GROWTH

HIGH STEM GROWTH

EXCURRENT GROWTH FORM

PINUS



PINUS

CONIFER FOREST

STEM

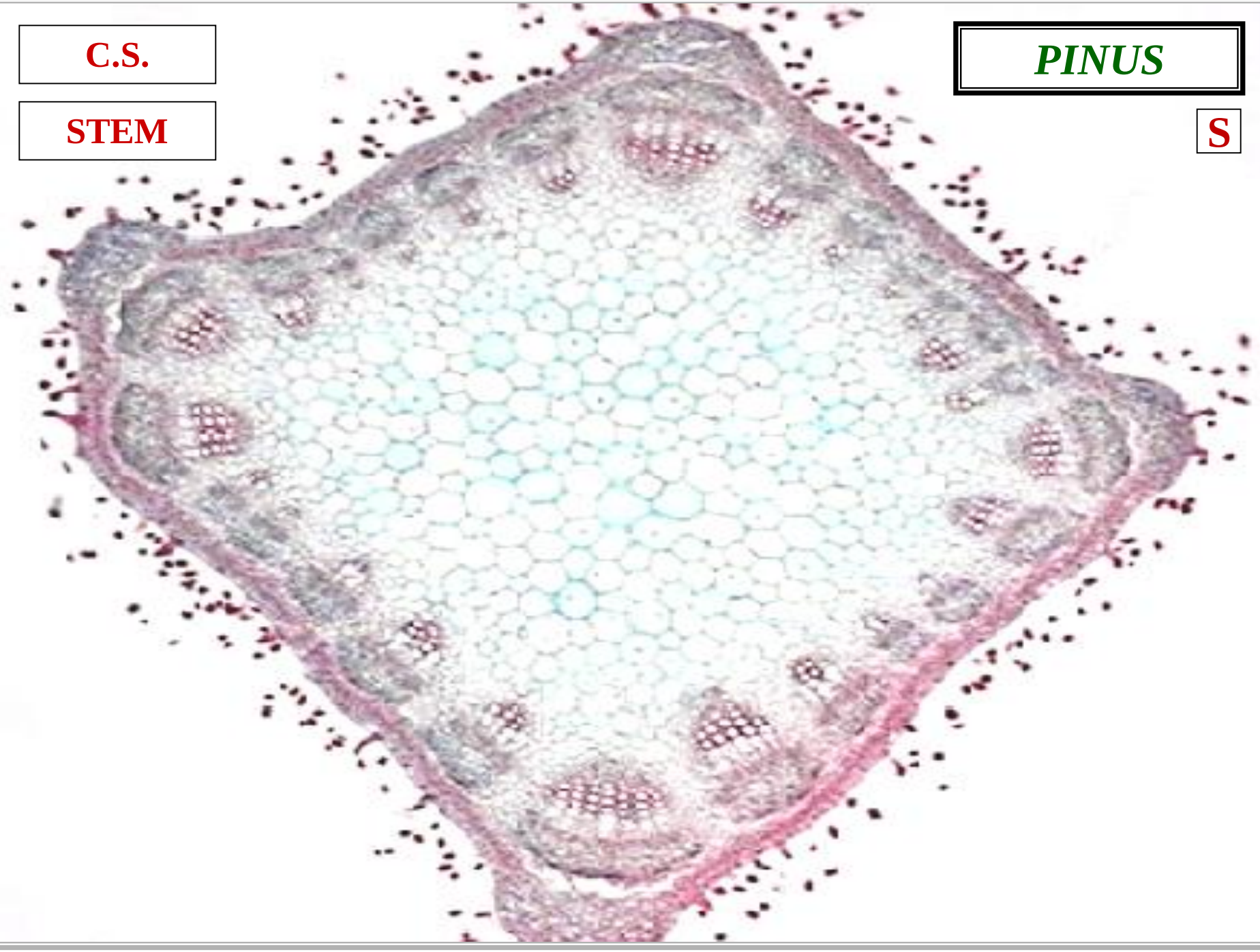
STEM STELE

C.S.

STEM

PINUS

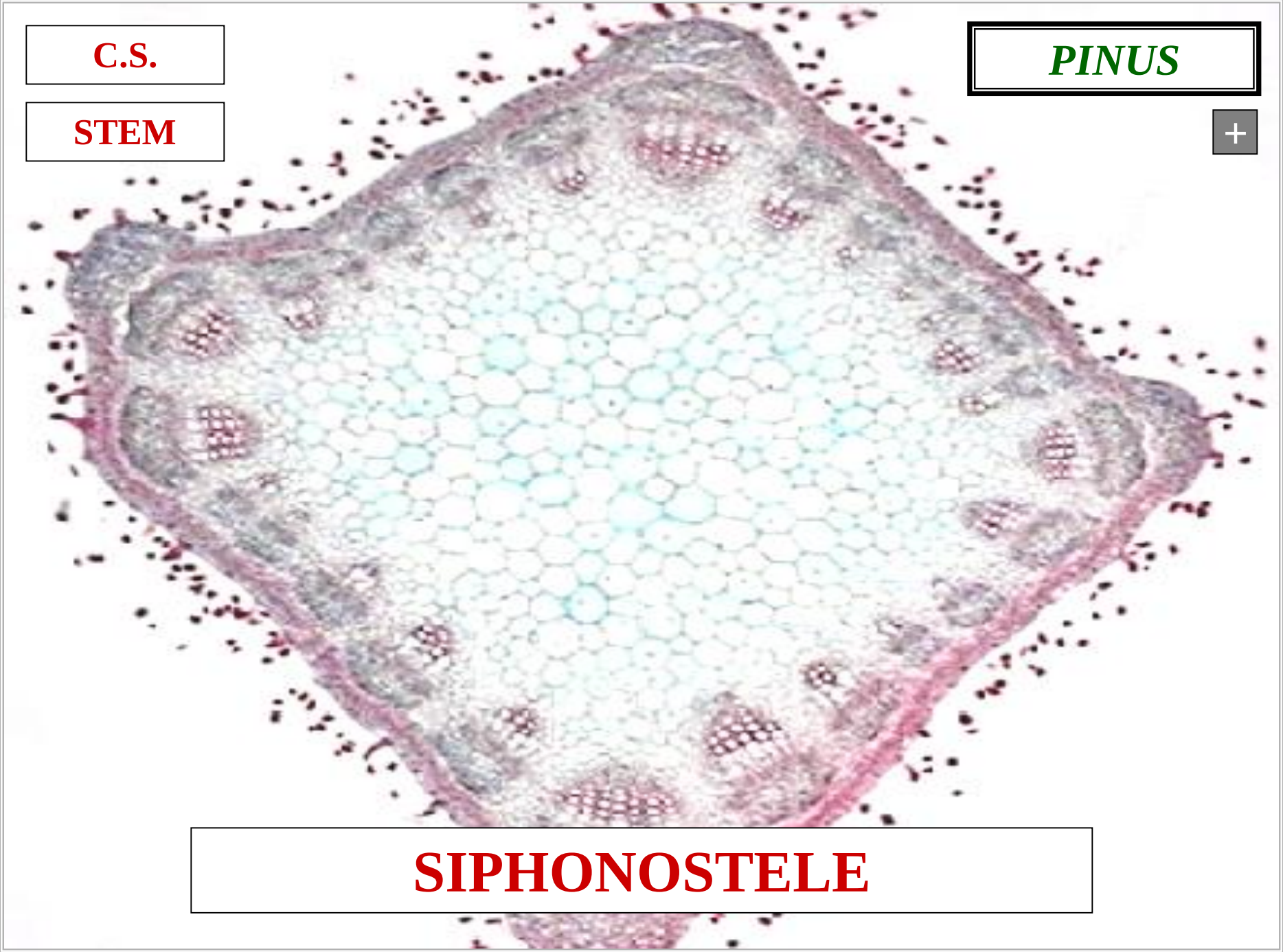
S



C.S.

STEM

PINUS



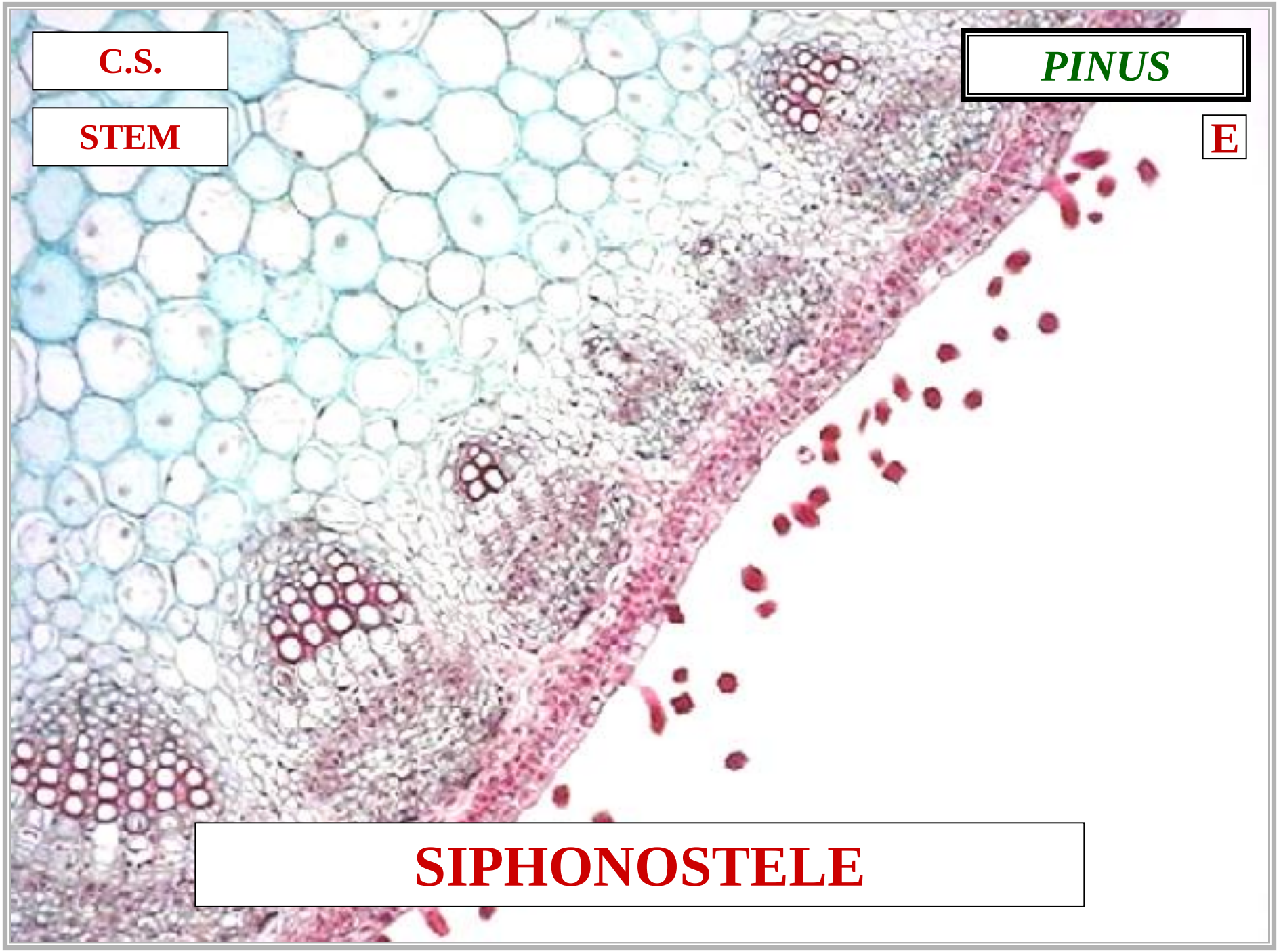
SIPHONOSTELE

C.S.

STEM

PINUS

E



SIPHONOSTELE

C.S.

STEM

PINUS

V

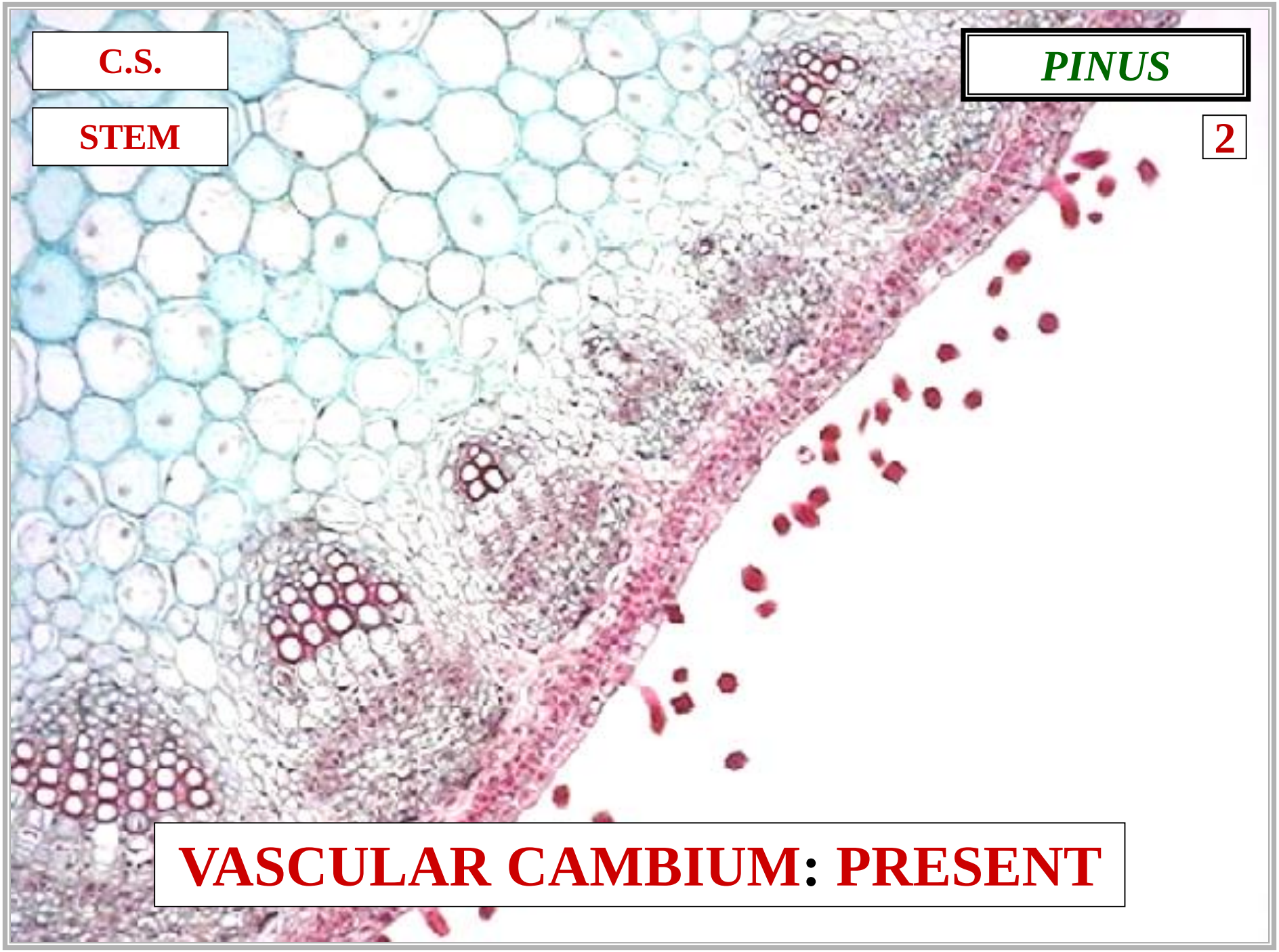
SIPHONOSTELE / EUSTELE

C.S.

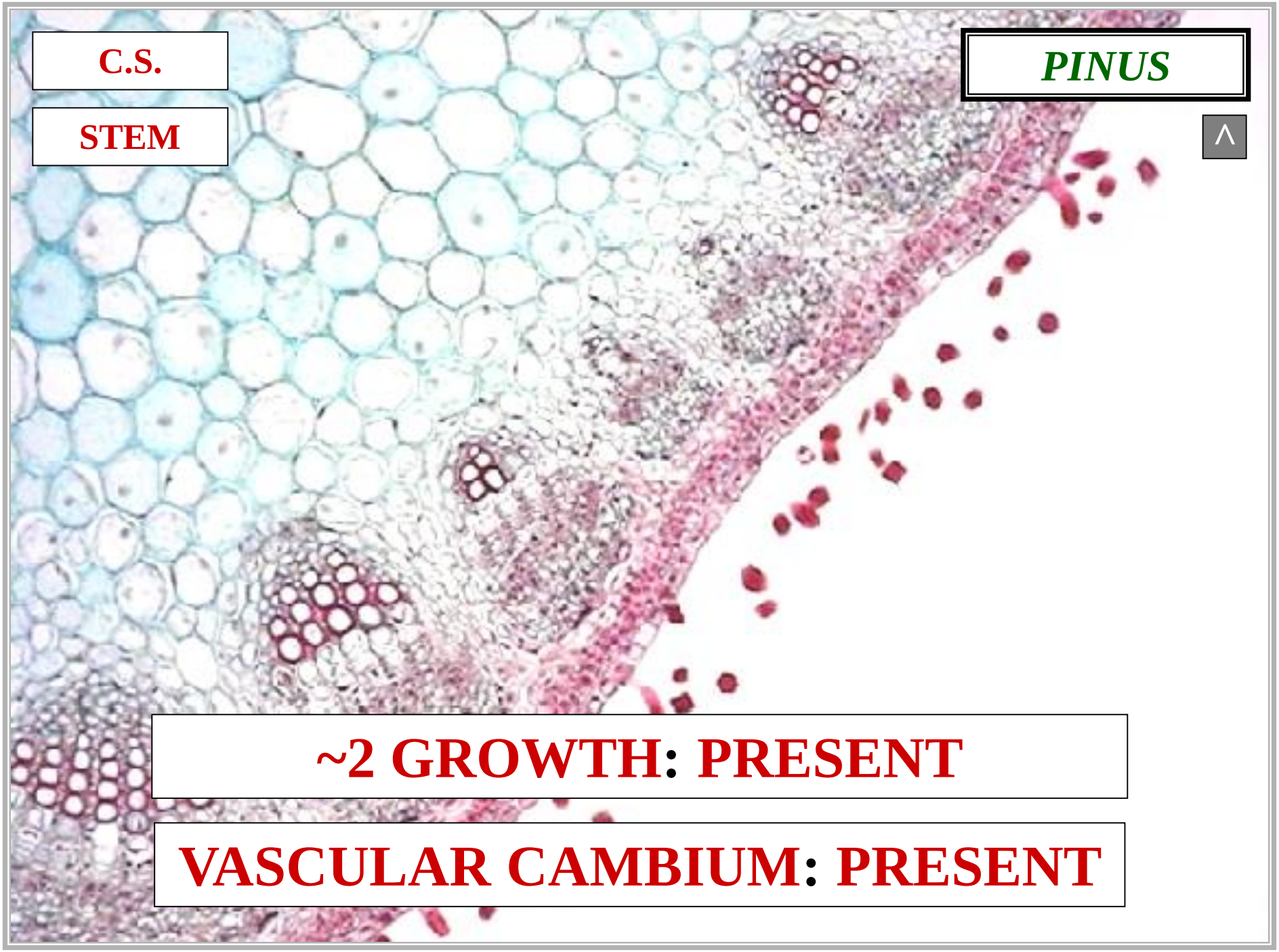
STEM

PINUS

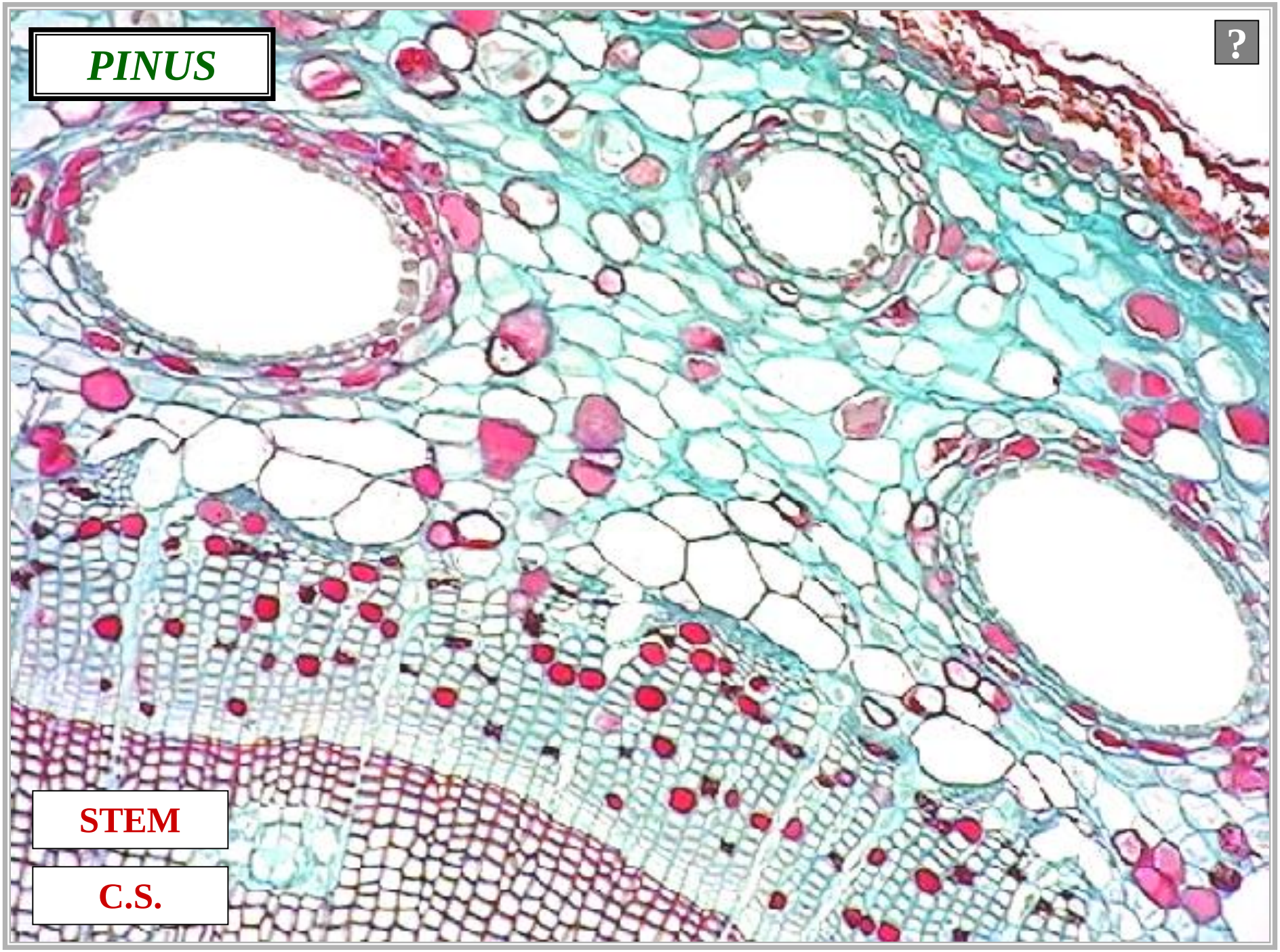
2

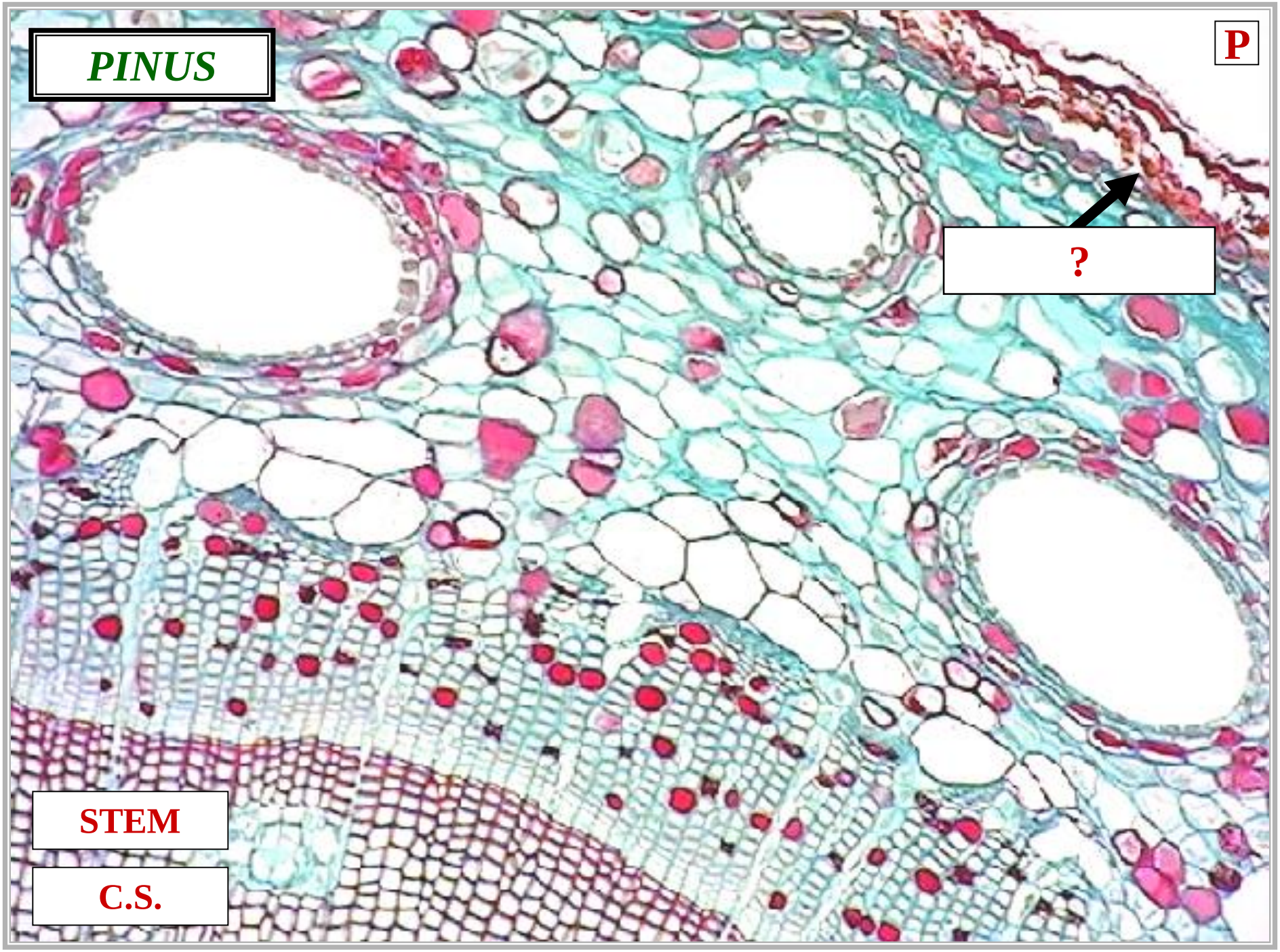


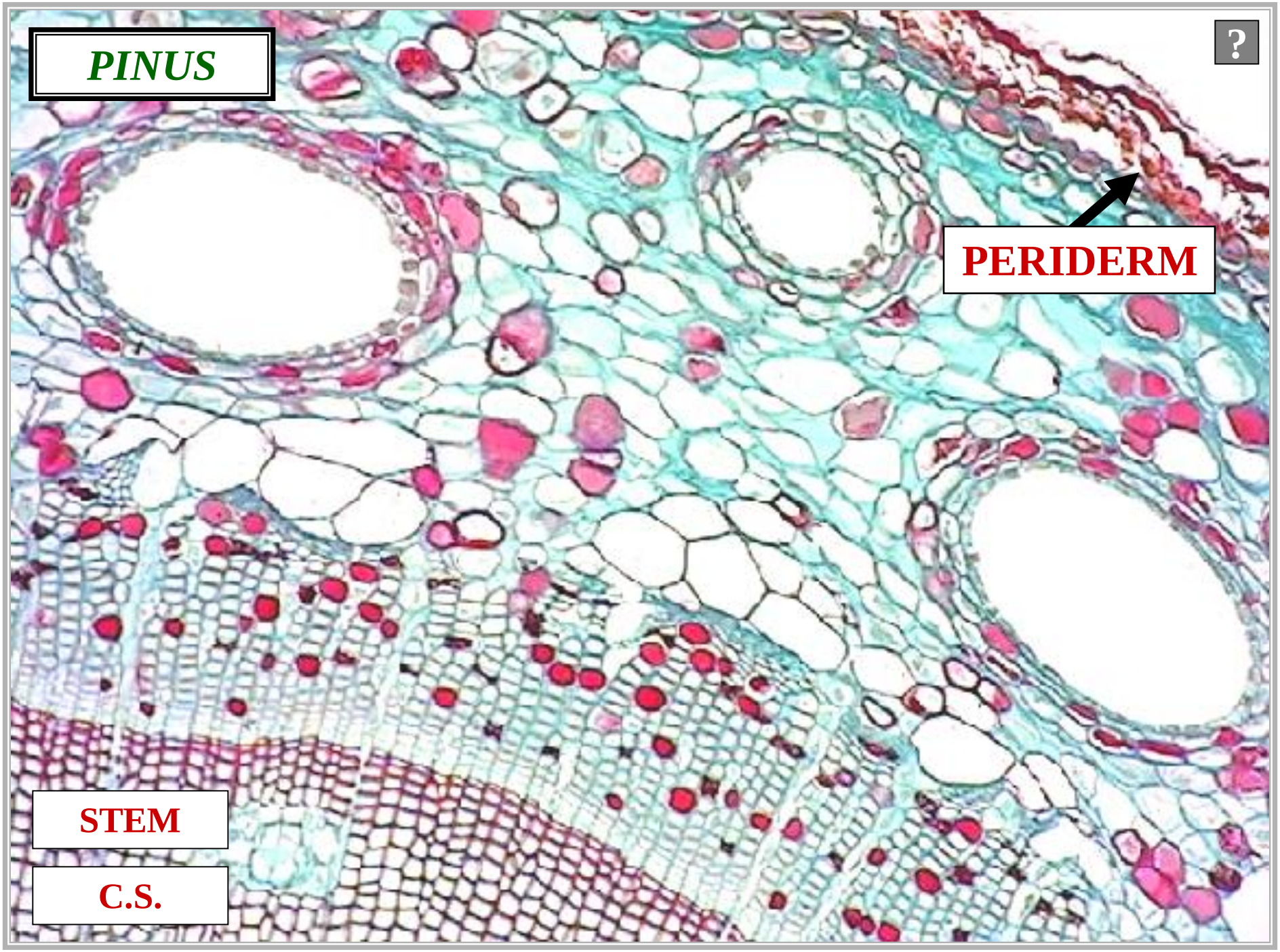
VASCULAR CAMBIUM: PRESENT

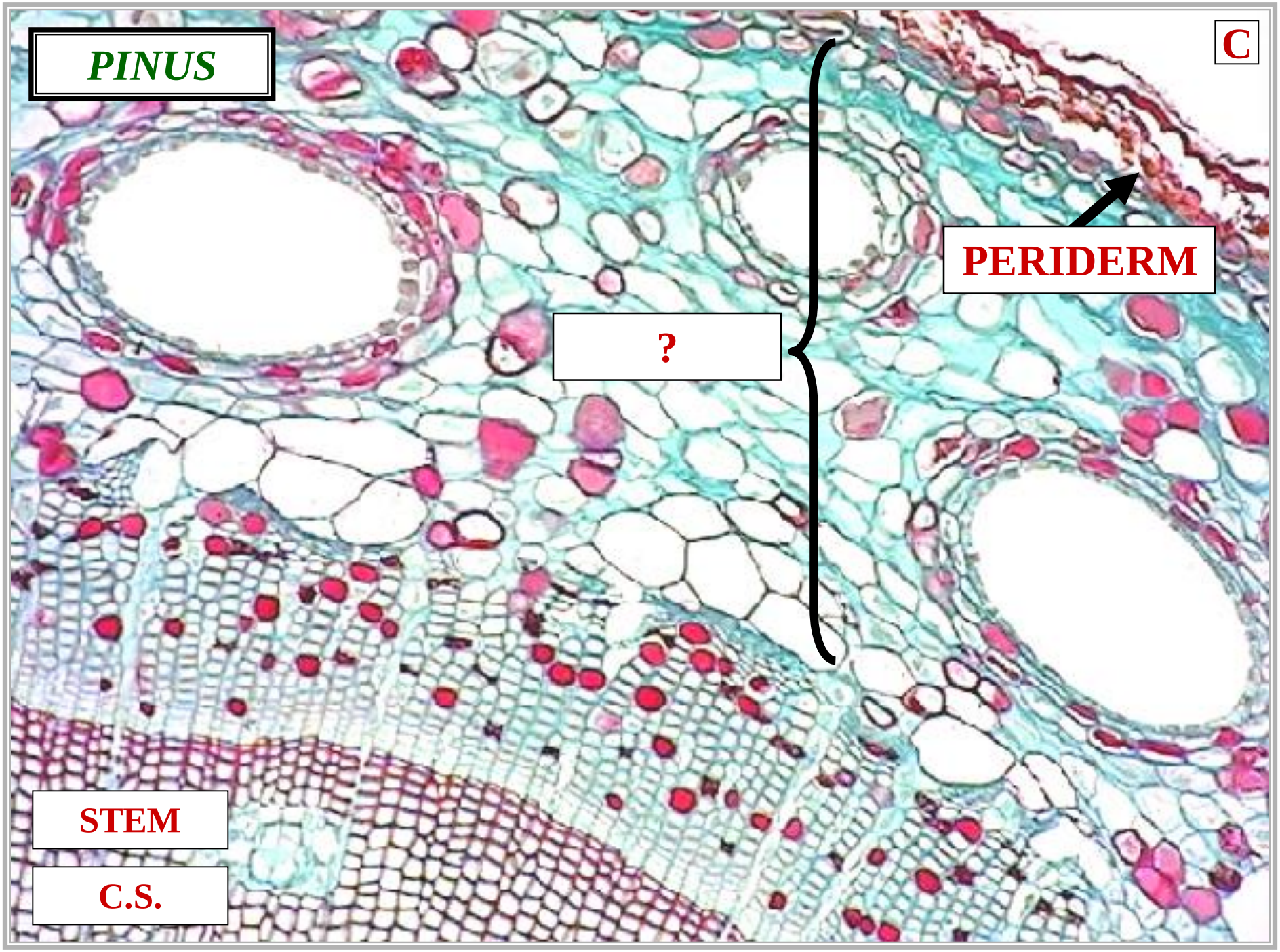

C.S.
STEM
PINUS
^
~2 GROWTH: PRESENT
VASCULAR CAMBIUM: PRESENT

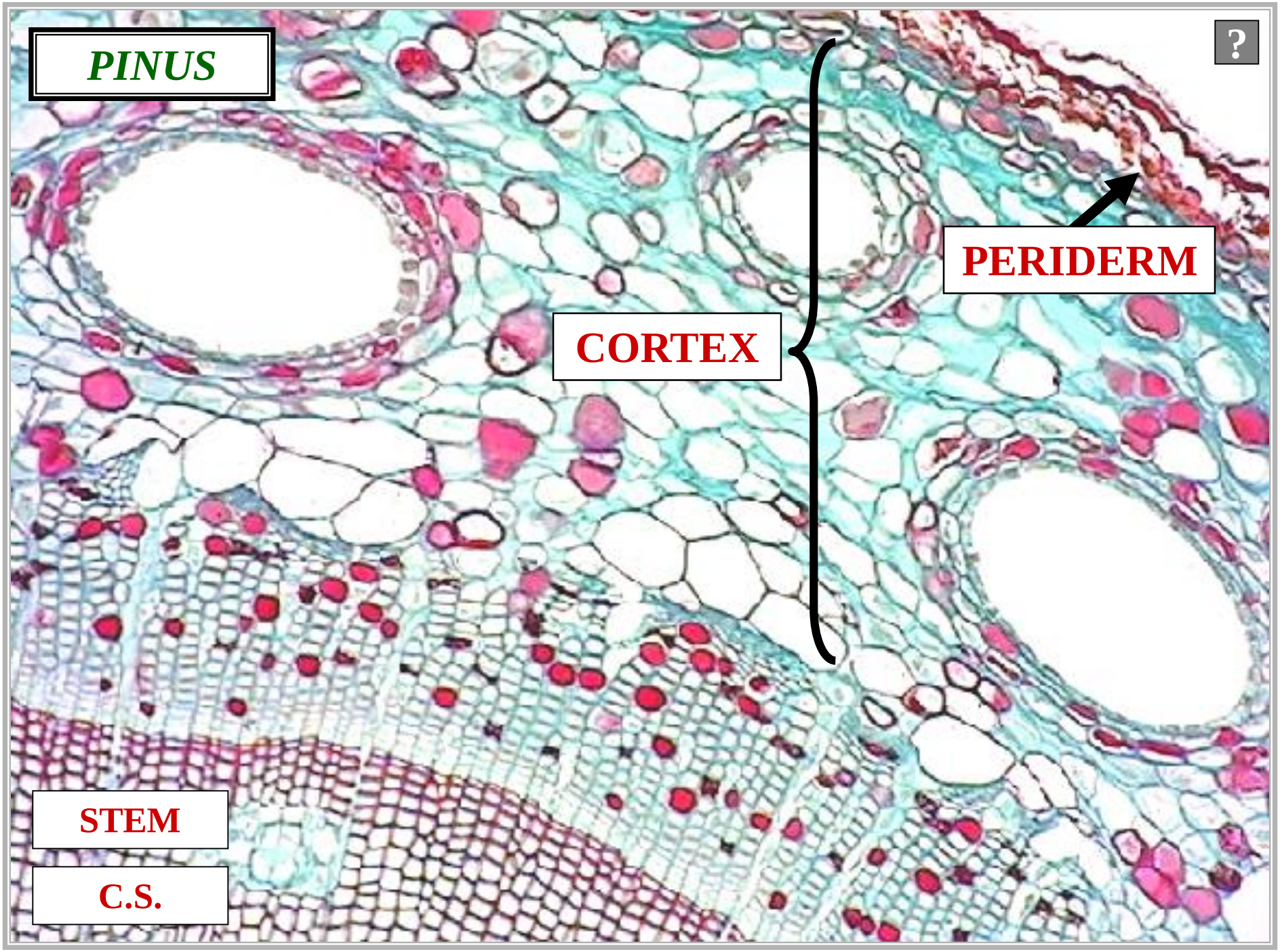
SECONDARY GROWTH ANATOMY

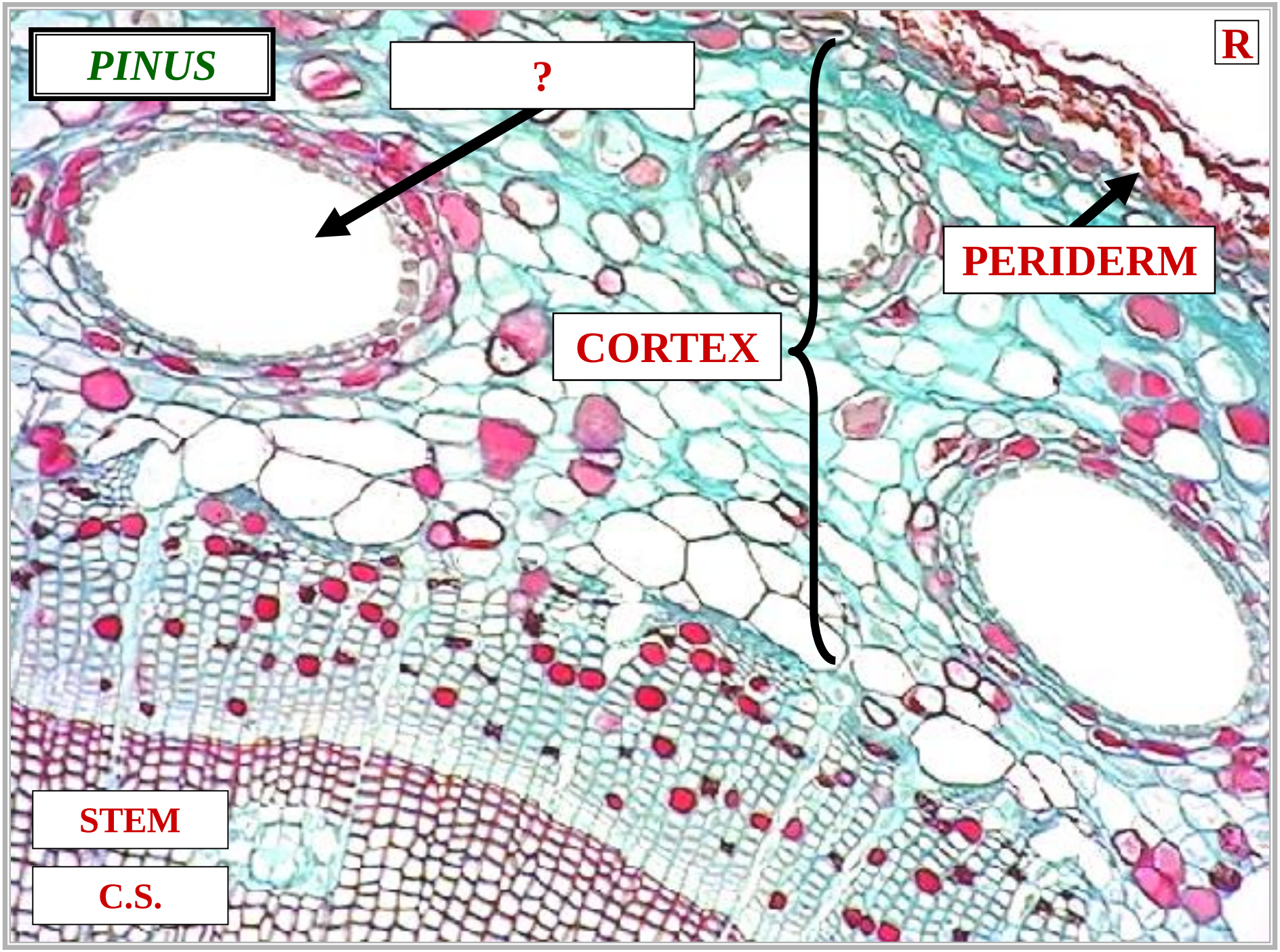

PINUS
?
STEM
C.S.

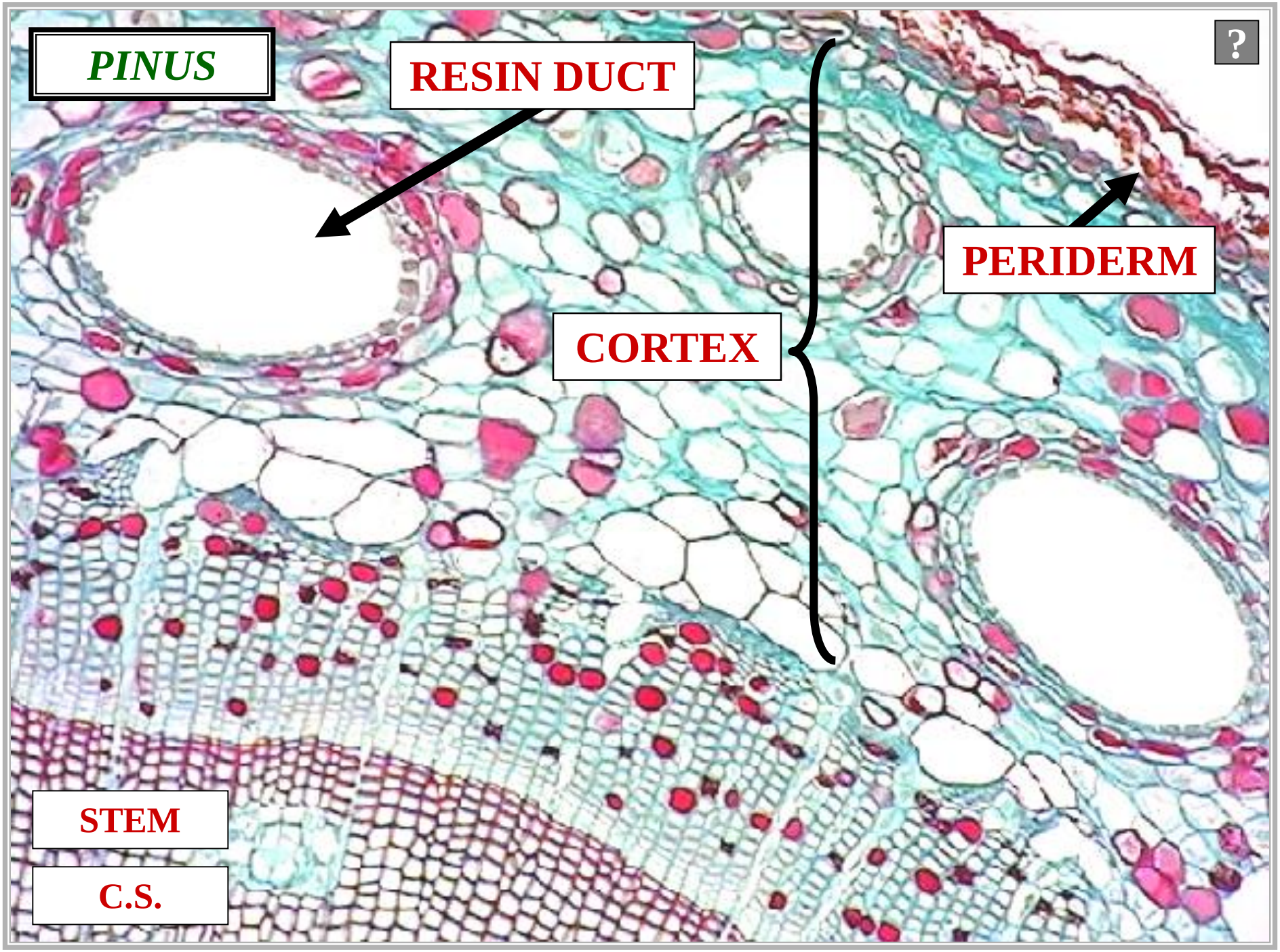

PINUS
P
?
STEM
C.S.

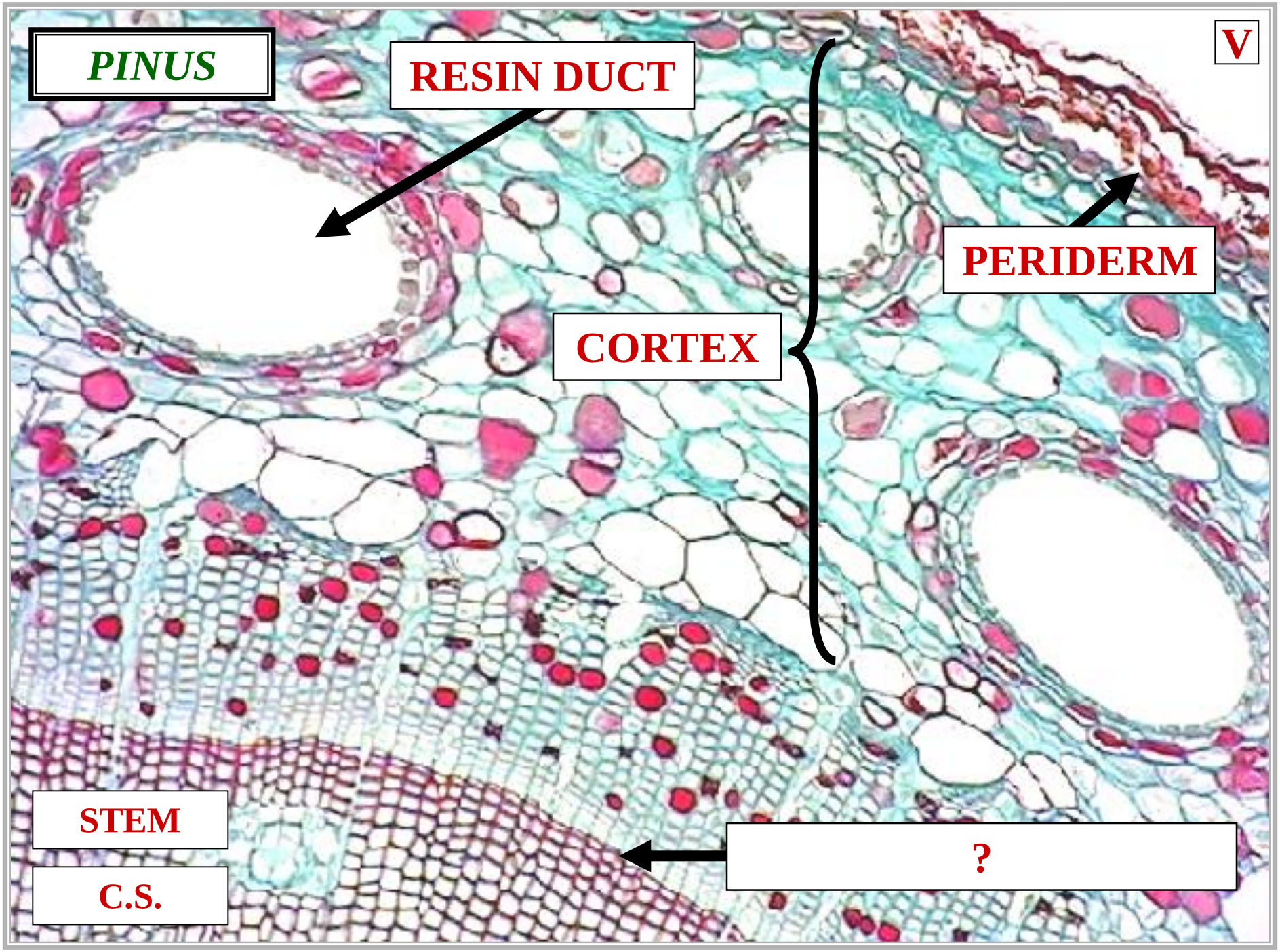

PINUS
?
PERIDERM
STEM
C.S.

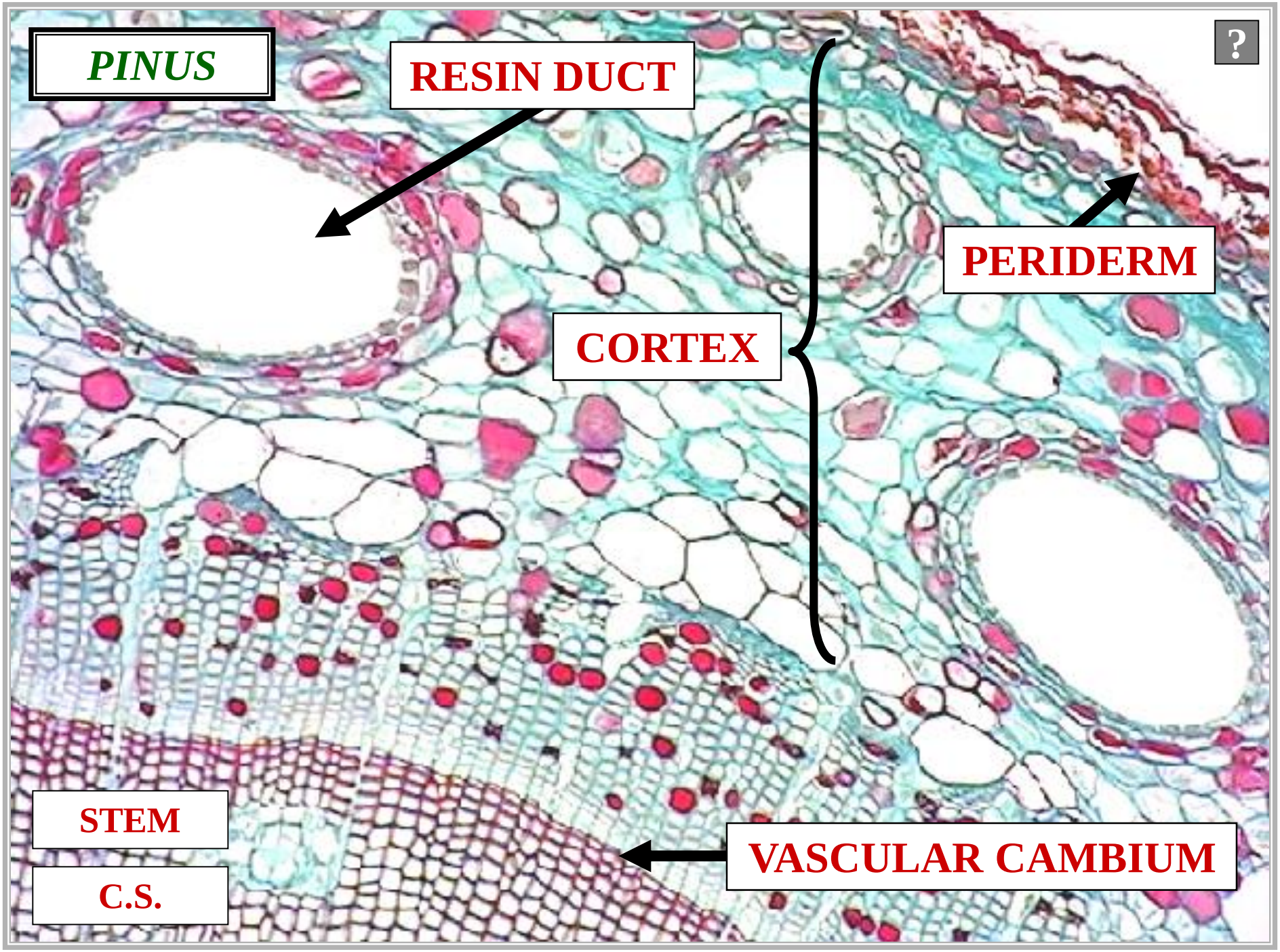

PINUS
C
PERIDERM
?
STEM
C.S.

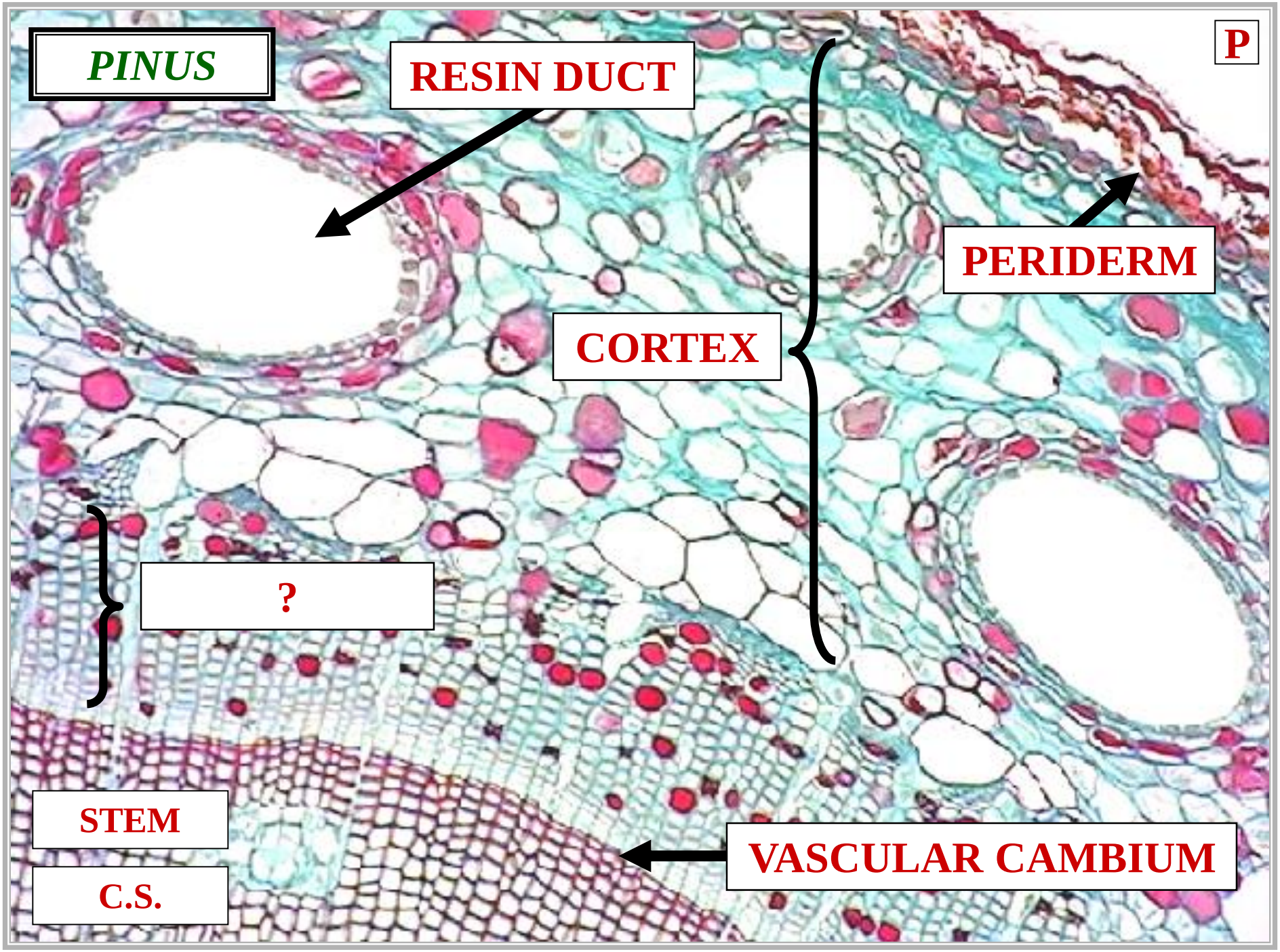

PINUS
?
PERIDERM
CORTEX
STEM
C.S.

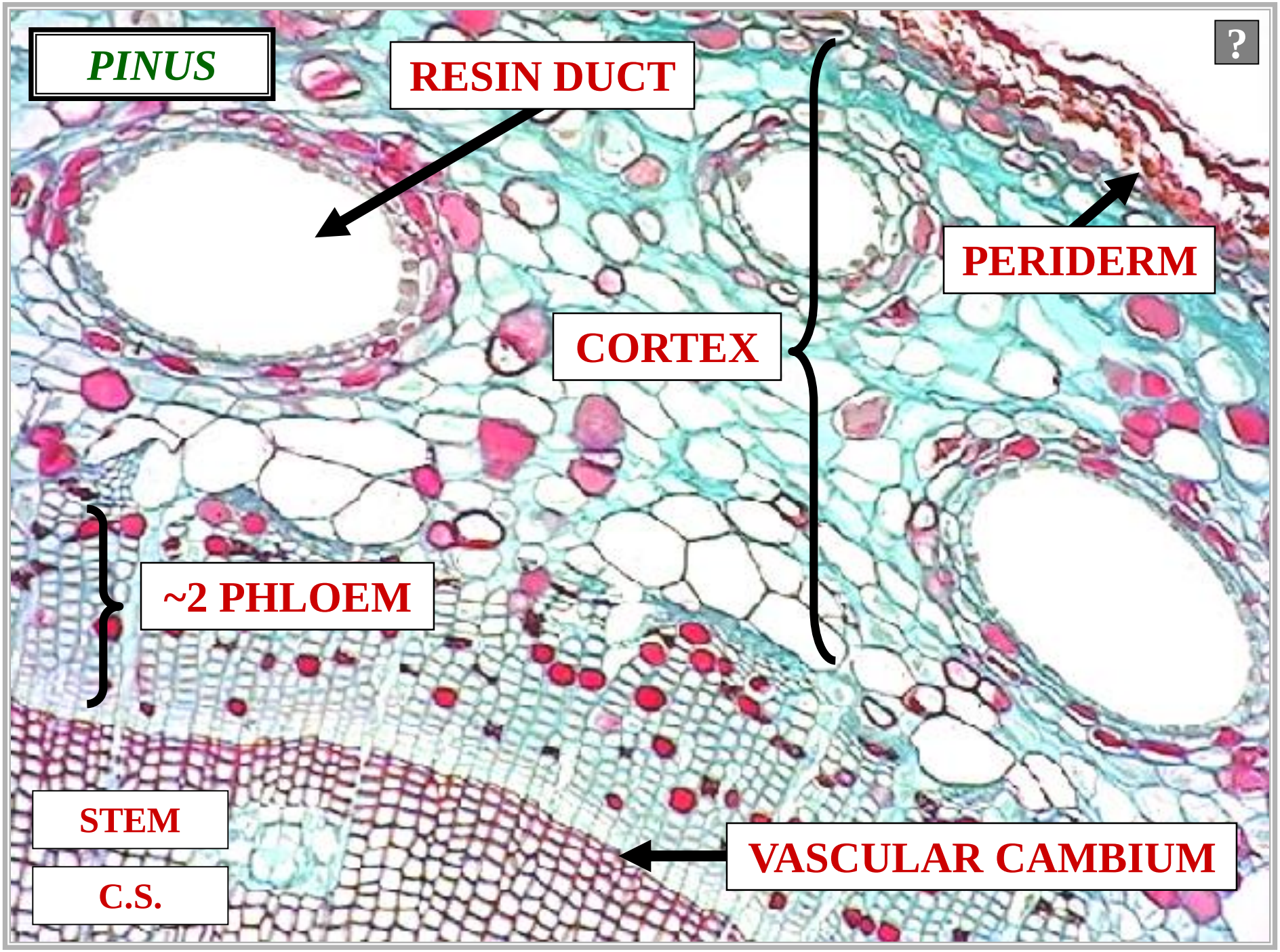

PINUS
?
R
PERIDERM
CORTEX
STEM
C.S.

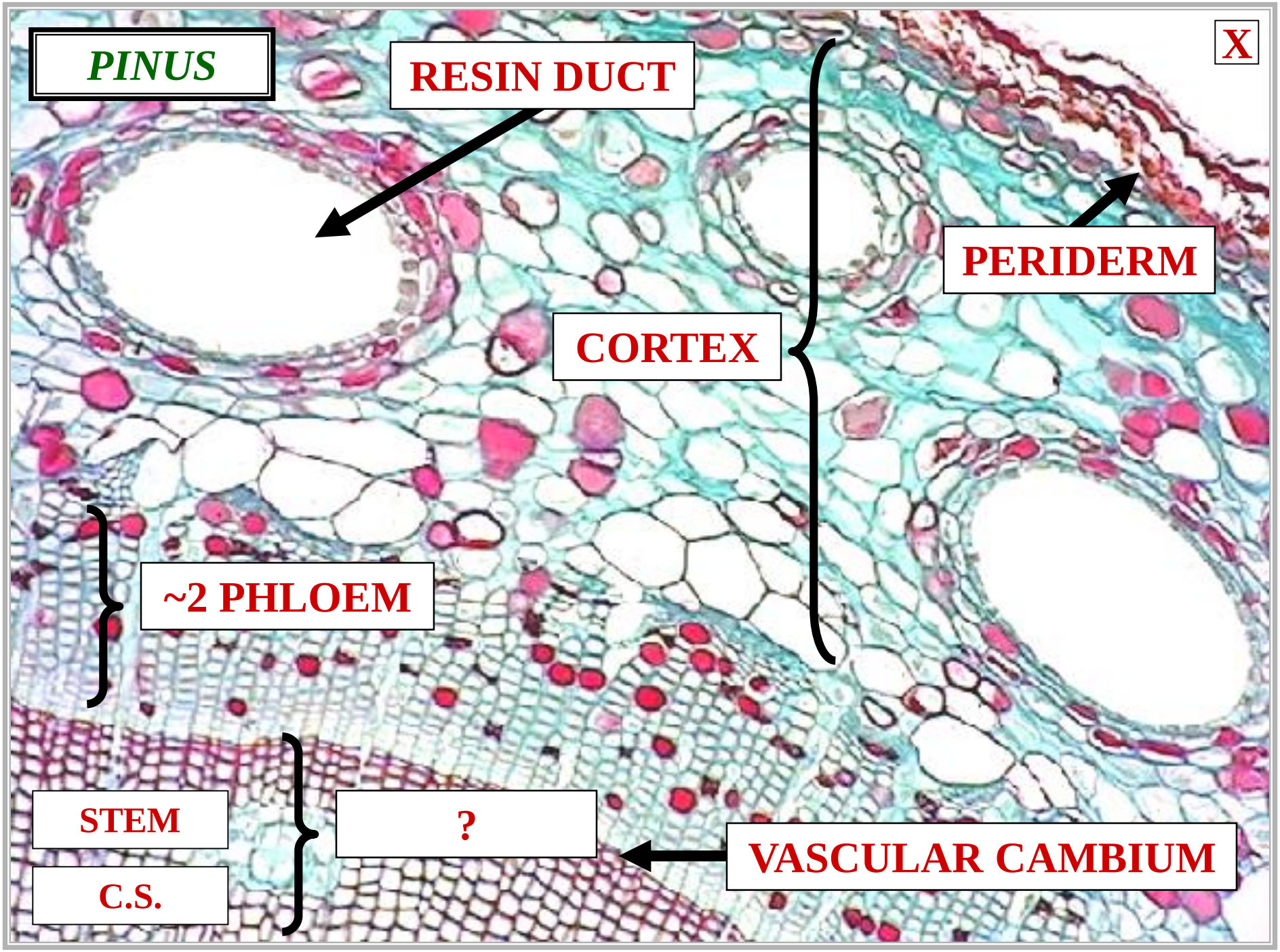

PINUS
RESIN DUCT
PERIDERM
CORTEX
STEM
C.S.
?

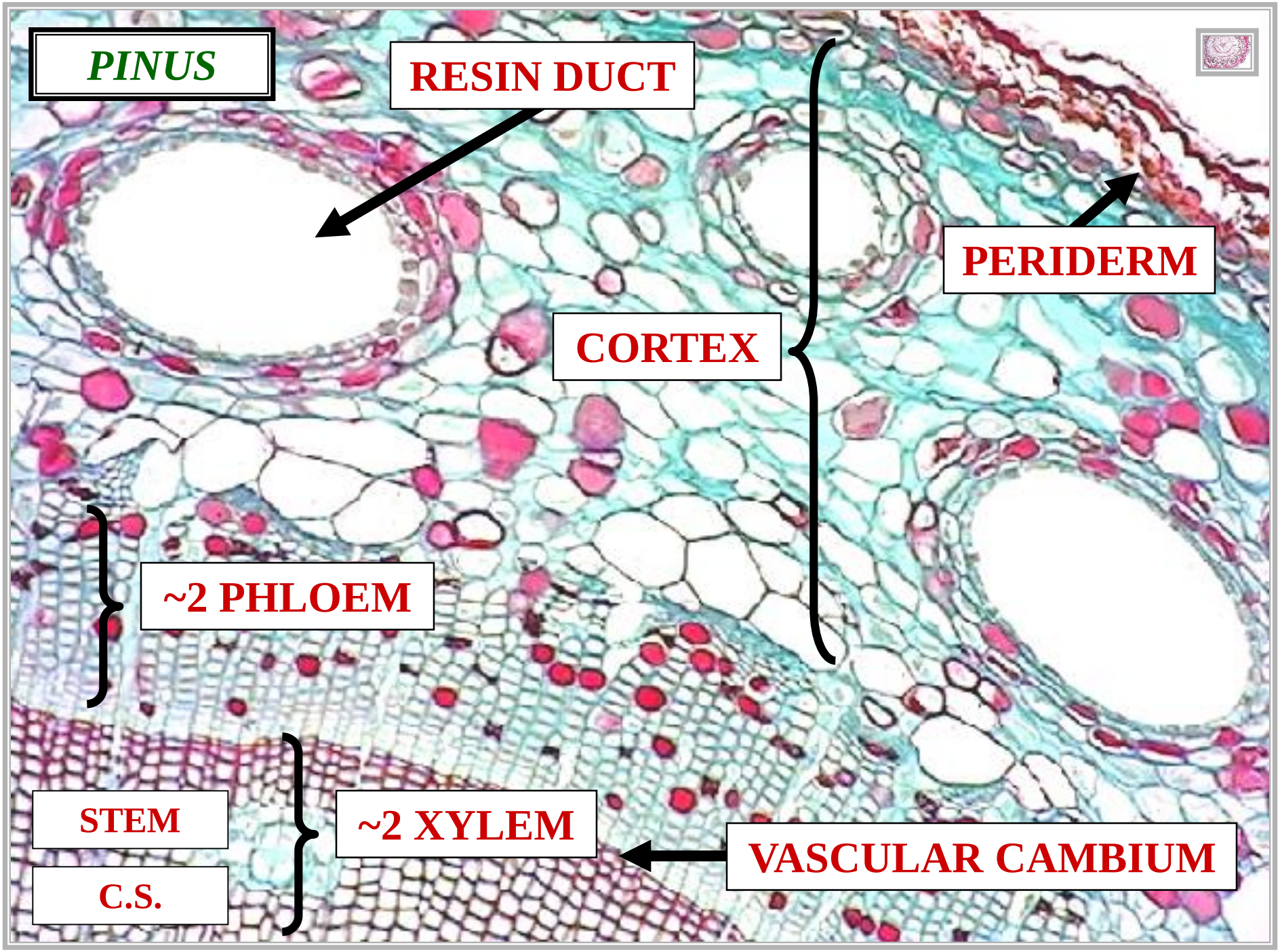

PINUS
RESIN DUCT
V
PERIDERM
CORTEX
STEM
C.S.
?

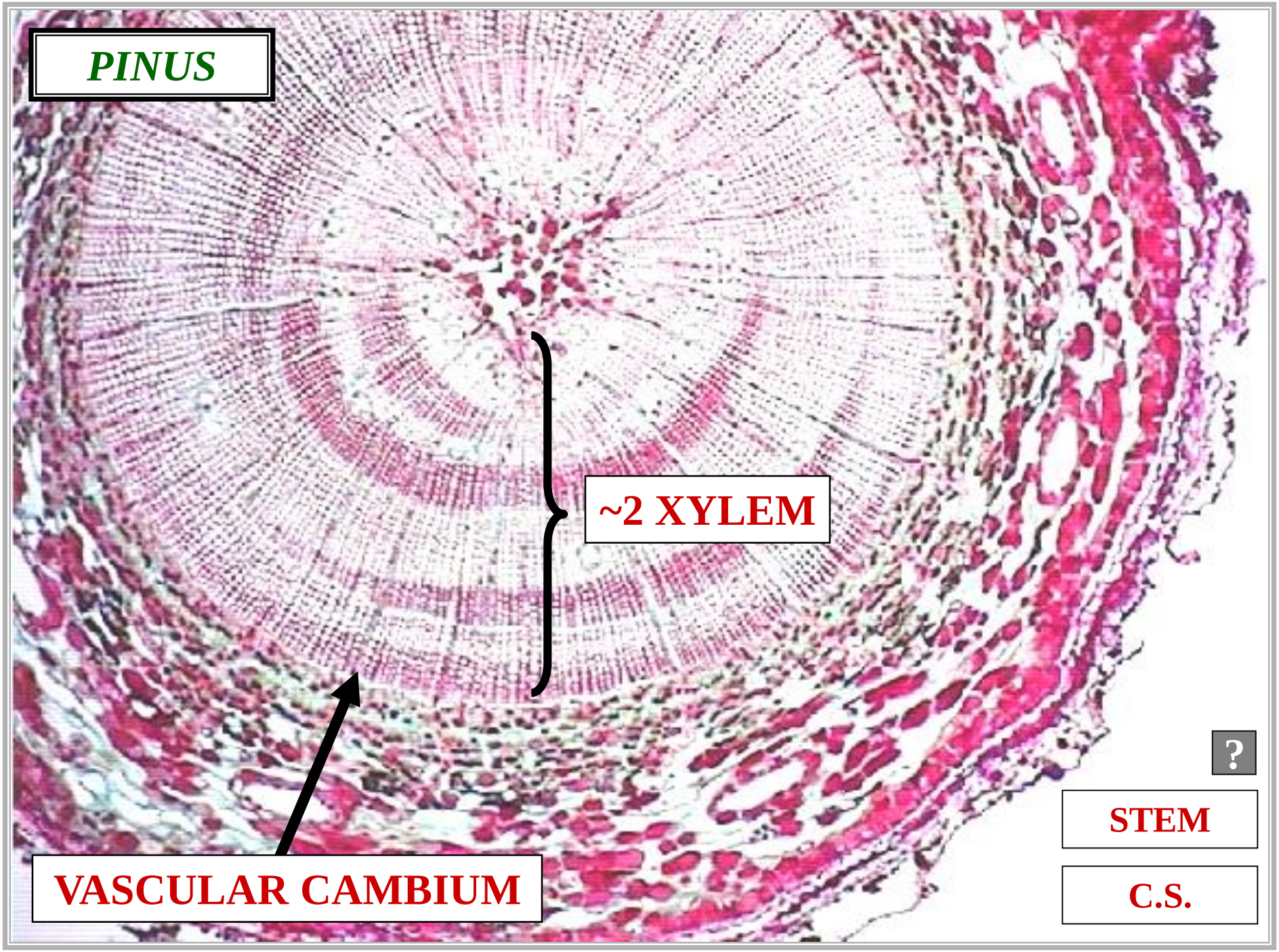

PINUS
RESIN DUCT
PERIDERM
CORTEX
STEM
C.S.
VASCULAR CAMBIUM
?

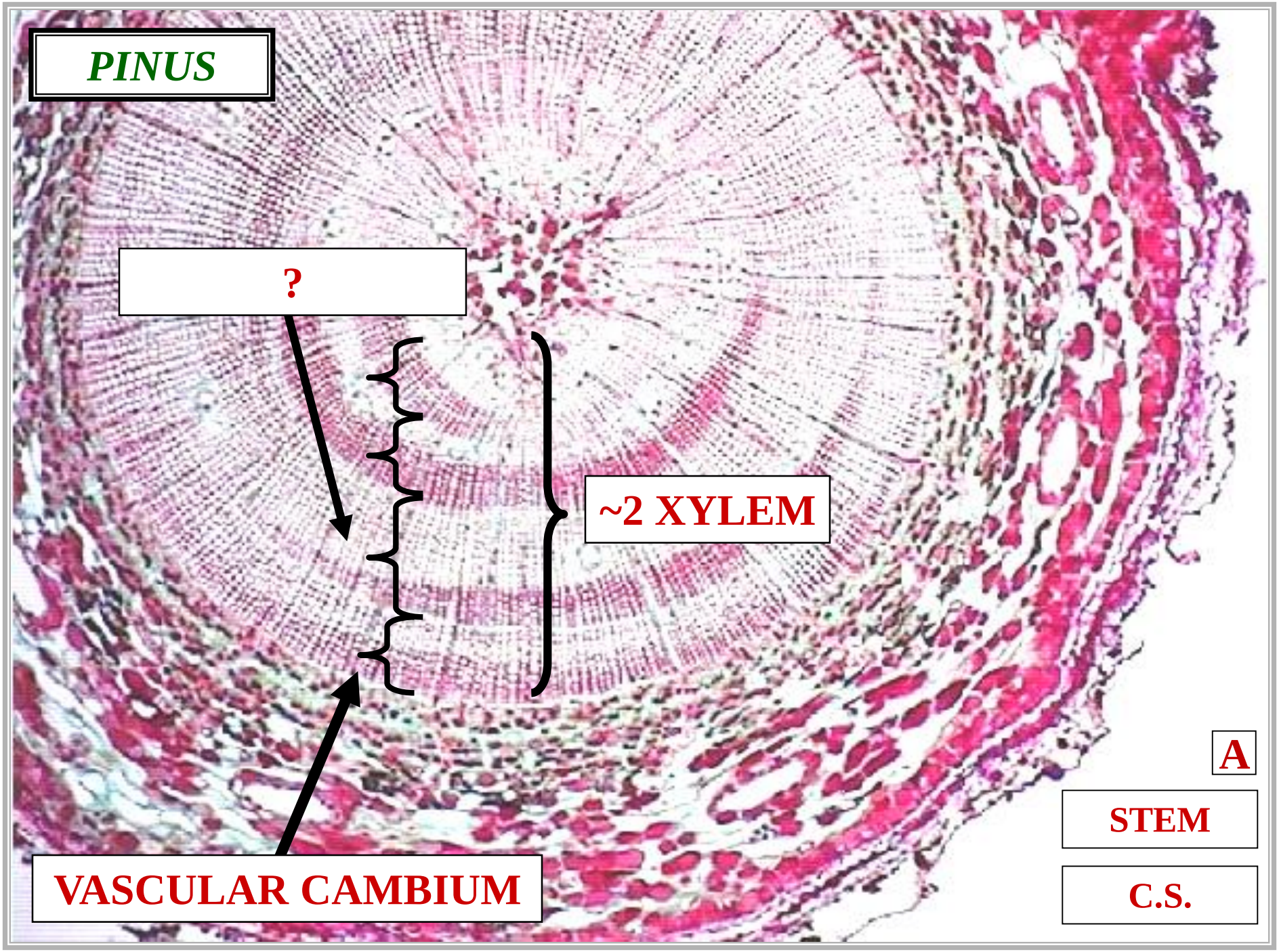

PINUS
RESIN DUCT
P
PERIDERM
CORTEX
?
STEM
C.S.
VASCULAR CAMBIUM

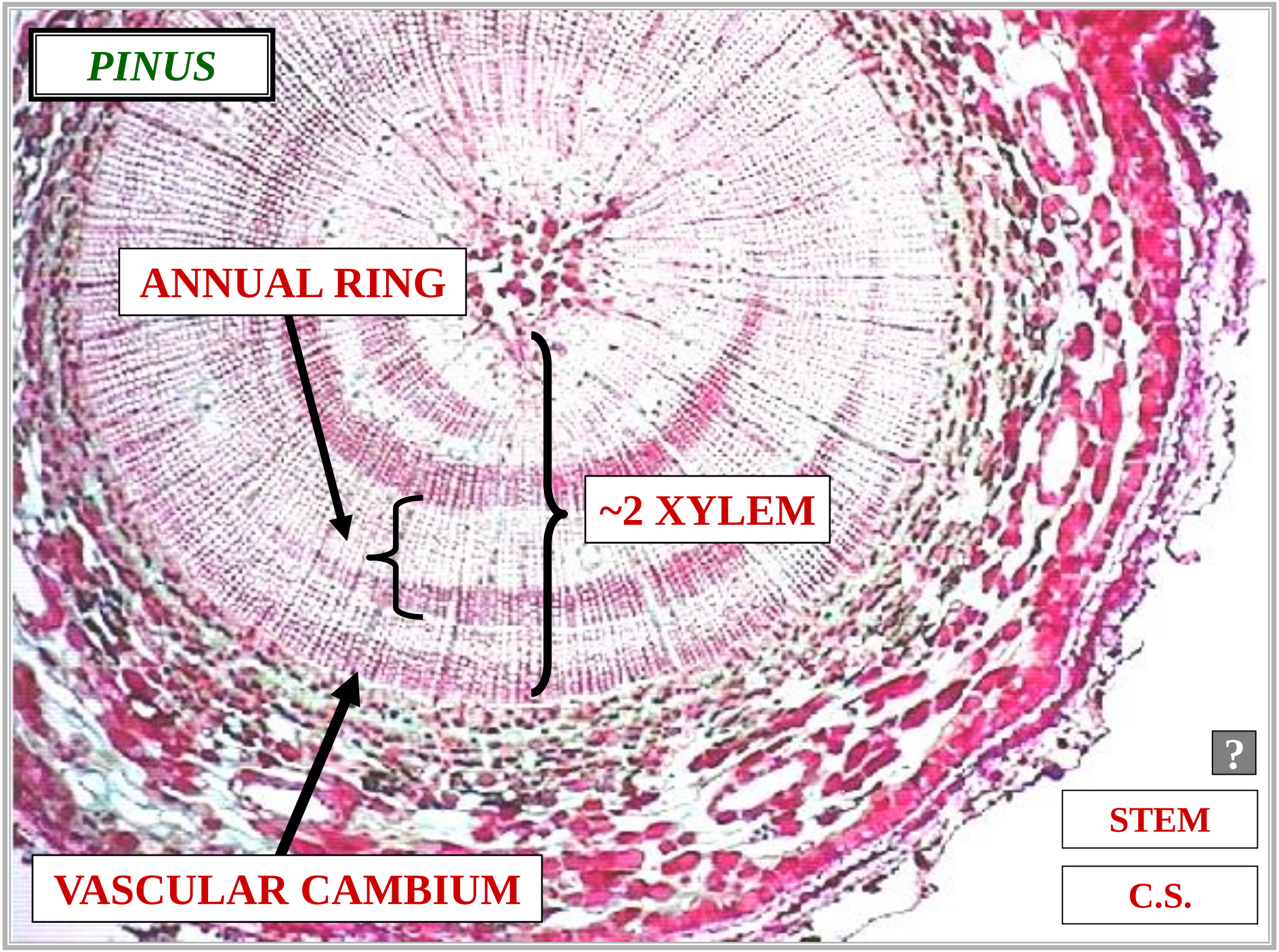

PINUS
RESIN DUCT
PERIDERM
CORTEX
~2 PHLOEM
STEM
C.S.
VASCULAR CAMBIUM
?

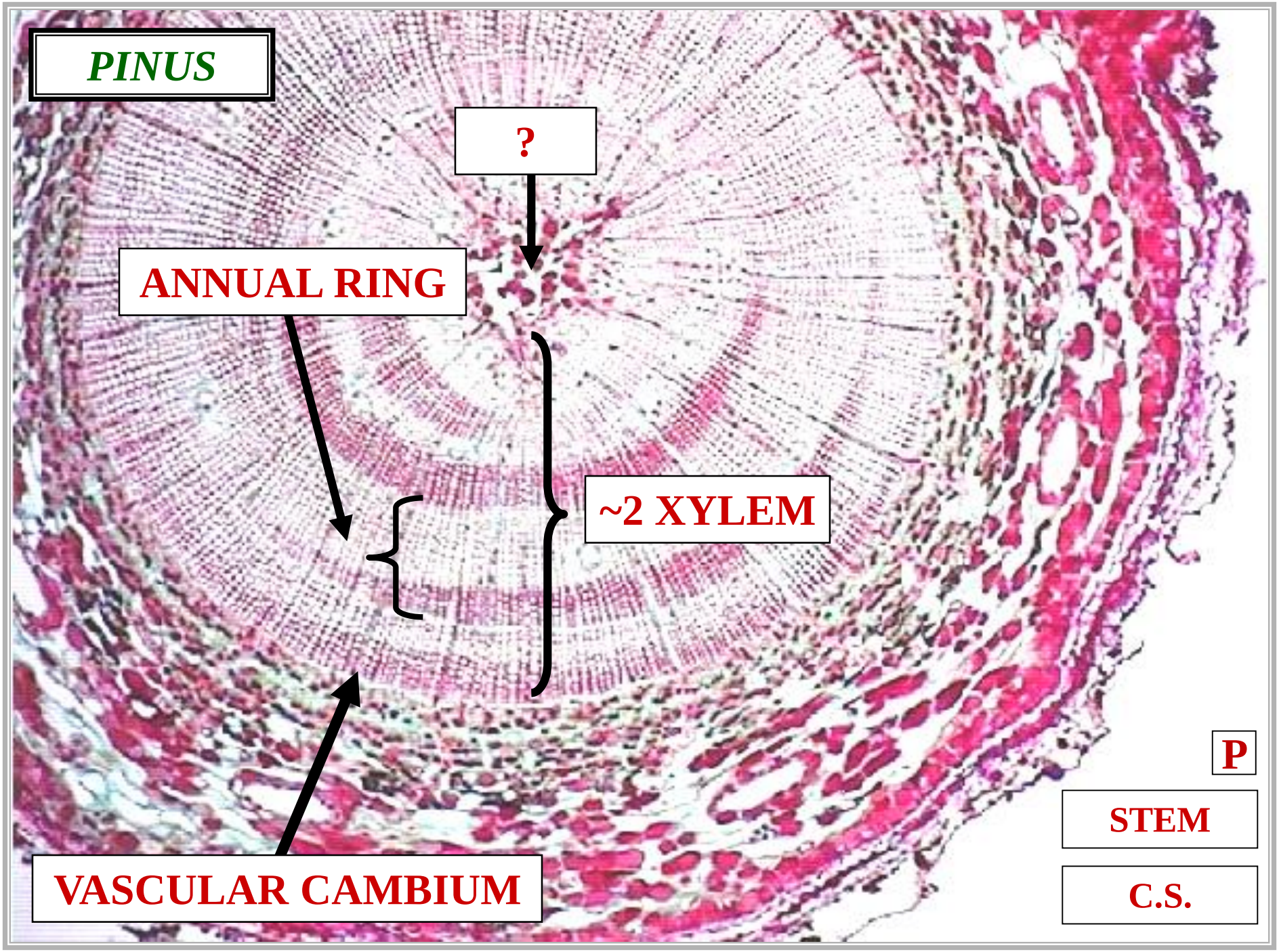

PINUS
RESIN DUCT
X
PERIDERM
CORTEX
~2 PHLOEM
STEM
C.S.
?
VASCULAR CAMBIUM

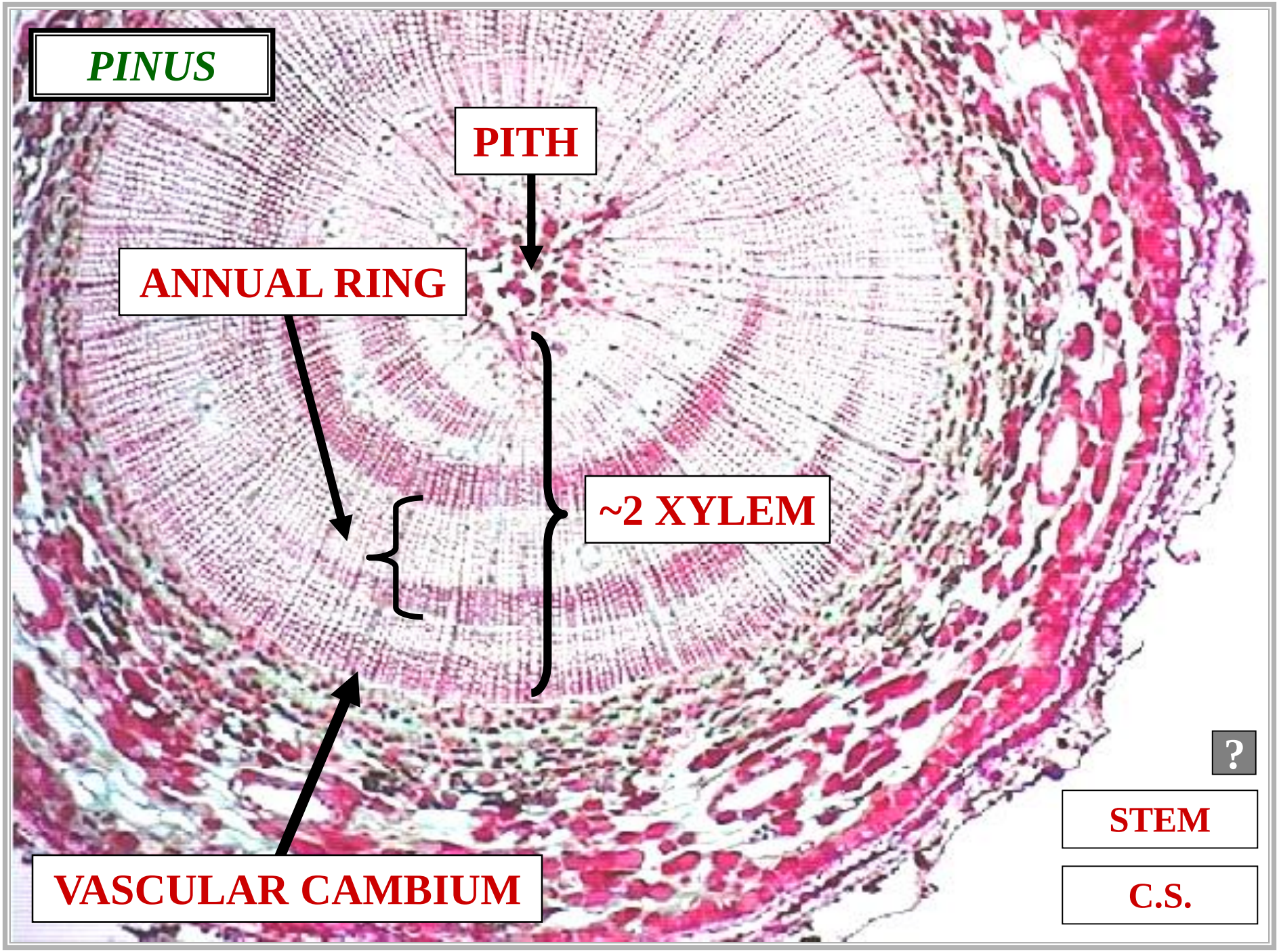

PINUS
RESIN DUCT
PERIDERM
CORTEX
~2 PHLOEM
STEM
C.S.
~2 XYLEM
VASCULAR CAMBIUM

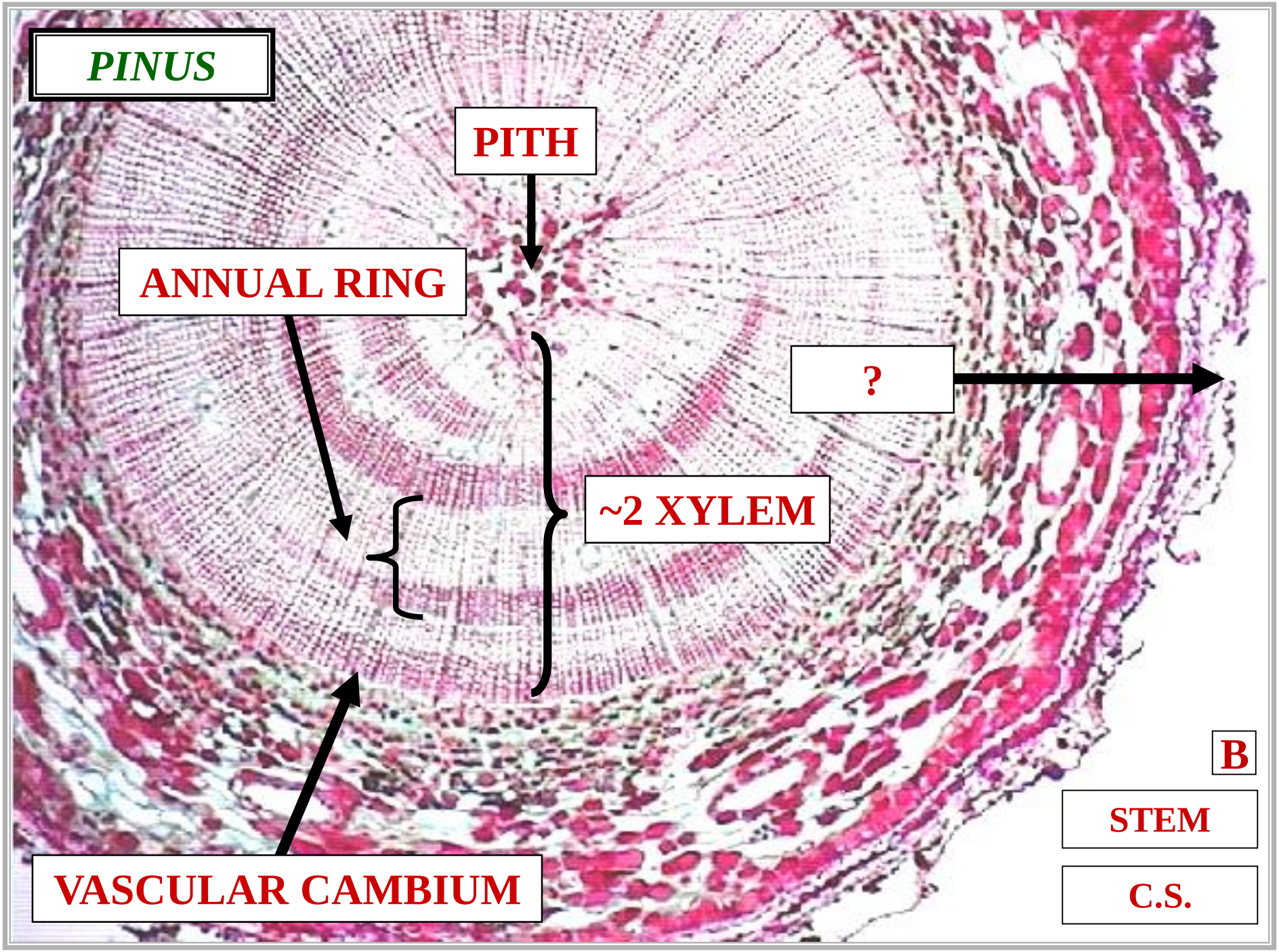

PINUS
~2 XYLEM
VASCULAR CAMBIUM
?
STEM
C.S.

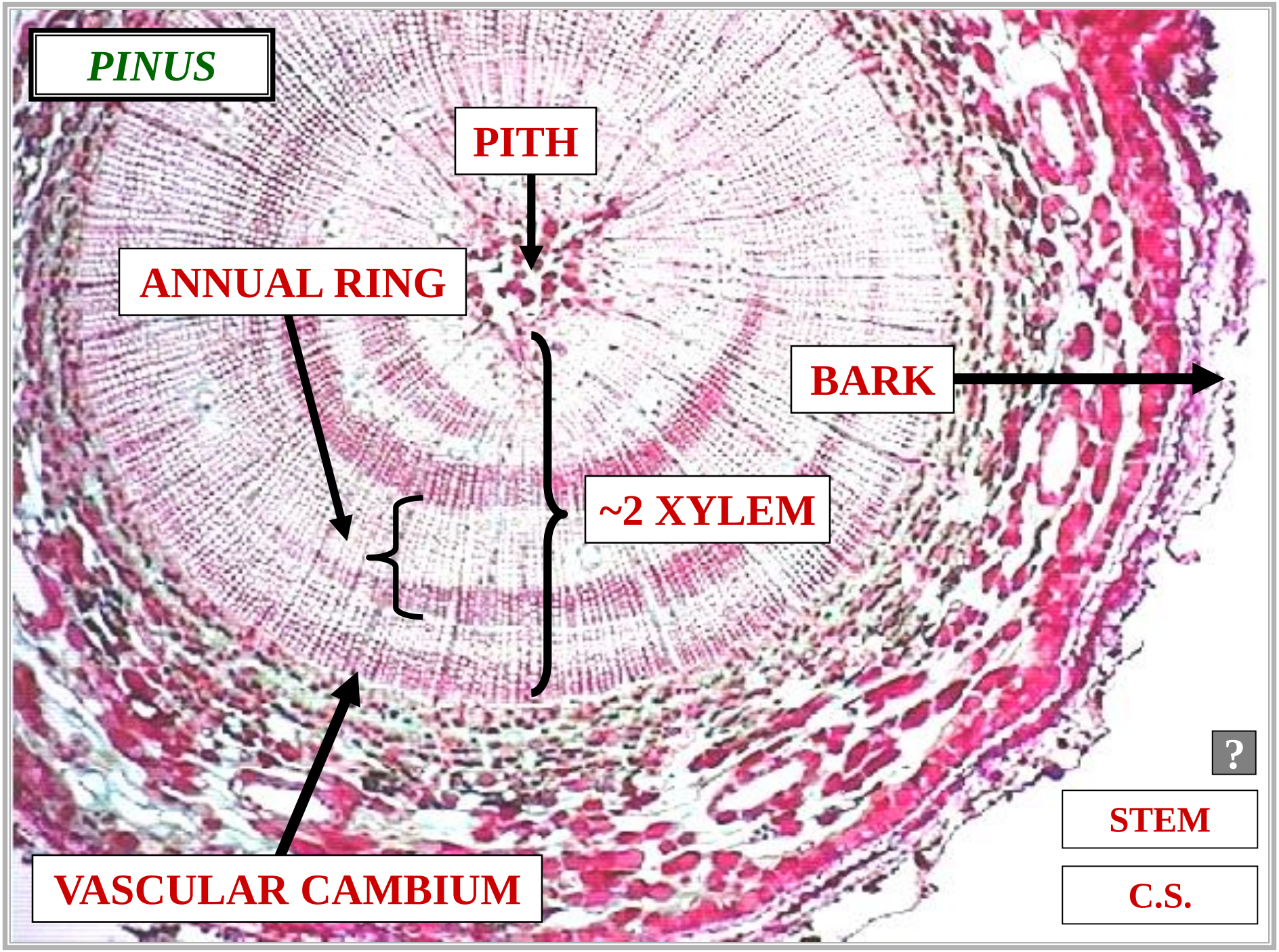

PINUS
?
~2 XYLEM
VASCULAR CAMBIUM
A
STEM
C.S.

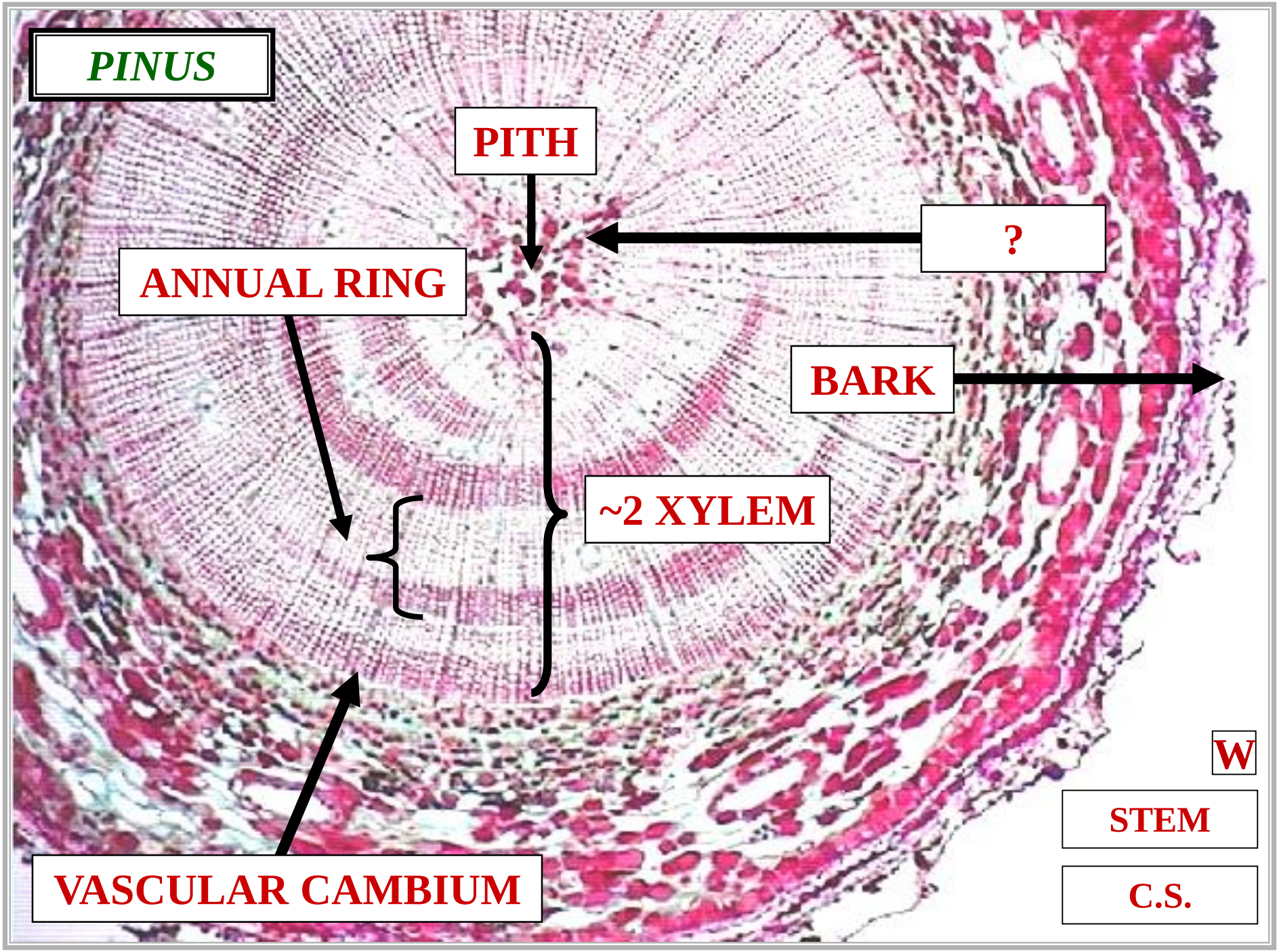

PINUS
ANNUAL RING
~2 XYLEM
VASCULAR CAMBIUM
?
STEM
C.S.

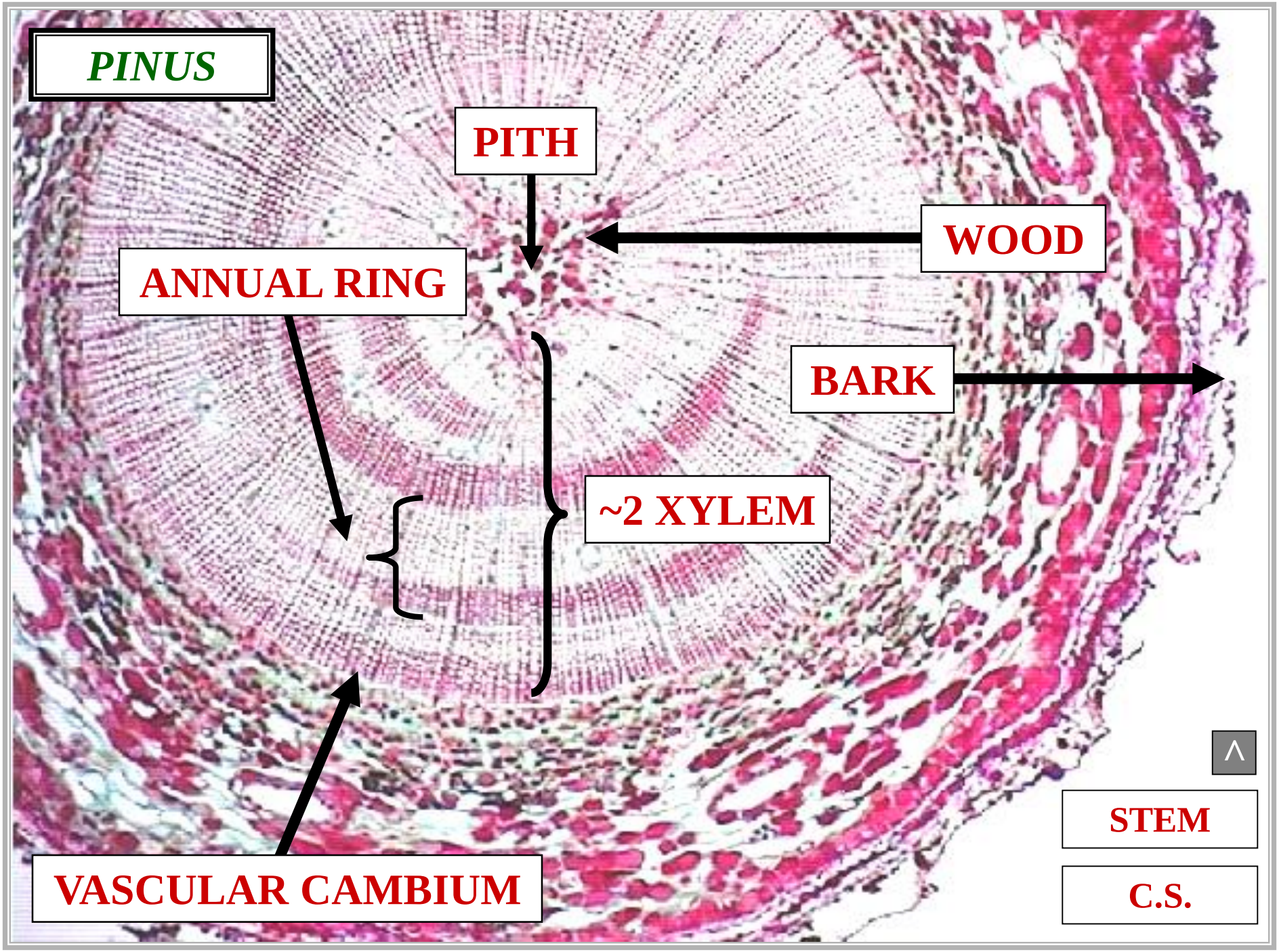

PINUS
?
ANNUAL RING
~2 XYLEM
VASCULAR CAMBIUM
P
STEM
C.S.


PINUS
PITH
ANNUAL RING
~2 XYLEM
VASCULAR CAMBIUM
?
STEM
C.S.


PINUS
PITH
ANNUAL RING
?
~2 XYLEM
VASCULAR CAMBIUM
B
STEM
C.S.


PINUS
PITH
ANNUAL RING
BARK
~2 XYLEM
VASCULAR CAMBIUM
?
STEM
C.S.


PINUS
PITH
?
ANNUAL RING
BARK
~2 XYLEM
VASCULAR CAMBIUM
W
STEM
C.S.

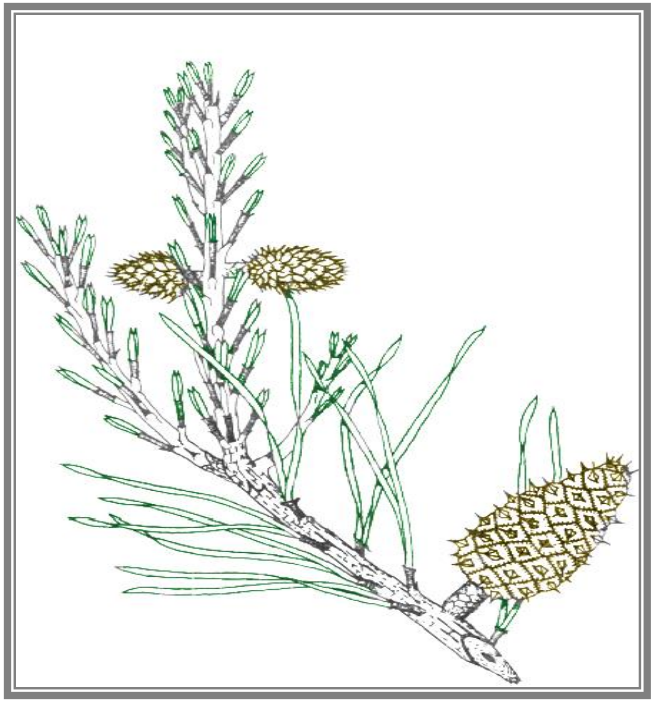

PINUS
PITH
WOOD
ANNUAL RING
BARK
~2 XYLEM
VASCULAR CAMBIUM
STEM
C.S.

STEM MORPHOLOGY

DIMORPHIC SHOOTS

PINUS

DIMORPHIC SHOOTS

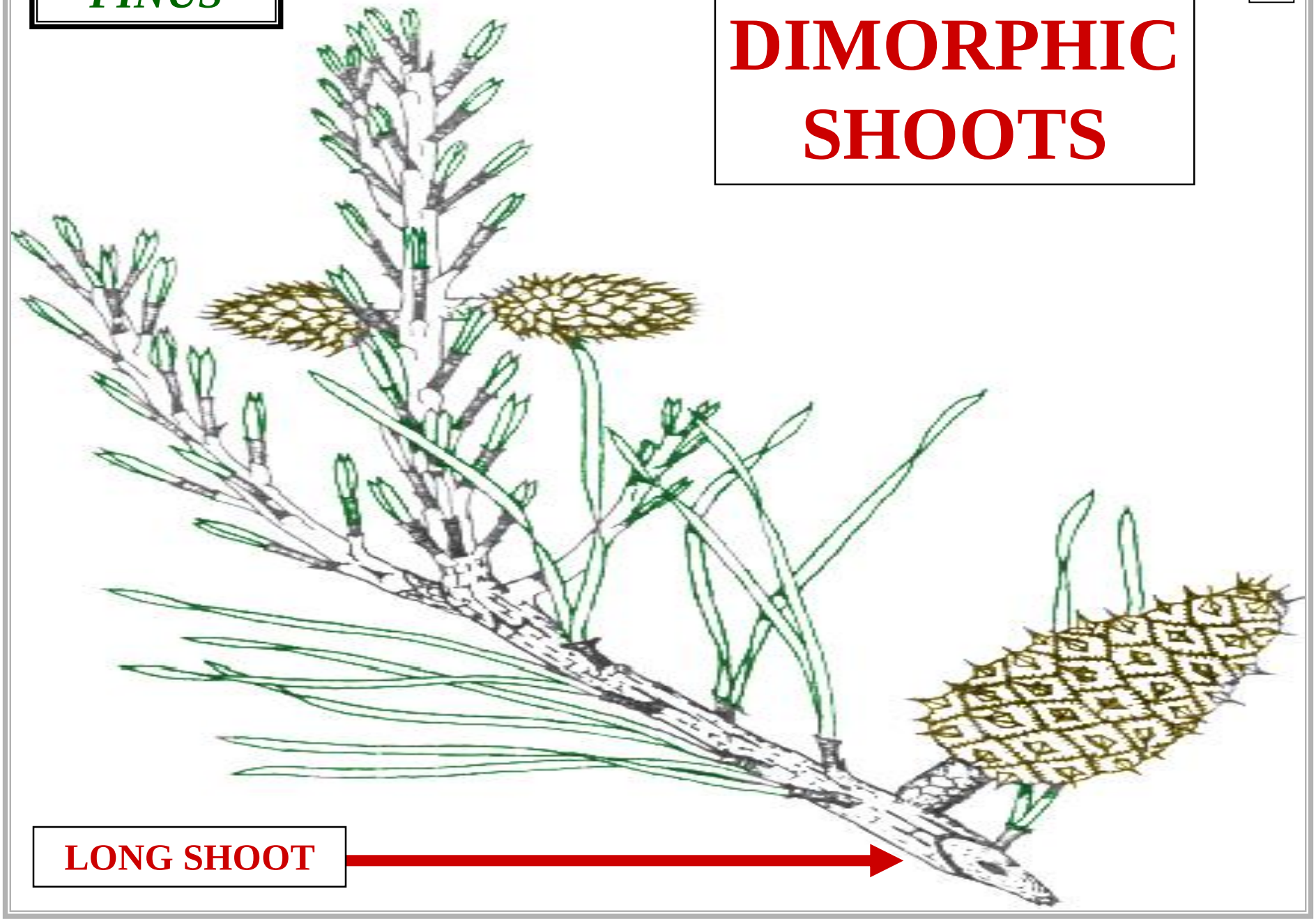


LONG SHOOTS

PINUS

S

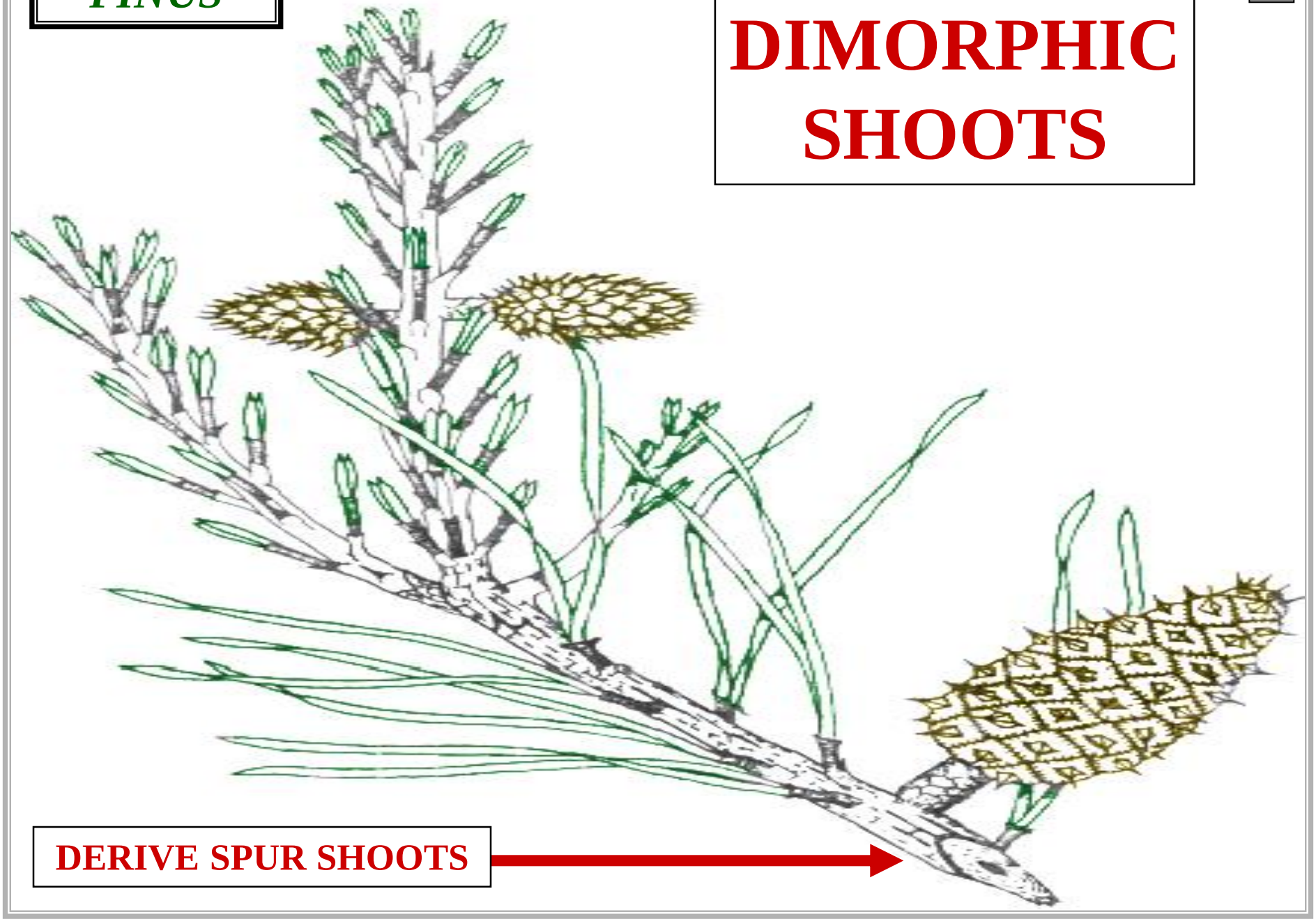
DIMORPHIC SHOOTS



LONG SHOOT

PINUS

DIMORPHIC SHOOTS



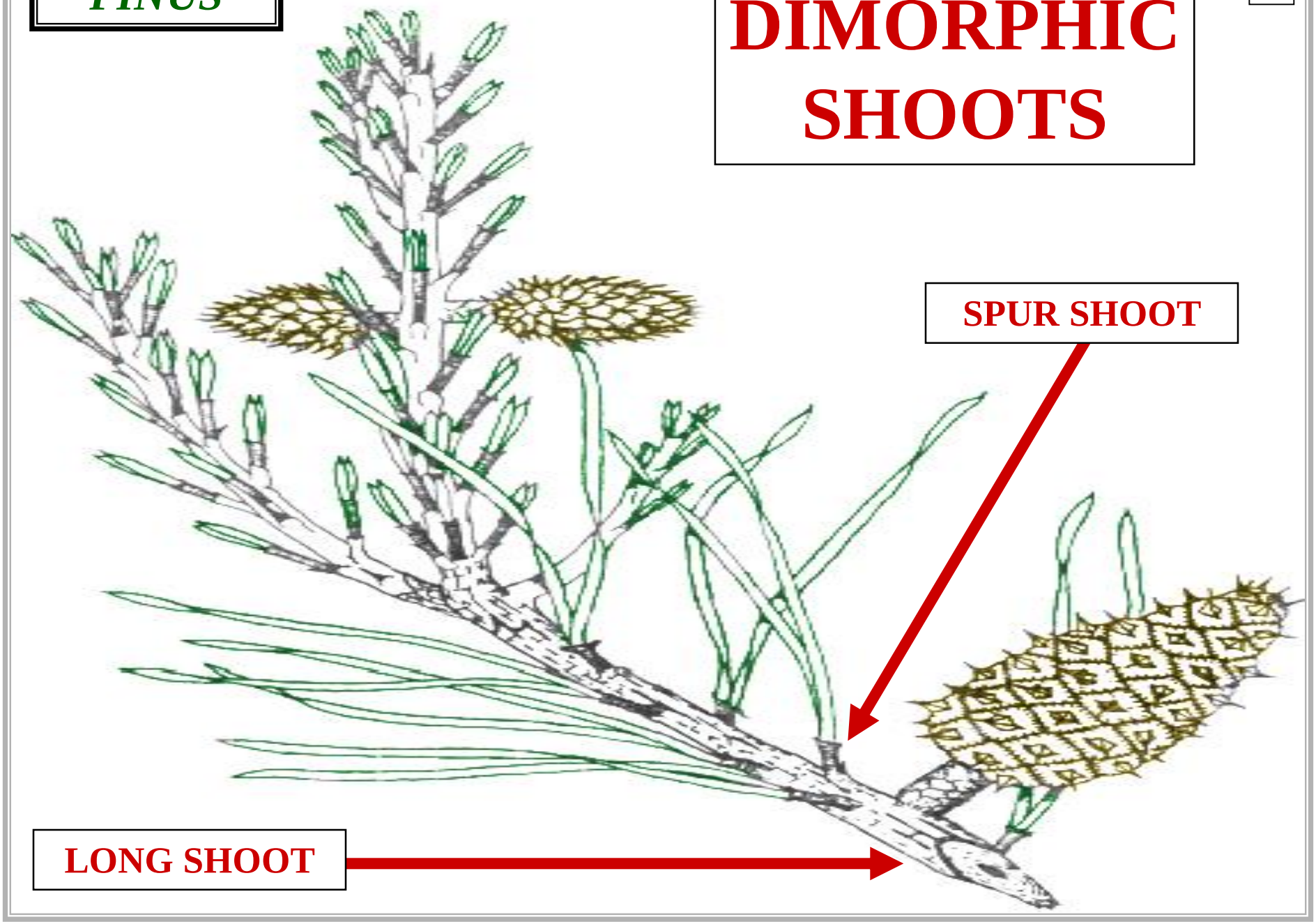
DERIVE SPUR SHOOTS

SPUR SHOOTS

PINUS

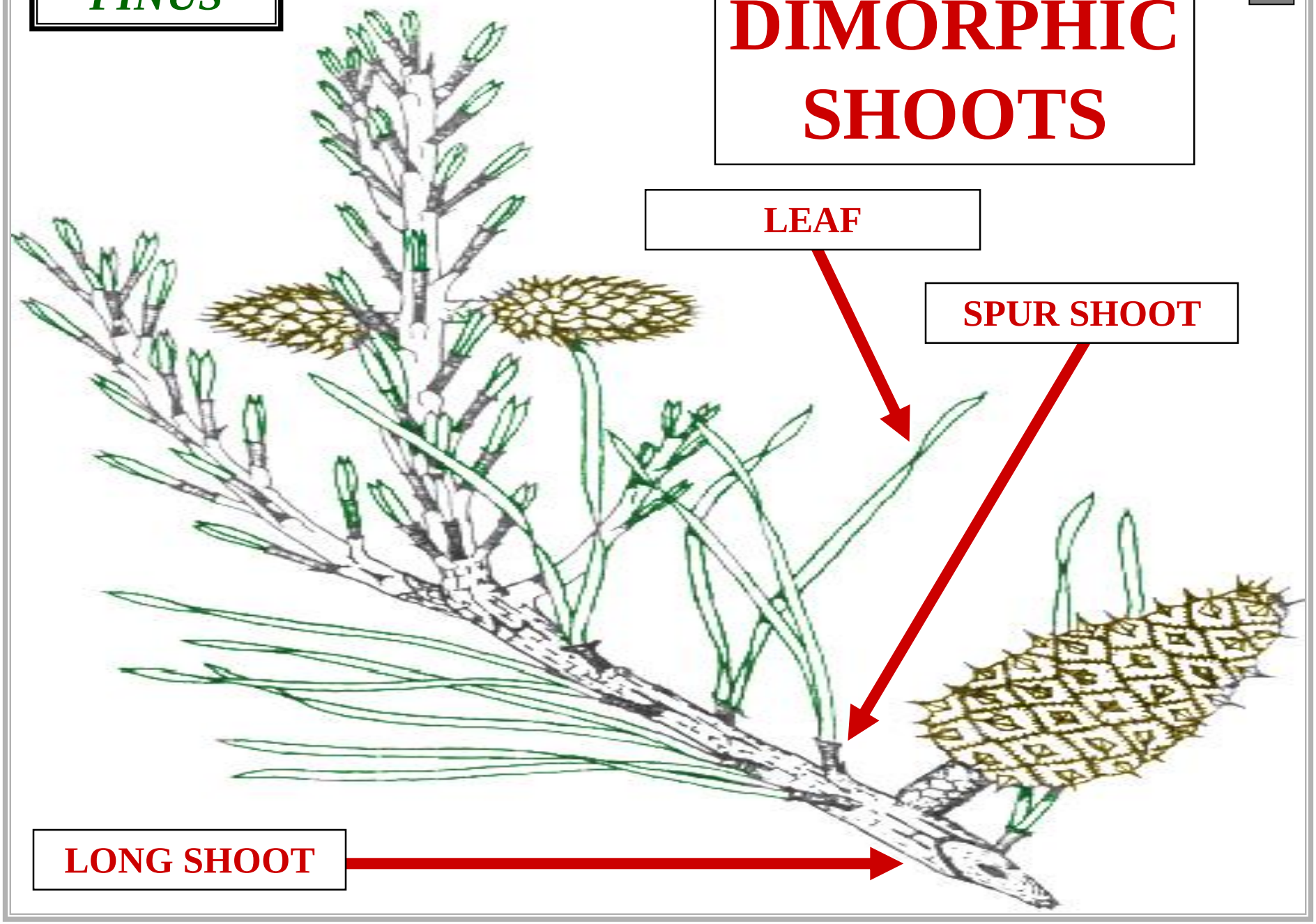
DIMORPHIC SHOOTS

L



PINUS

DIMORPHIC SHOOTS



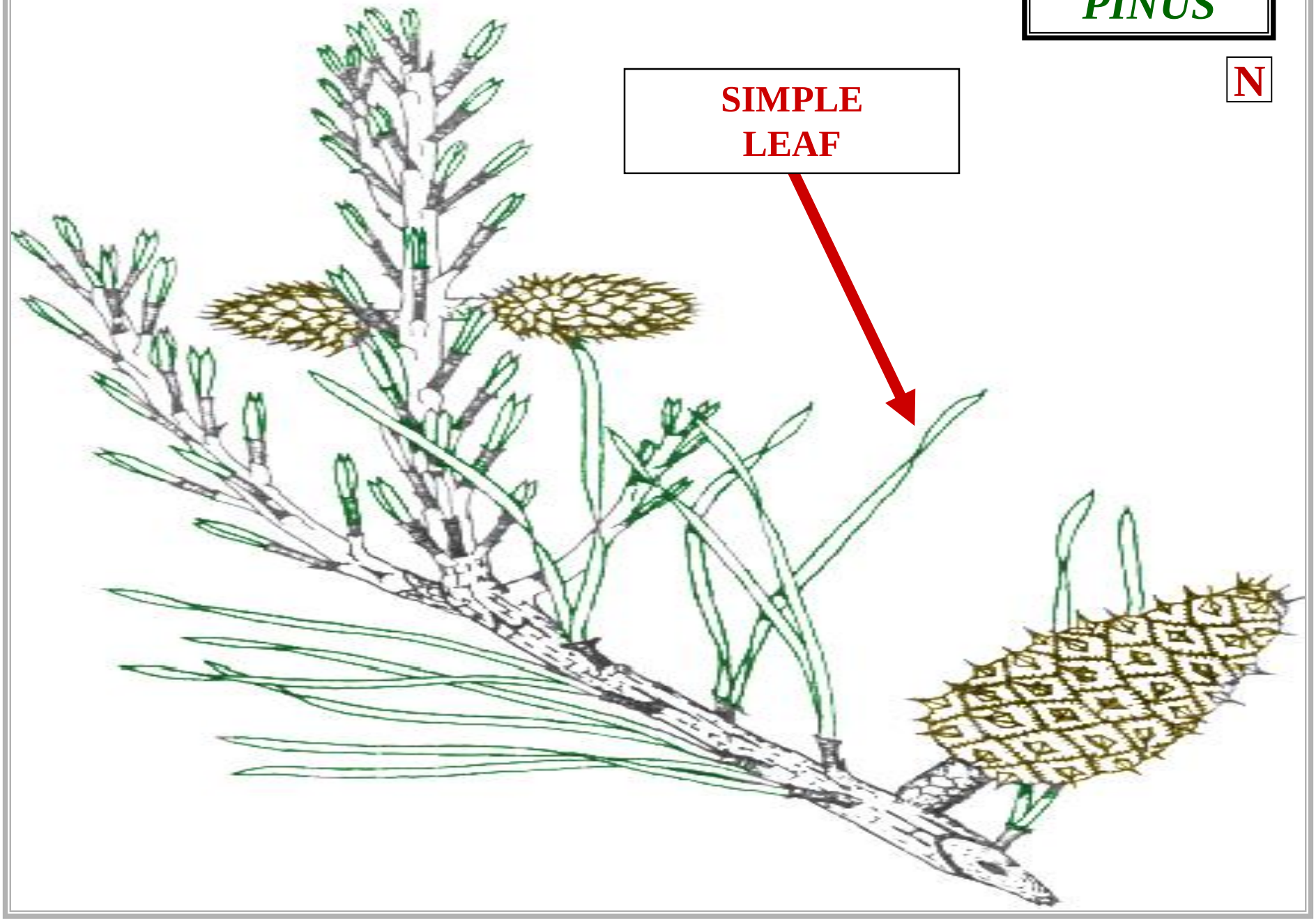
LEAF

LEAF MORPHOLOGY

SIMPLE LEAF
PINUS

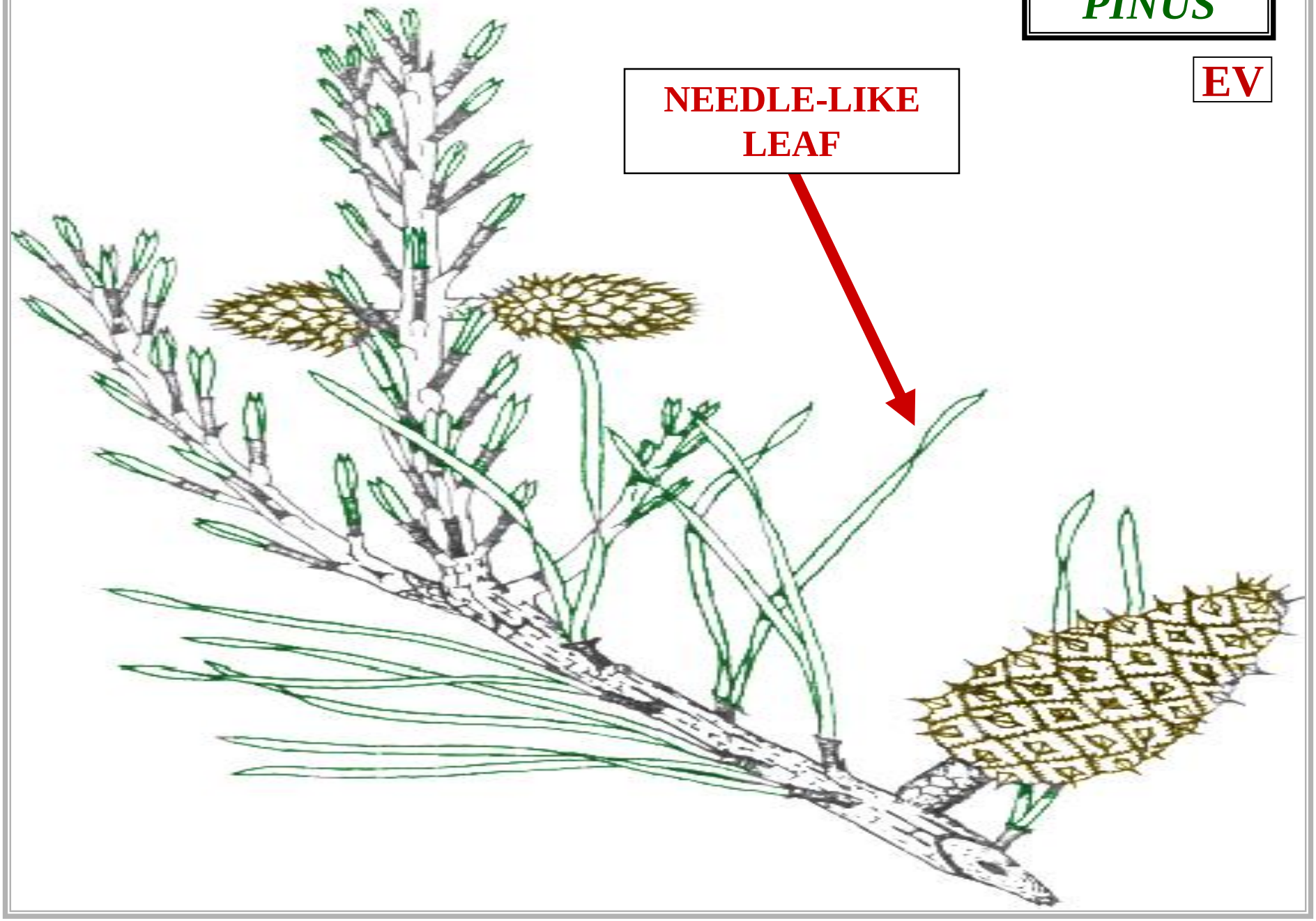
PINUS

N



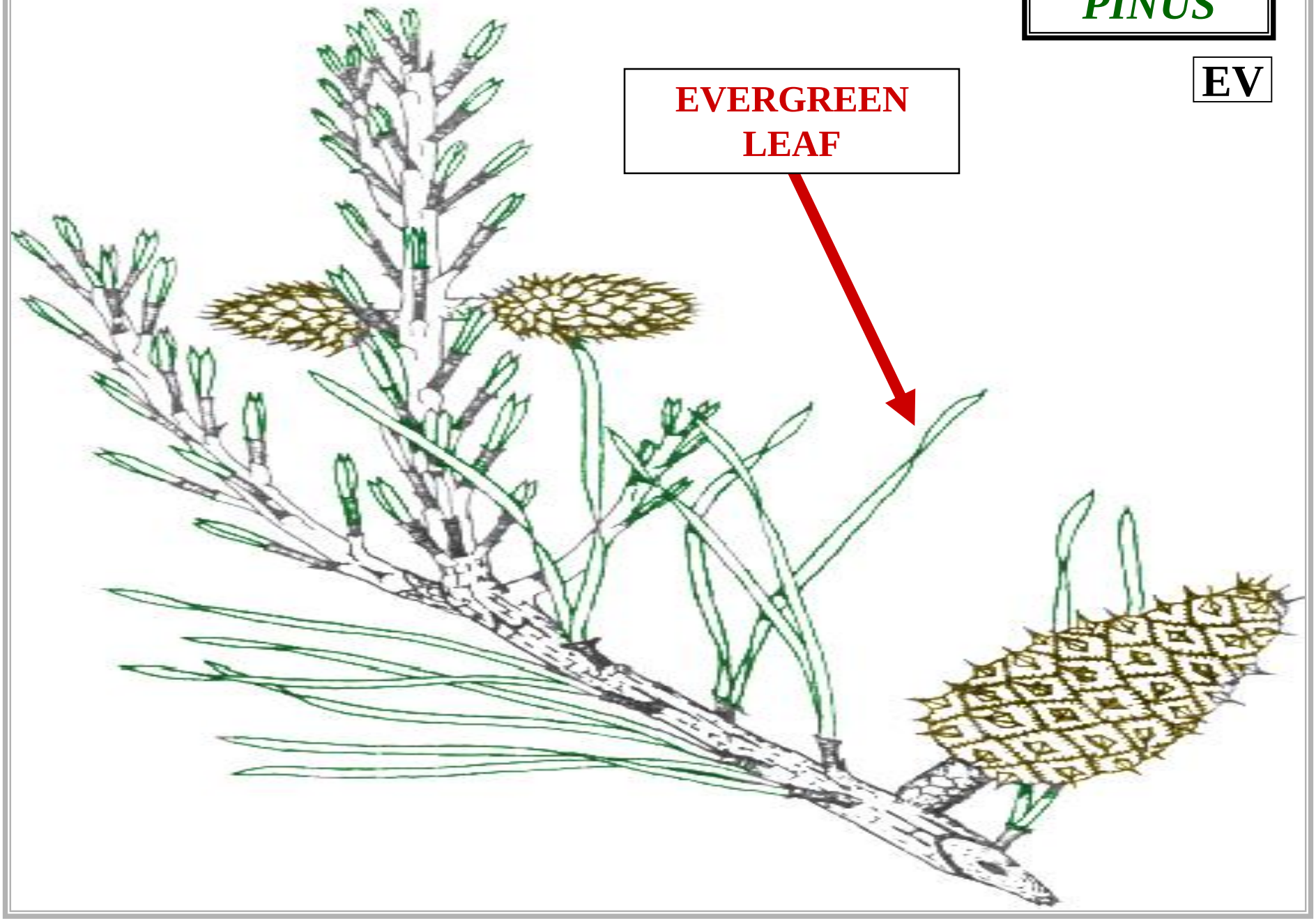
PINUS

EV



PINUS

EV



EVERGREEN

F

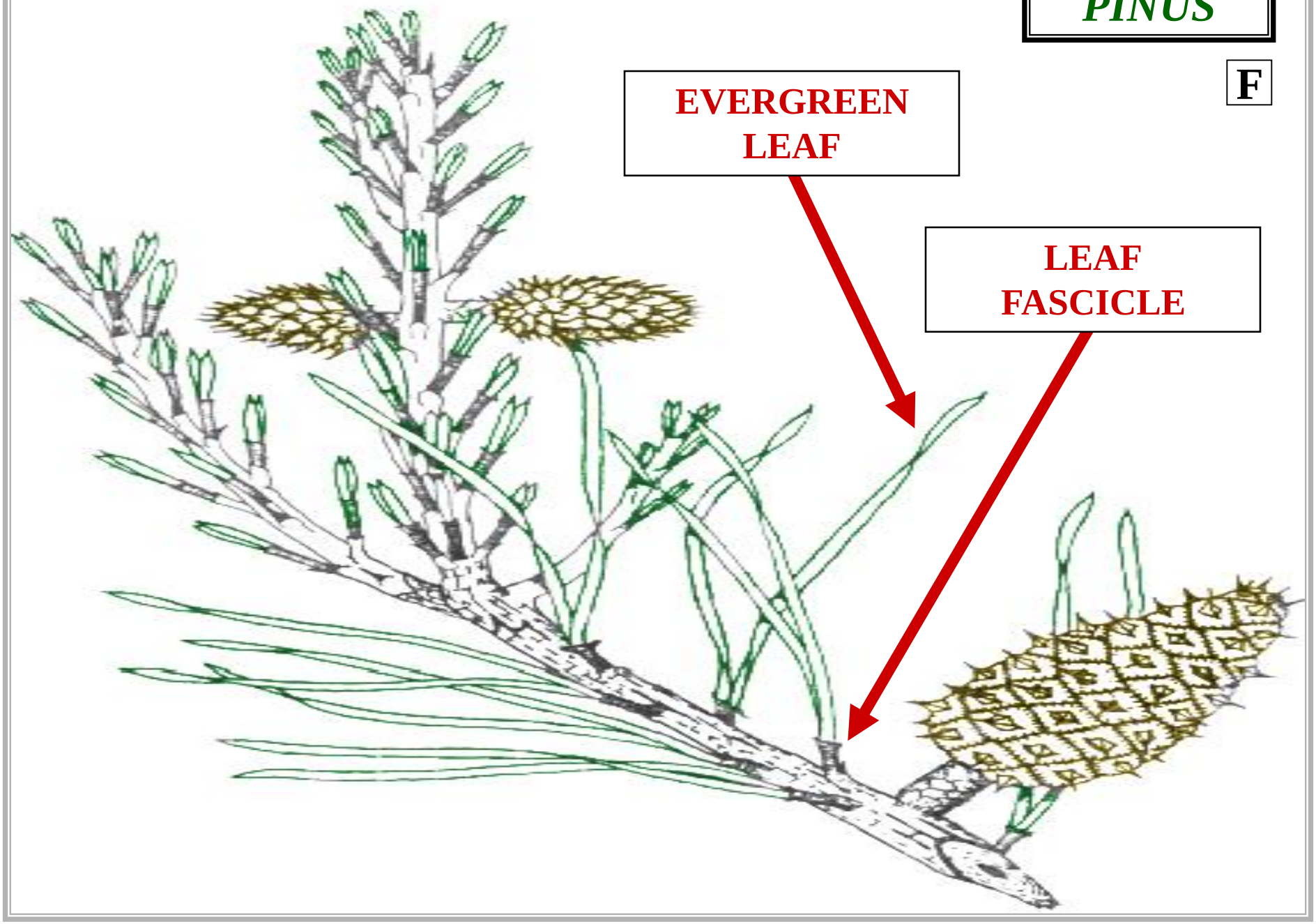
PINOPHYTA
EVERGREEN LEAF

FUNCTIONAL
1+ SEASON

PINOPHYTA
EVERGREEN LEAF

PINUS

F



FASCICLE

PINOPHYTA
LEAF FASCICLE

LEAF AGGREGATE

PINOPHYTA
LEAF FASCICLE

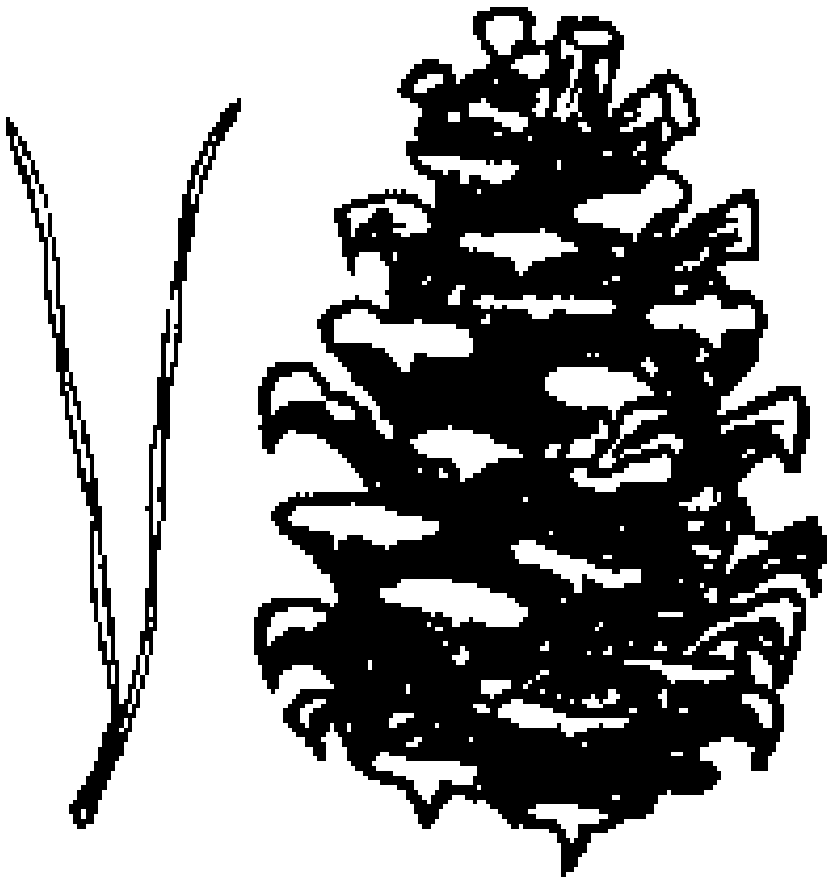
PINOPHYTA
LEAF FASCICLE

LEAF
NUMBER / FASCICLE
SPECIES SPECIFIC

PINOPHYTA
LEAF FASCICLE

PINUS

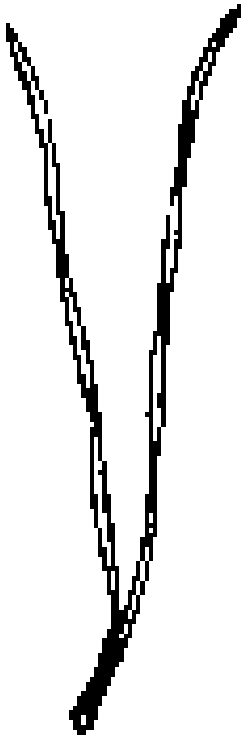
V



PINUS VIRGINIANA

PINUS

2 LEAVES PER FASCICLE

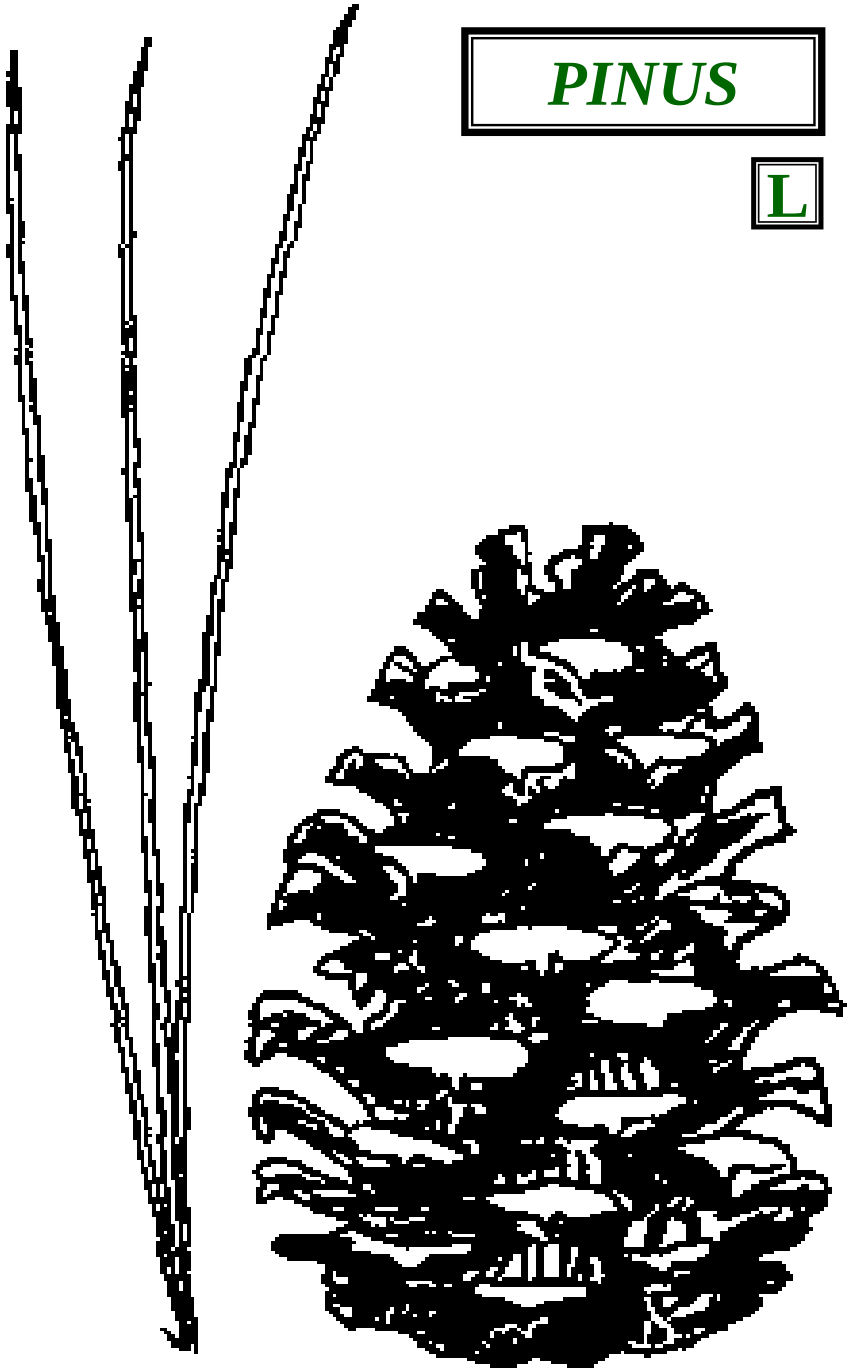


VIRGINIA PINE

PINUS TAEDA

PINUS

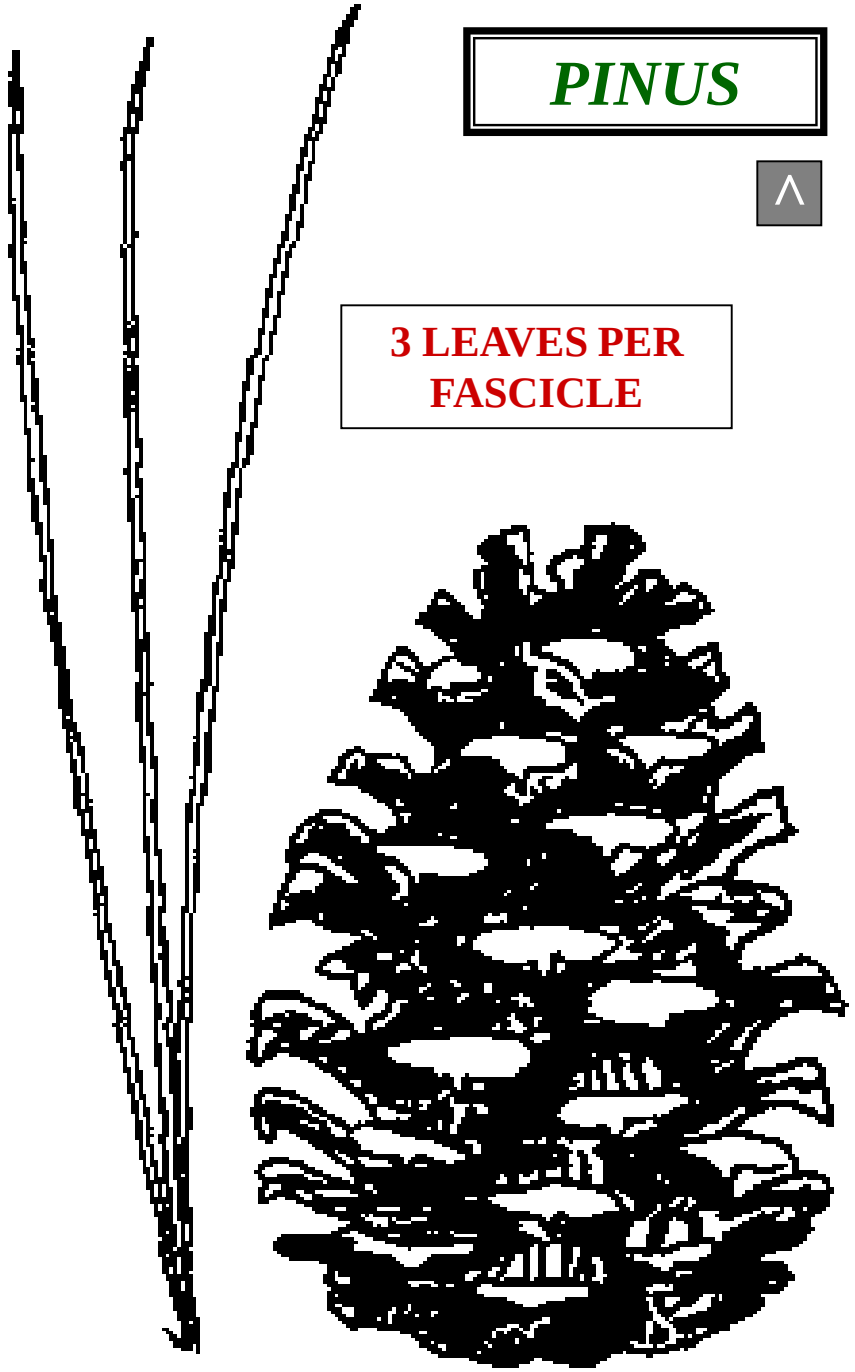
L



LOBLOLLY PINE

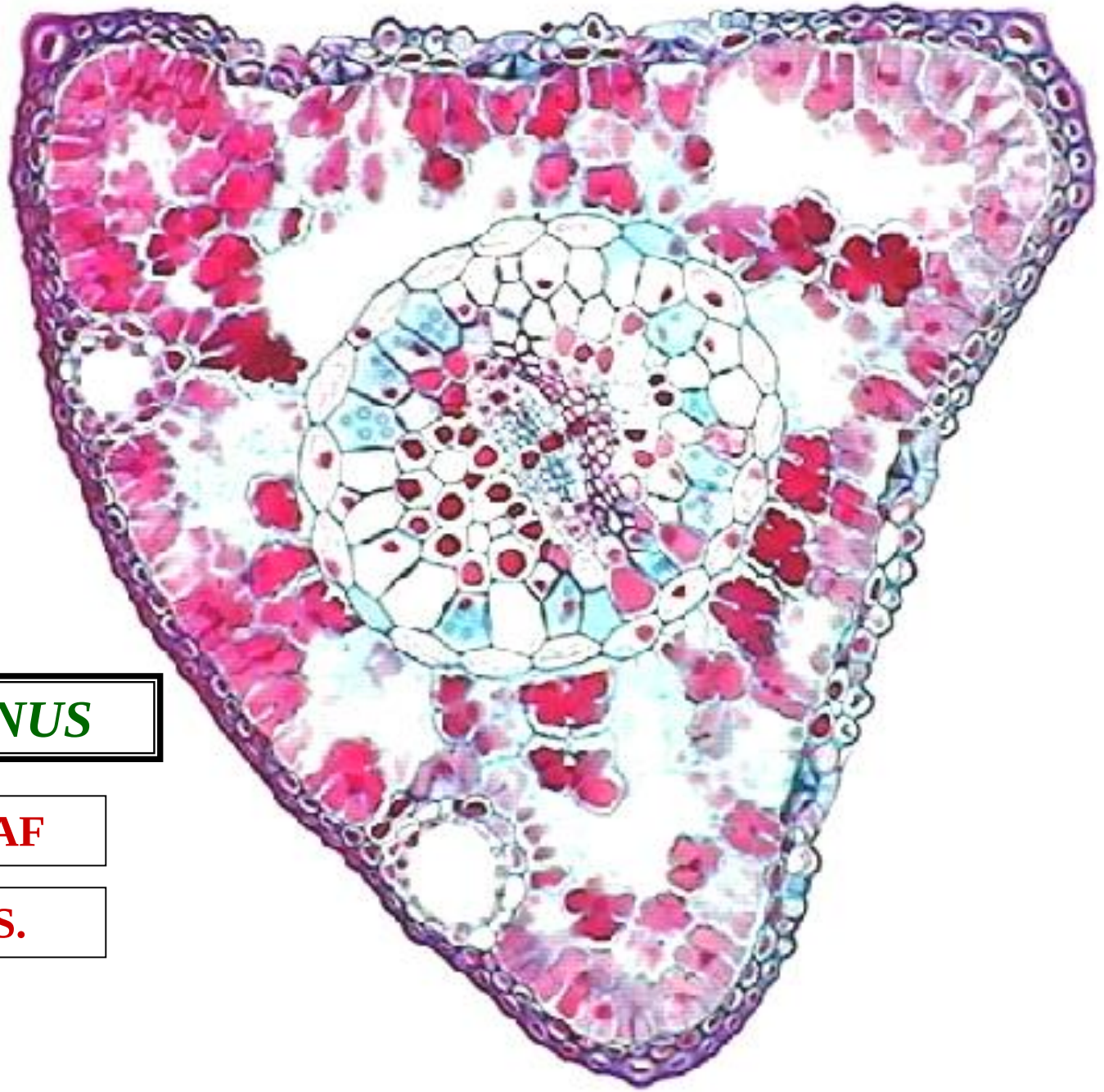
PINUS

3 LEAVES PER FASCICLE



LEAF ANATOMY

T

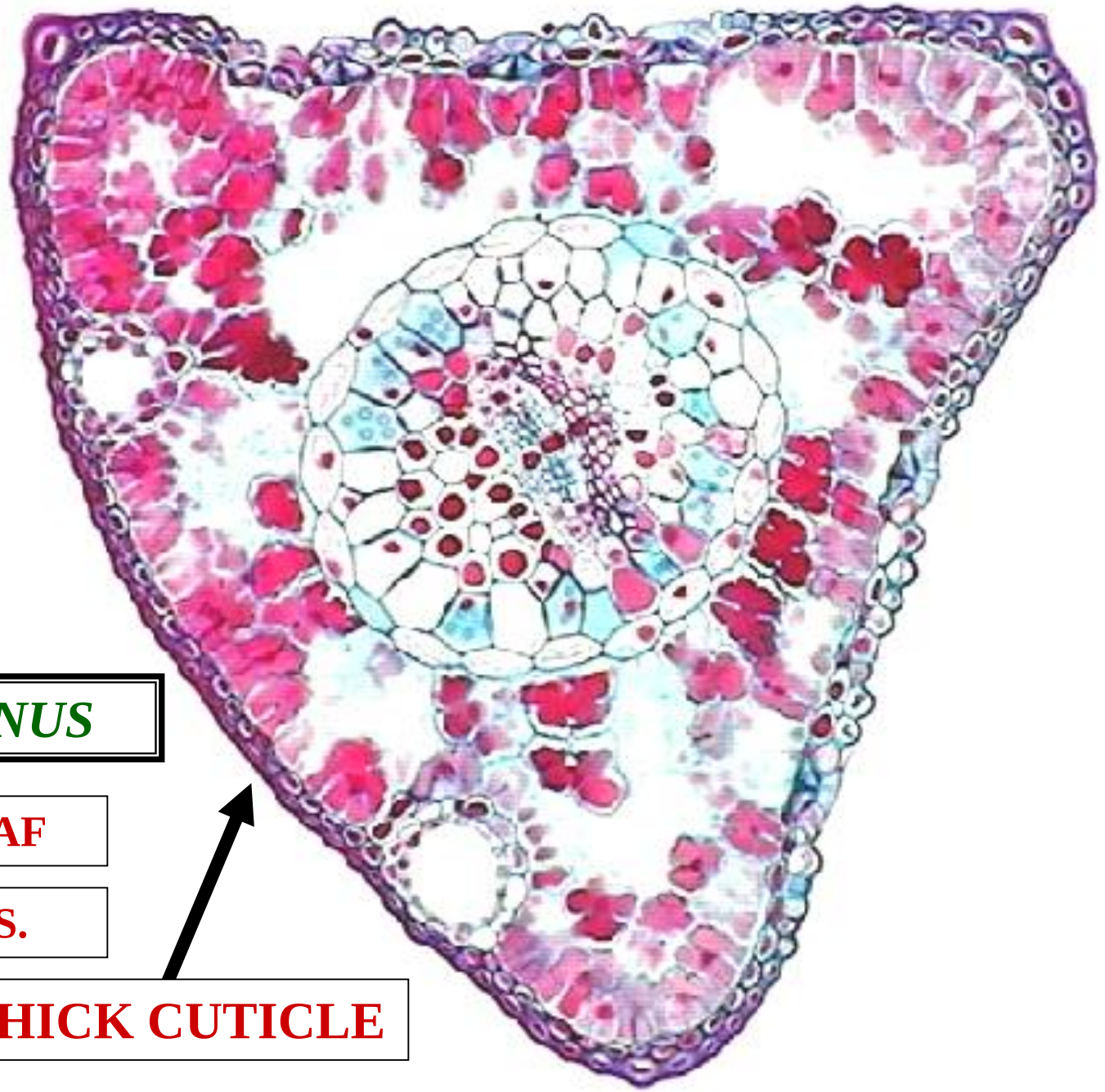


PINUS

LEAF

C.S.

?



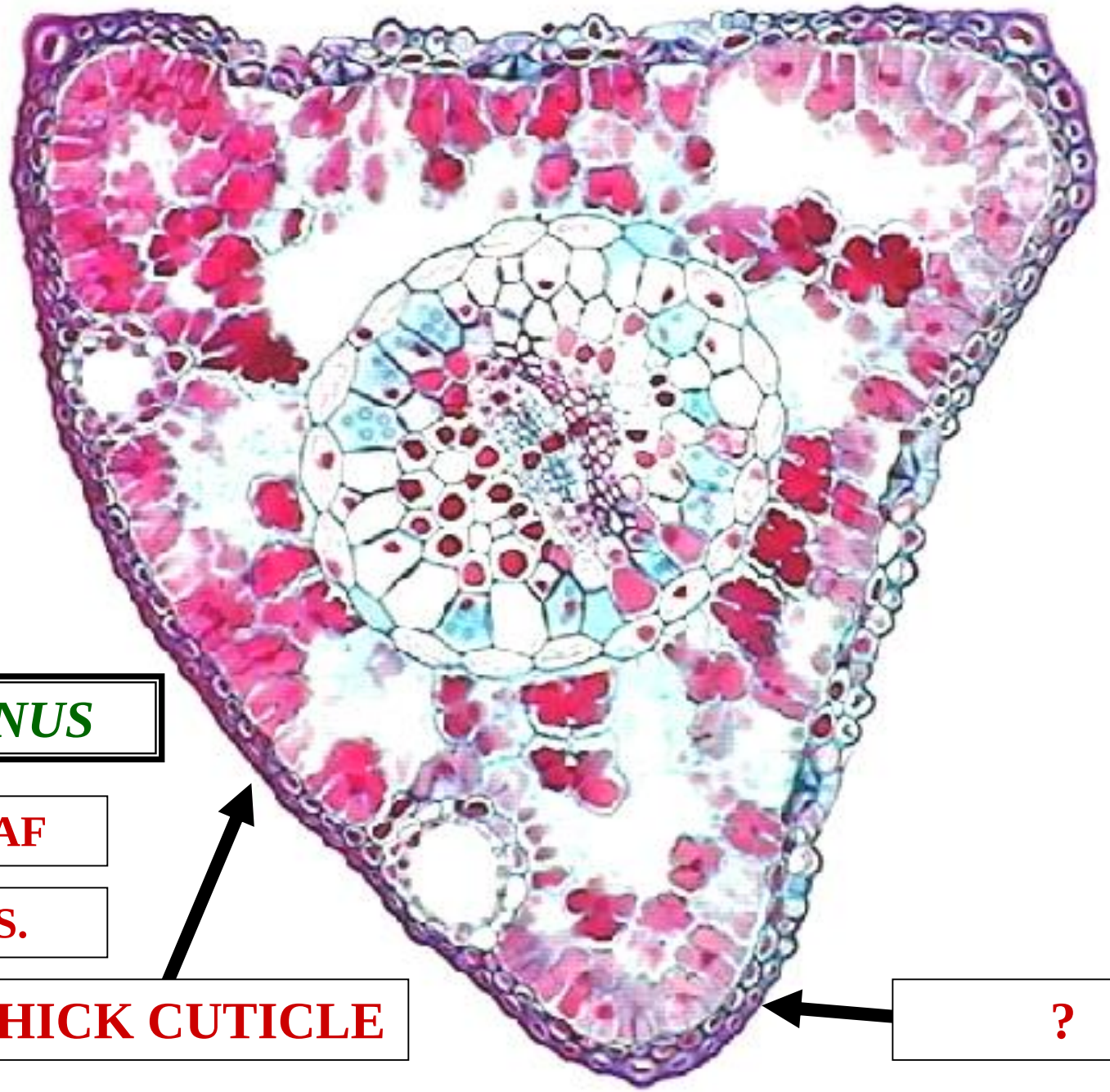
PINUS

LEAF

C.S.

THICK CUTICLE

E



PINUS

LEAF

C.S.

THICK CUTICLE

?