

ATMOSPHERE



EPIDERMIS

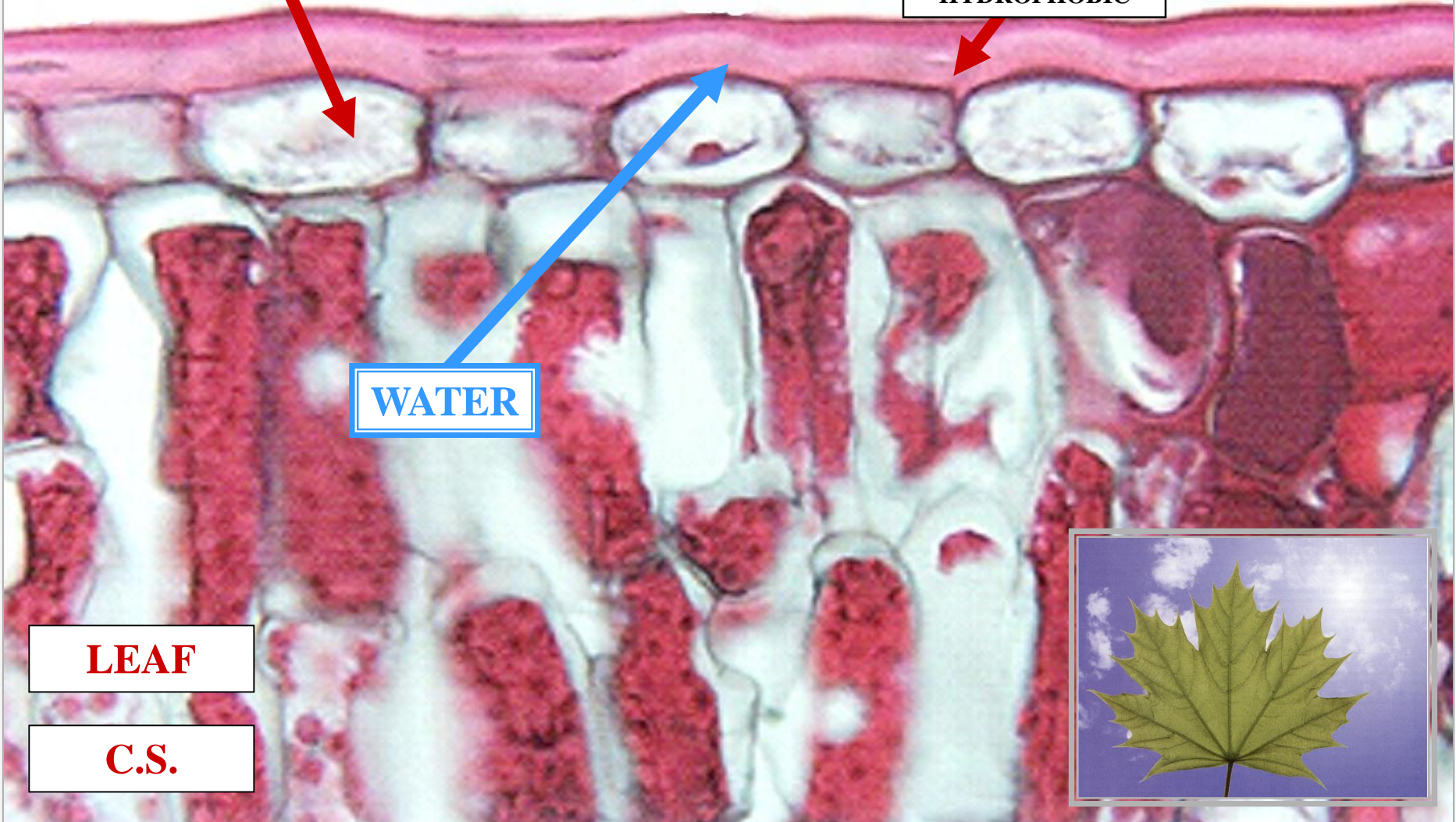
CUTICLE

HYDROPHOBIC

WATER

LEAF

C.S.



ATMOSPHERE



EPIDERMIS

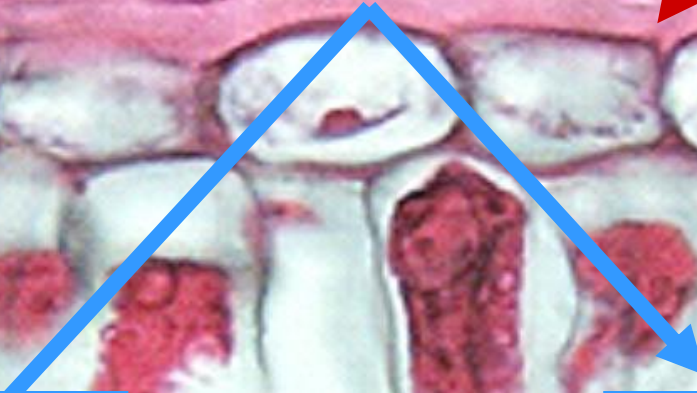
CUTICLE

HYDROPHOBIC



WATER

WATER



LEAF

C.S.



ATMOSPHERE

^

P

EPIDERMIS

CUTICLE

HYDROPHOBIC

WATER

WATER

EPIDERMIS INHIBITS DESICCATION

LEAF

C.S.



PATHOGENS

DERMAL TISSUE



PROTECTION / PATHOGENS

DISEASE AGENTS

DERMAL TISSUE

PROTECTION / PATHOGENS



SD

SOYBEANS

SUDDEN DEATH SYNDROME



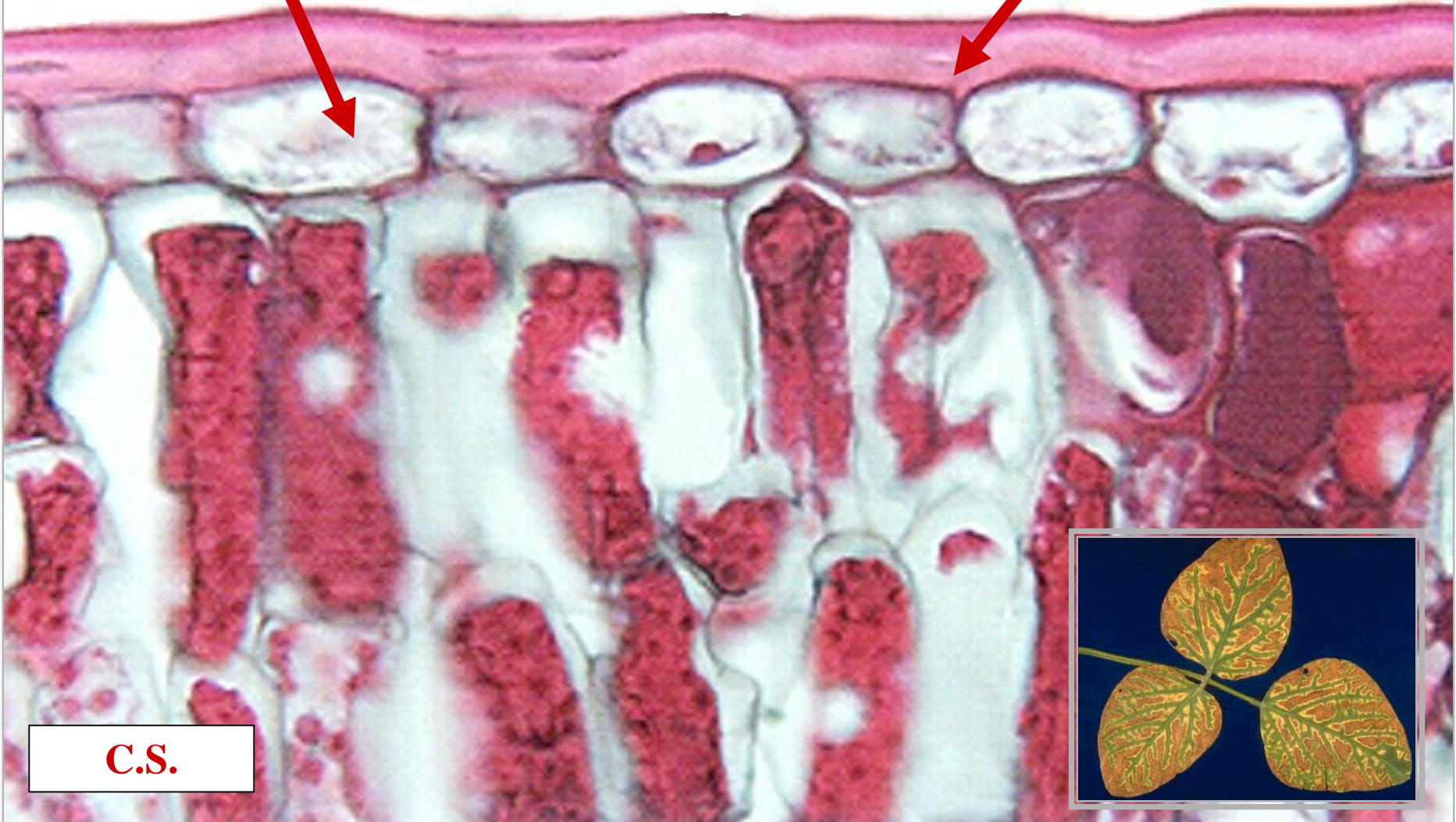
SOYBEANS

VIRUS



EPIDERMIS

CUTICLE



C.S.



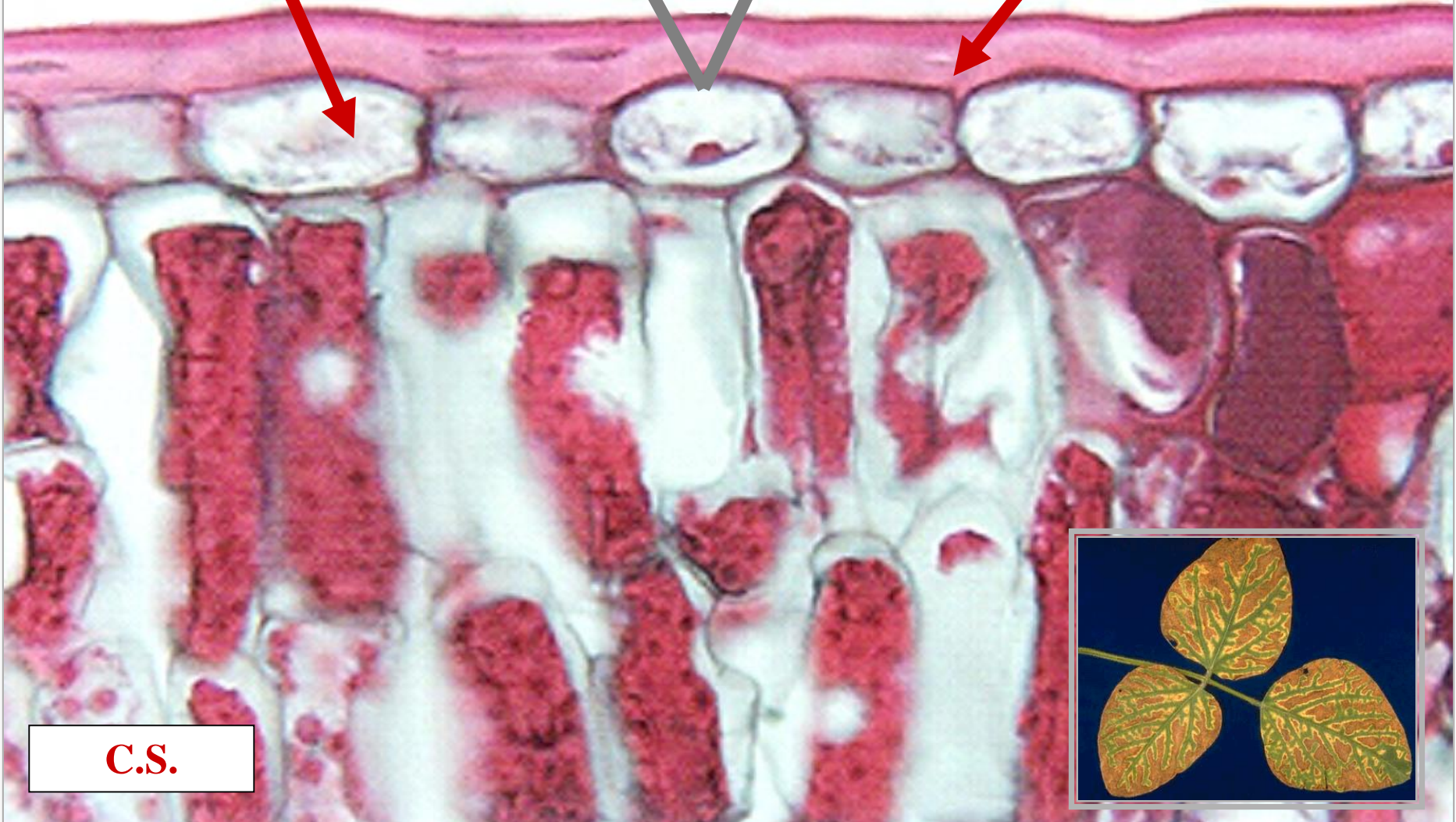
VIRUS

+

S

EPIDERMIS

CUTICLE



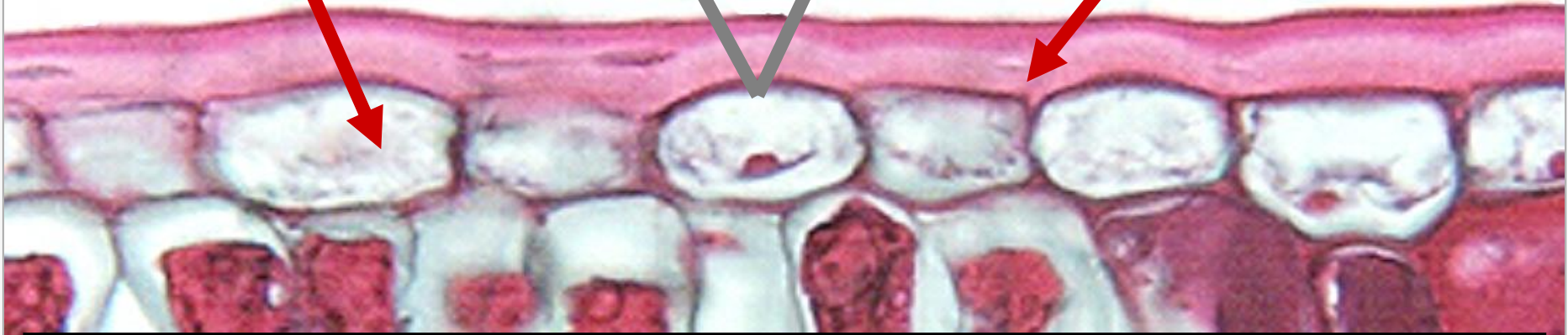
C.S.



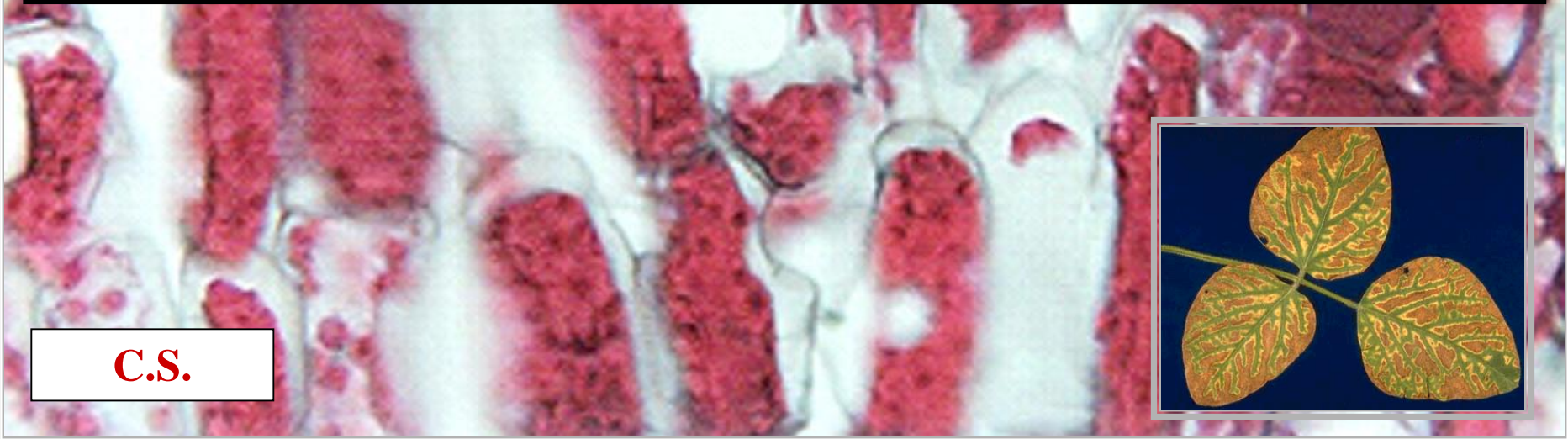
VIRUS

EPIDERMIS

CUTICLE



EPIDERMIS INHIBITS PATHOGENS



C.S.



HERBIVORES

DERMAL TISSUE



PROTECTION / HERBIVORES

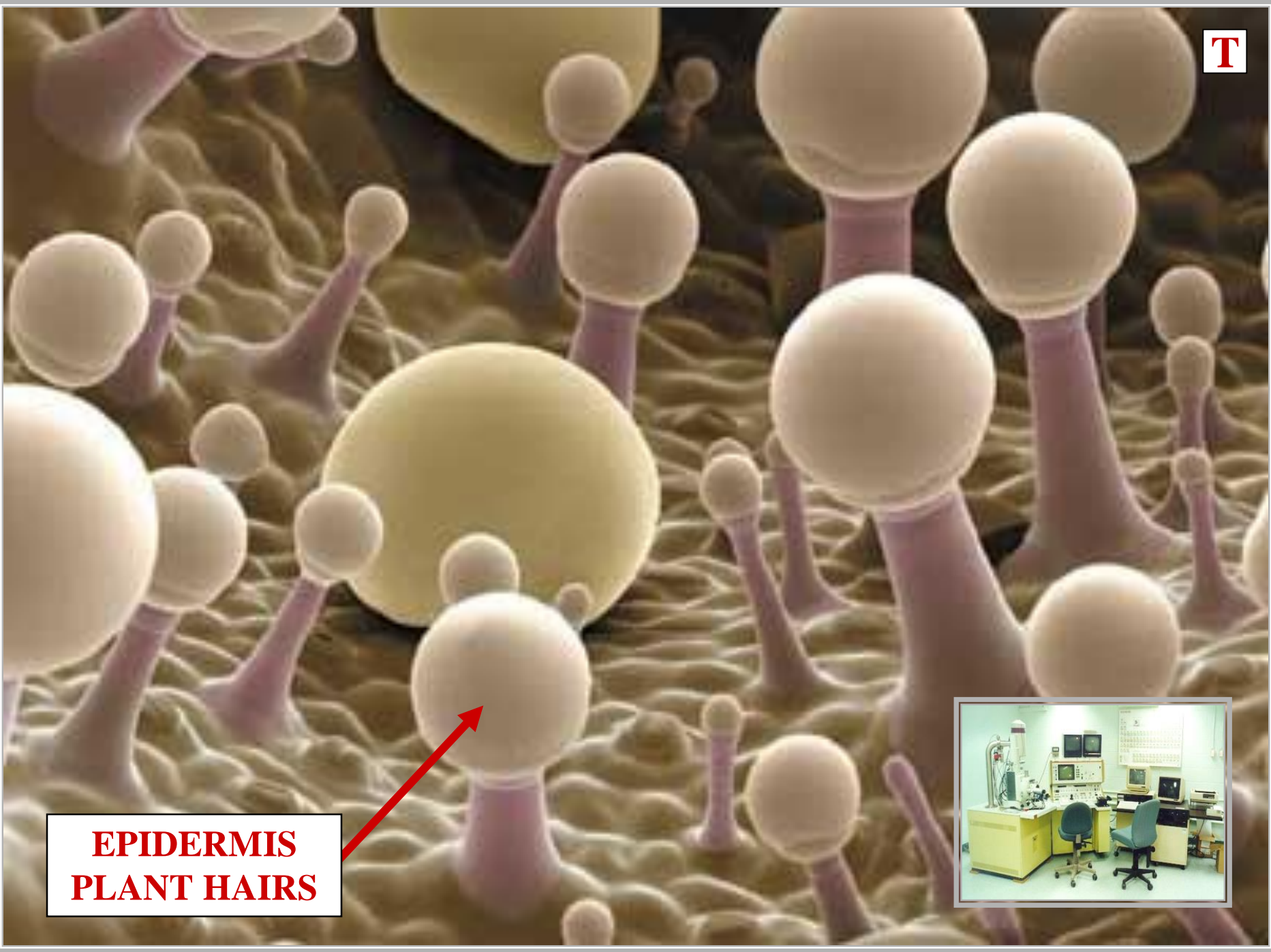
**AGAINST
HERBIVORE
CONSUMPTION**

DERMAL TISSUE

PROTECTION / HERBIVORES

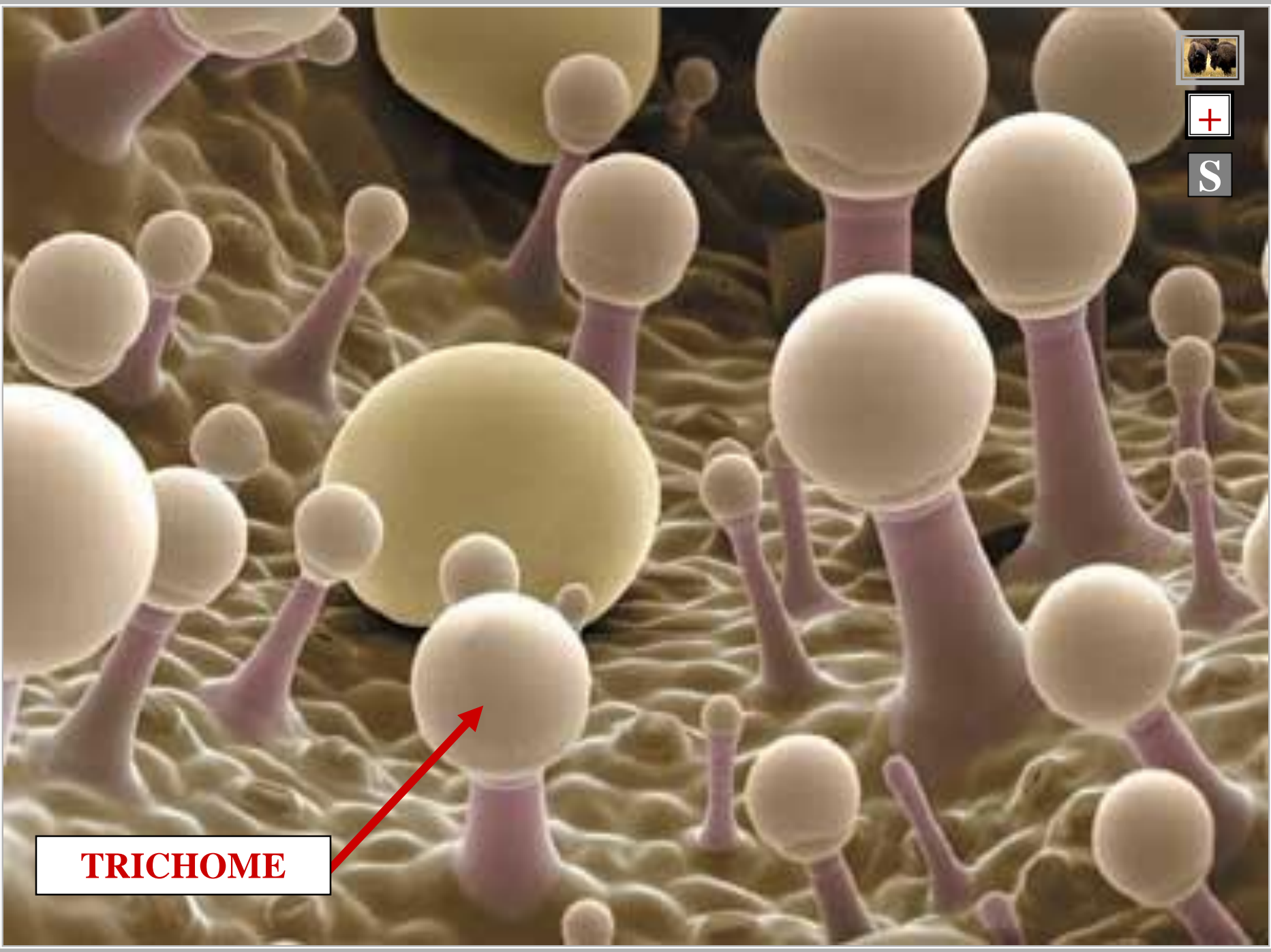






**EPIDERMIS
PLANT HAIRS**





TRICHOME



S



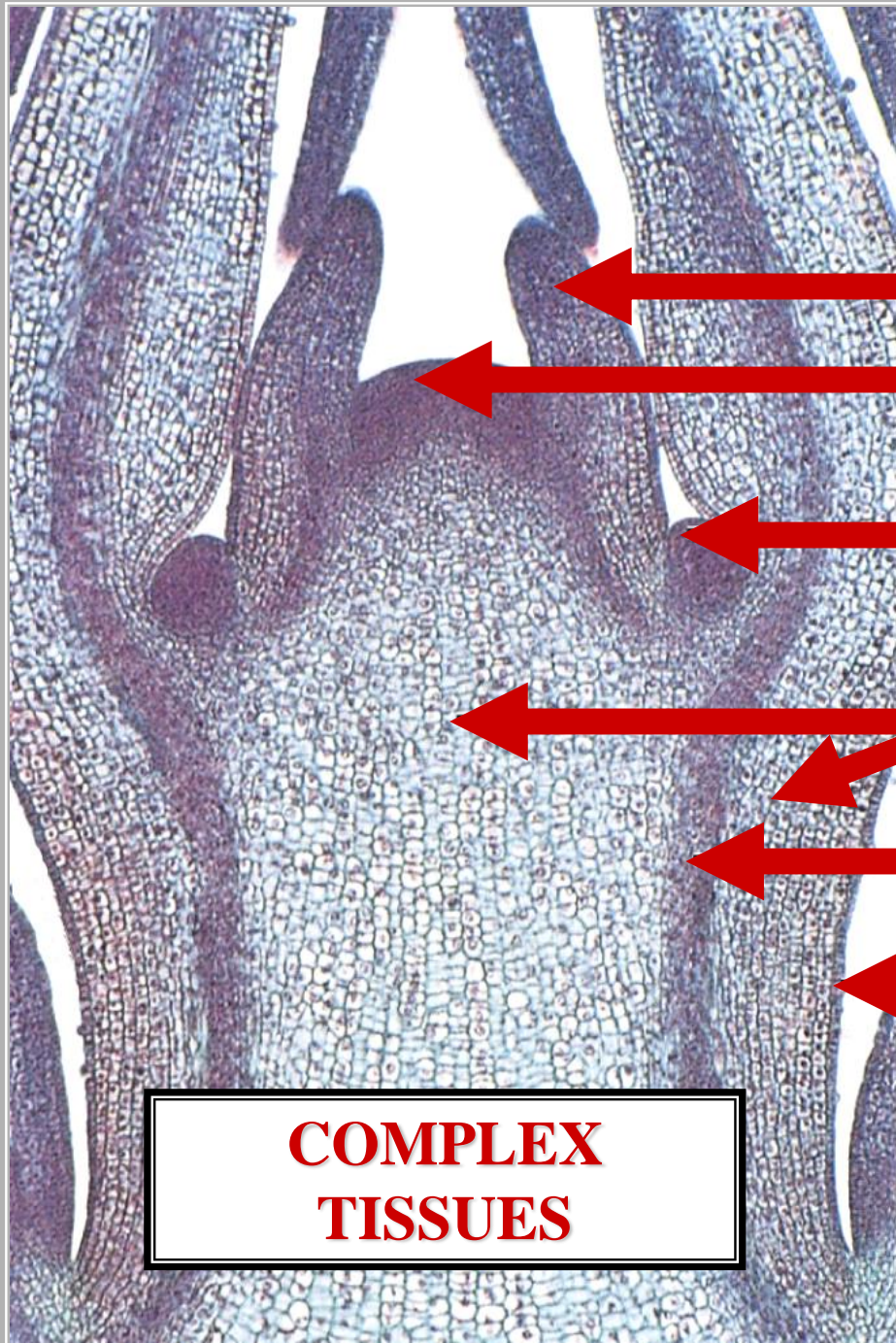
EPIDERMIS INHIBITS HERBIVORES



TRACHEOPHYTE COMPLEX TISSUES SUMMARY

TRACHEOPHYTE COMPLEX TISSUES

G



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MERISTEM

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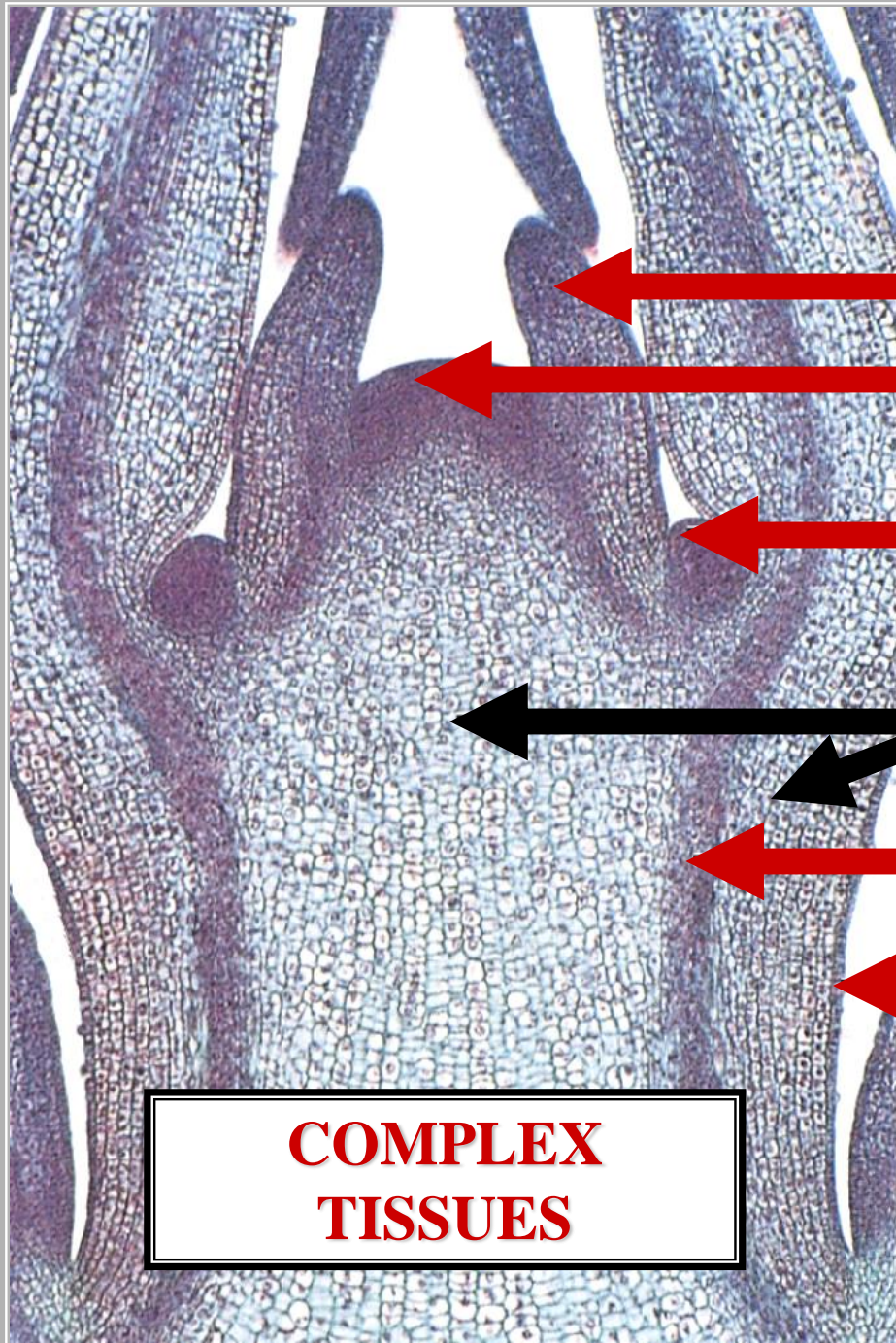
**COMPLEX
TISSUES**

STEM

L.S.

TRACHEOPHYTE COMPLEX TISSUES

V



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MERISTEM

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GROUND TISSUE

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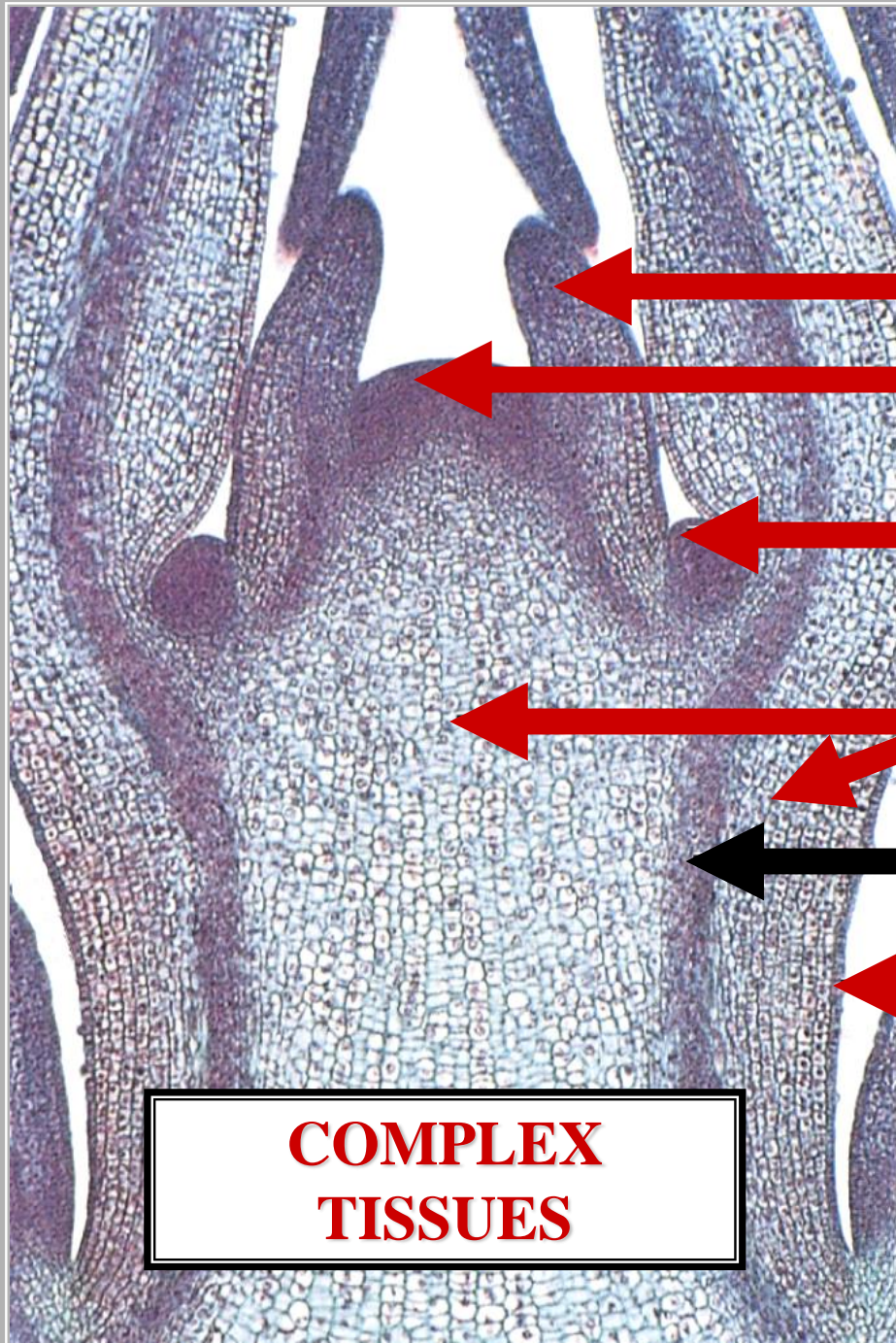
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**COMPLEX
TISSUES**

STEM

L.S.

TRACHEOPHYTE D COMPLEX TISSUES



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MERISTEM

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GROUND TISSUE

VASCULAR TISSUE

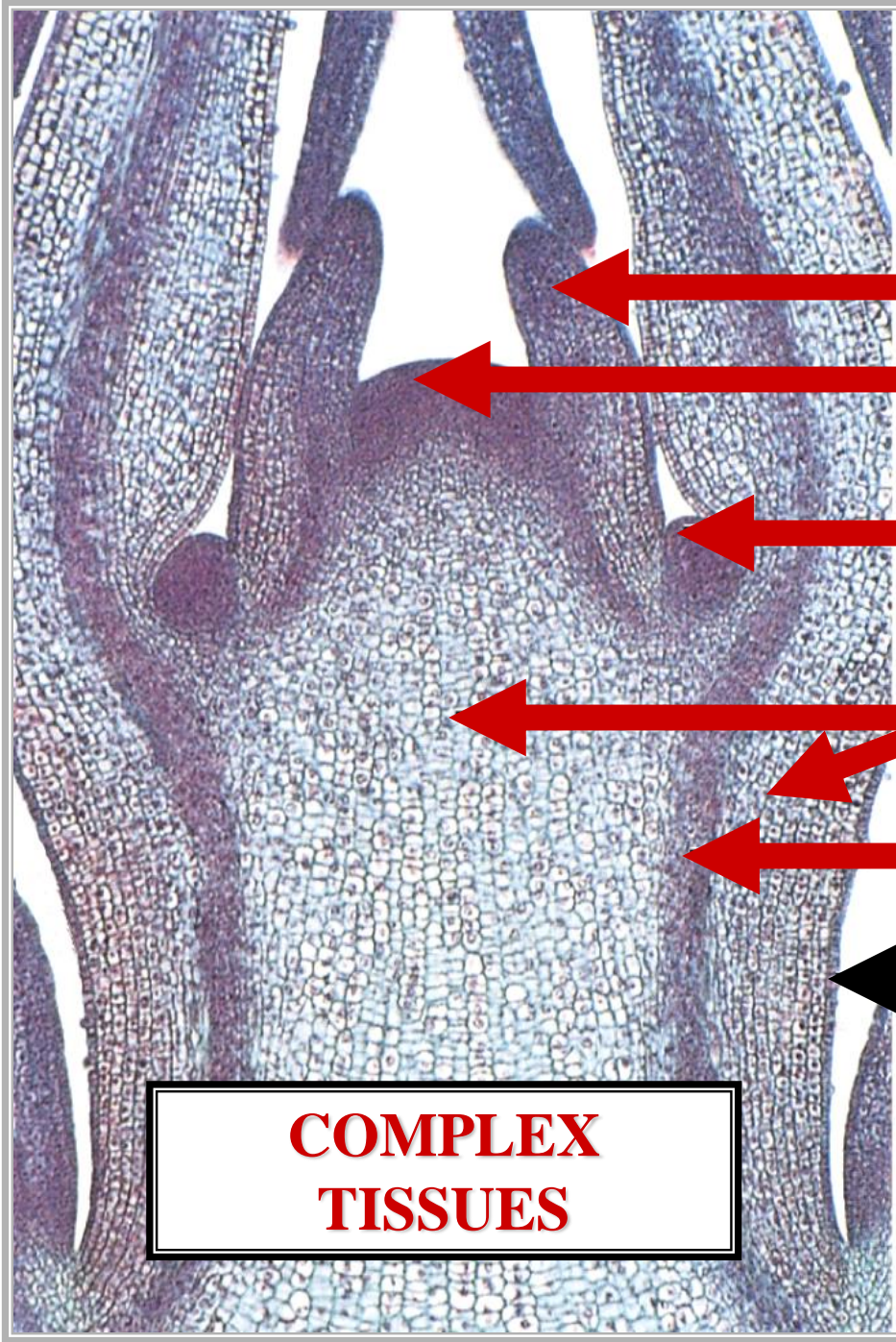
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**COMPLEX
TISSUES**

STEM

L.S.

TRACHEOPHYTE COMPLEX TISSUES



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MERISTEM

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GROUND TISSUE

VASCULAR TISSUE

DERMAL TISSUE

**COMPLEX
TISSUES**

STEM

L.S.



TRACHEOPHYTE GROWTH

PRIMARY TRACHEOPHYTE GROWTH

**PRIMARY
TRACHEOPHYTE
GROWTH**

TRACHEOPHYTE GROWTH[^]
PRIMARY GROWTH

APICAL MERISTEM
DERIVED

TRACHEOPHYTE GROWTH
PRIMARY GROWTH

APICAL MERISTEM

APICAL MERISTEM

**PRIMARY GROWTH
APICAL MERISTEM**



**APEX
STEM & ROOT**

**PRIMARY GROWTH
APICAL MERISTEM**

**PRIMARY GROWTH
APICAL MERISTEM**



APEX STEM & ROOT

INCREASES HEIGHT

**PRIMARY GROWTH
APICAL MERISTEM**

**PRIMARY GROWTH
APICAL MERISTEM**

APEX STEM & ROOT

**INCREASES HEIGHT
NOT GIRTH**

**PRIMARY GROWTH
APICAL MERISTEM**





PLANT

L.S.



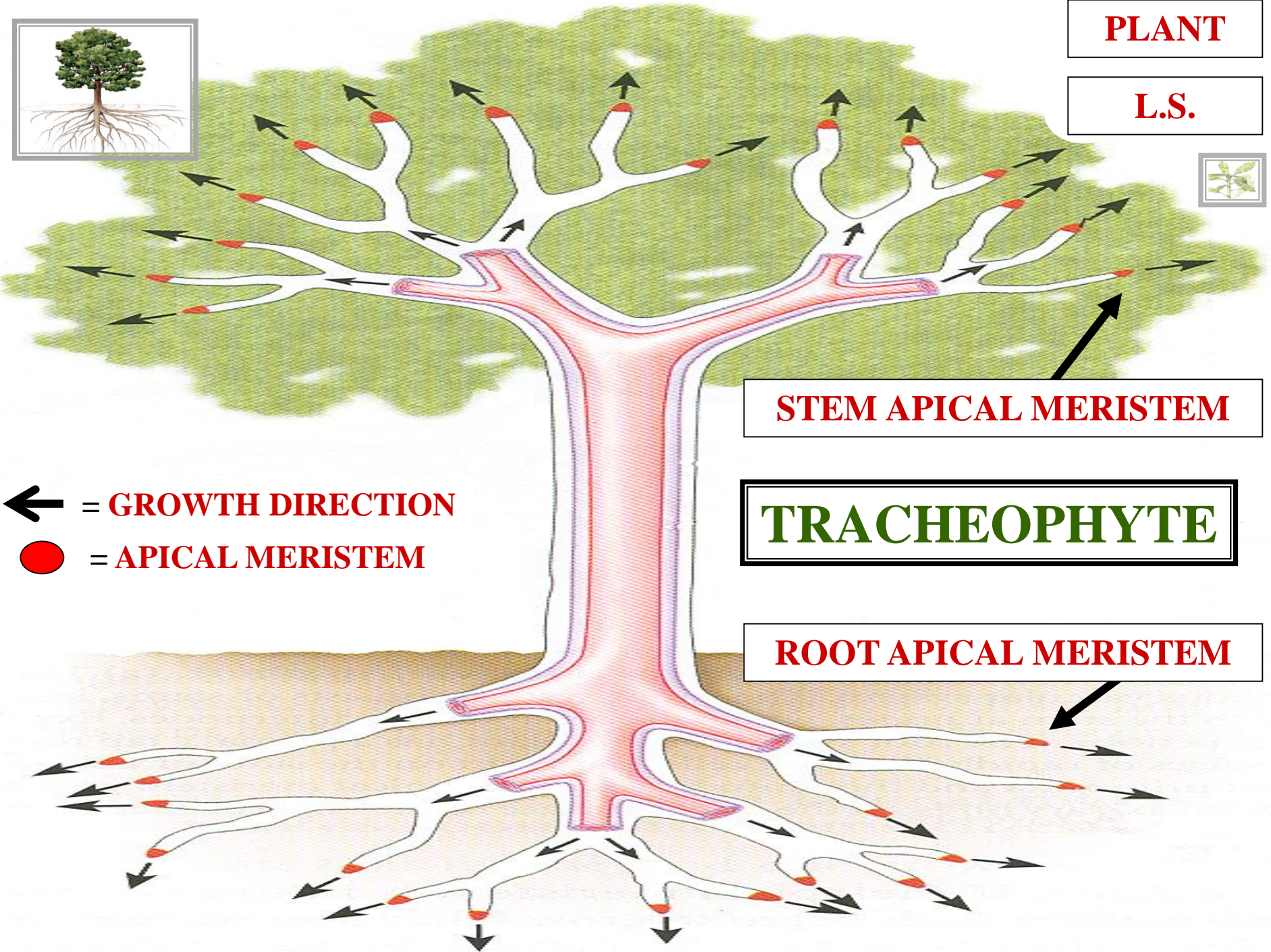
← = GROWTH DIRECTION

● = APICAL MERISTEM

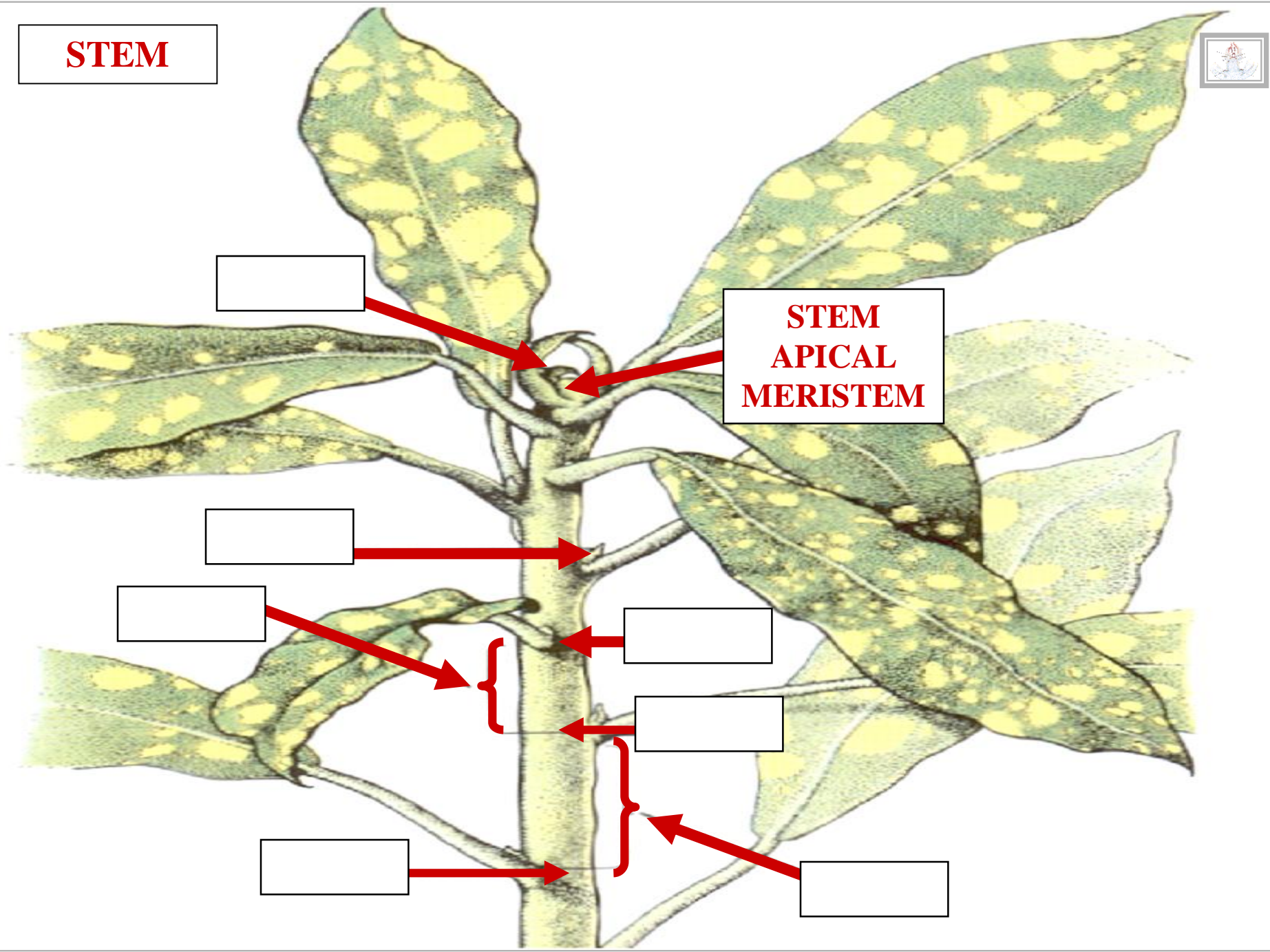
STEM APICAL MERISTEM

TRACHEOPHYTE

ROOT APICAL MERISTEM



STEM



**STEM
APICAL
MERISTEM**

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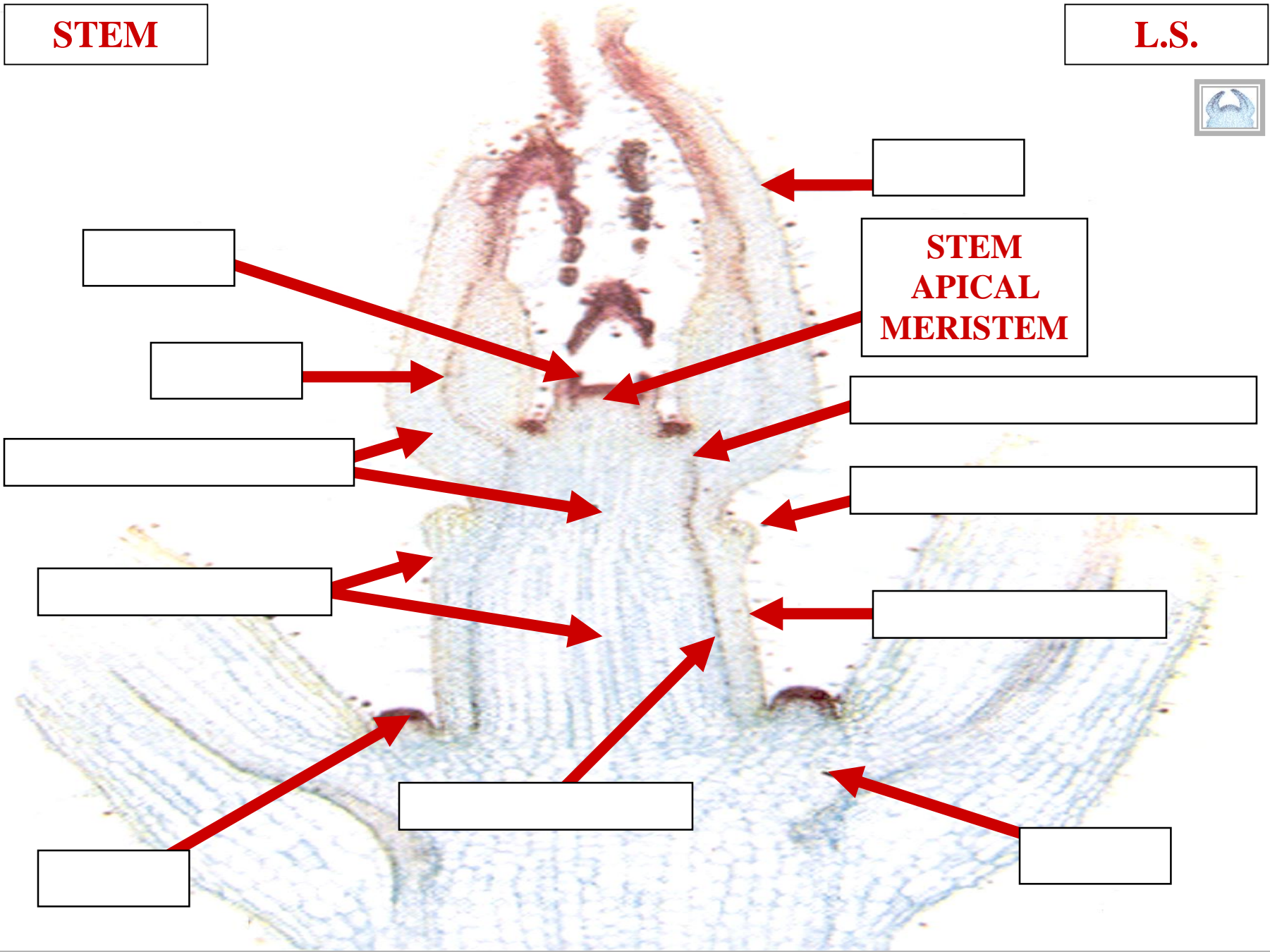
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STEM

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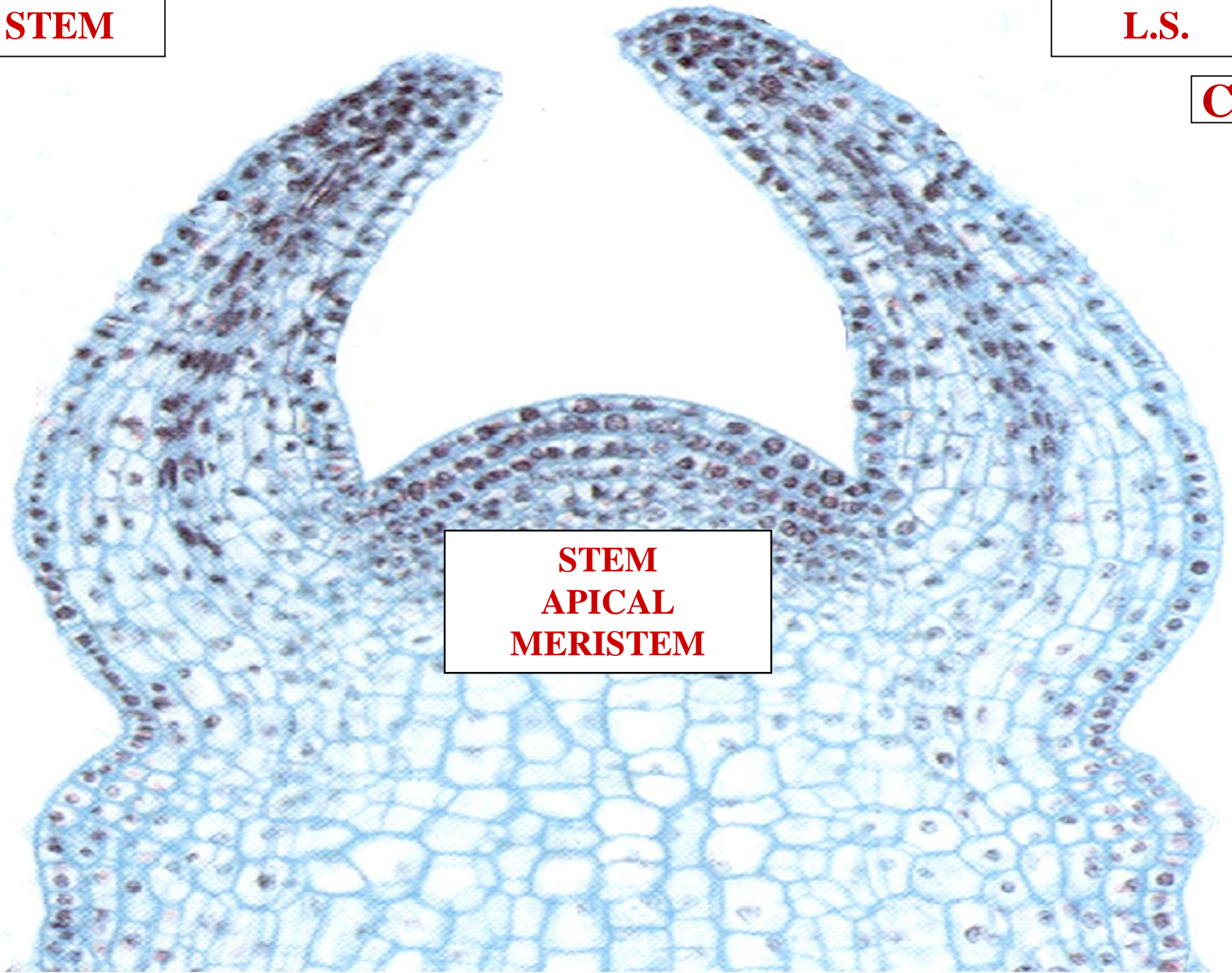


STEM

L.S.

CI

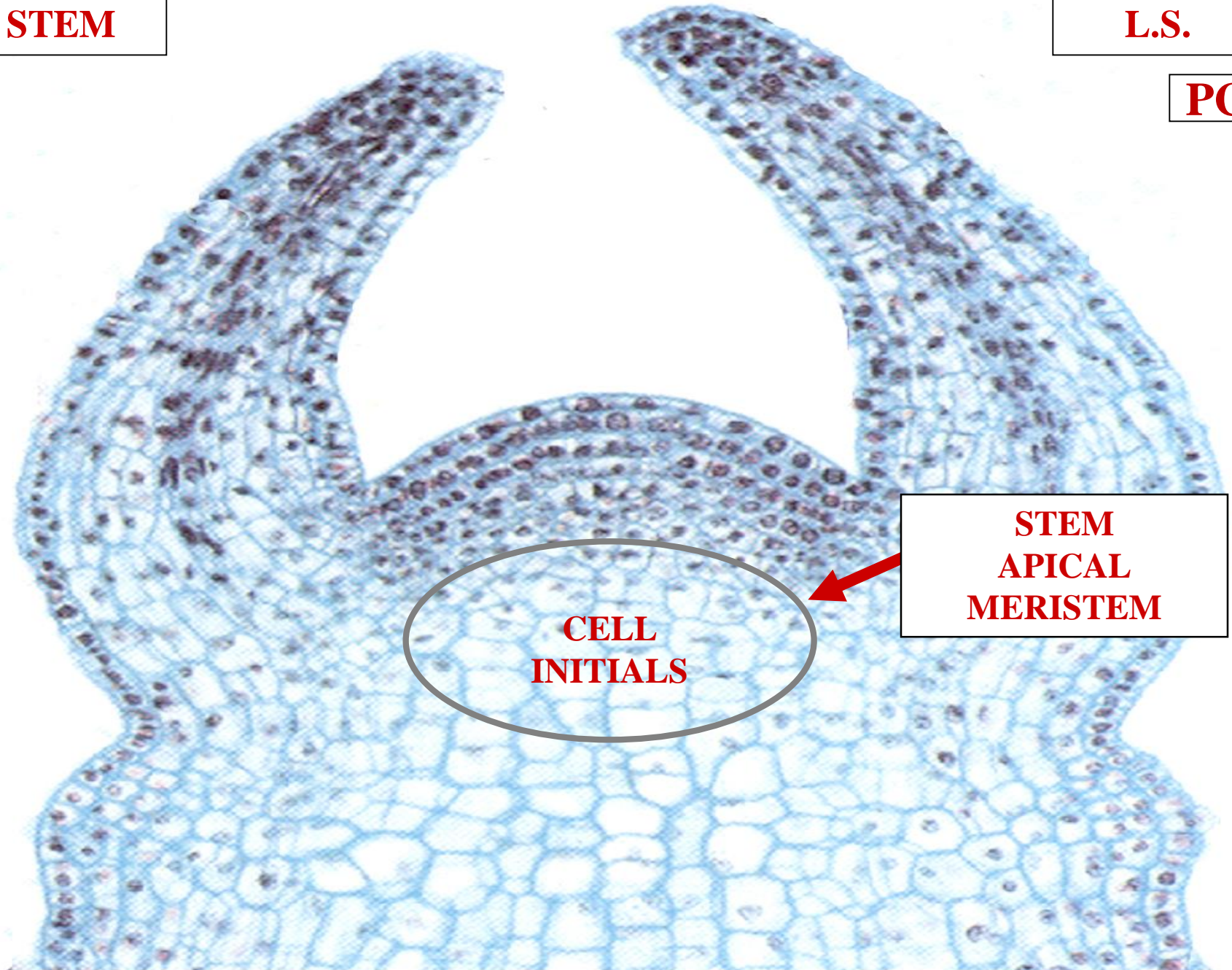
**STEM
APICAL
MERISTEM**



STEM

L.S.

PC



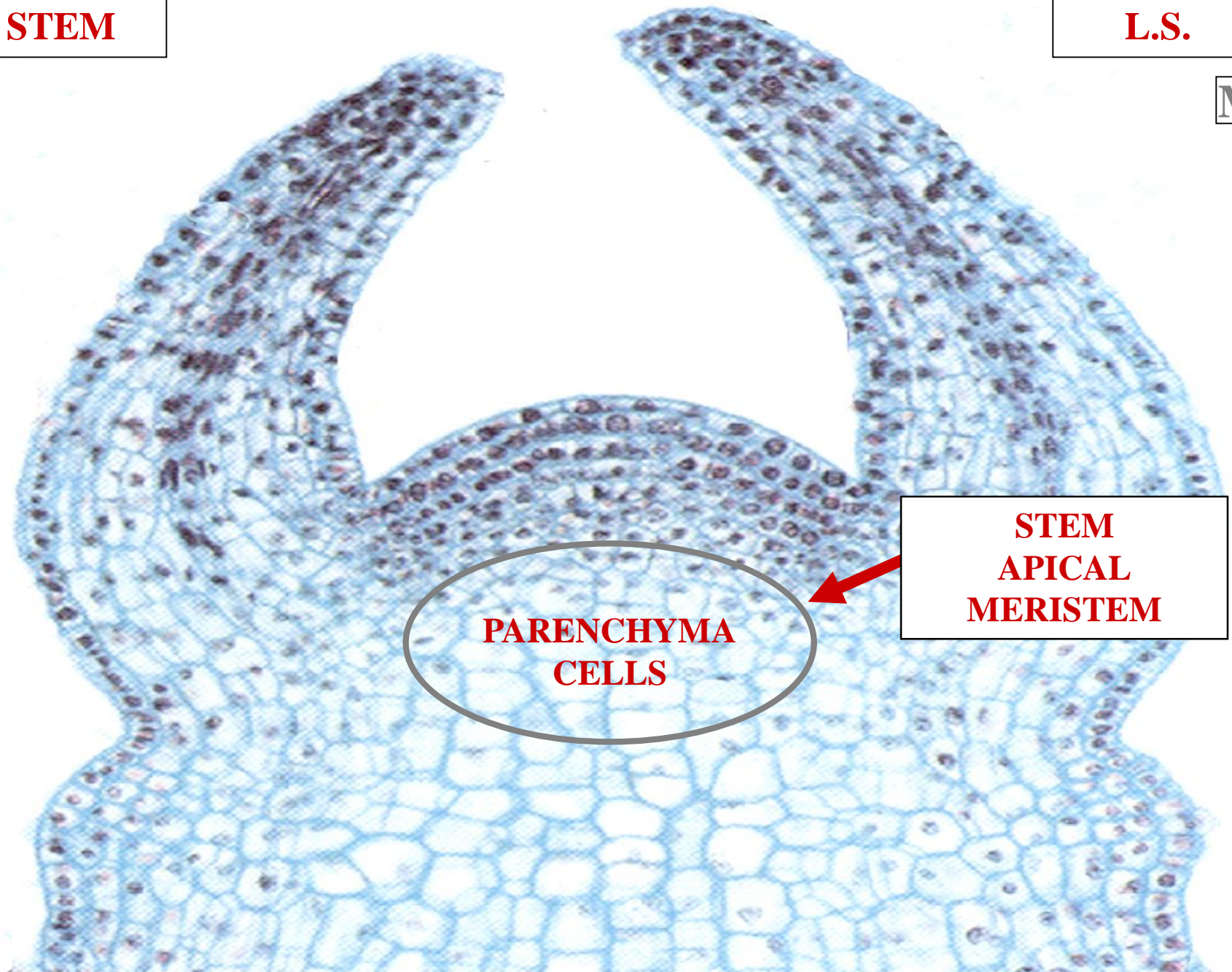
**CELL
INITIALS**

**STEM
APICAL
MERISTEM**

STEM

L.S.

M



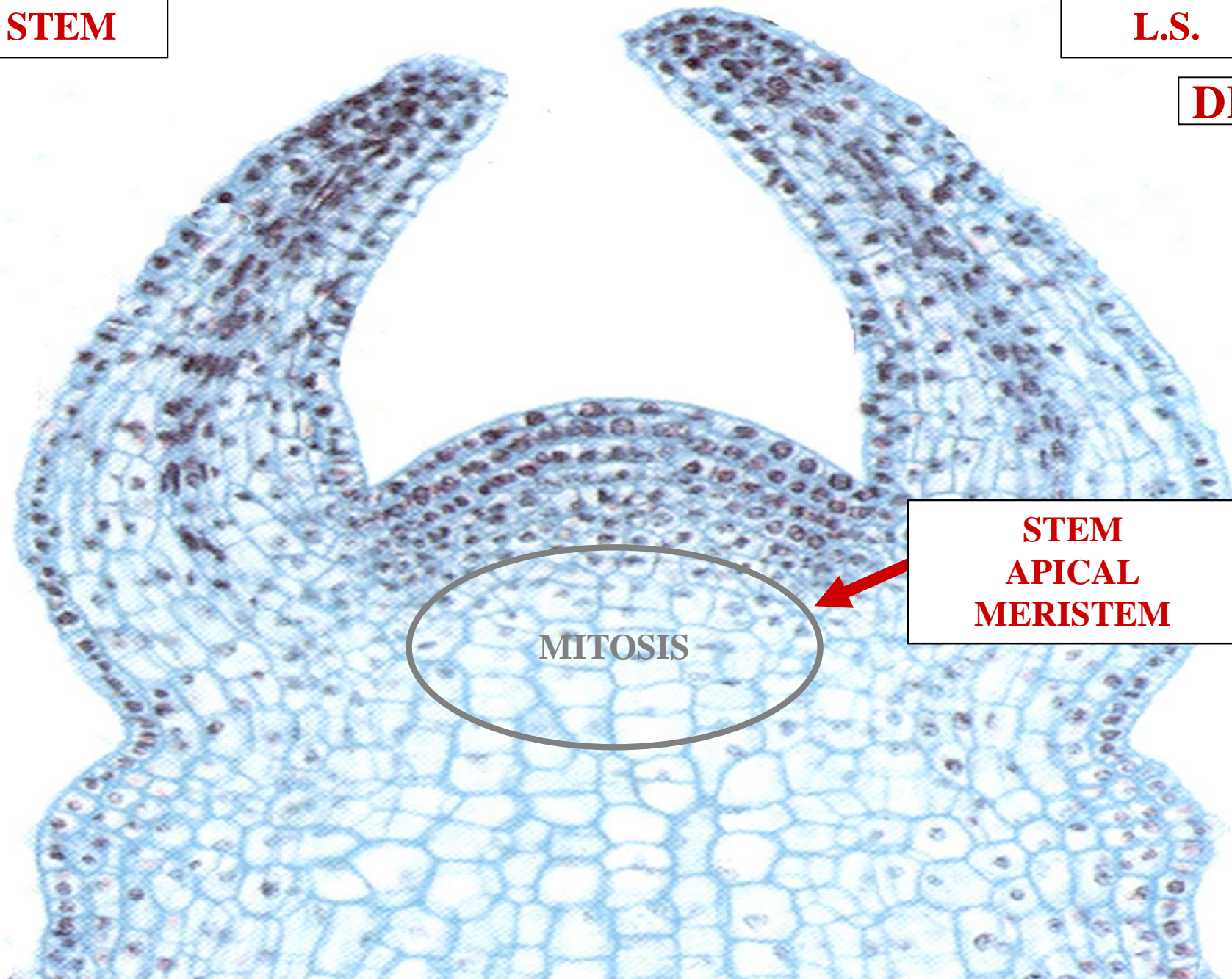
**STEM
APICAL
MERISTEM**

**PARENCHYMA
CELLS**

STEM

L.S.

DR



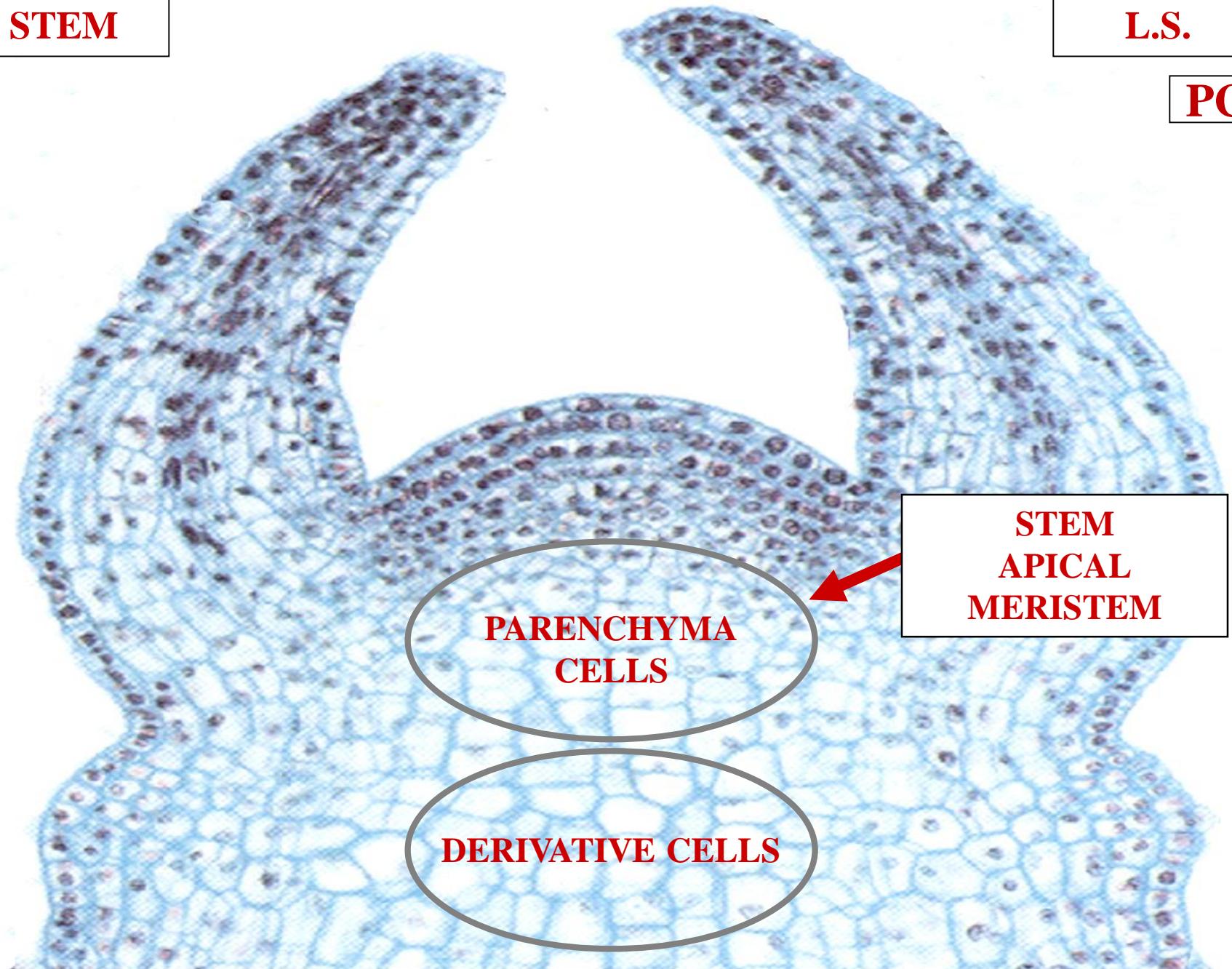
**STEM
APICAL
MERISTEM**

MITOSIS

STEM

L.S.

PC



**STEM
APICAL
MERISTEM**

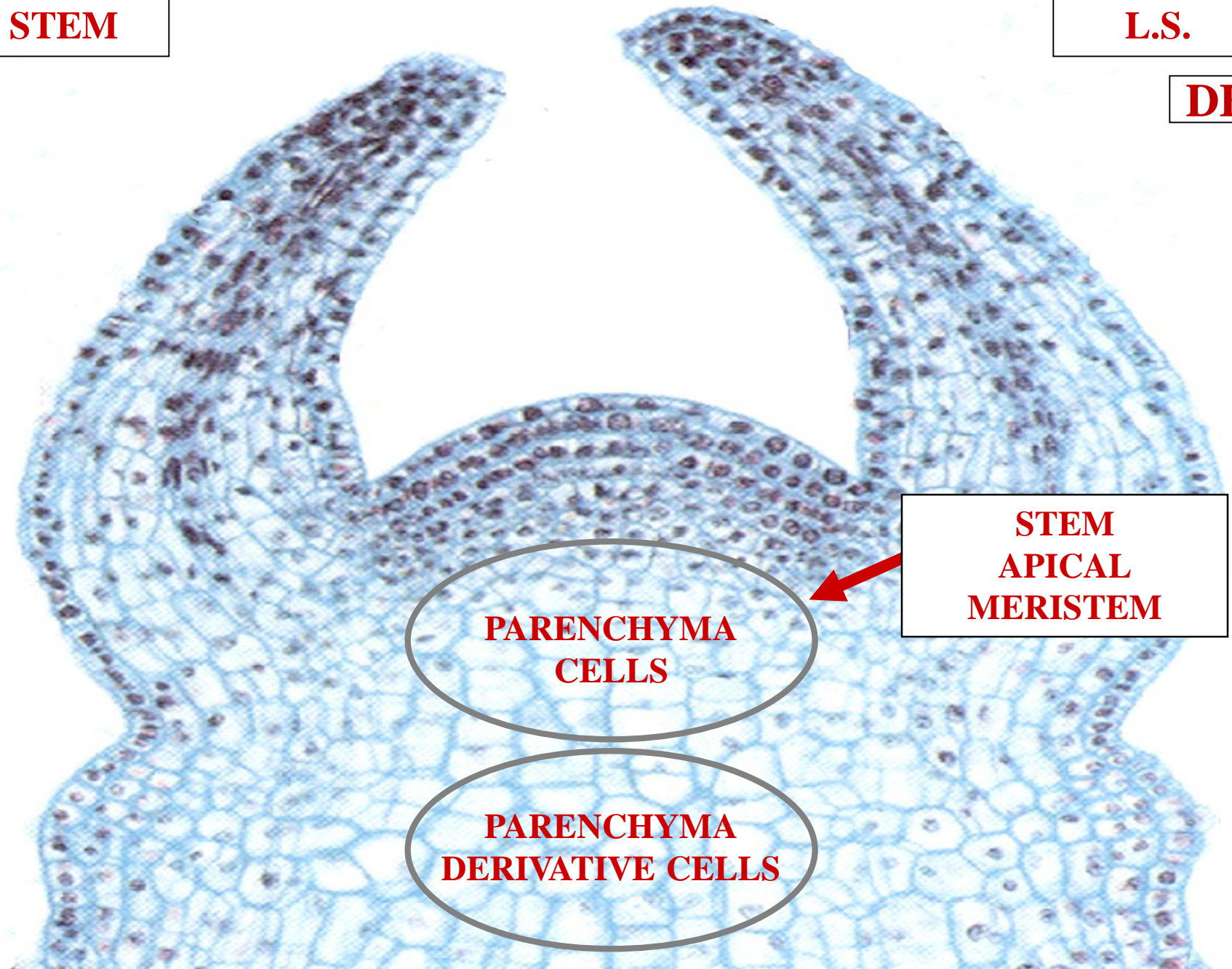
**PARENCHYMA
CELLS**

DERIVATIVE CELLS

STEM

L.S.

DF



**STEM
APICAL
MERISTEM**

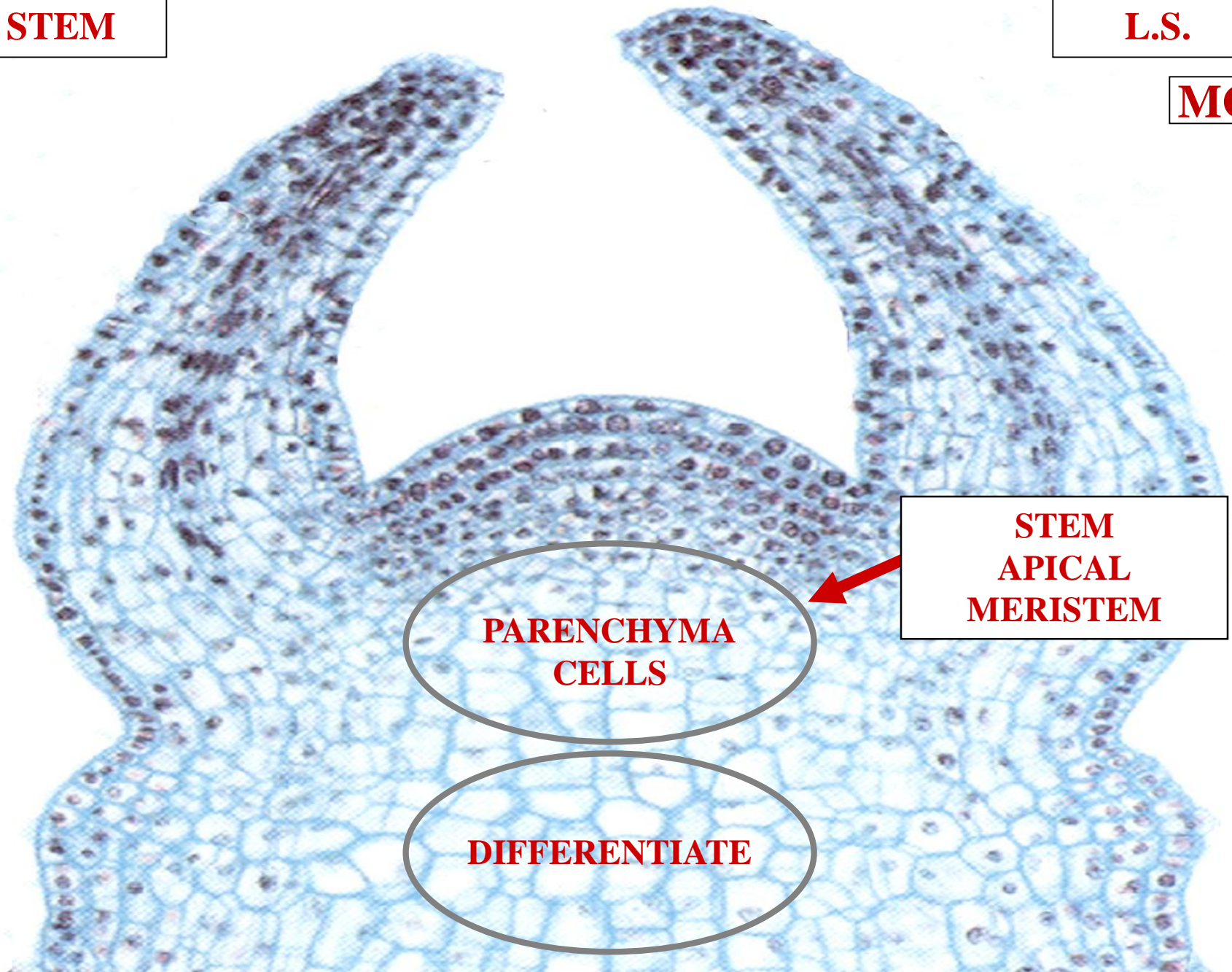
**PARENCHYMA
CELLS**

**PARENCHYMA
DERIVATIVE CELLS**

STEM

L.S.

MC



**STEM
APICAL
MERISTEM**

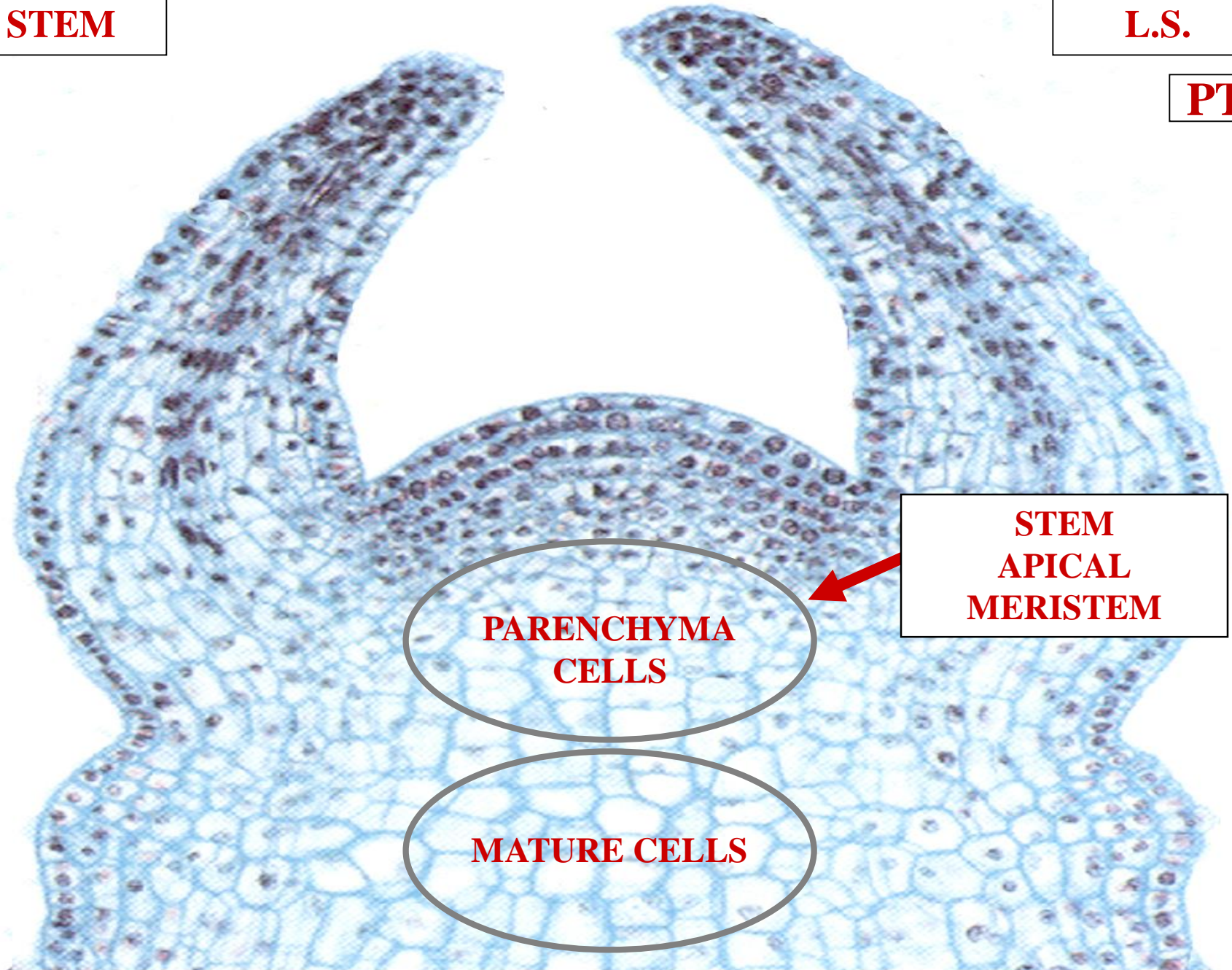
**PARENCHYMA
CELLS**

DIFFERENTIATE

STEM

L.S.

PT



**STEM
APICAL
MERISTEM**

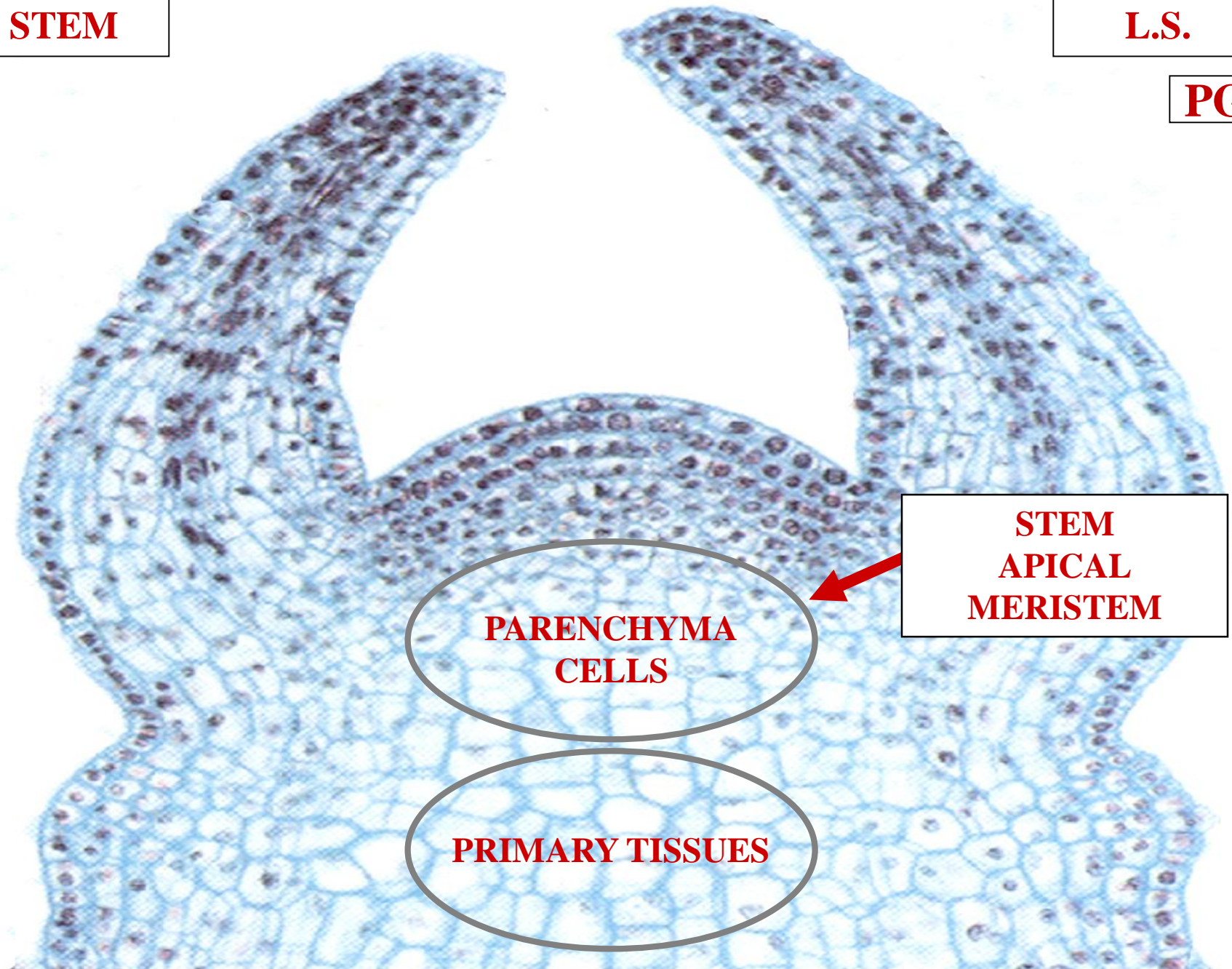
**PARENCHYMA
CELLS**

MATURE CELLS

STEM

L.S.

PG



**STEM
APICAL
MERISTEM**

**PARENCHYMA
CELLS**

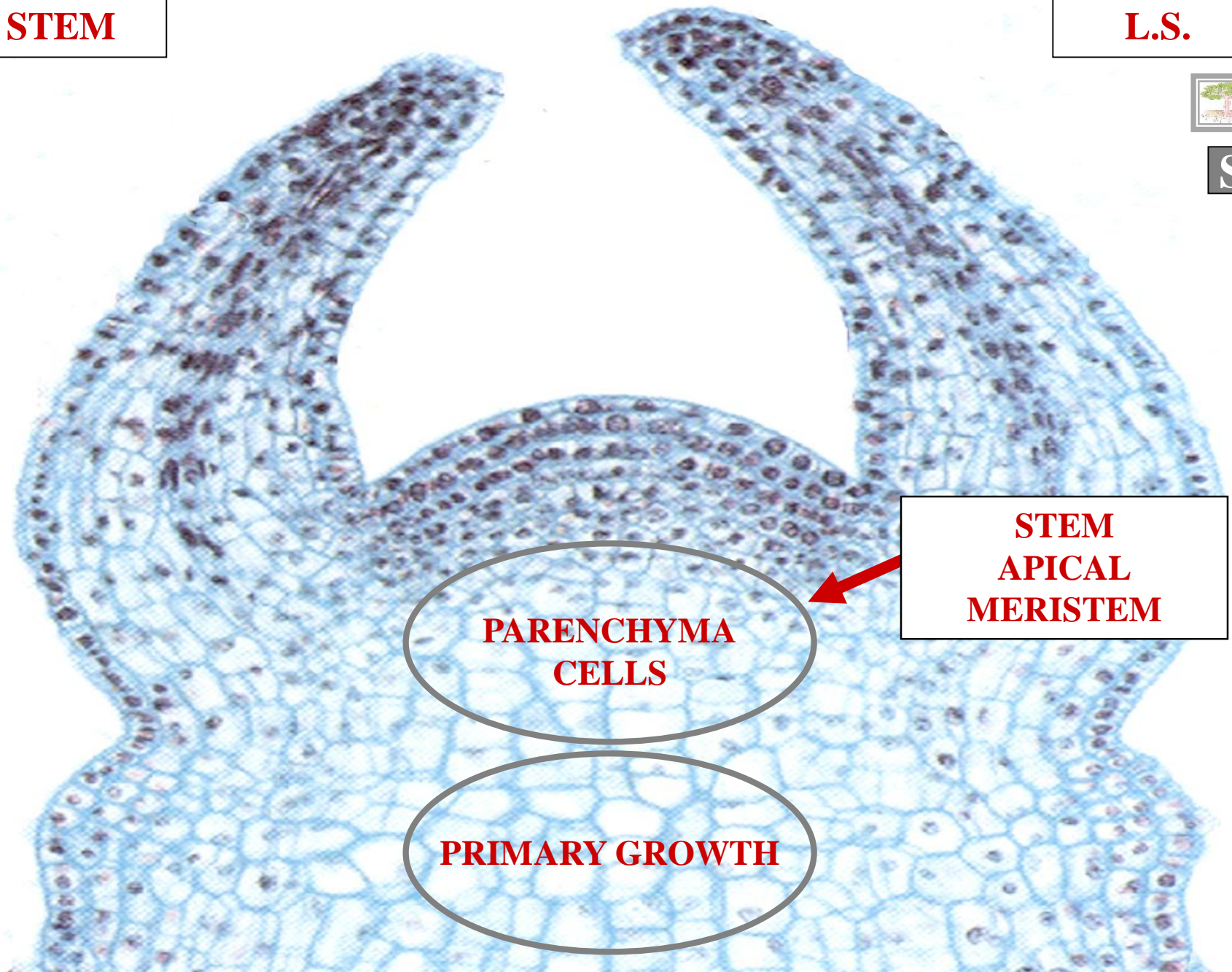
PRIMARY TISSUES

STEM

L.S.



S



**STEM
APICAL
MERISTEM**

**PARENCHYMA
CELLS**

PRIMARY GROWTH

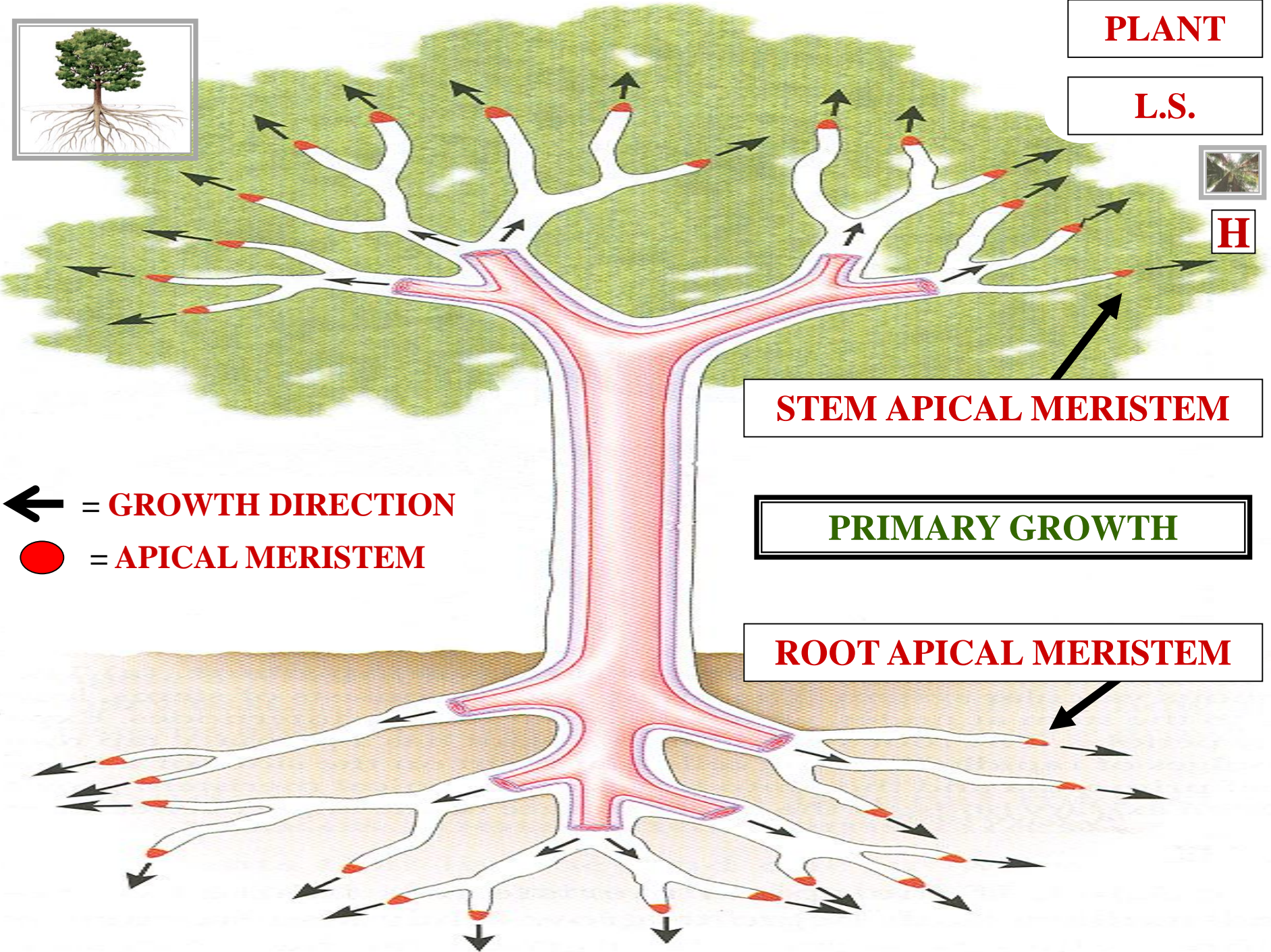


PLANT

L.S.



H



STEM APICAL MERISTEM

PRIMARY GROWTH

ROOT APICAL MERISTEM

← = GROWTH DIRECTION

● = APICAL MERISTEM



N

INCREASES HEIGHT



INCREASES HEIGHT

NOT GIRTH

SECONDARY TRACHEOPHYTE GROWTH

**SECONDARY
TRACHEOPHYTE
GROWTH**

TRACHEOPHYTE GROWTH[^]
SECONDARY GROWTH

LATERAL MERISTEM
DERIVED

TRACHEOPHYTE GROWTH
SECONDARY GROWTH

LATERAL MERISTEM

LATERAL MERISTEM

SECONDARY GROWTH LATERAL MERISTEM



PERIPHERY STEM & ROOT

**SECONDARY GROWTH
LATERAL MERISTEM**

SECONDARY GROWTH LATERAL MERISTEM



PERIPHERY STEM & ROOT

INCREASES PLANT GIRTH

SECONDARY GROWTH
LATERAL MERISTEM

SECONDARY GROWTH LATERAL MERISTEM



PERIPHERY STEM & ROOT

INCREASES PLANT GIRTH

NOT HEIGHT

SECONDARY GROWTH
LATERAL MERISTEM

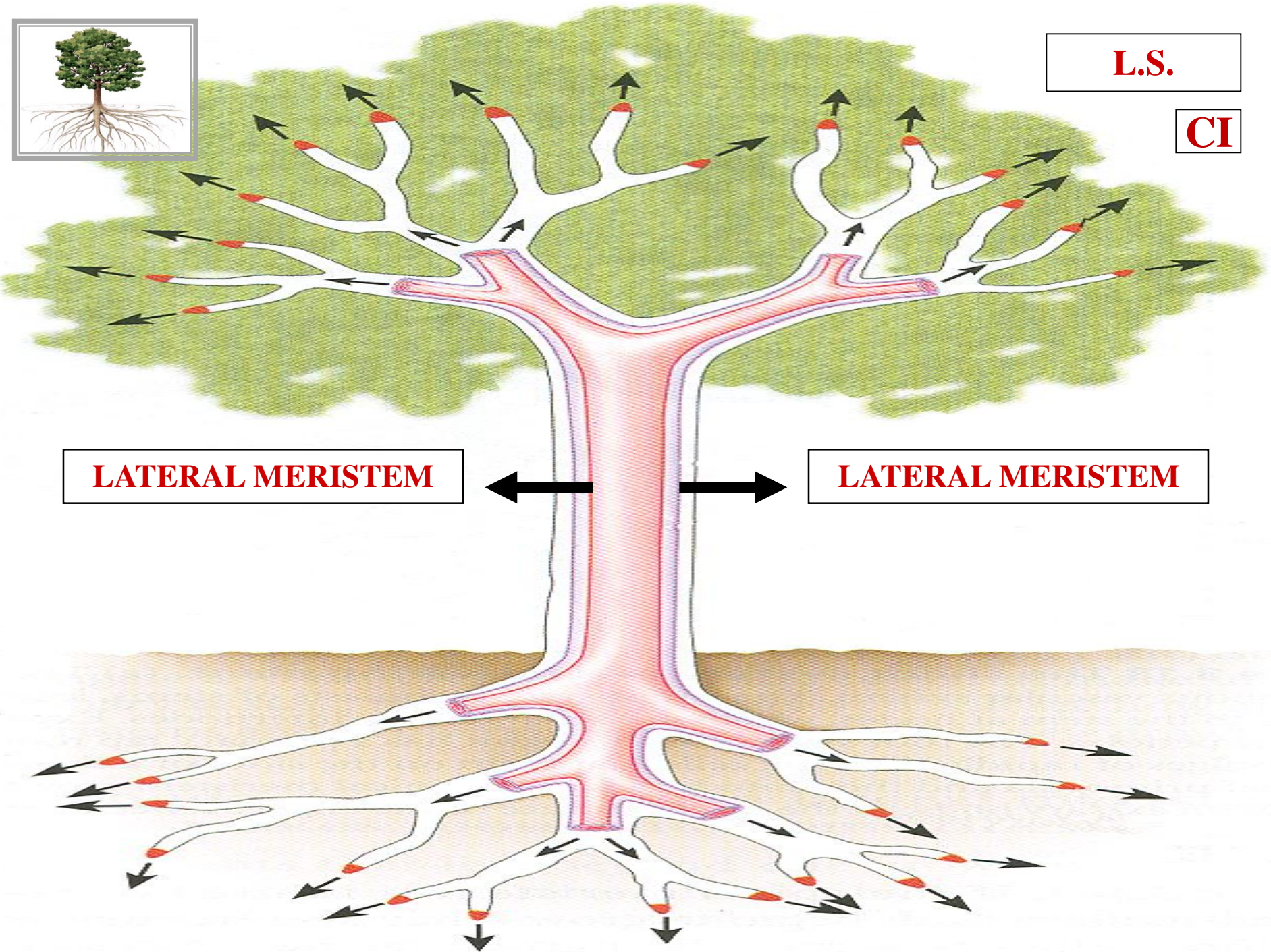


L.S.

CI

LATERAL MERISTEM

LATERAL MERISTEM



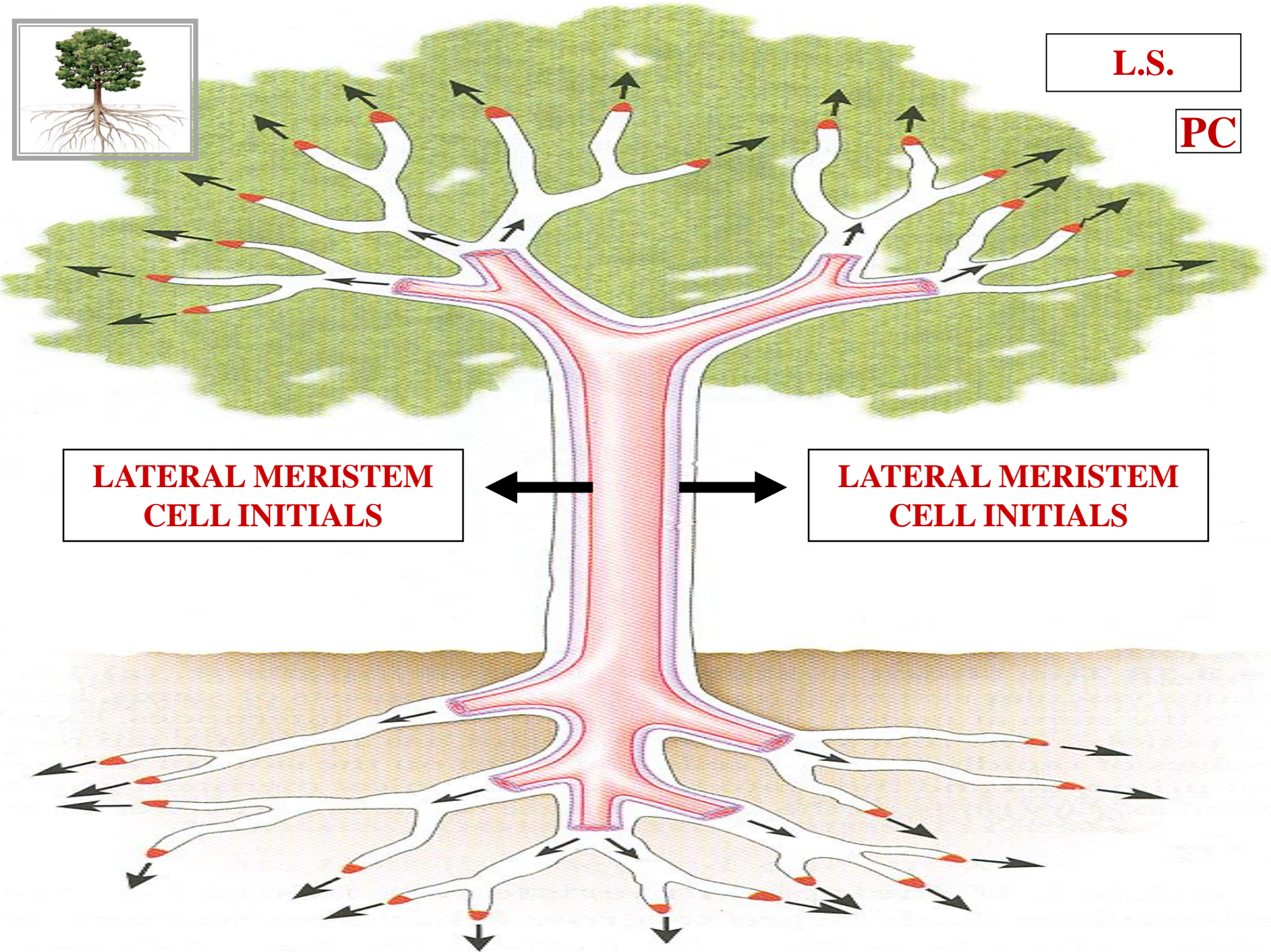


L.S.

PC

**LATERAL MERISTEM
CELL INITIALS**

**LATERAL MERISTEM
CELL INITIALS**



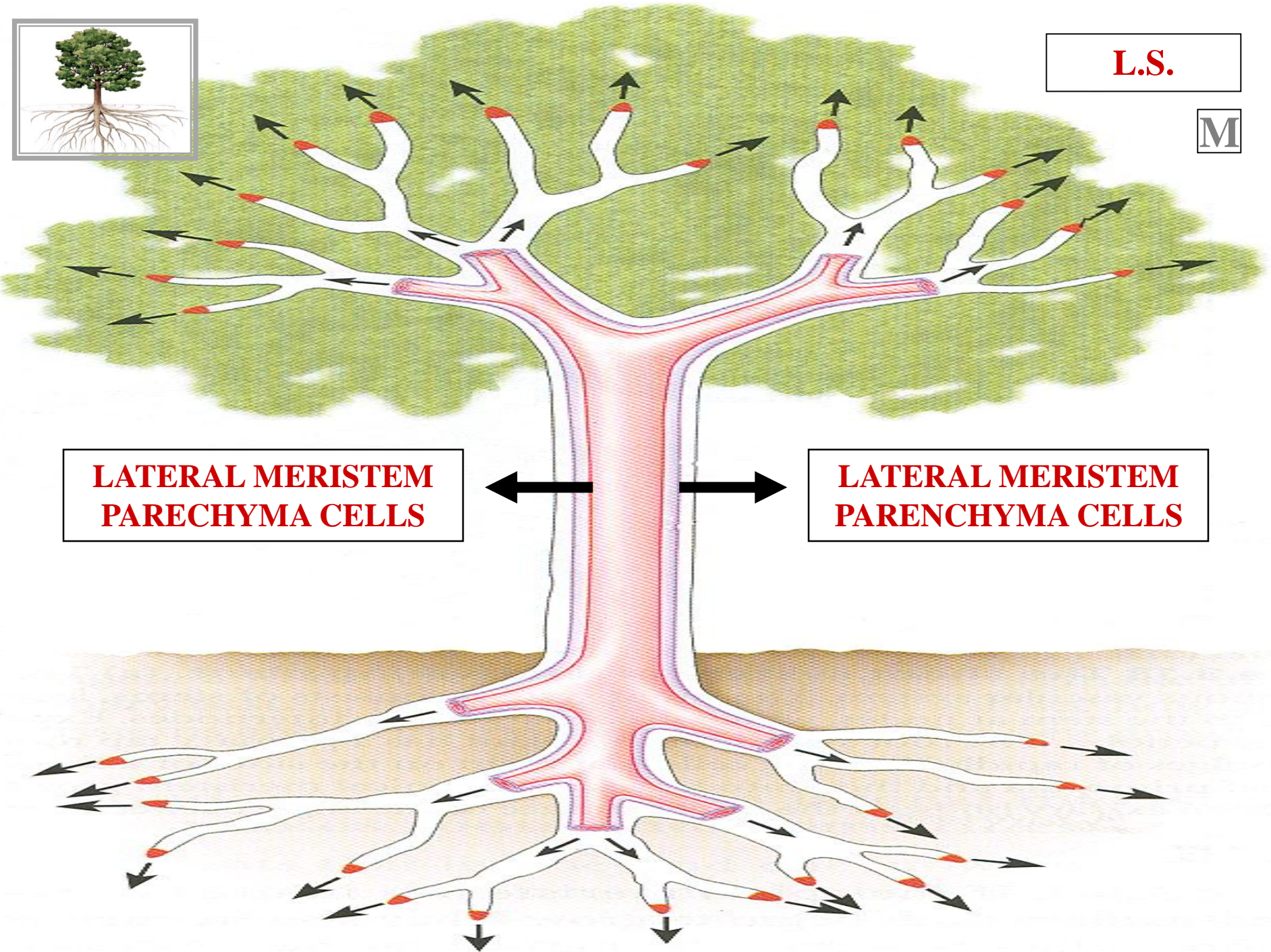


L.S.

M

**LATERAL MERISTEM
PARENCHYMA CELLS**

**LATERAL MERISTEM
PARENCHYMA CELLS**



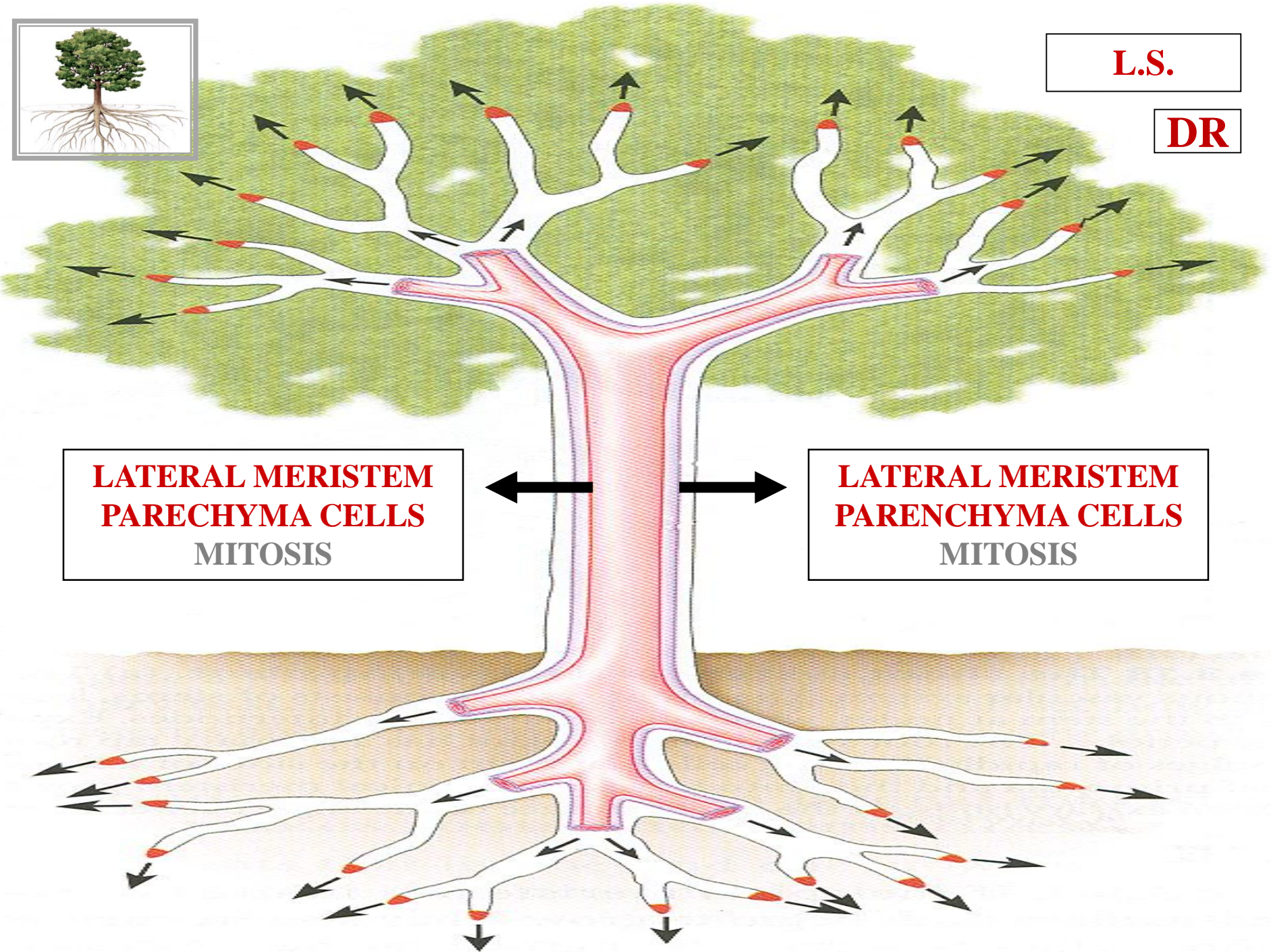


L.S.

DR

**LATERAL MERISTEM
PARENCHYMA CELLS
MITOSIS**

**LATERAL MERISTEM
PARENCHYMA CELLS
MITOSIS**



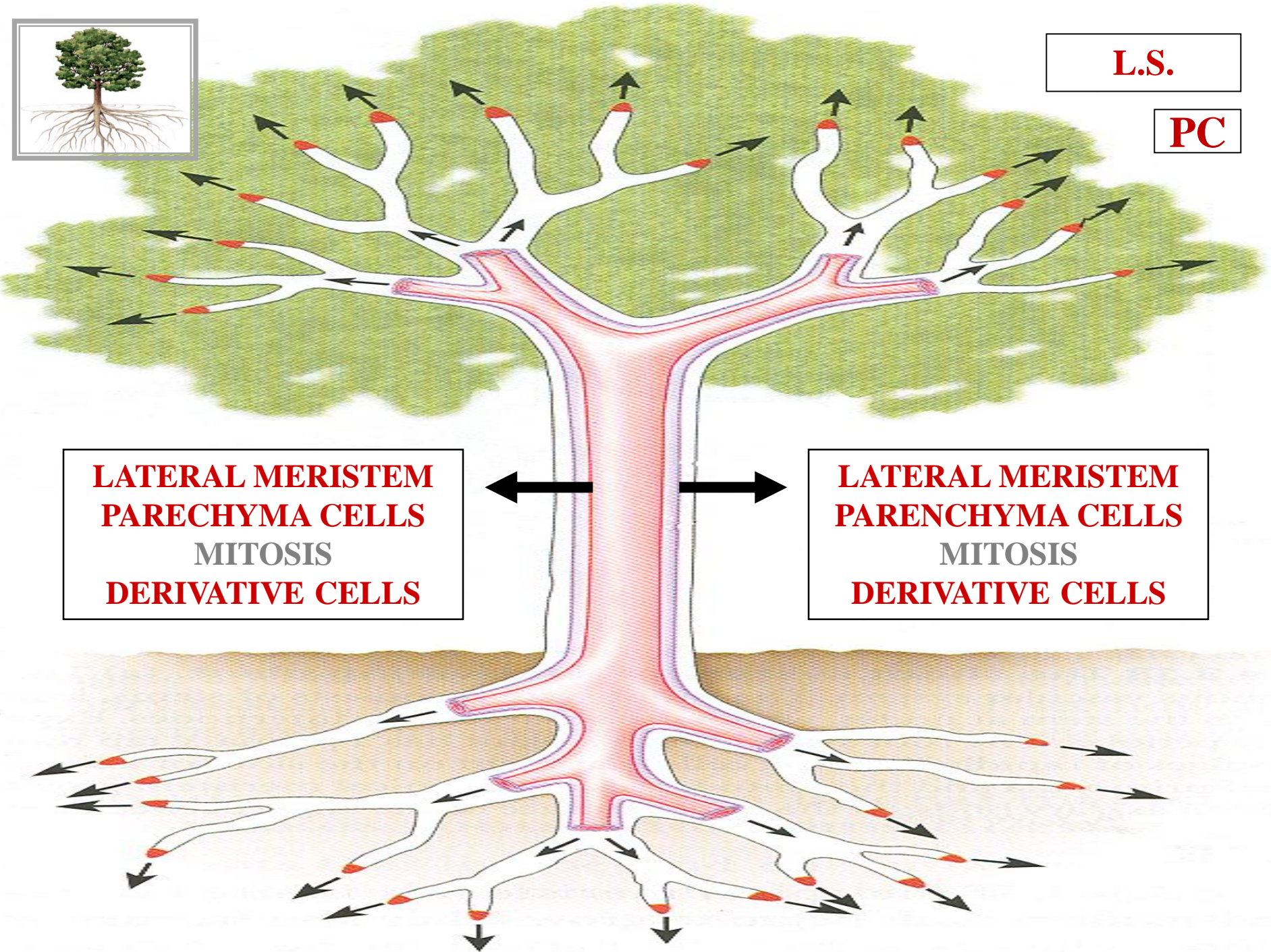


L.S.

PC

**LATERAL MERISTEM
PARENCHYMA CELLS
MITOSIS
DERIVATIVE CELLS**

**LATERAL MERISTEM
PARENCHYMA CELLS
MITOSIS
DERIVATIVE CELLS**



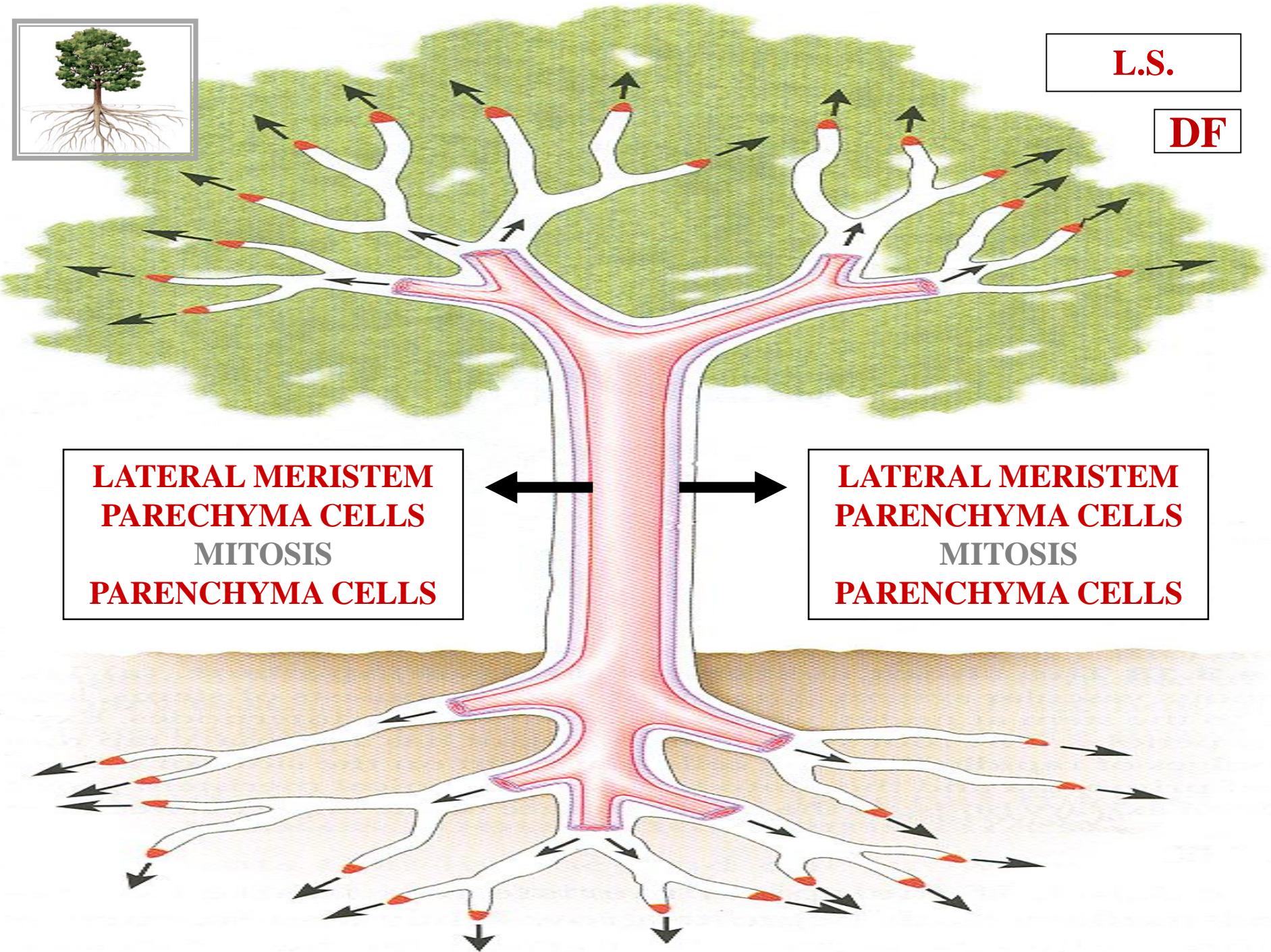


L.S.

DF

LATERAL MERISTEM
PARENCHYMA CELLS
MITOSIS
PARENCHYMA CELLS

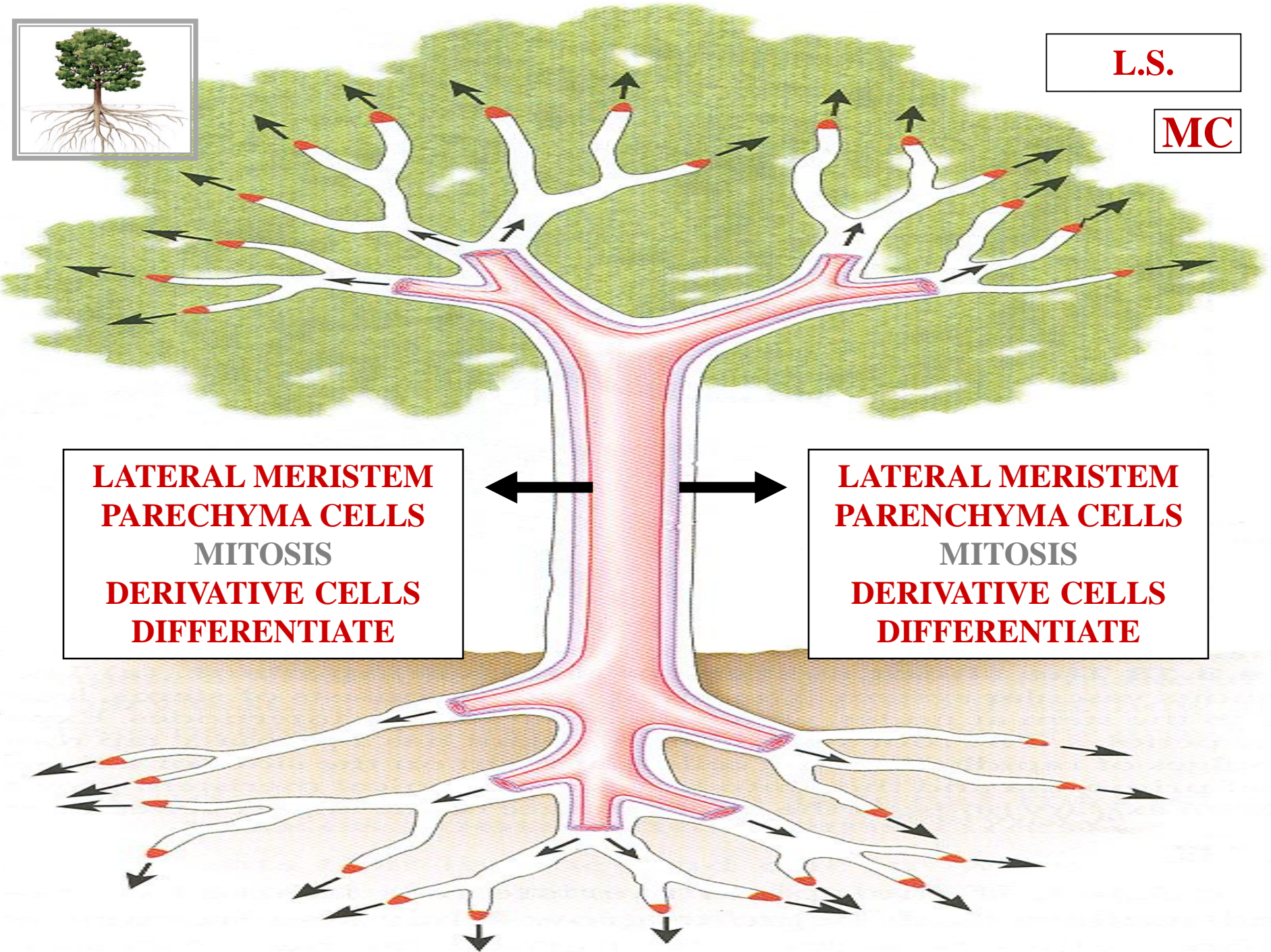
LATERAL MERISTEM
PARENCHYMA CELLS
MITOSIS
PARENCHYMA CELLS





L.S.

MC



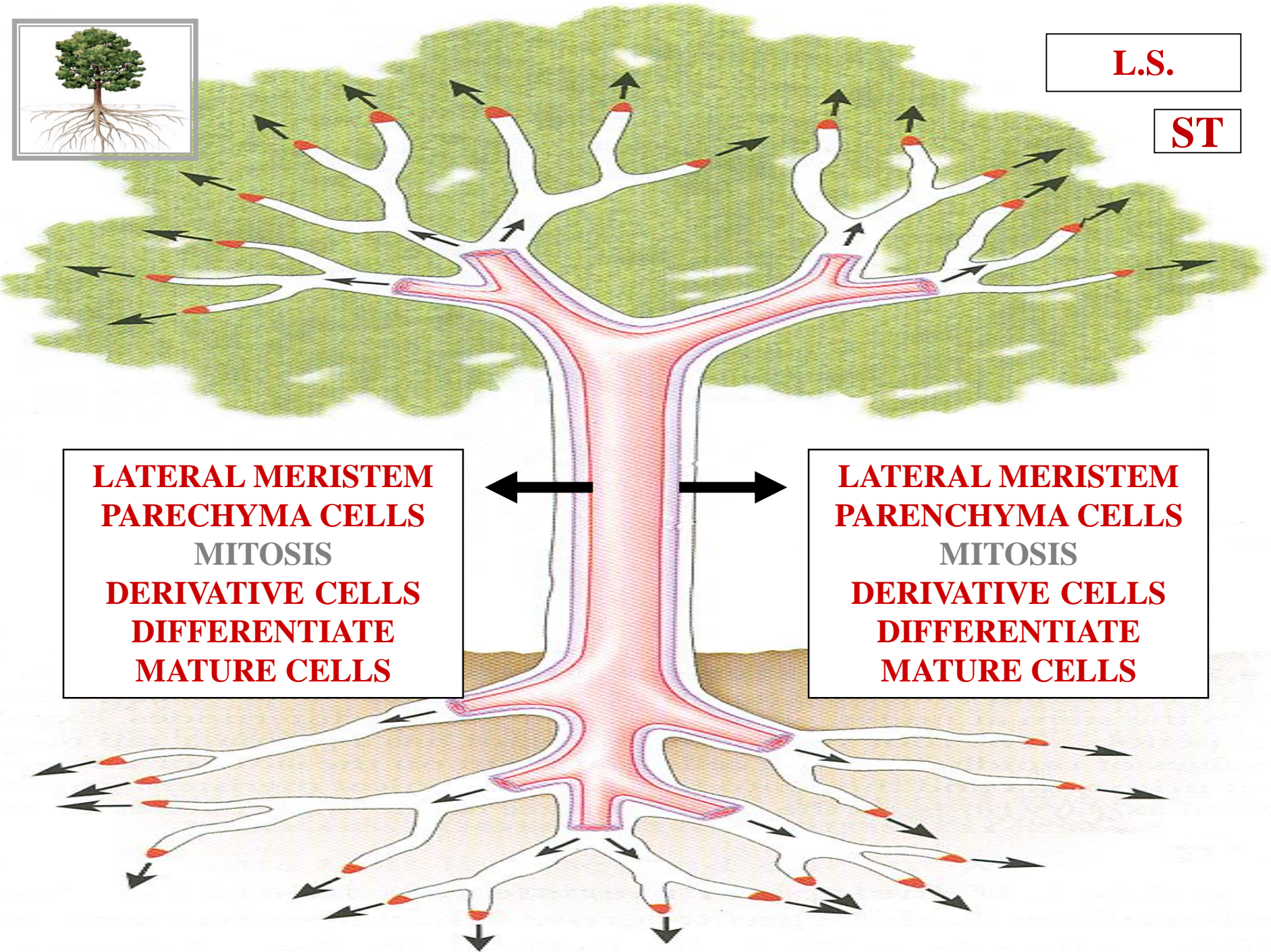
**LATERAL MERISTEM
PARENCHYMA CELLS
MITOSIS
DERIVATIVE CELLS
DIFFERENTIATE**

**LATERAL MERISTEM
PARENCHYMA CELLS
MITOSIS
DERIVATIVE CELLS
DIFFERENTIATE**



L.S.

ST



**LATERAL MERISTEM
PARENCHYMA CELLS
MITOSIS
DERIVATIVE CELLS
DIFFERENTIATE
MATURE CELLS**

**LATERAL MERISTEM
PARENCHYMA CELLS
MITOSIS
DERIVATIVE CELLS
DIFFERENTIATE
MATURE CELLS**

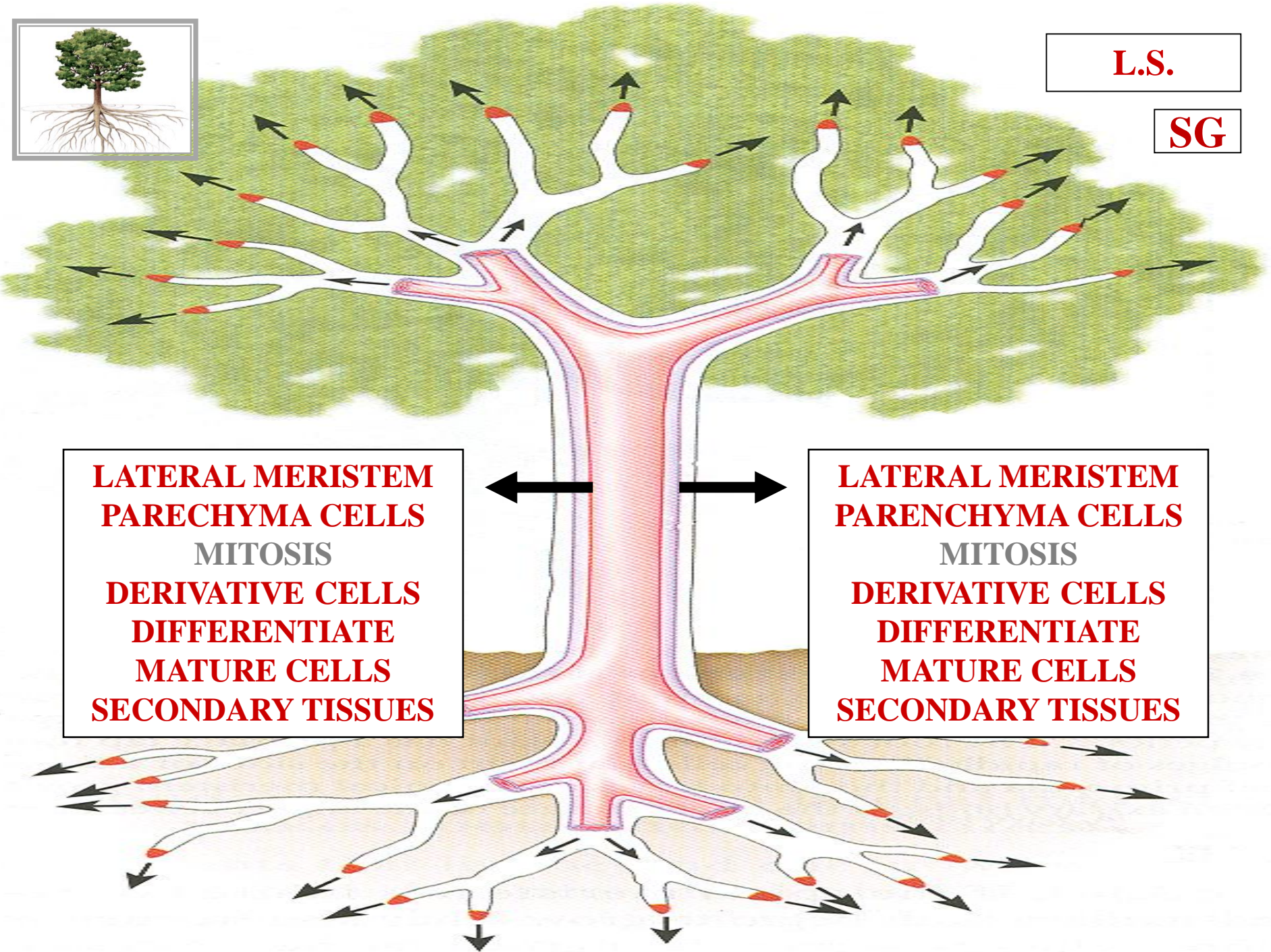


L.S.

SG

**LATERAL MERISTEM
PARENCHYMA CELLS
MITOSIS
DERIVATIVE CELLS
DIFFERENTIATE
MATURE CELLS
SECONDARY TISSUES**

**LATERAL MERISTEM
PARENCHYMA CELLS
MITOSIS
DERIVATIVE CELLS
DIFFERENTIATE
MATURE CELLS
SECONDARY TISSUES**





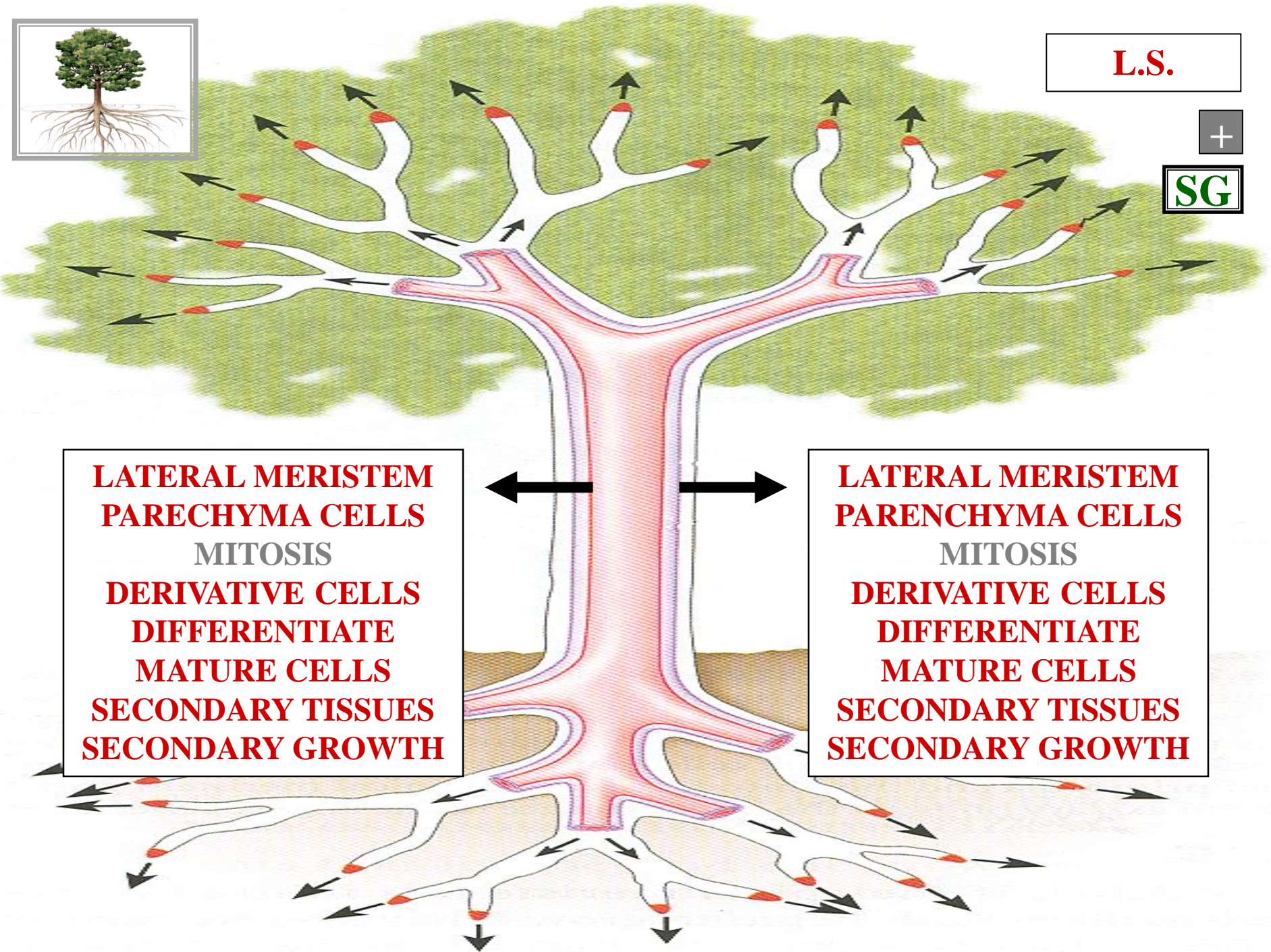
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SG

**LATERAL MERISTEM
PARENCHYMA CELLS
MITOSIS
DERIVATIVE CELLS
DIFFERENTIATE
MATURE CELLS
SECONDARY TISSUES
SECONDARY GROWTH**

**LATERAL MERISTEM
PARENCHYMA CELLS
MITOSIS
DERIVATIVE CELLS
DIFFERENTIATE
MATURE CELLS
SECONDARY TISSUES
SECONDARY GROWTH**



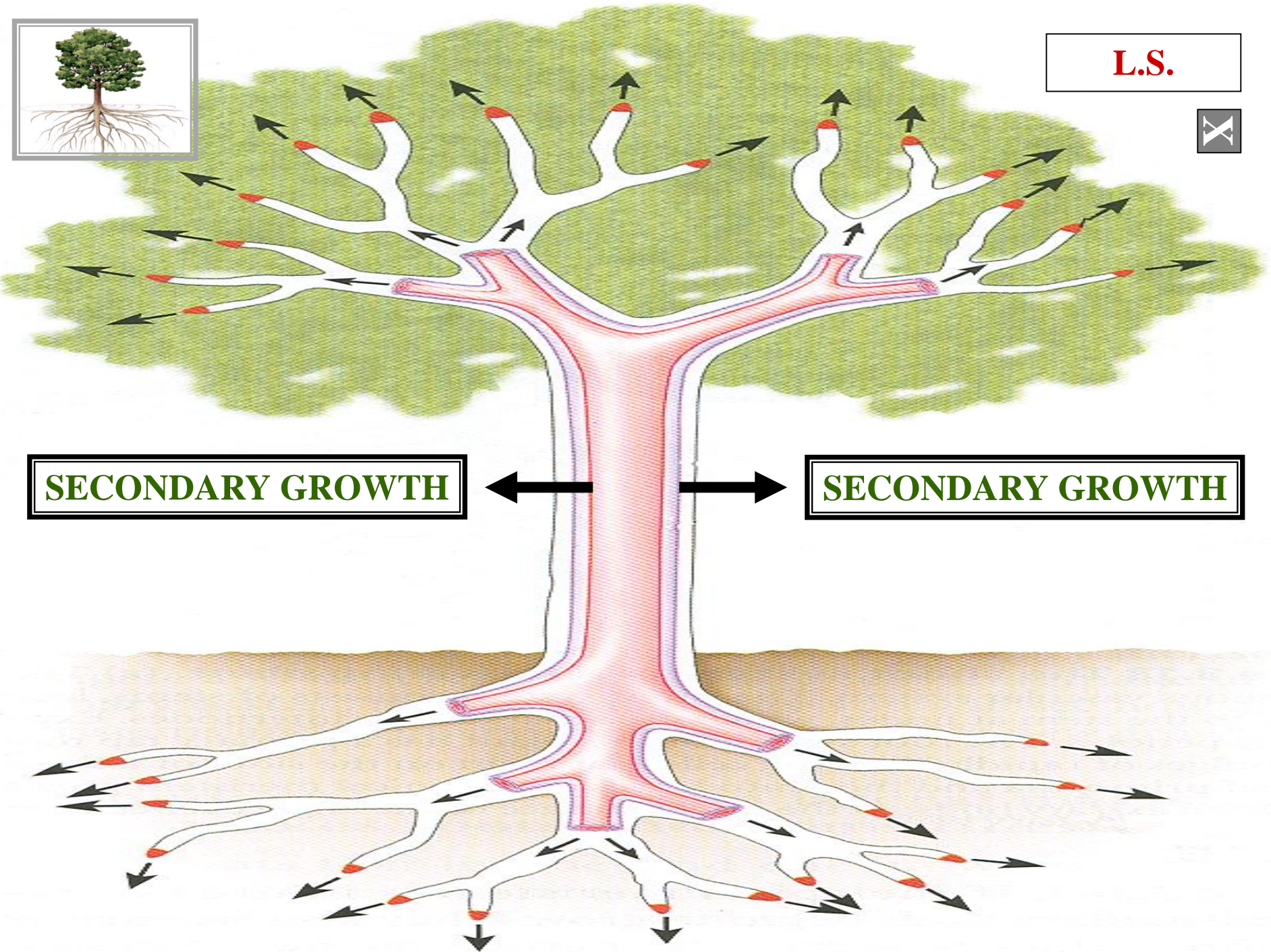


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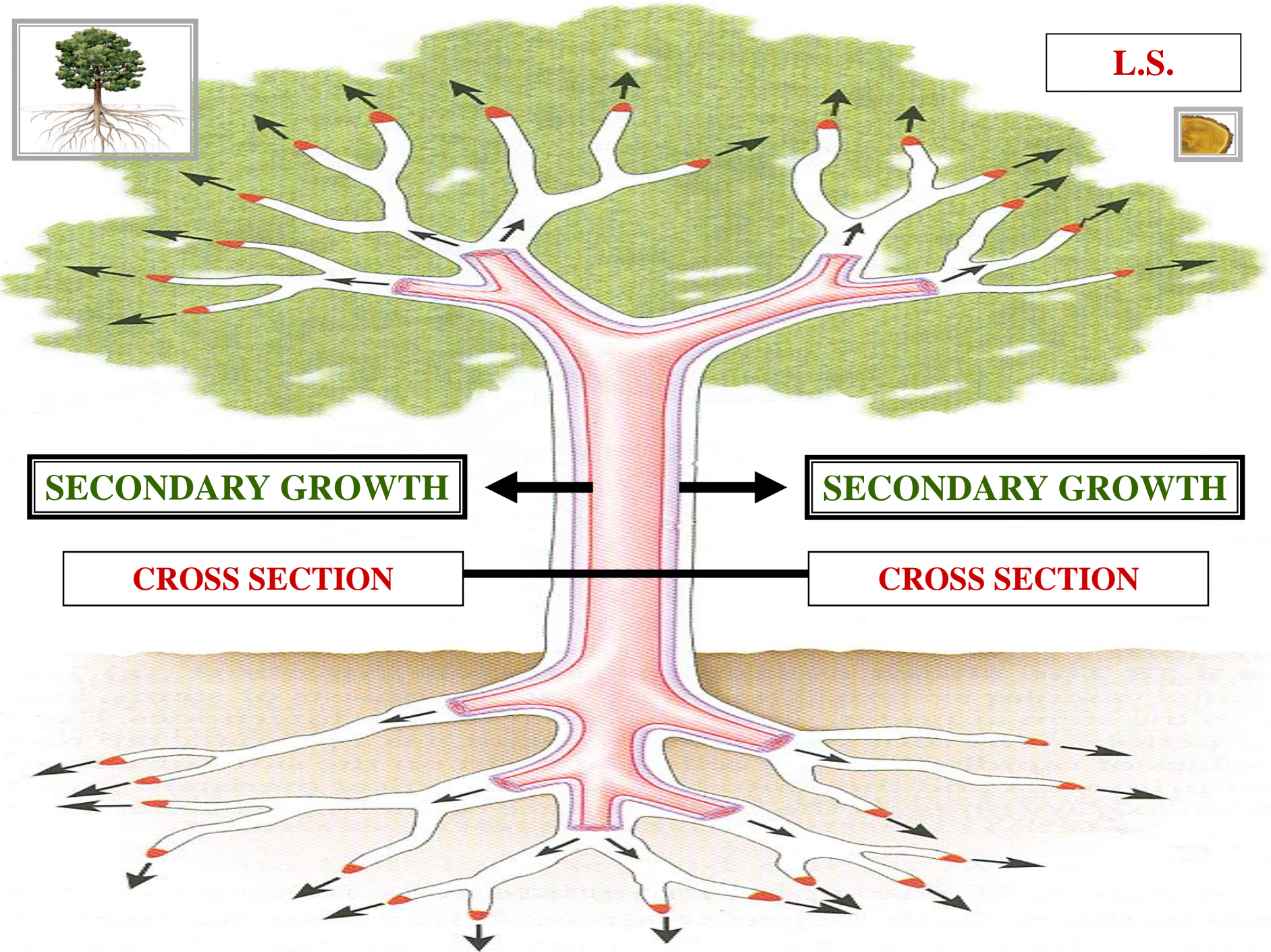
SECONDARY GROWTH

SECONDARY GROWTH





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SECONDARY GROWTH

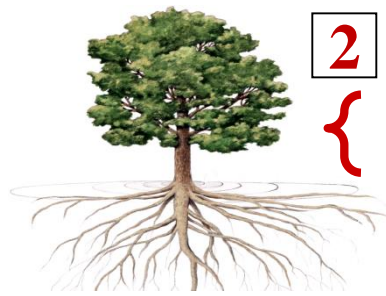
SECONDARY GROWTH

CROSS SECTION

CROSS SECTION



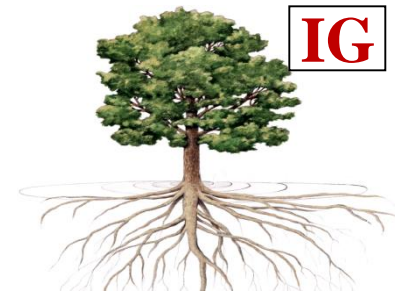
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STEM

C.S.

IG

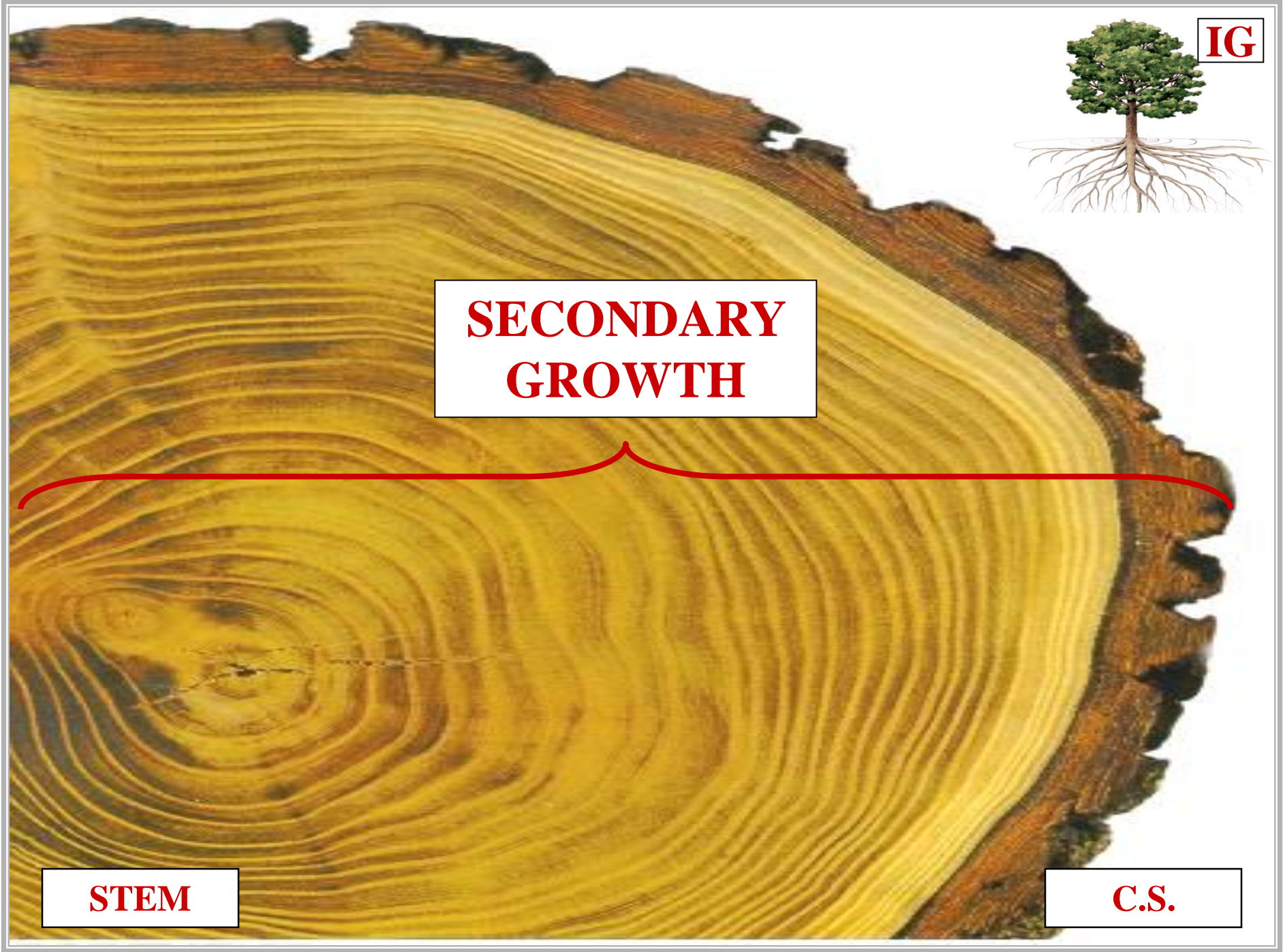


**SECONDARY
GROWTH**

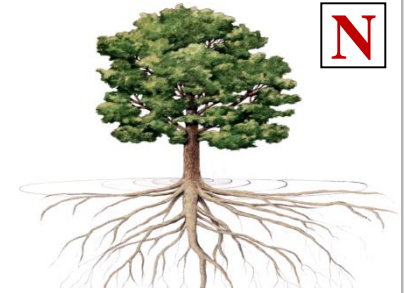


STEM

C.S.



N

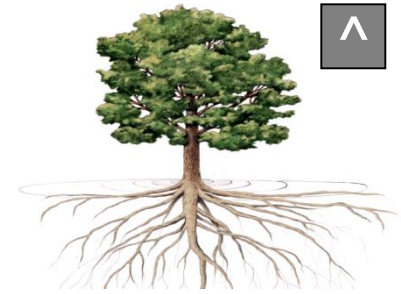


**SECONDARY
GROWTH**

INCREASES GIRTH

STEM

C.S.



**SECONDARY
GROWTH**

INCREASES GIRTH

NOT HEIGHT

STEM

C.S.

LATERAL MERISTEM TYPES

LATERAL MERISTEM TYPES

VASCULAR CAMBIUM

LATERAL MERISTEM TYPES



LATERAL MERISTEM TYPES

VASCULAR CAMBIUM
CORK CAMBIUM

**LATERAL MERISTEM
TYPES**

VASCULAR CAMBIUM

VASCULAR CAMBIUM

LATERAL MERISTEM VASCULAR CAMBIUM



**DERIVES
SECONDARY
VASCULAR TISSUE**

**LATERAL MERISTEM
VASCULAR CAMBIUM**



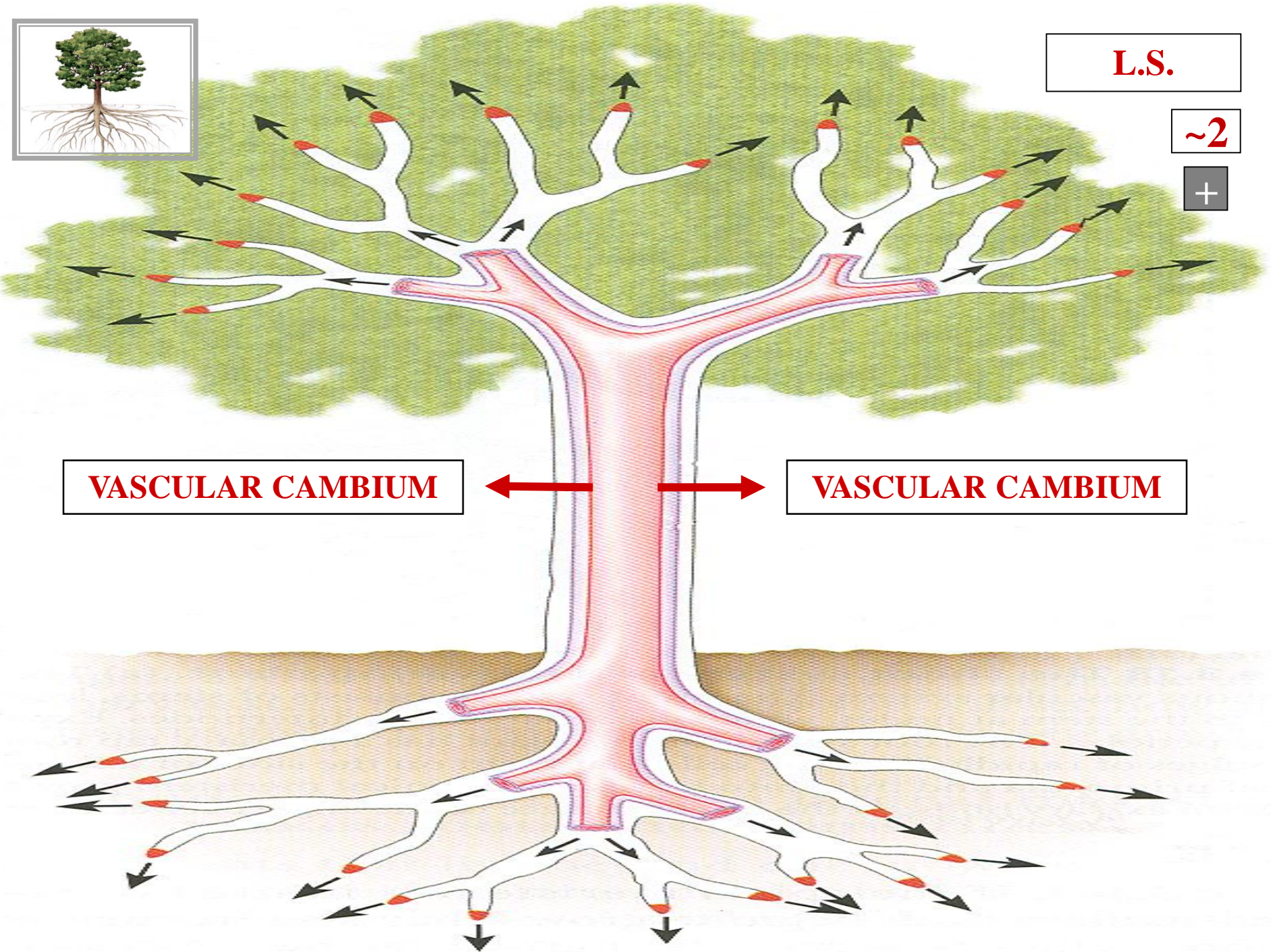
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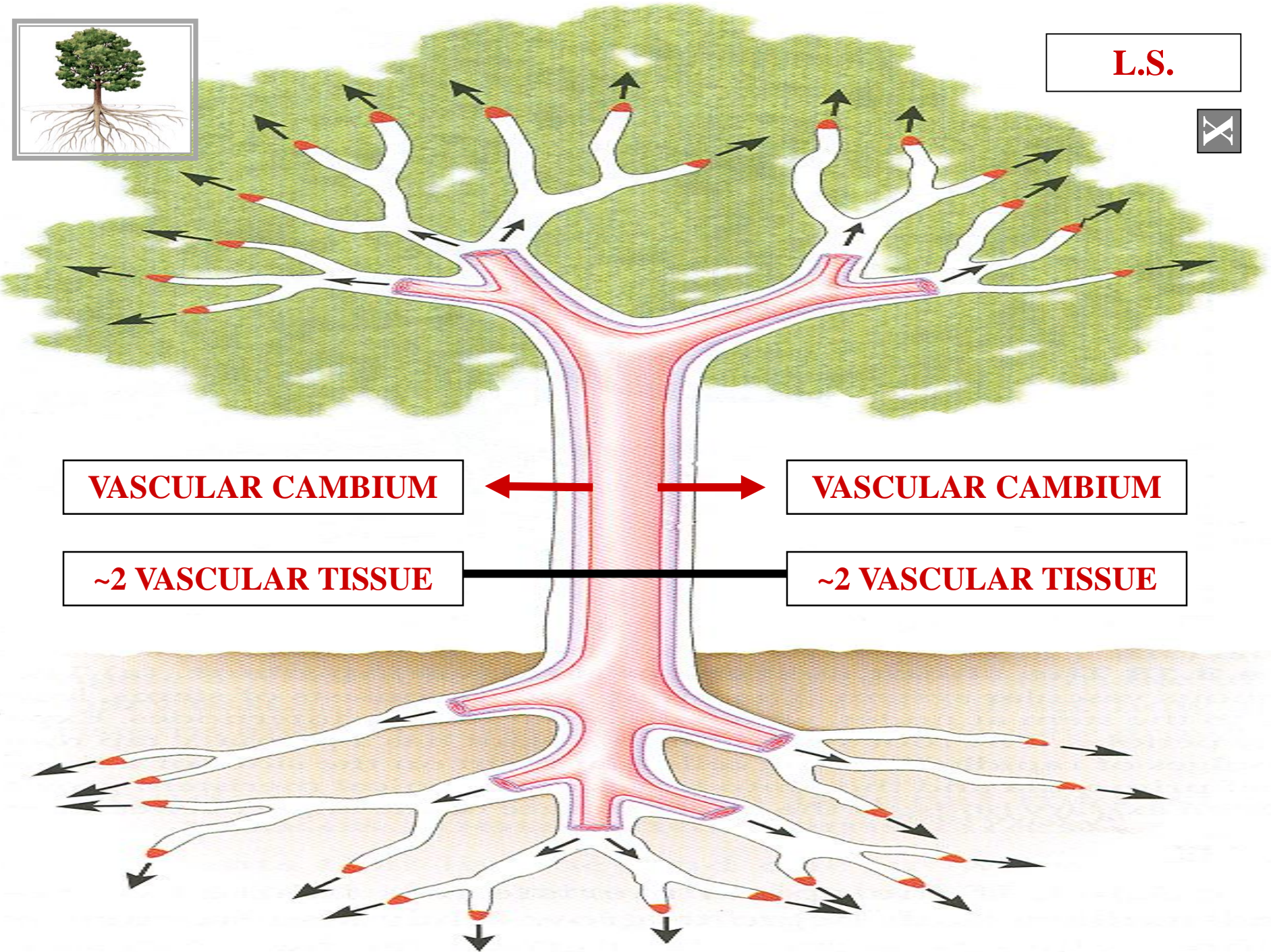
VASCULAR CAMBIUM

VASCULAR CAMBIUM





L.S.



VASCULAR CAMBIUM

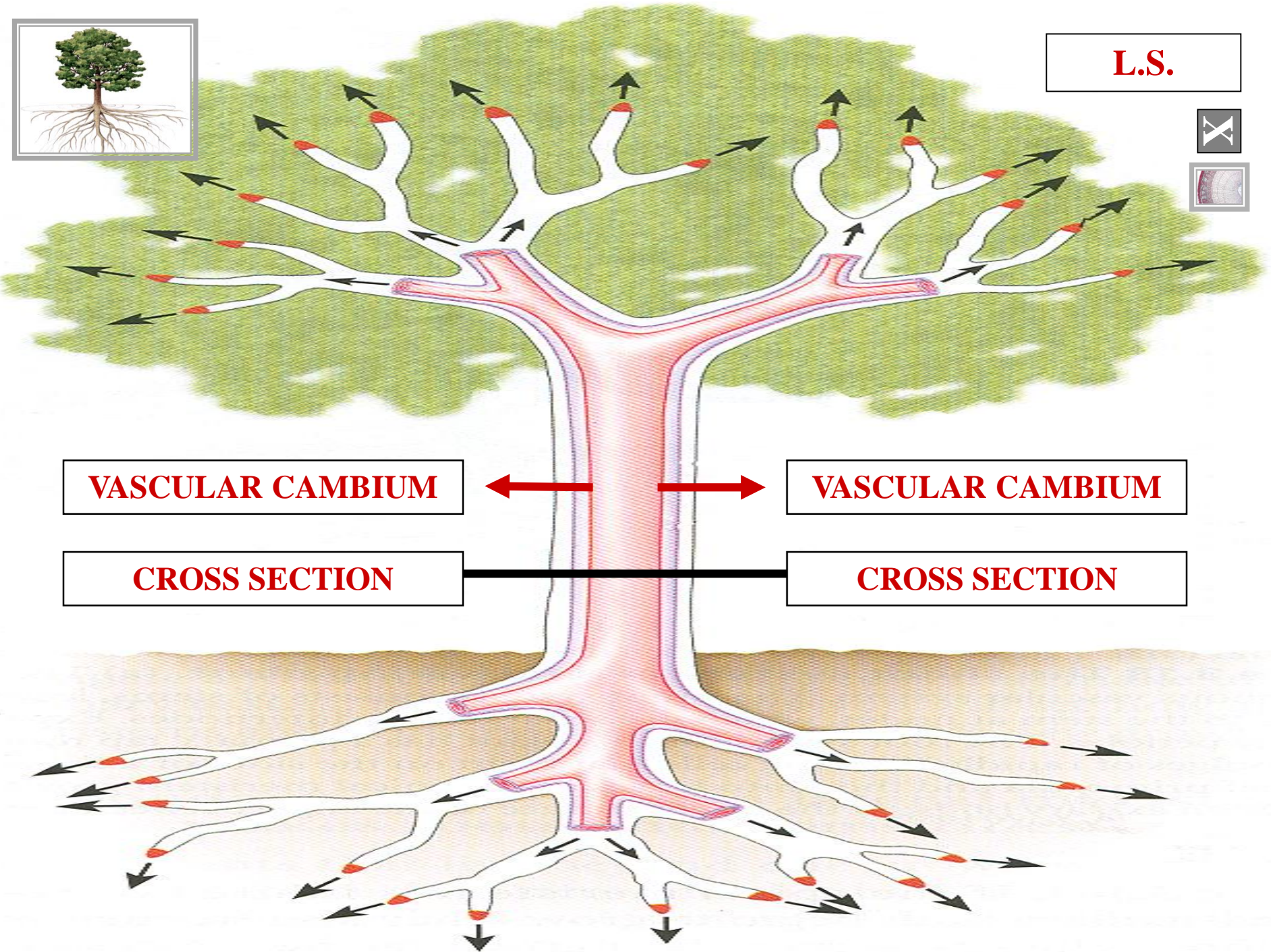
VASCULAR CAMBIUM

~2 VASCULAR TISSUE

~2 VASCULAR TISSUE



L.S.



VASCULAR CAMBIUM



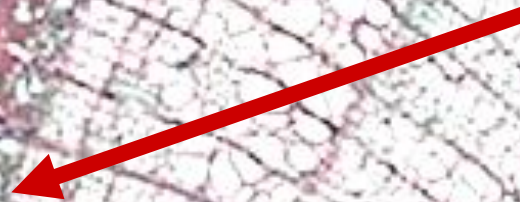
VASCULAR CAMBIUM

CROSS SECTION



CROSS SECTION

**VASCULAR
CAMBIUM**



STEM



C.S.



**VASCULAR
CAMBIUM**

**SECONDARY
VASCULAR TISSUE**

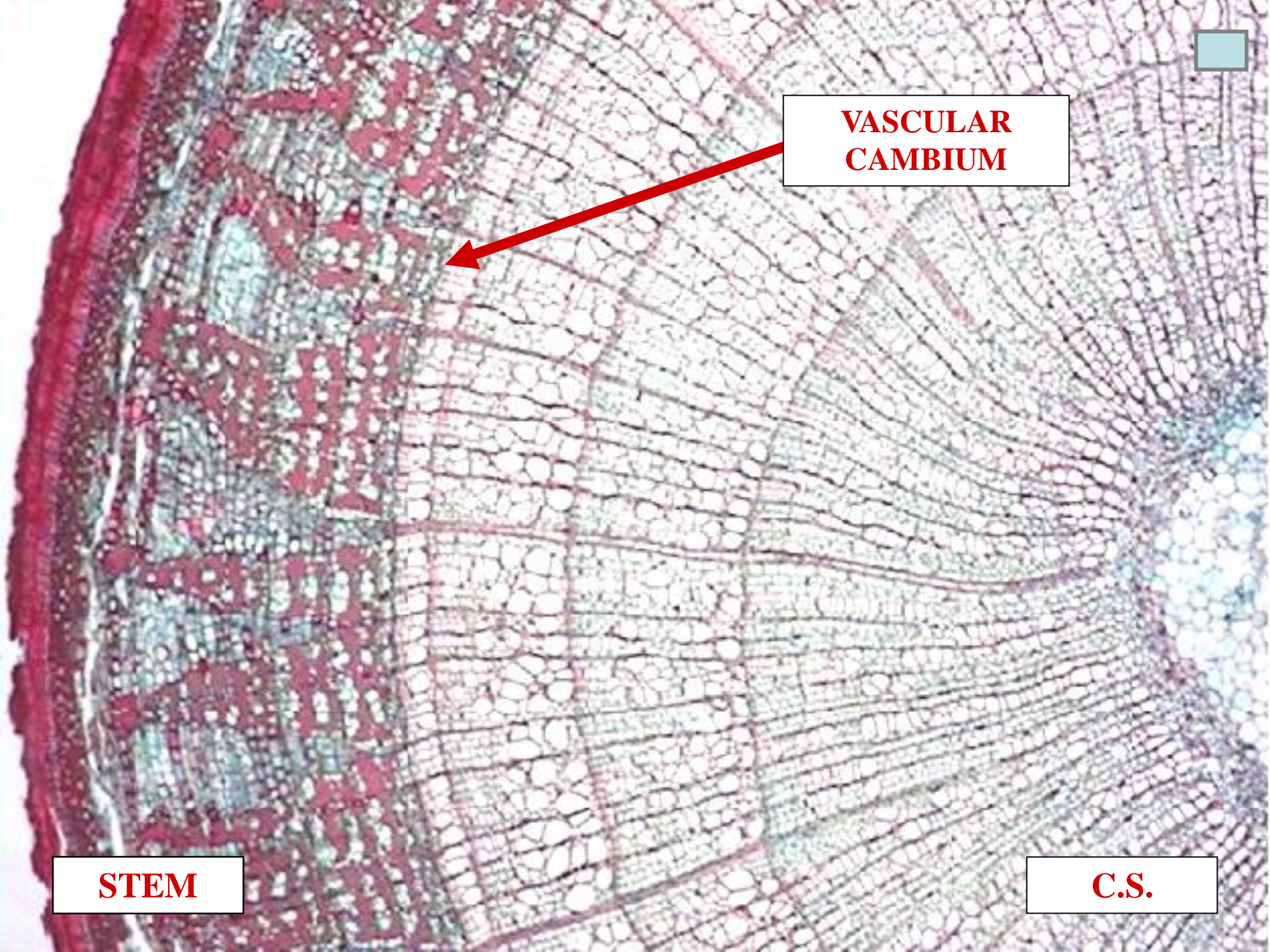
STEM



C.S.



VASCULAR CAMBIUM ACTIVITY



**VASCULAR
CAMBIUM**

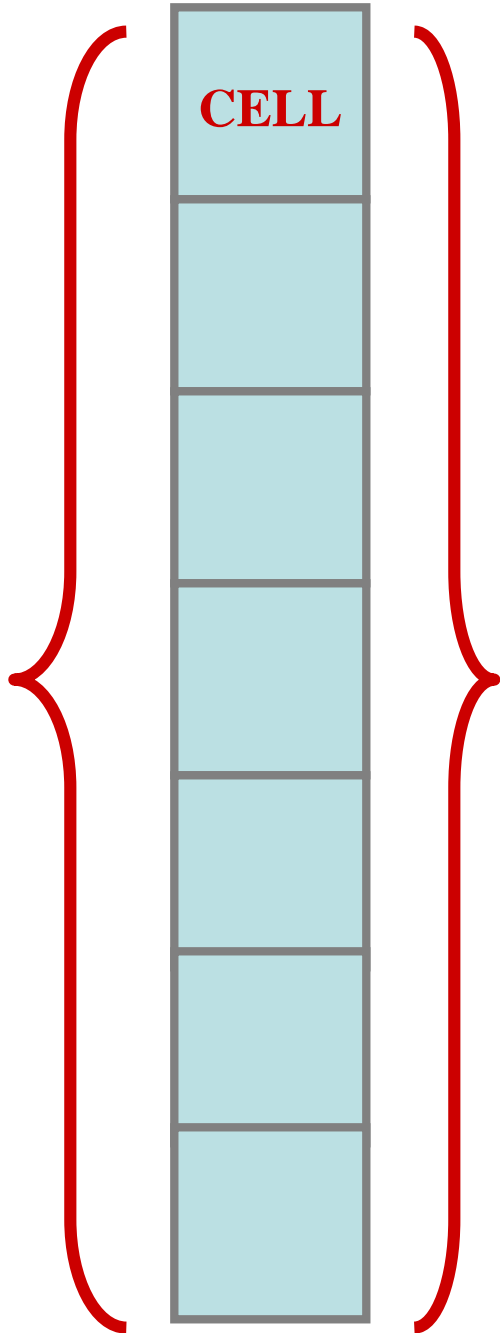
STEM

C.S.

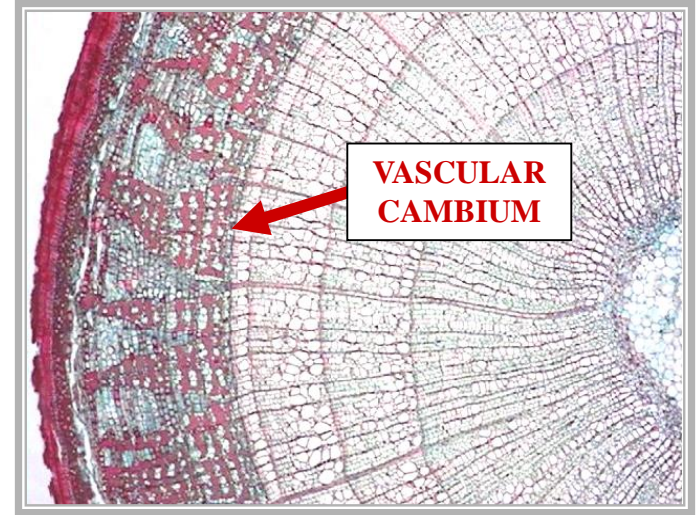


**VASCULAR
CAMBIUM**

STEM



CELL



**VASCULAR
CAMBIUM**

**VASCULAR
CAMBIUM**

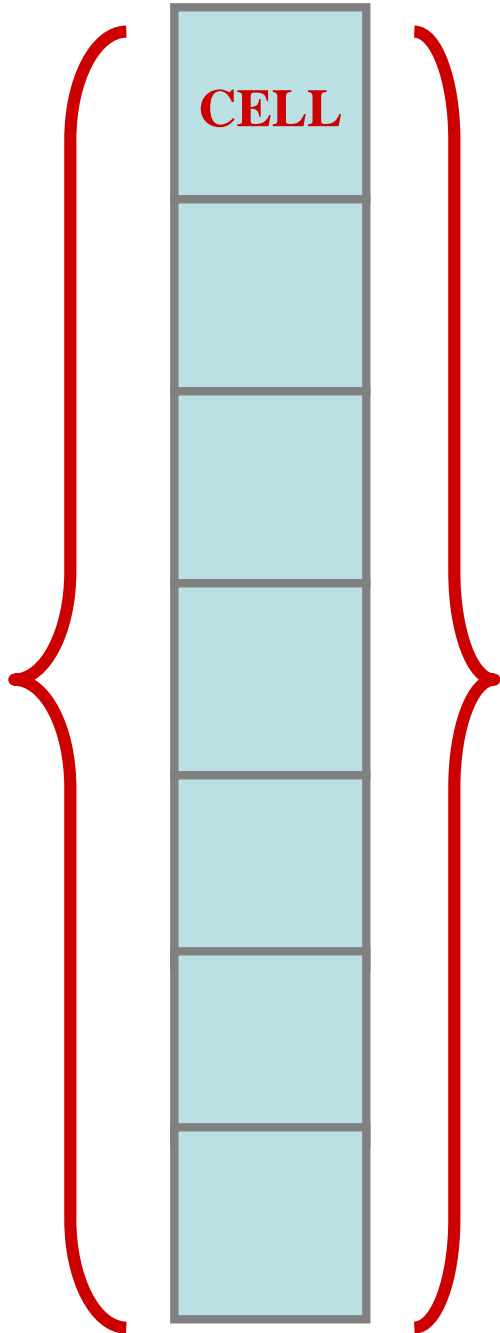
PC

C.S.

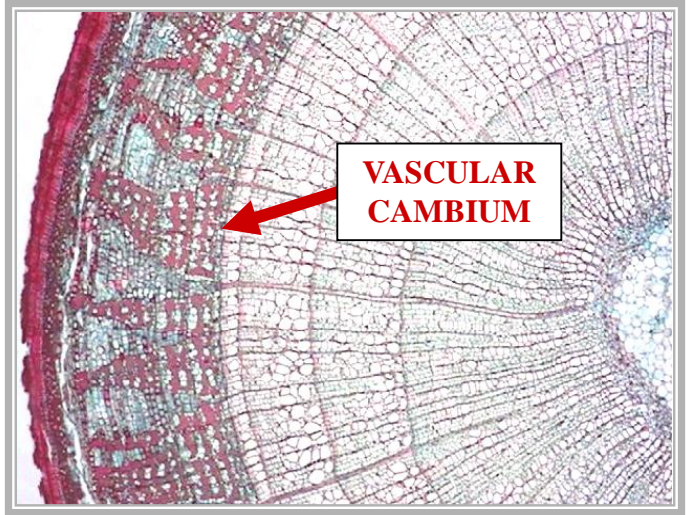


**PARENCHYMA
CELL INITIALS**

STEM



CELL



**VASCULAR
CAMBIUM**

**PARENCHYMA
CELL INITIALS**

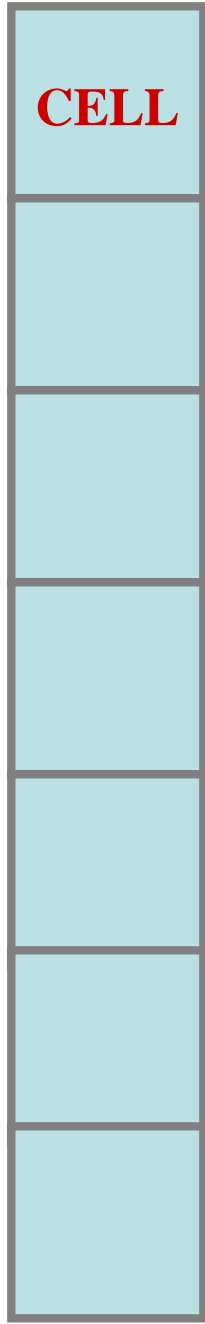
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M

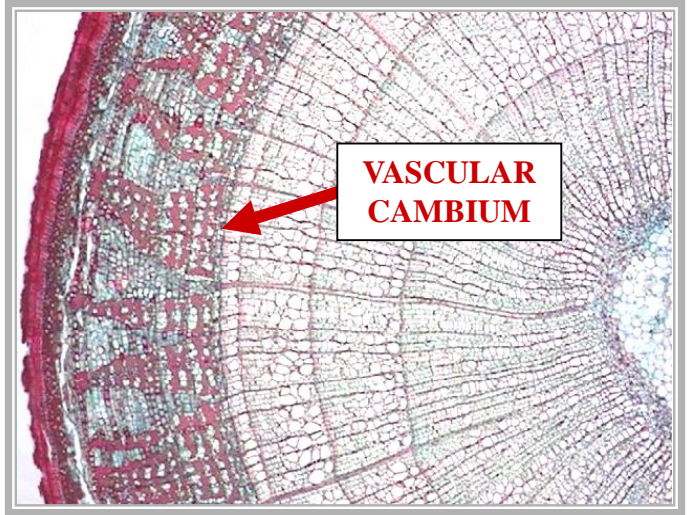


MITOSIS

STEM



CELL



**VASCULAR
CAMBIUM**

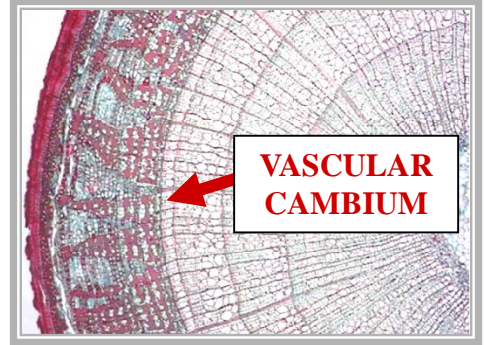
MITOSIS

C.S.

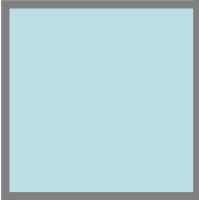
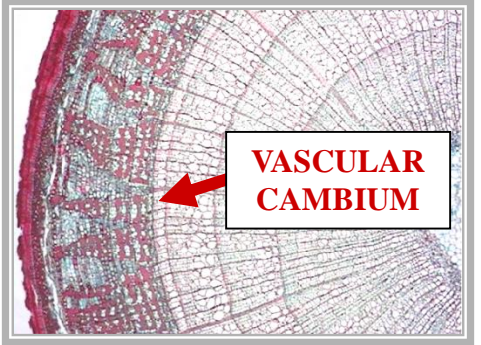




**INSIDE
VASCULAR
CAMBIUM**



**OUTSIDE
VASCULAR
CAMBIUM**



OUTSIDE

**DERIVATIVE
PARENCHYMA
CELLS**

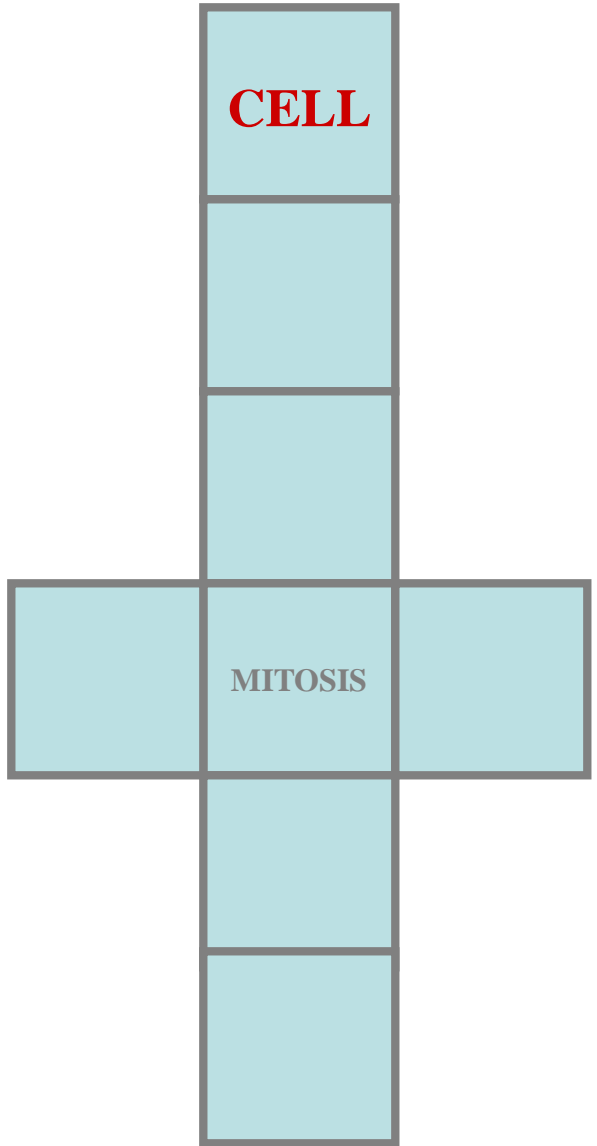
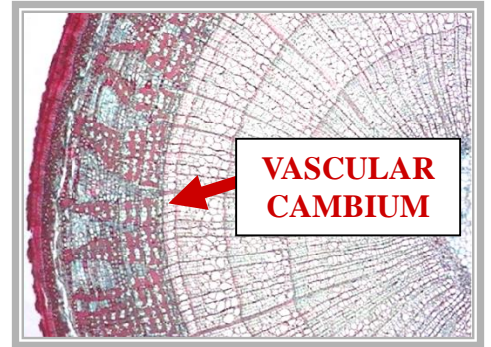
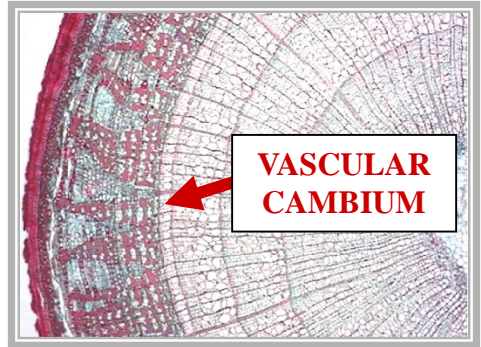
STEM

**VASCULAR
CAMBIUM**

C.S.

**OUTSIDE
VASCULAR
CAMBIUM**

**INSIDE
VASCULAR
CAMBIUM**



OUTSIDE

INSIDE

**DERIVATIVE
PARENCHYMA
CELLS**

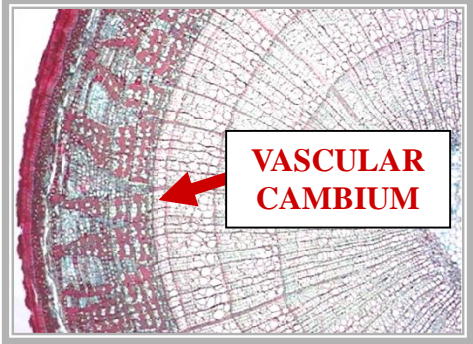
**DERIVATIVE
PARENCHYMA
CELLS**

STEM

**VASCULAR
CAMBIUM**

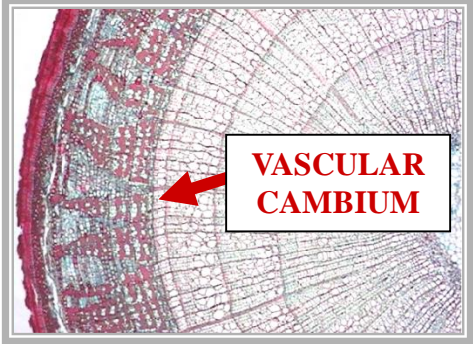
C.S.

**OUTSIDE
VASCULAR
CAMBIUM**



**VASCULAR
CAMBIUM**

**INSIDE
VASCULAR
CAMBIUM**

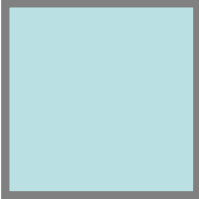


**VASCULAR
CAMBIUM**

OUTSIDE

**DERIVATIVE
PARENCHYMA
CELLS**

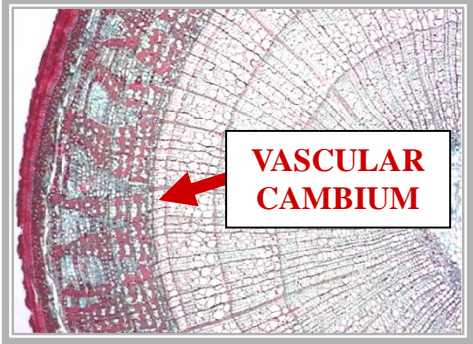
STEM



**VASCULAR
CAMBIUM**

C.S.

**OUTSIDE
VASCULAR
CAMBIUM**

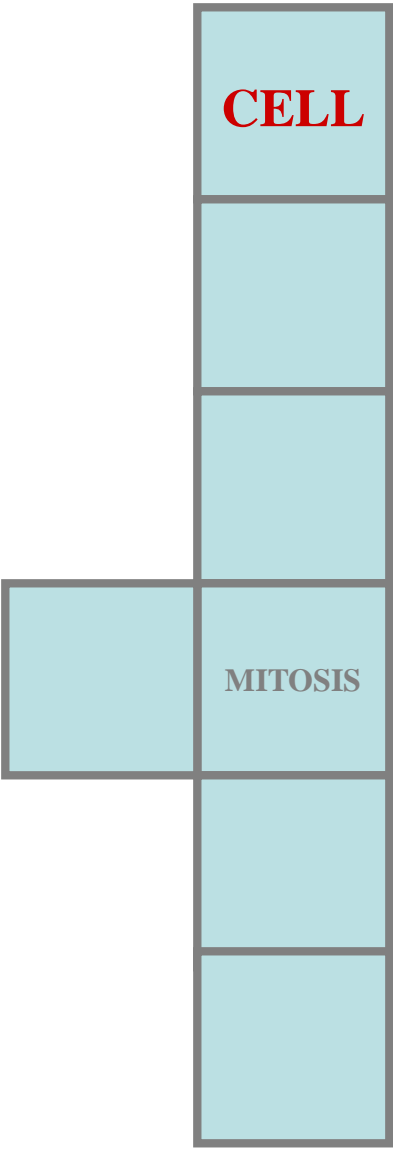


**VASCULAR
CAMBIUM**

OUTSIDE

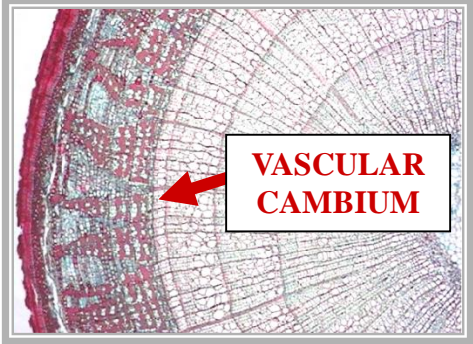
~2 PHLOEM

STEM



**VASCULAR
CAMBIUM**

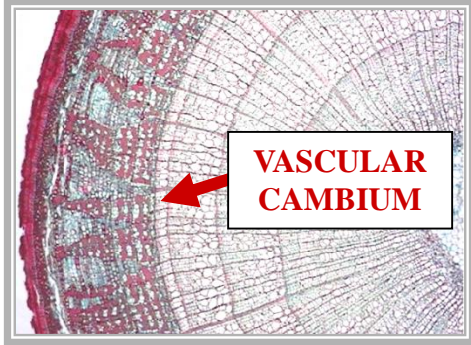
**INSIDE
VASCULAR
CAMBIUM**



**VASCULAR
CAMBIUM**

C.S.

**OUTSIDE
VASCULAR
CAMBIUM**



OUTSIDE

**~2 PHLOEM
LOW ANNUAL
QUANTITY**

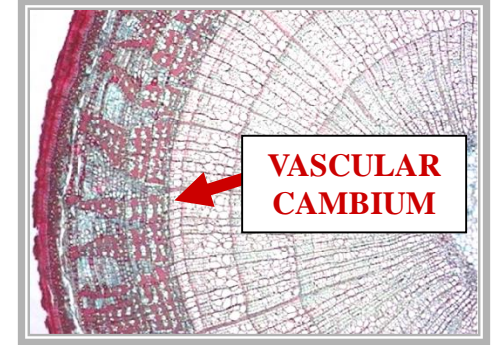
STEM

CELL

MITOSIS

**VASCULAR
CAMBIUM**

**INSIDE
VASCULAR
CAMBIUM**



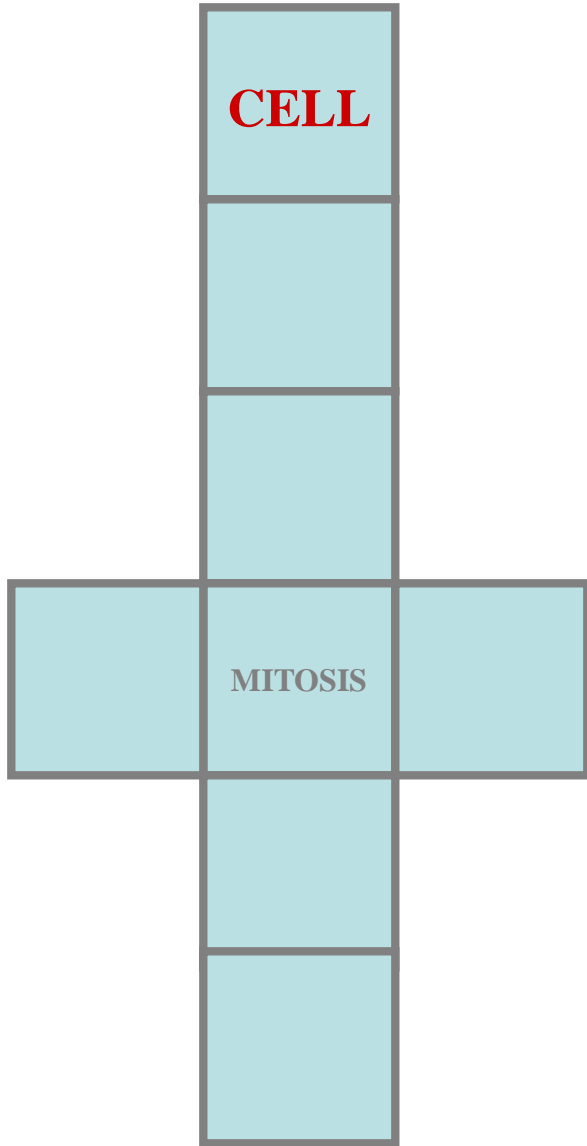
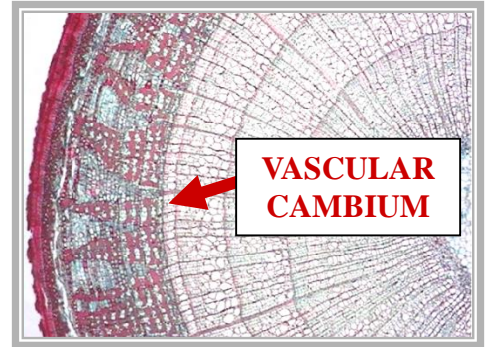
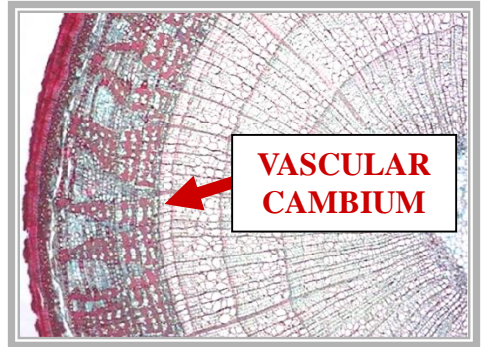
C.S.

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I**

2X

**OUTSIDE
VASCULAR
CAMBIUM**

**INSIDE
VASCULAR
CAMBIUM**



OUTSIDE

INSIDE

~2 PHLOEM

**DERIVATIVE
PARENCHYMA
CELLS**

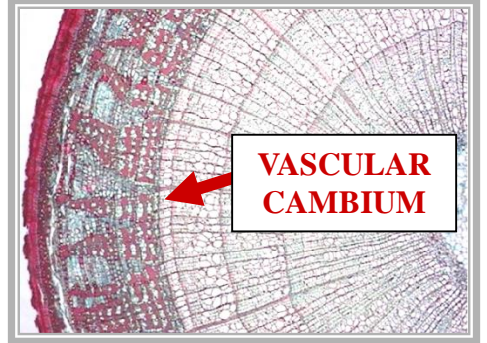
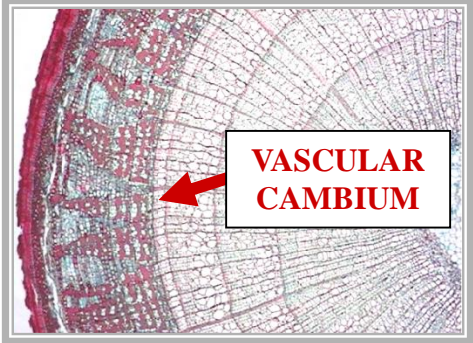
STEM

**VASCULAR
CAMBIUM**

C.S.

**OUTSIDE
VASCULAR
CAMBIUM**

**INSIDE
VASCULAR
CAMBIUM**



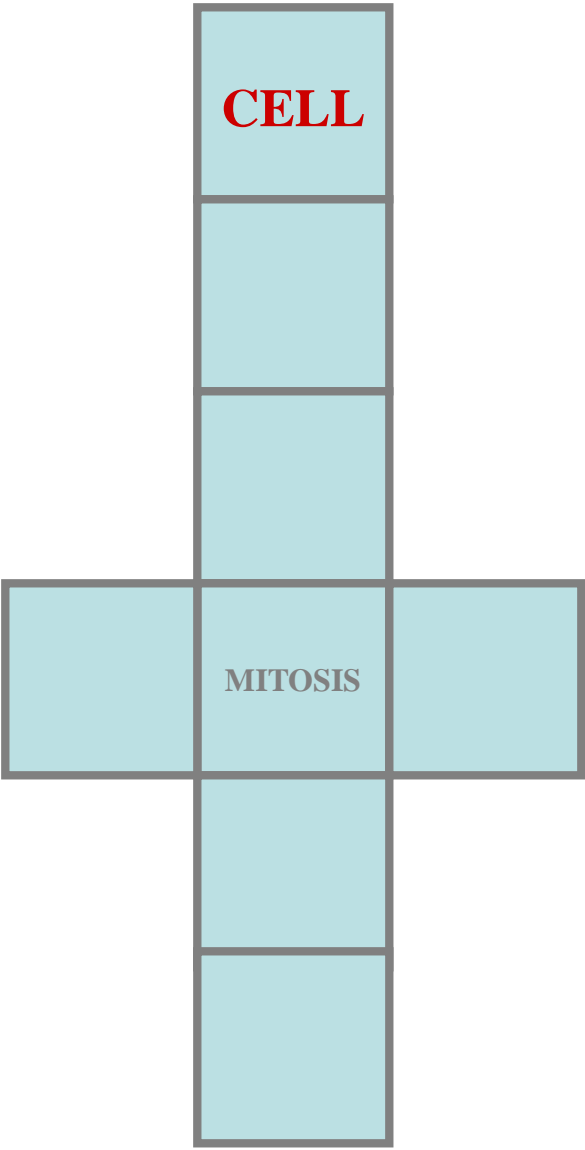
OUTSIDE

INSIDE

~2 PHLOEM

~2 XYLEM

STEM

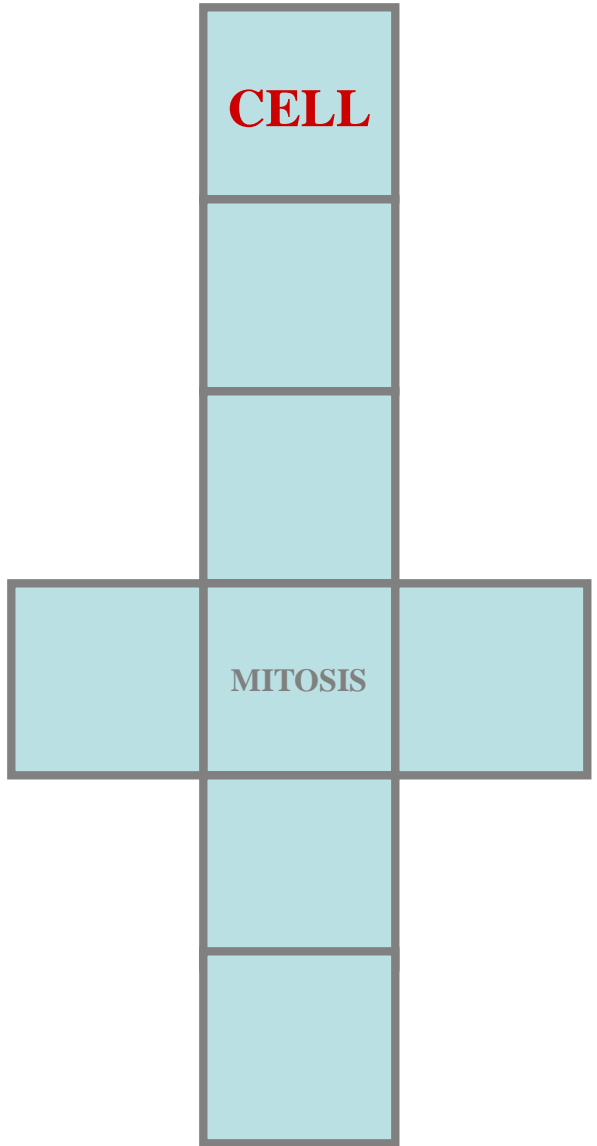
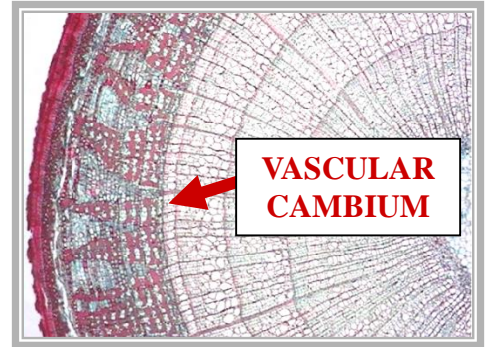
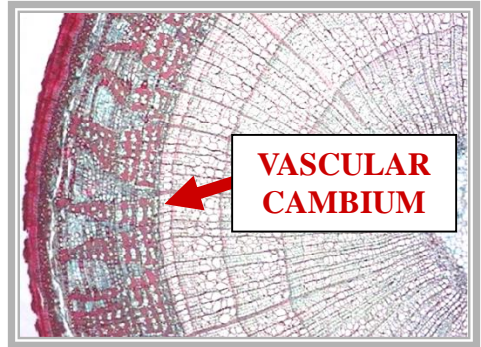


**VASCULAR
CAMBIUM**

C.S.

**OUTSIDE
VASCULAR
CAMBIUM**

**INSIDE
VASCULAR
CAMBIUM**



OUTSIDE

INSIDE

~2 PHLOEM

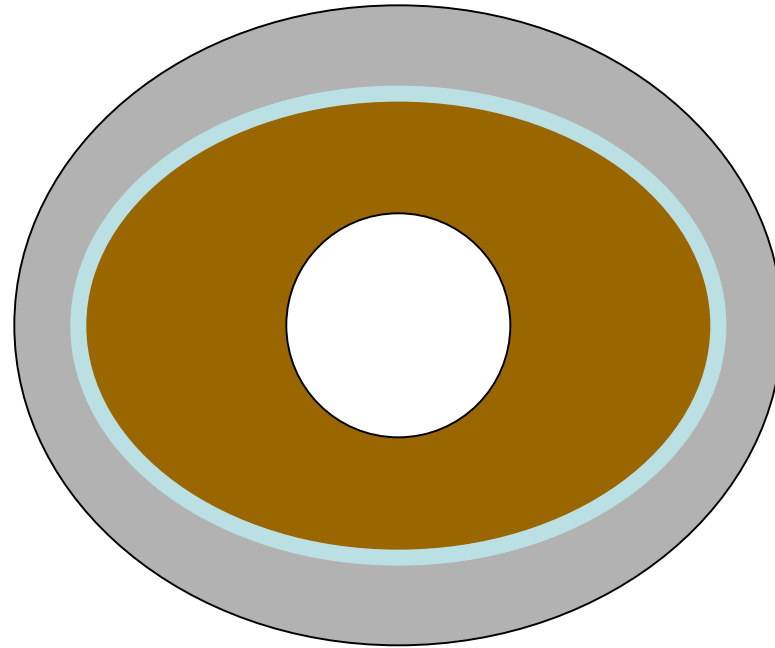
**~2 XYLEM
HIGH ANNUAL
QUANTITY**

STEM

**VASCULAR
CAMBIUM**

C.S.

**VASCULAR
CAMBIUM
ACTIVITY
EXAMPLE**

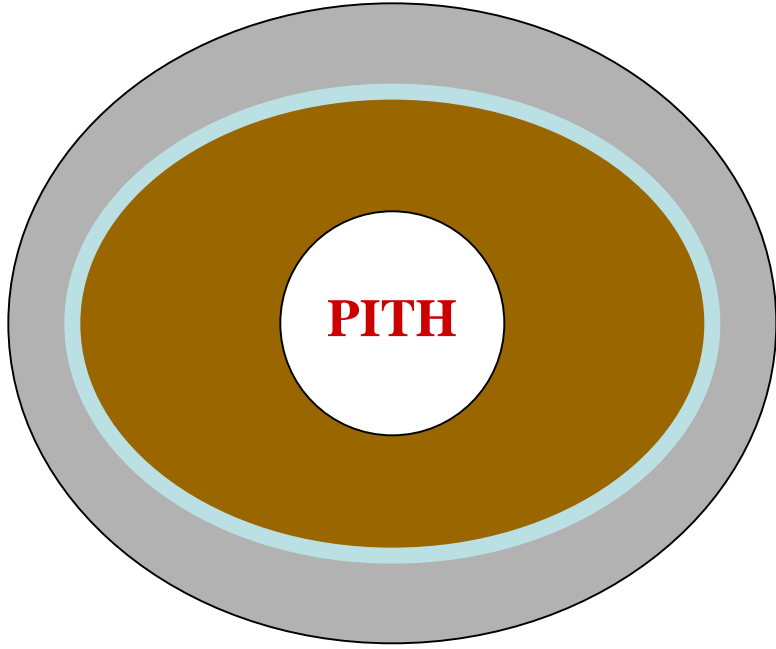


STEM

PRIMARY GROWTH

C.S.

VASCULAR CAMBIUM ACTIVITY



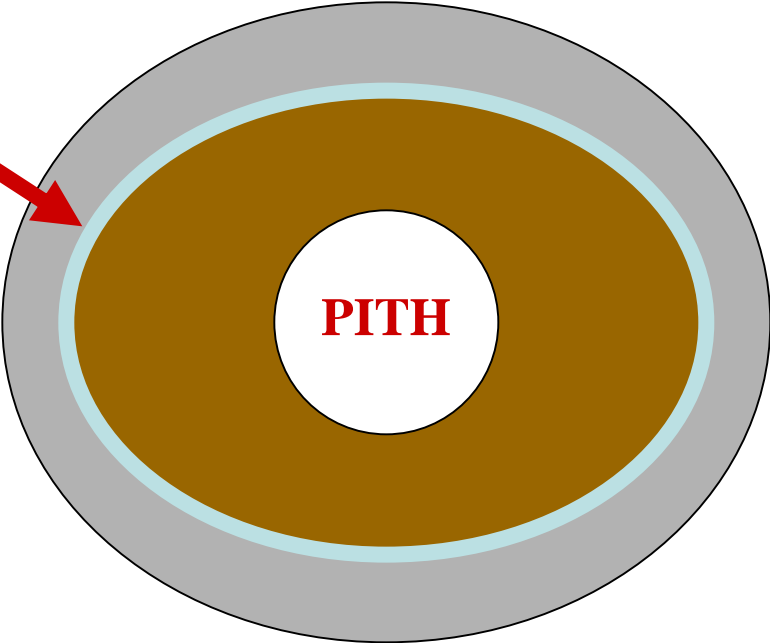
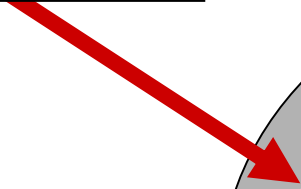
STEM

PRIMARY GROWTH

C.S.

VASCULAR CAMBIUM ACTIVITY

VASCULAR
CAMBIUM



STEM

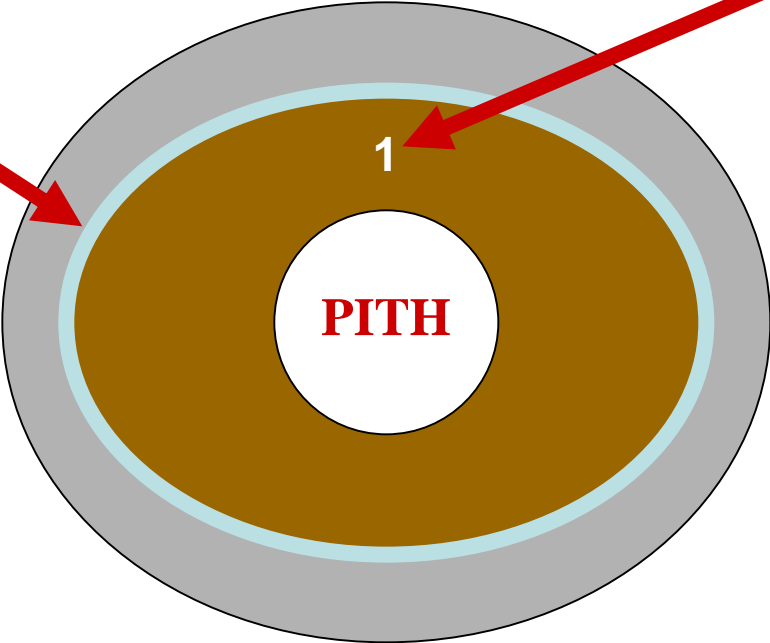
PRIMARY GROWTH

C.S.

VASCULAR CAMBIUM ACTIVITY

VASCULAR CAMBIUM

PRIMARY XYLEM



STEM

PRIMARY GROWTH

C.S.

VASCULAR CAMBIUM ACTIVITY