



**PT**

**SIEVE MEMBER  
COMPANION CELL  
MICROGRAPH  
C.S.**

**SM**



**PHLOEM TISSUE**

**C.S.**

**SP**



**SIEVE MEMBER**

A light micrograph of a plant stem cross-section. The image shows a central vascular bundle. A single cell, the sieve member, is highlighted with a red bracket and labeled. It contains a dense cluster of golden-brown granules. The surrounding tissue consists of large, thin-walled parenchyma cells. The entire vascular bundle is surrounded by a layer of cells, the cortex (C.S.).

**PHLOEM**

**C.S.**



**SIEVE PLATE  
LARGE PORES**

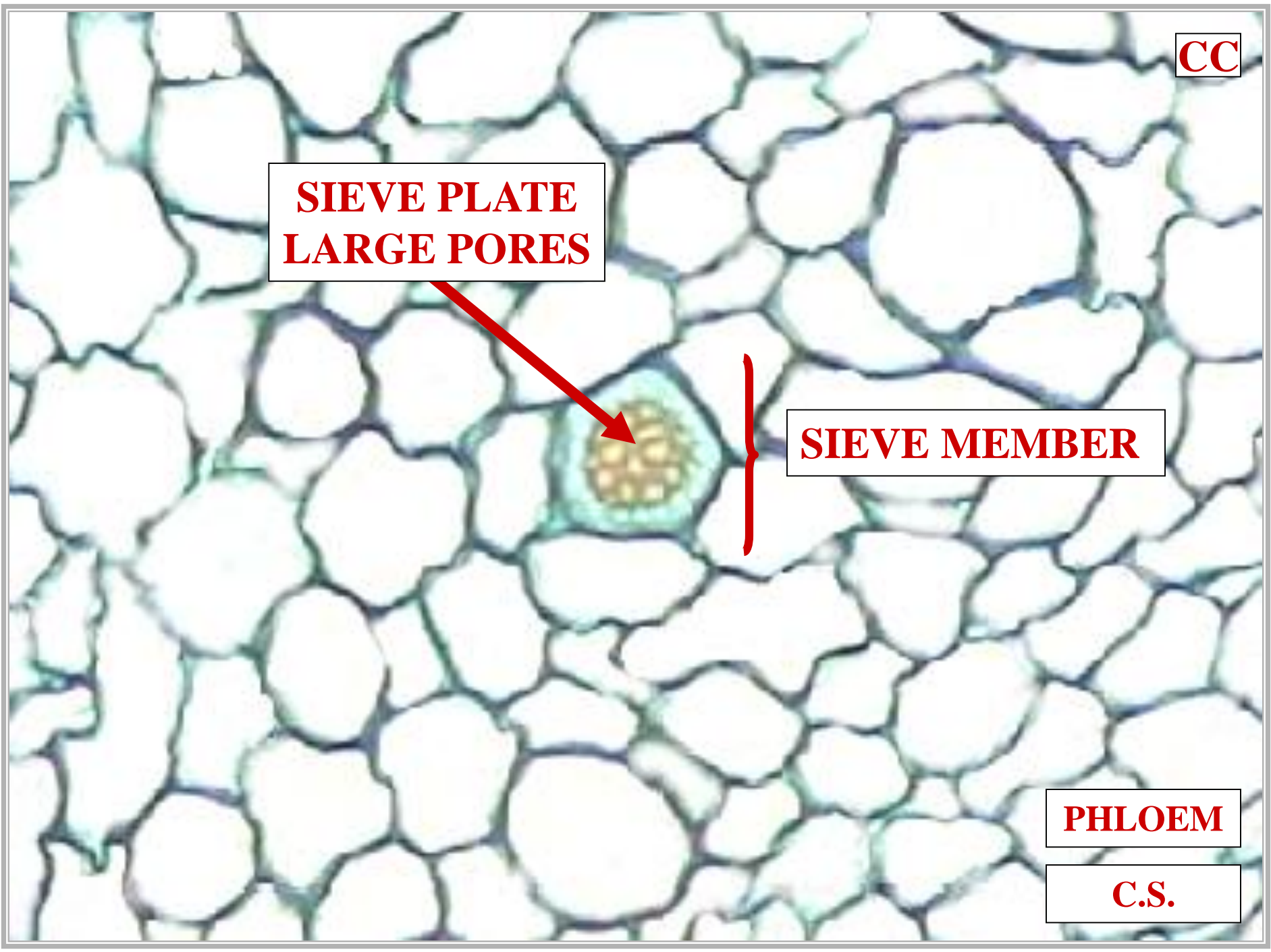


**SIEVE MEMBER**



**PHLOEM**

**C.S.**







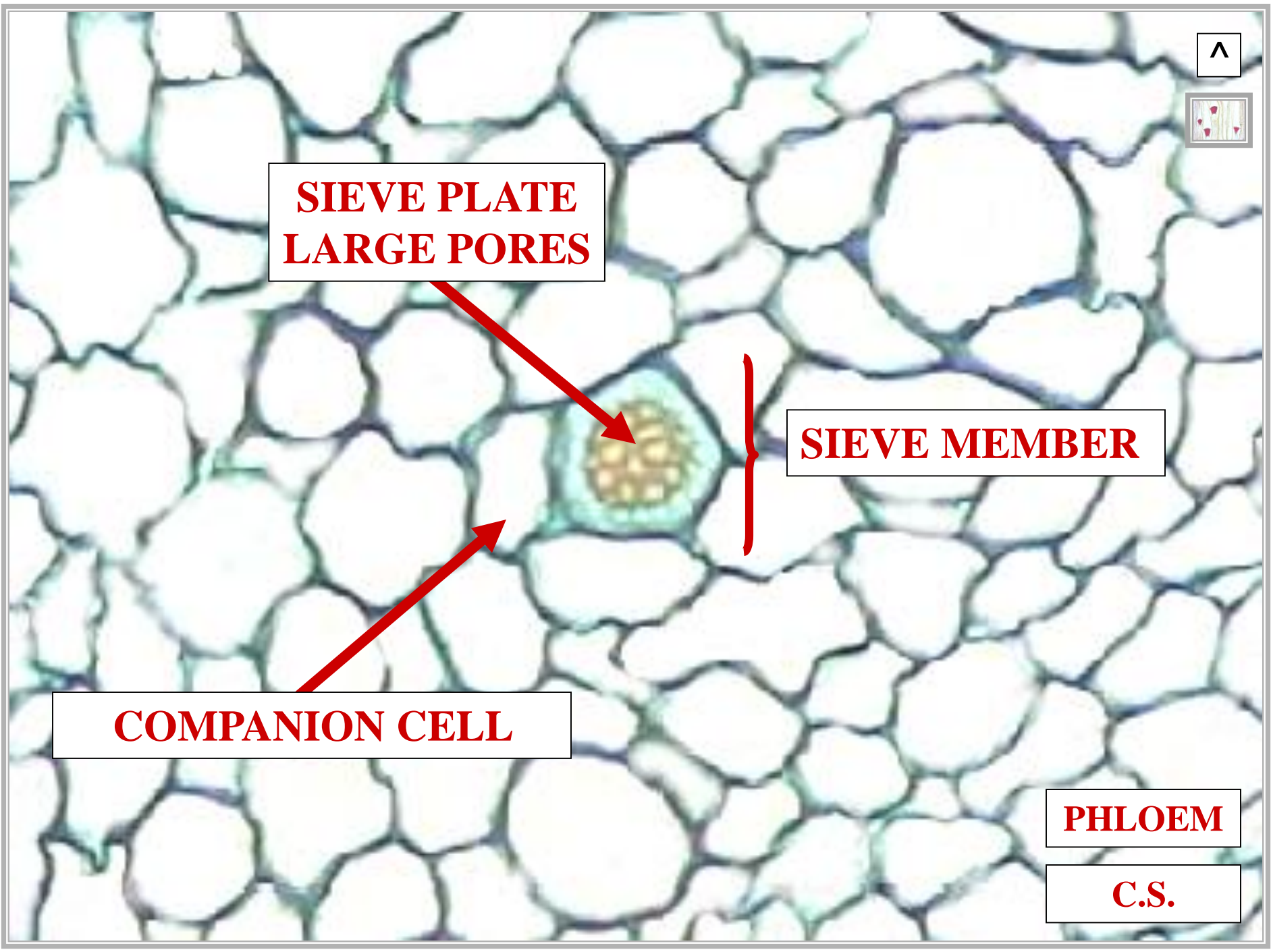
**SIEVE PLATE  
LARGE PORES**

**SIEVE MEMBER**

**COMPANION CELL**

**PHLOEM**

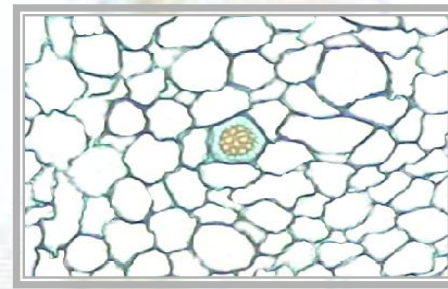
**C.S.**





**PT**

**SIEVE MEMBER  
COMPANION CELL  
MICROGRAPH  
L.S.**

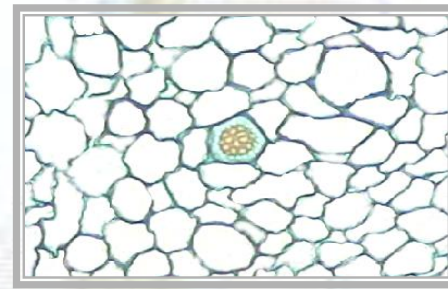


# PHLOEM TISSUE

L.S.



**SP**

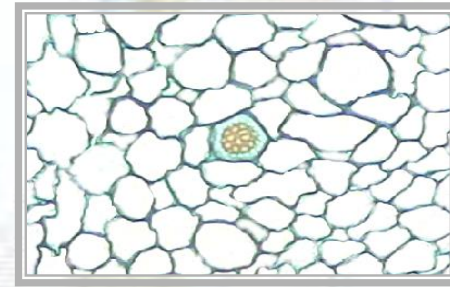


**SIEVE MEMBER**

**PHLOEM**

**L.S.**

**SIEVE PLATE  
LARGE PORES**

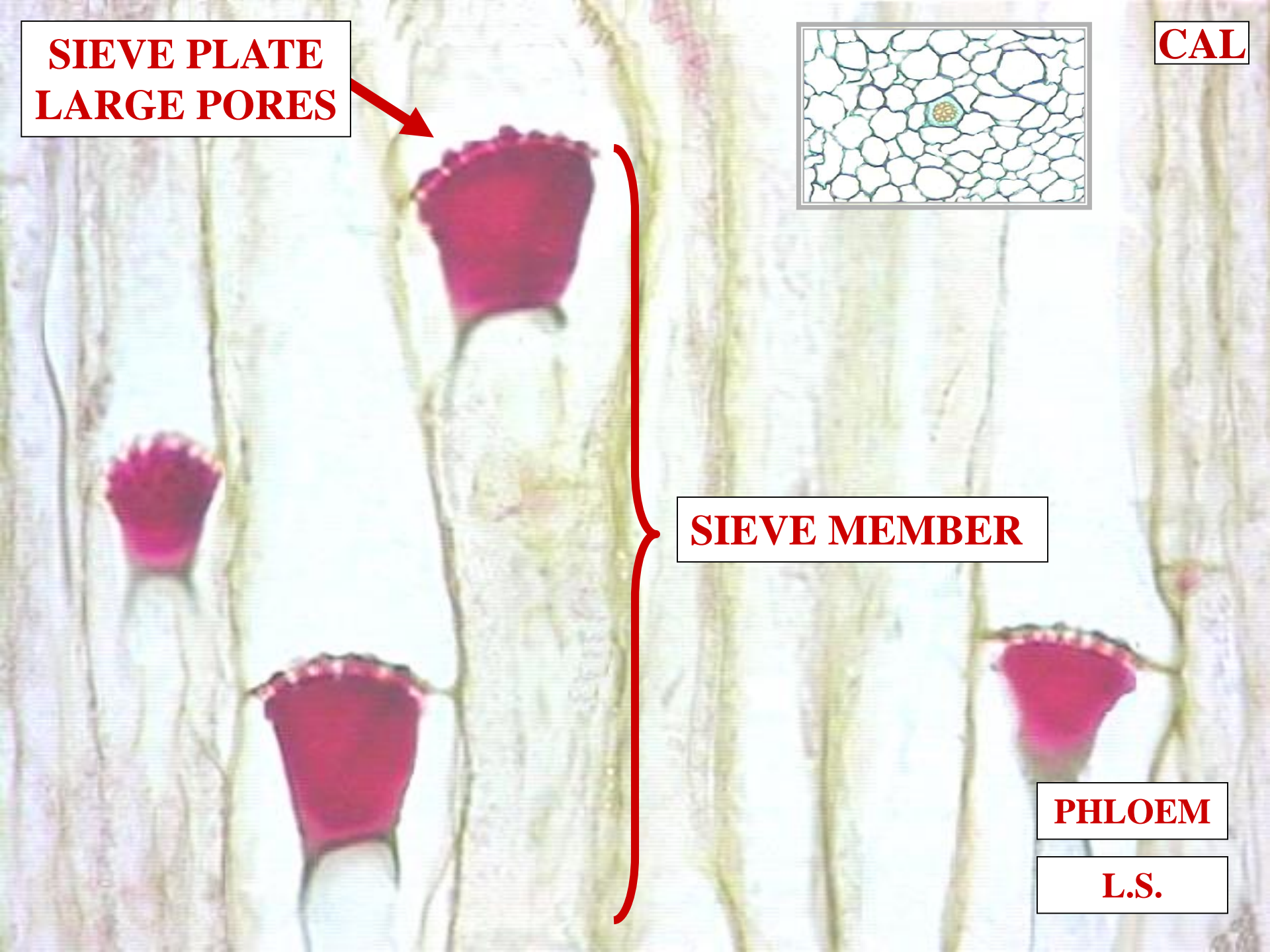


**CAL**

**SIEVE MEMBER**

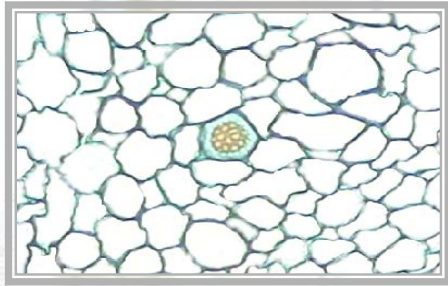
**PHLOEM**

**L.S.**





**SIEVE PLATE  
LARGE PORES**

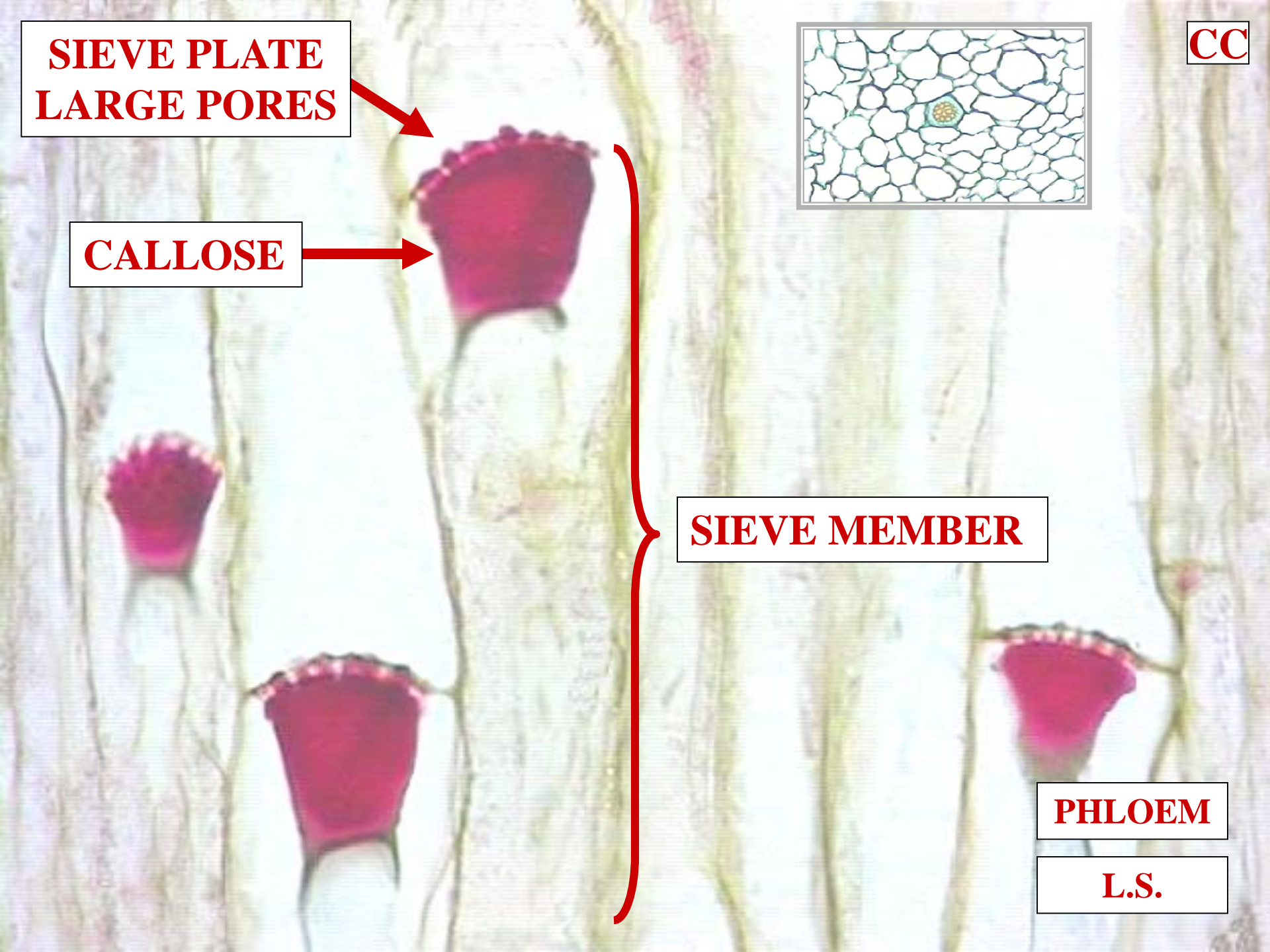


**CALLOSE**

**SIEVE MEMBER**

**PHLOEM**

**L.S.**





**SIEVE PLATE**  
**LARGE PORES**

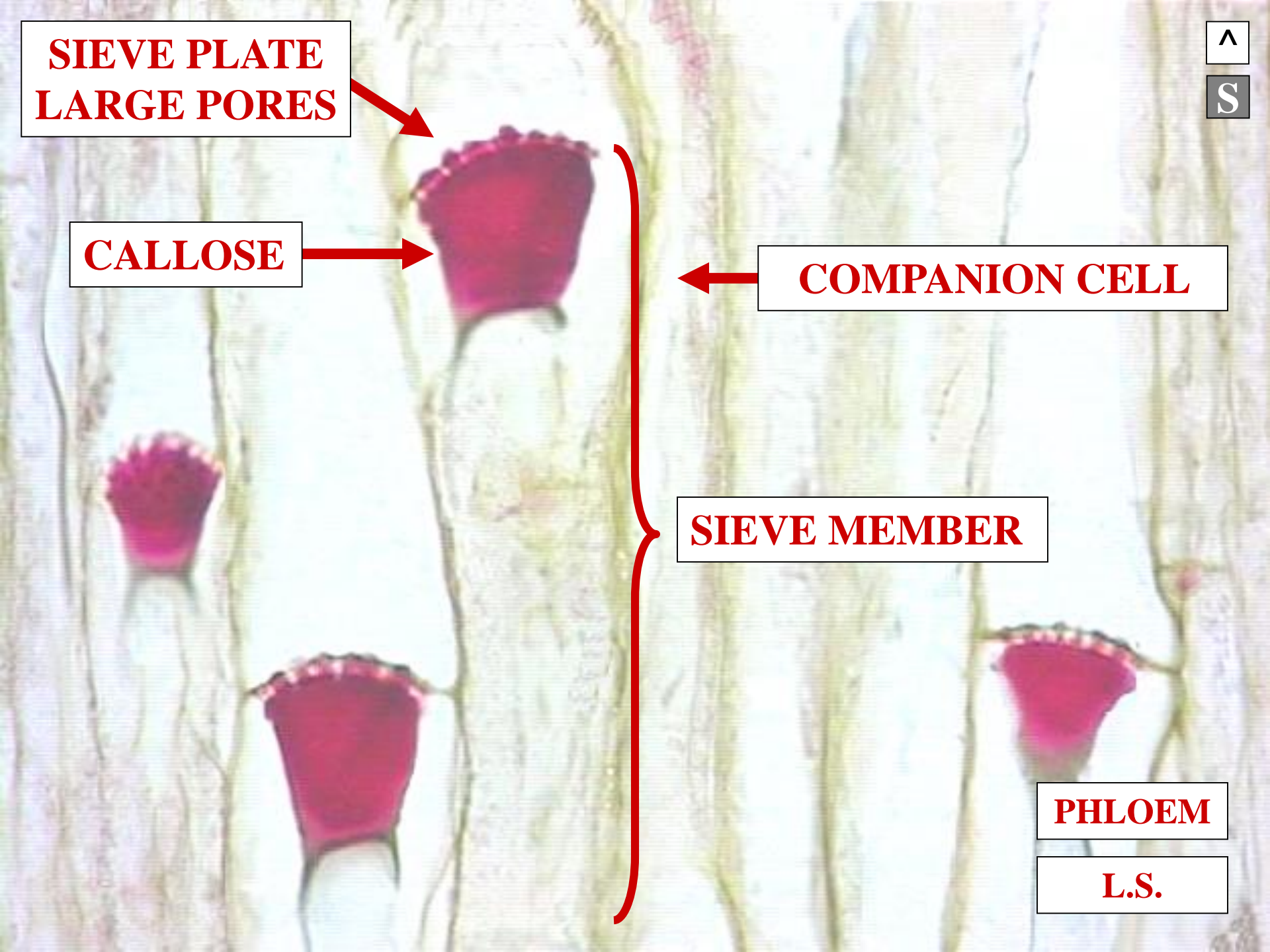
**CALLOSE**

**COMPANION CELL**

**SIEVE MEMBER**

**PHLOEM**

**L.S.**





# PHLOEM TISSUE SUMMARY

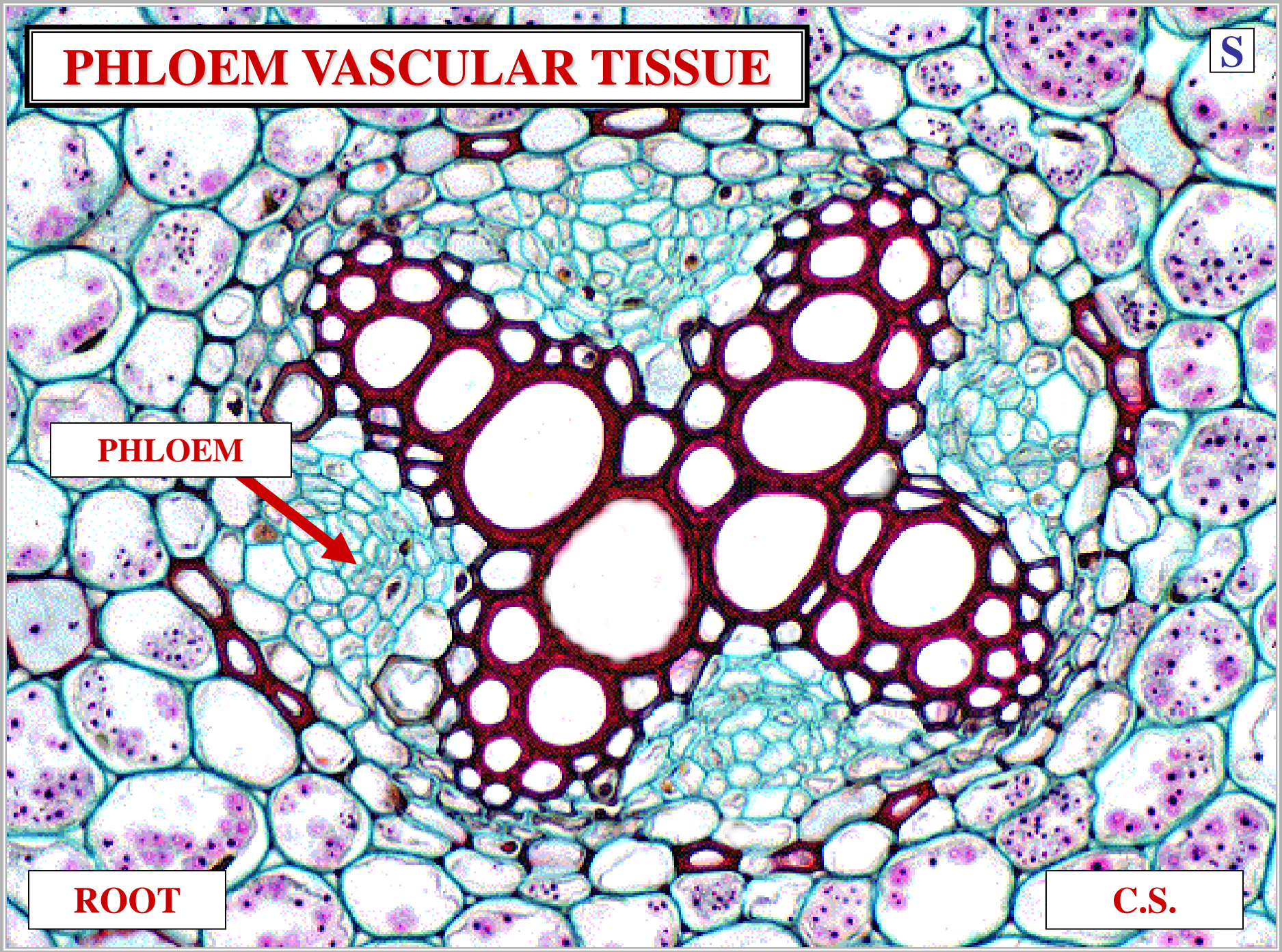
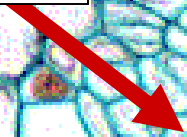
# PHLOEM VASCULAR TISSUE

S

PHLOEM

ROOT

C.S.

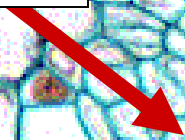




# PHLOEM VASCULAR TISSUE

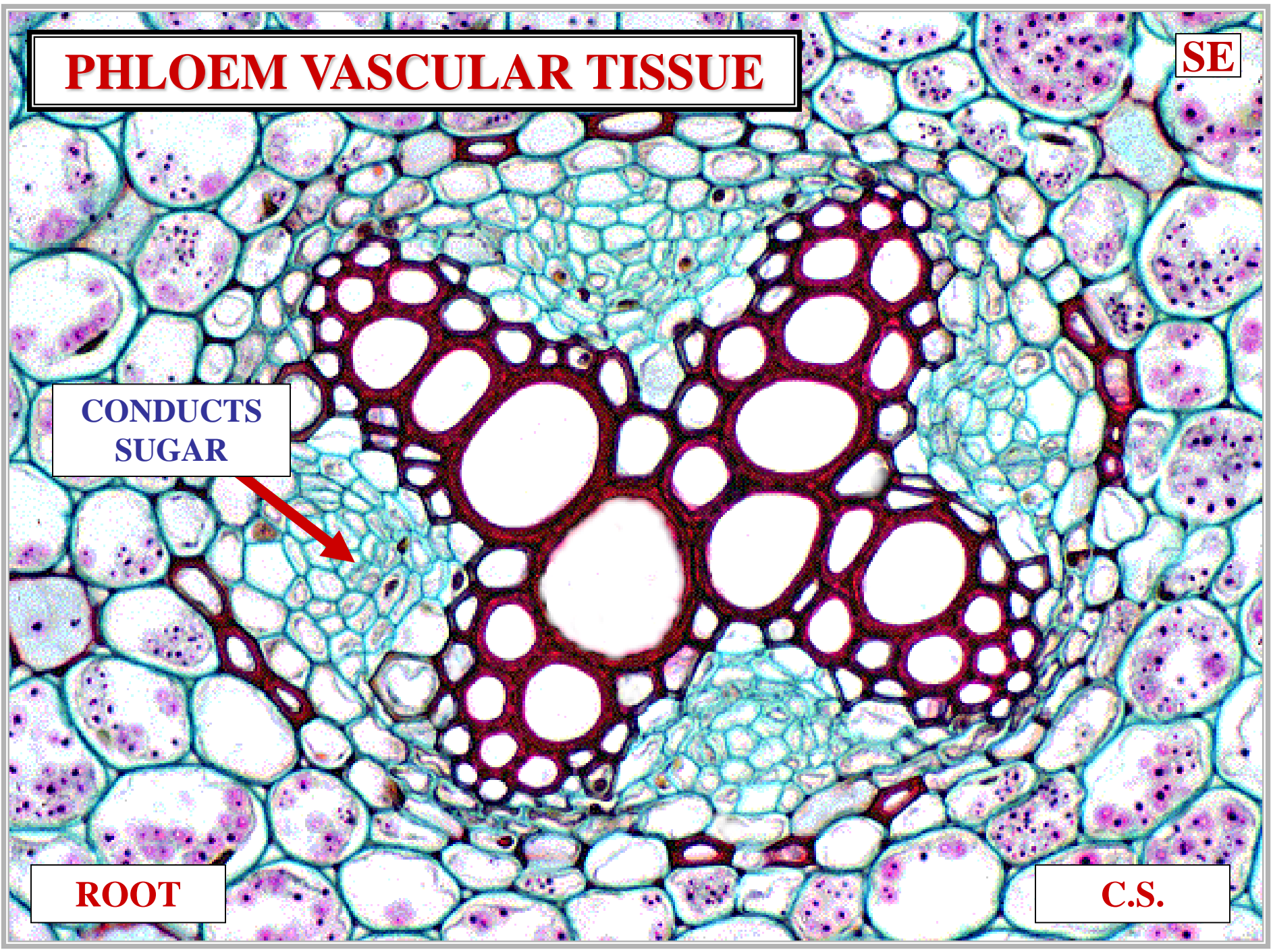
SE

CONDUCTS  
SUGAR



ROOT

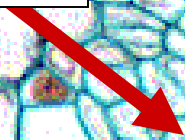
C.S.



# PHLOEM VASCULAR TISSUE

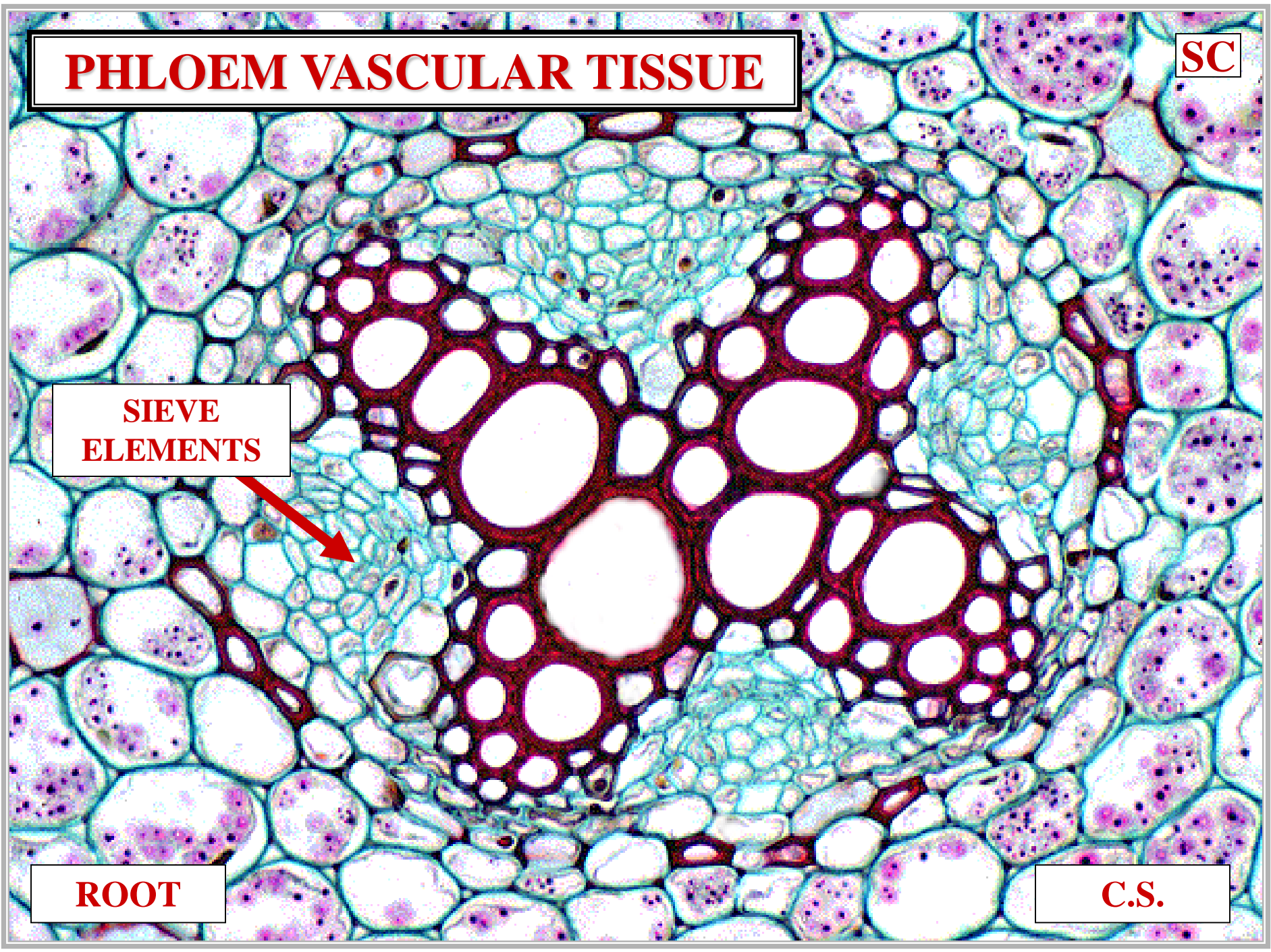
SC

SIEVE  
ELEMENTS



ROOT

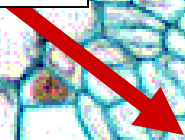
C.S.



# PHLOEM VASCULAR TISSUE

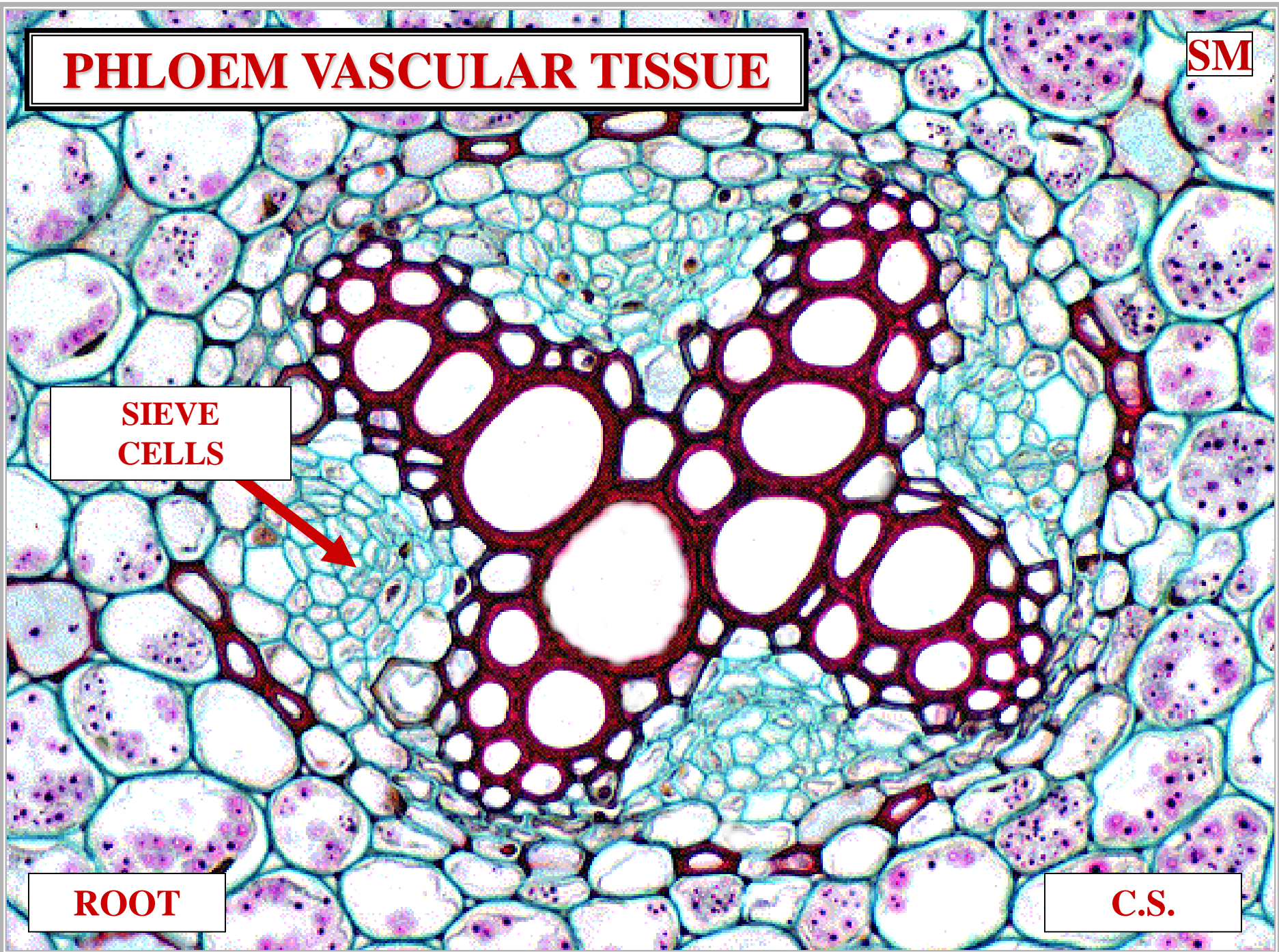
SM

SIEVE  
CELLS



ROOT

C.S.



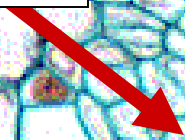


# PHLOEM VASCULAR TISSUE

SC

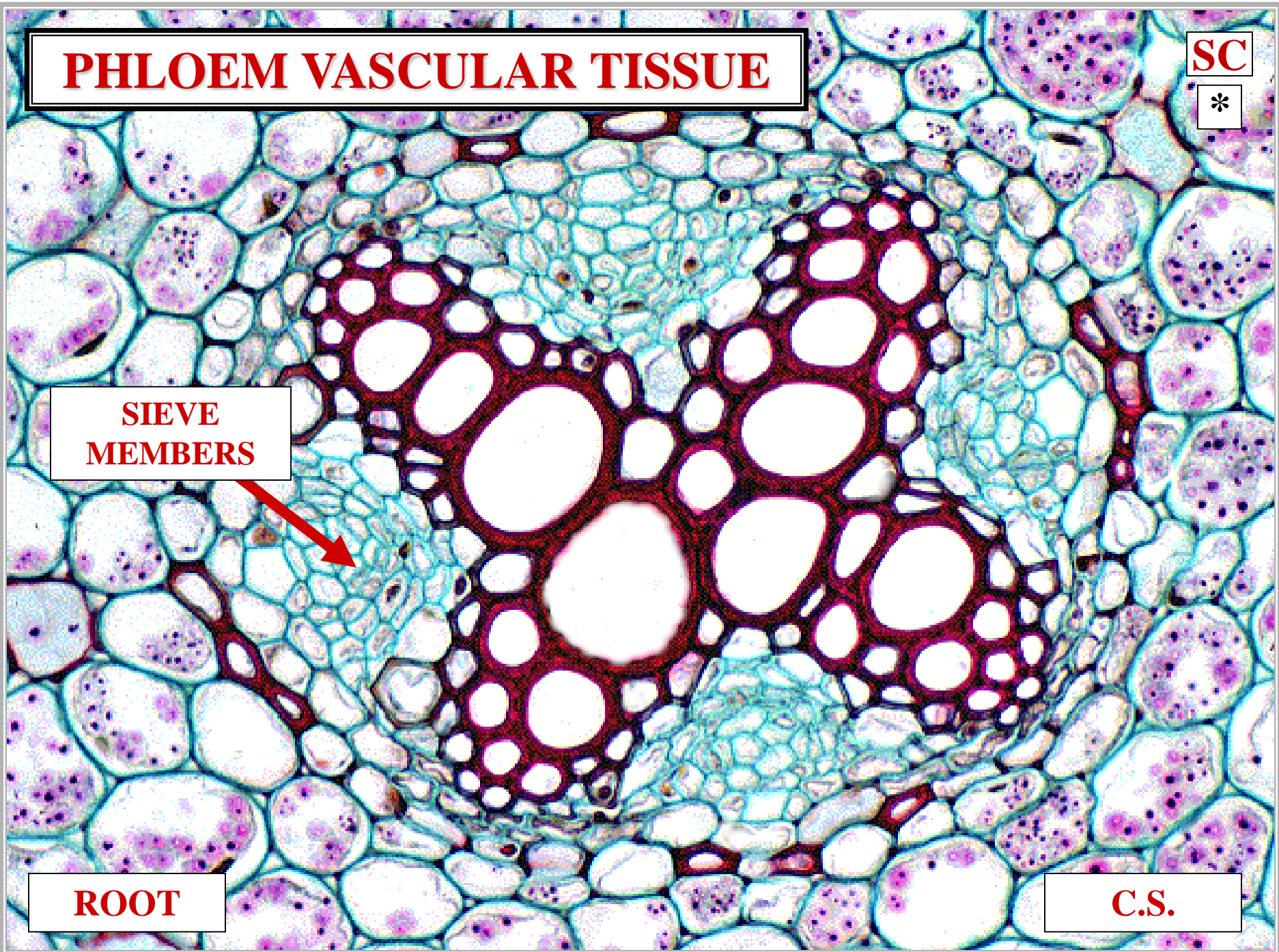
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SIEVE  
MEMBERS



ROOT

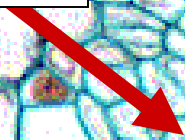
C.S.



# PHLOEM VASCULAR TISSUE

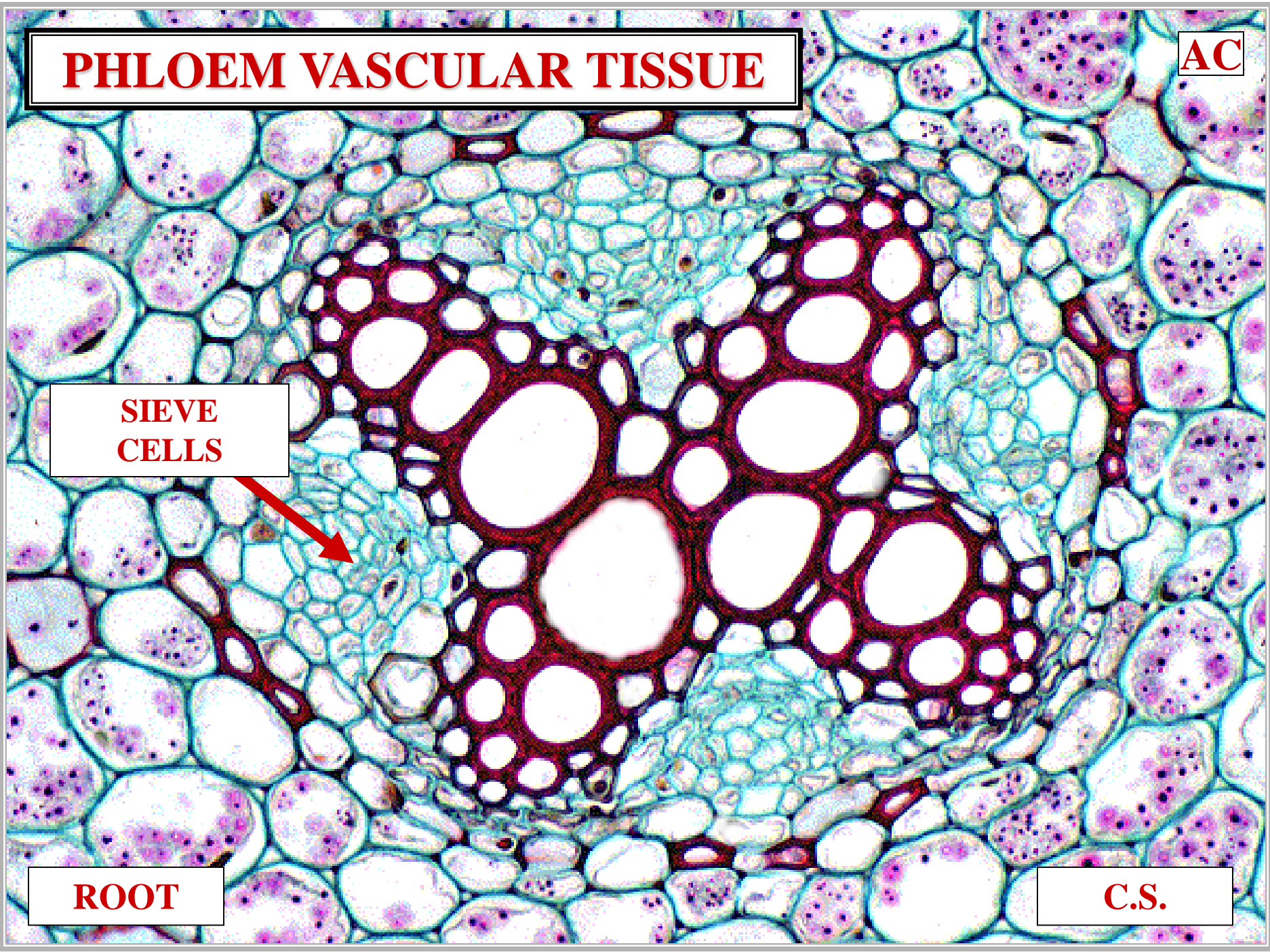
AC

SIEVE  
CELLS



ROOT

C.S.

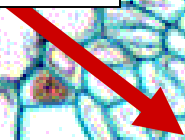


# PHLOEM VASCULAR TISSUE

SM

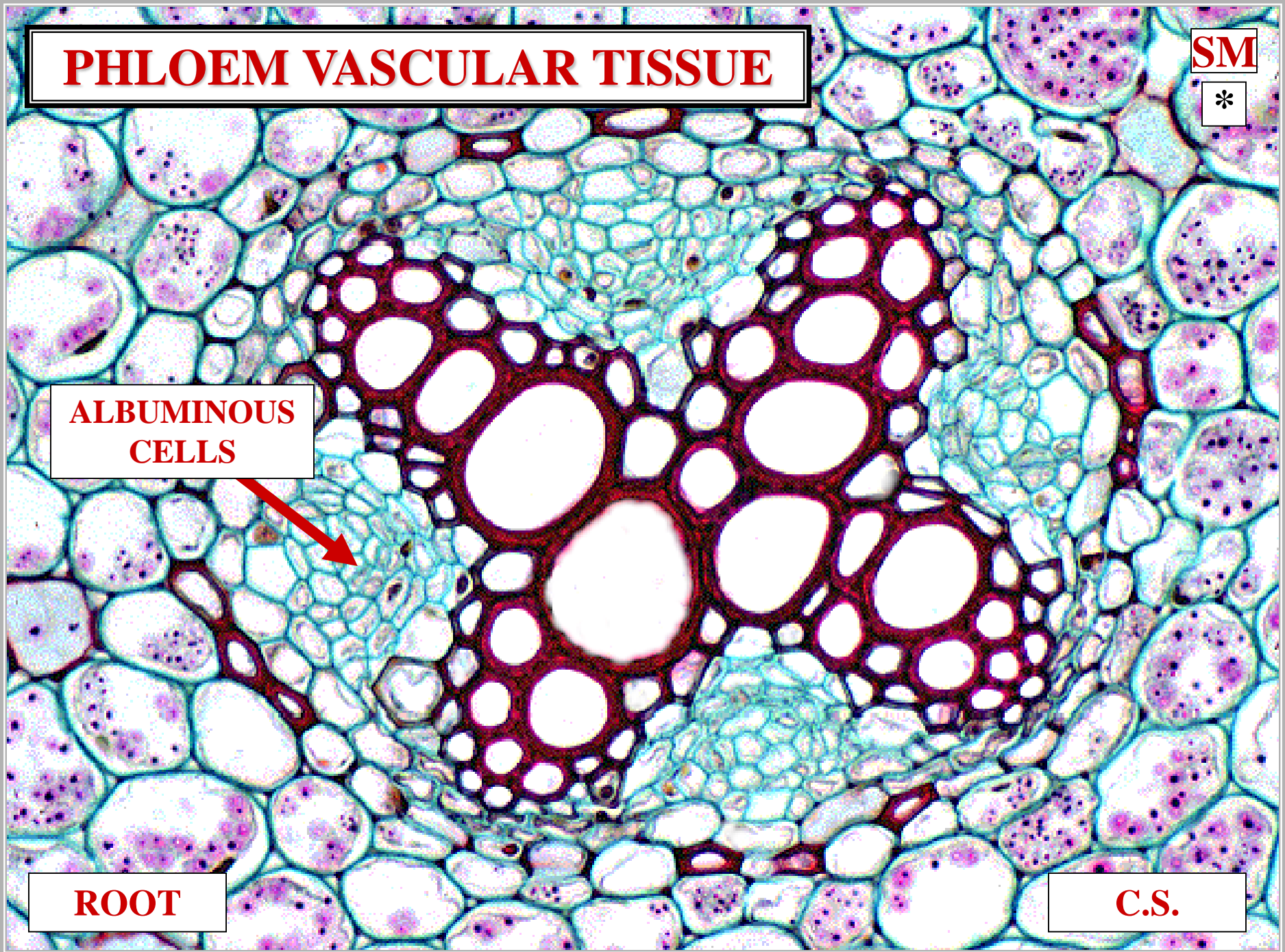
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ALBUMINOUS  
CELLS



ROOT

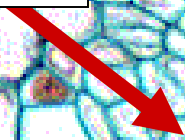
C.S.



# PHLOEM VASCULAR TISSUE

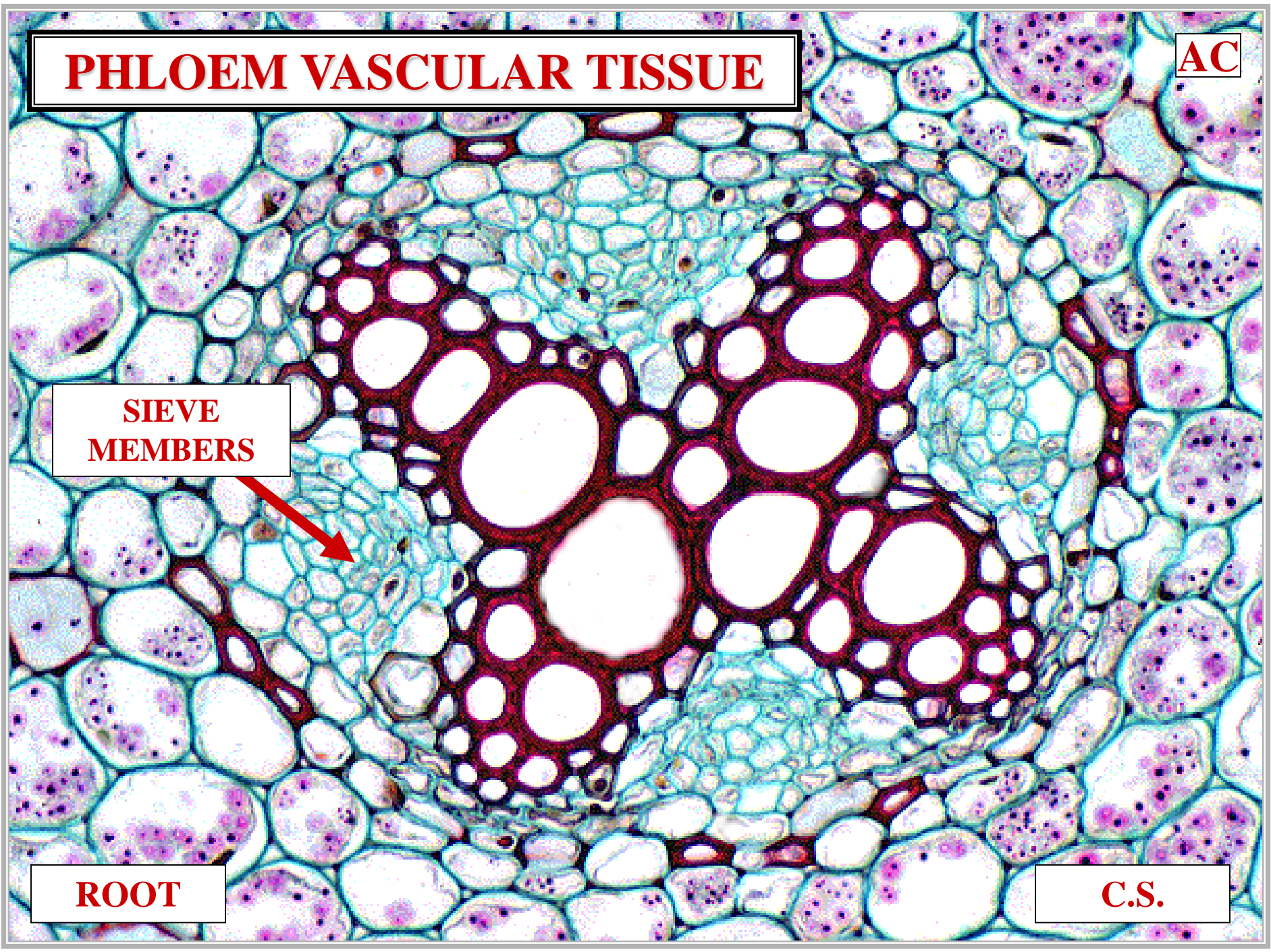
AC

SIEVE MEMBERS



ROOT

C.S.



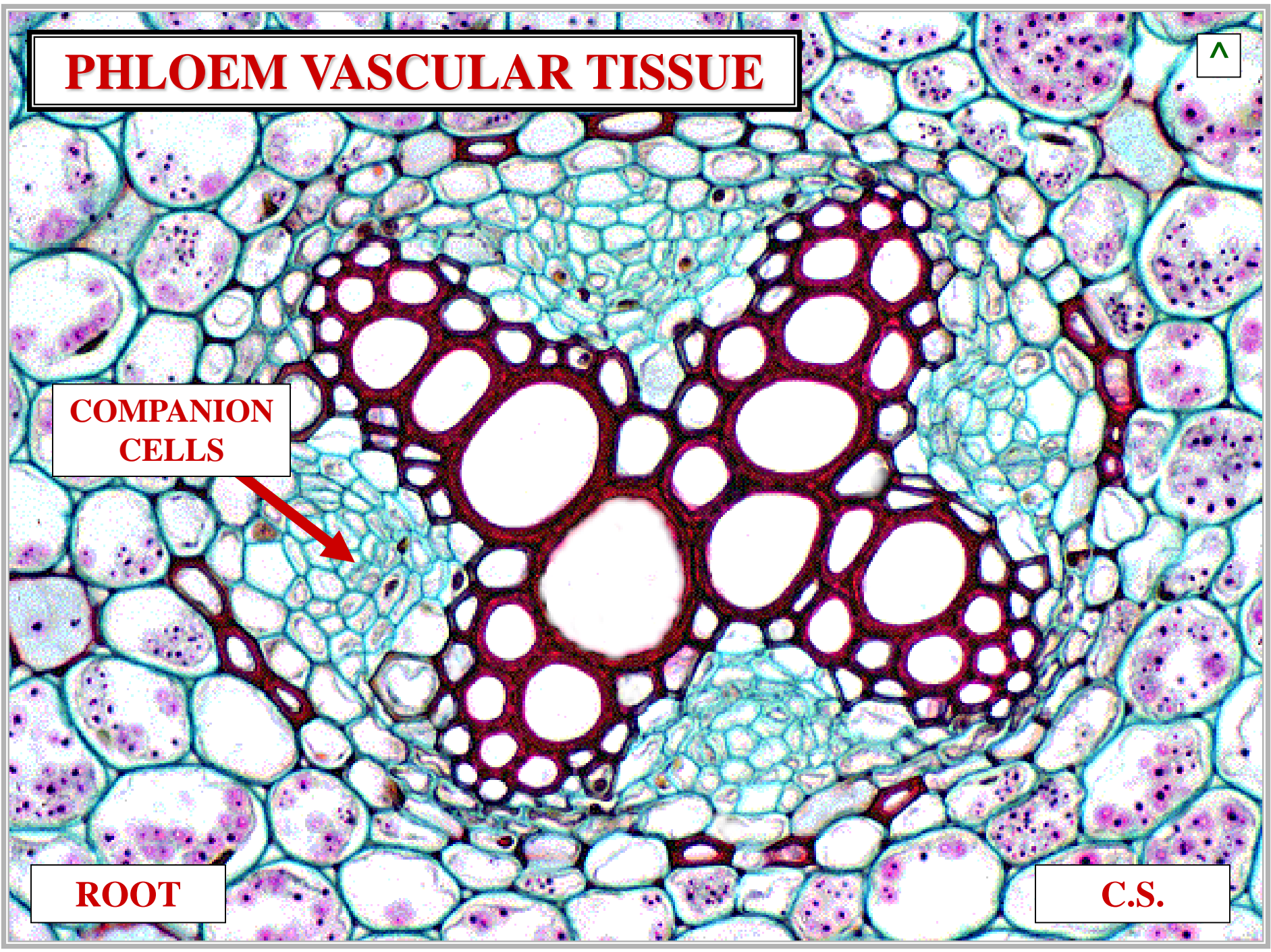
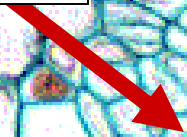


# PHLOEM VASCULAR TISSUE

COMPANION  
CELLS

ROOT

C.S.



# ANGIOSPERM VASCULAR STELES

**STELLE**



**STELE**

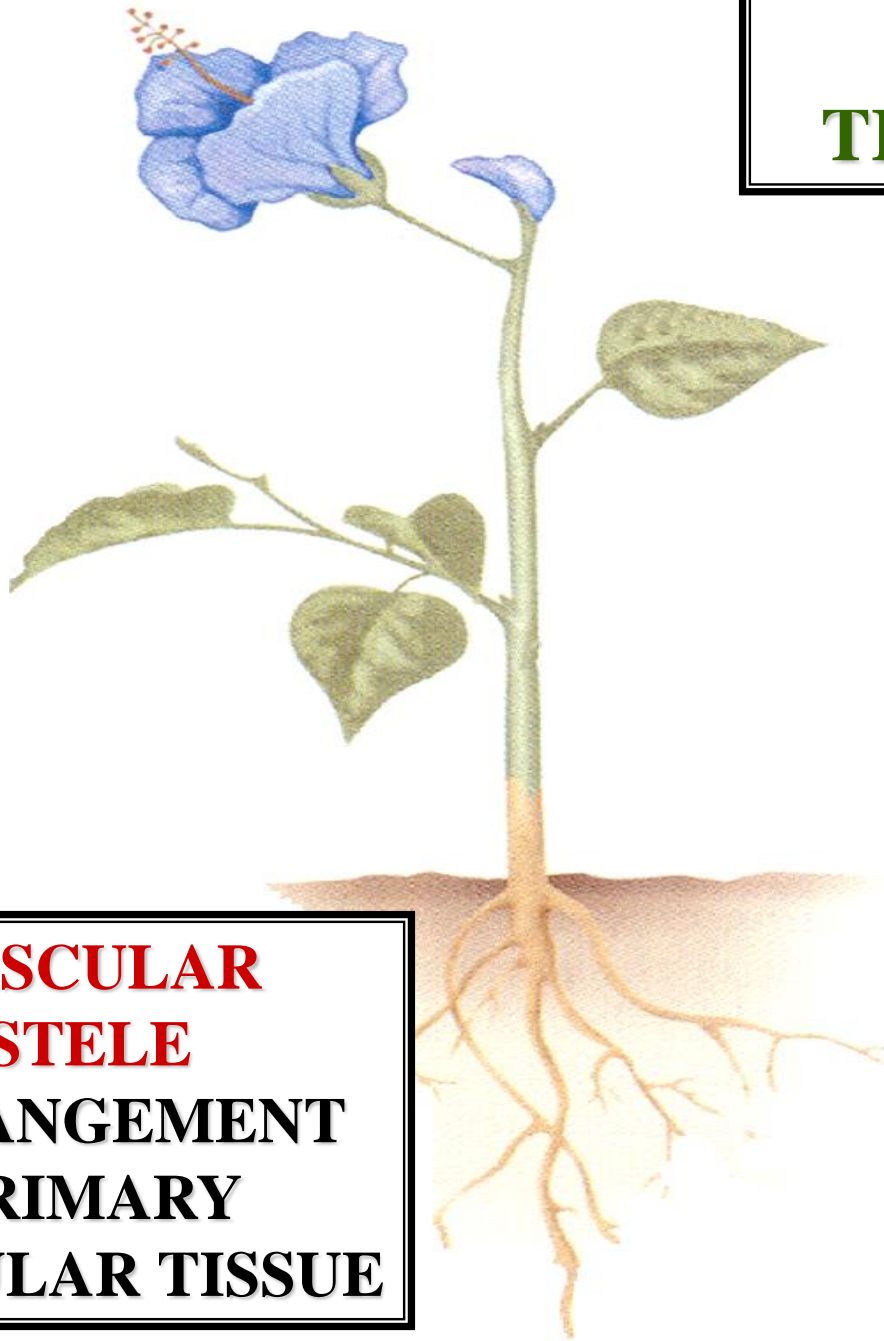
**ARRANGEMENT  
PRIMARY  
VASCULAR TISSUE**

**STELE**



# TYPICAL TRACHEOPHYTE

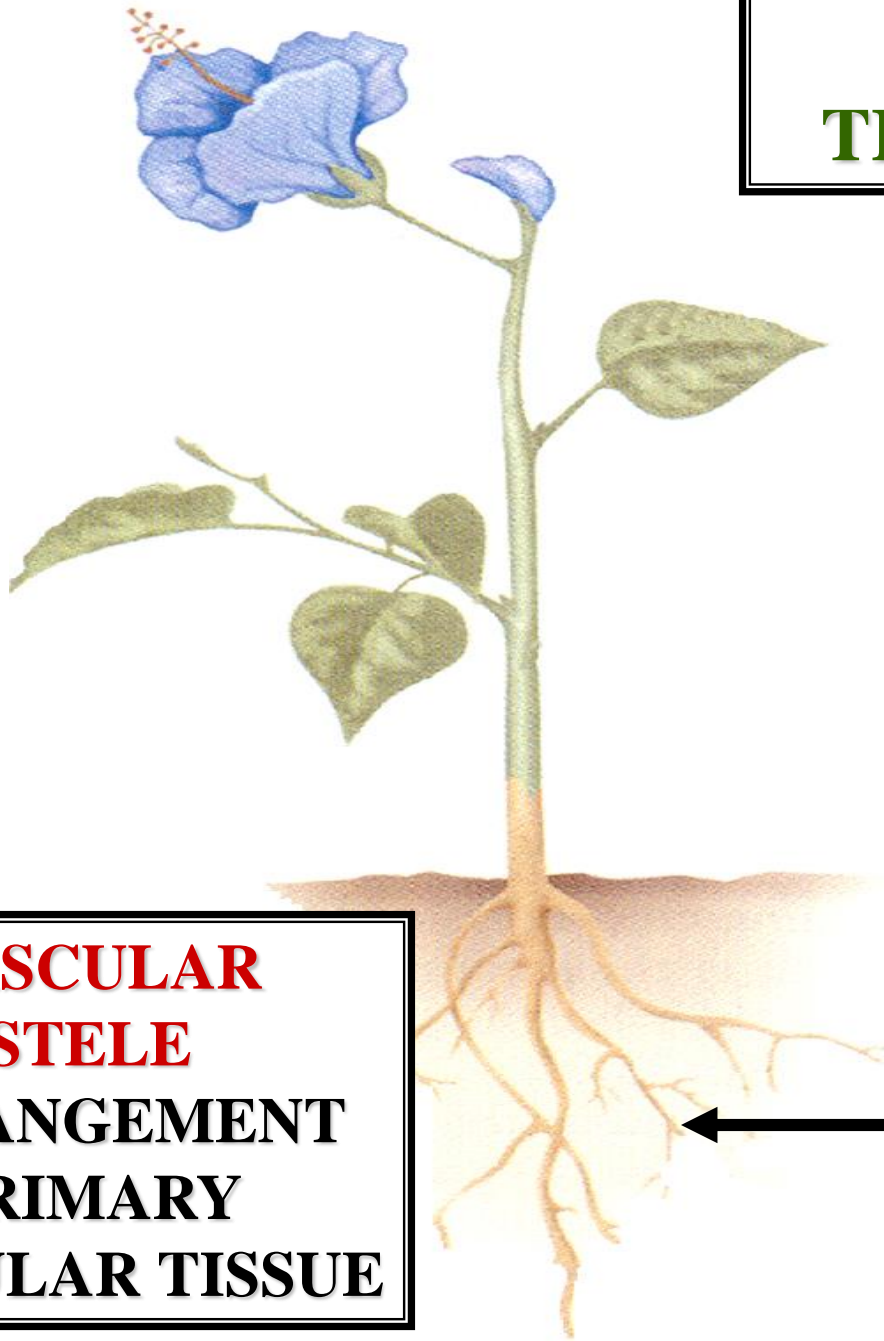
RT



**VASCULAR  
STELE  
ARRANGEMENT  
PRIMARY  
VASCULAR TISSUE**

# TYPICAL TRACHEOPHYTE

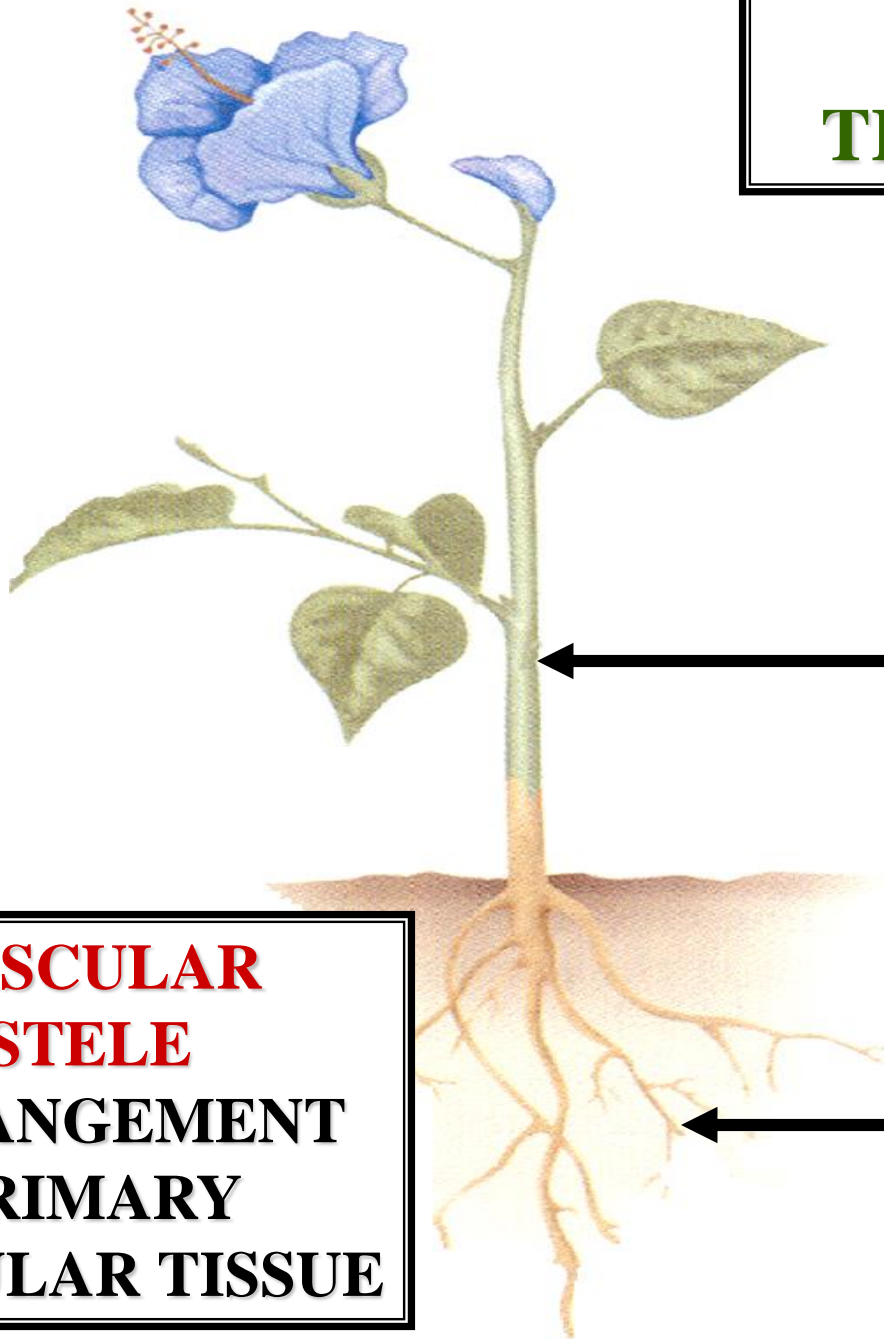
ST



**VASCULAR  
STELE  
ARRANGEMENT  
PRIMARY  
VASCULAR TISSUE**

**ROOT**

# TYPICAL TRACHEOPHYTE



**STEM**

**ROOT**

**VASCULAR  
STELE  
ARRANGEMENT  
PRIMARY  
VASCULAR TISSUE**



**EPIDERMIS**



**VASCULAR STELE**



**CORTEX**



**~1 XYLEM**

**~1 PHLOEM**

**PLANT X-SECTION**

**ARRANGEMENT  
PRIMARY  
VASCULAR TISSUE**

**STEM**

**ROOT**



**C.S.**

**TRACHEOPHYTE  
VASCULAR  
STELES  
TYPES**



# **VASCULAR STELE TYPES**

**PROTOSTELES**

# **VASCULAR STELE TYPES**

# **VASCULAR STELE TYPES**

**PROTOSTELES**

**SIPHONOSTELES**

# **VASCULAR STELE TYPES**

# VASCULAR STELE TYPES



PROTOSTELES

SIPHONOSTELES

ATACTOSTELE

# VASCULAR STELE TYPES

# PROTOSTELES

**PROTOSTELE**

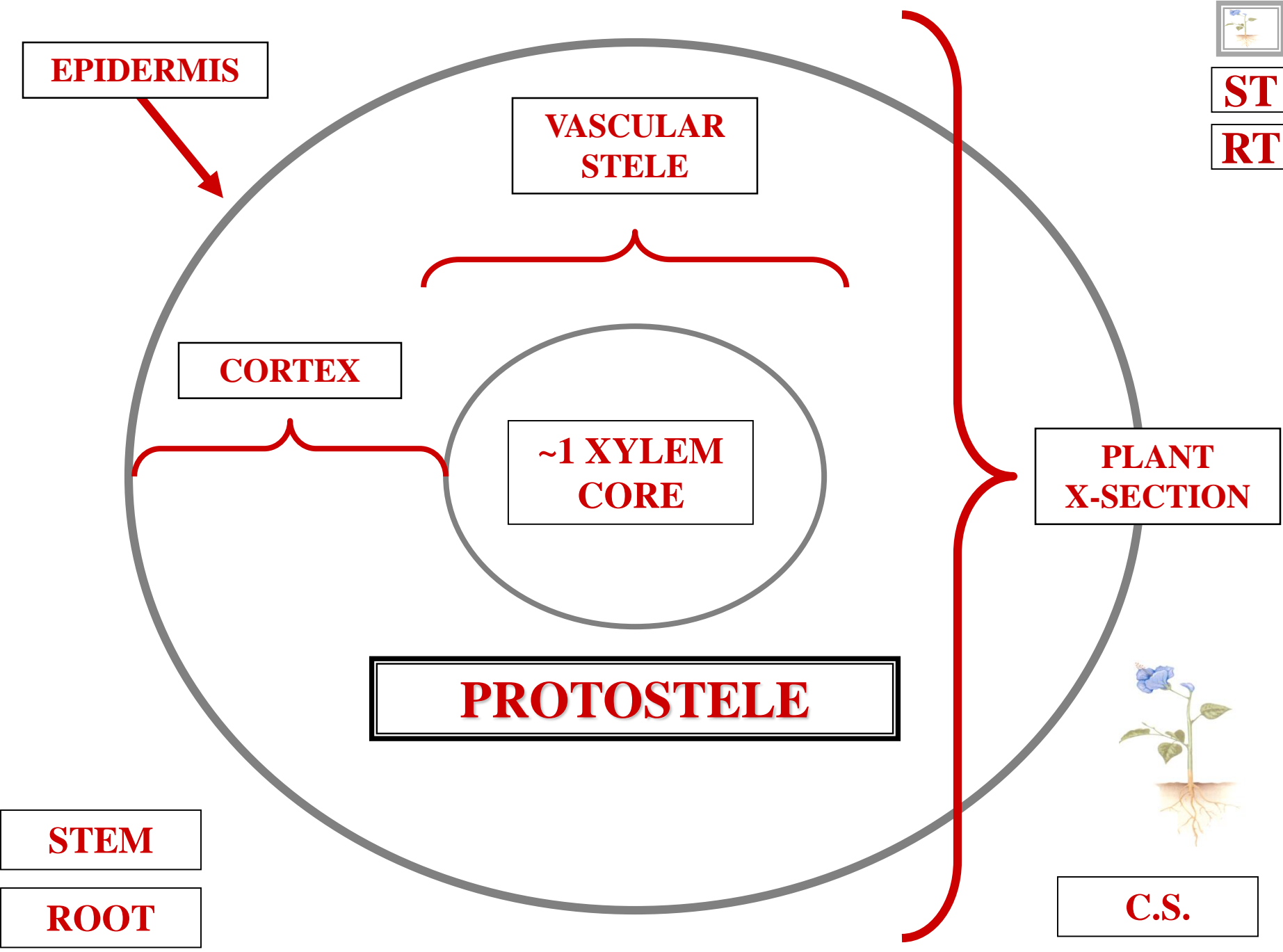


**VASCULAR STELE  
PROTOSTELE**

**XYLEM CORE  
WITH**

**PERIPHERAL PHLOEM**

**VASCULAR STELE  
PROTOSTELE**



**EPIDERMIS**



**VASCULAR STELE**

**CORTEX**



**~1 XYLEM CORE**



**PROTOSTELE**

**PLANT X-SECTION**



**ST**

**RT**

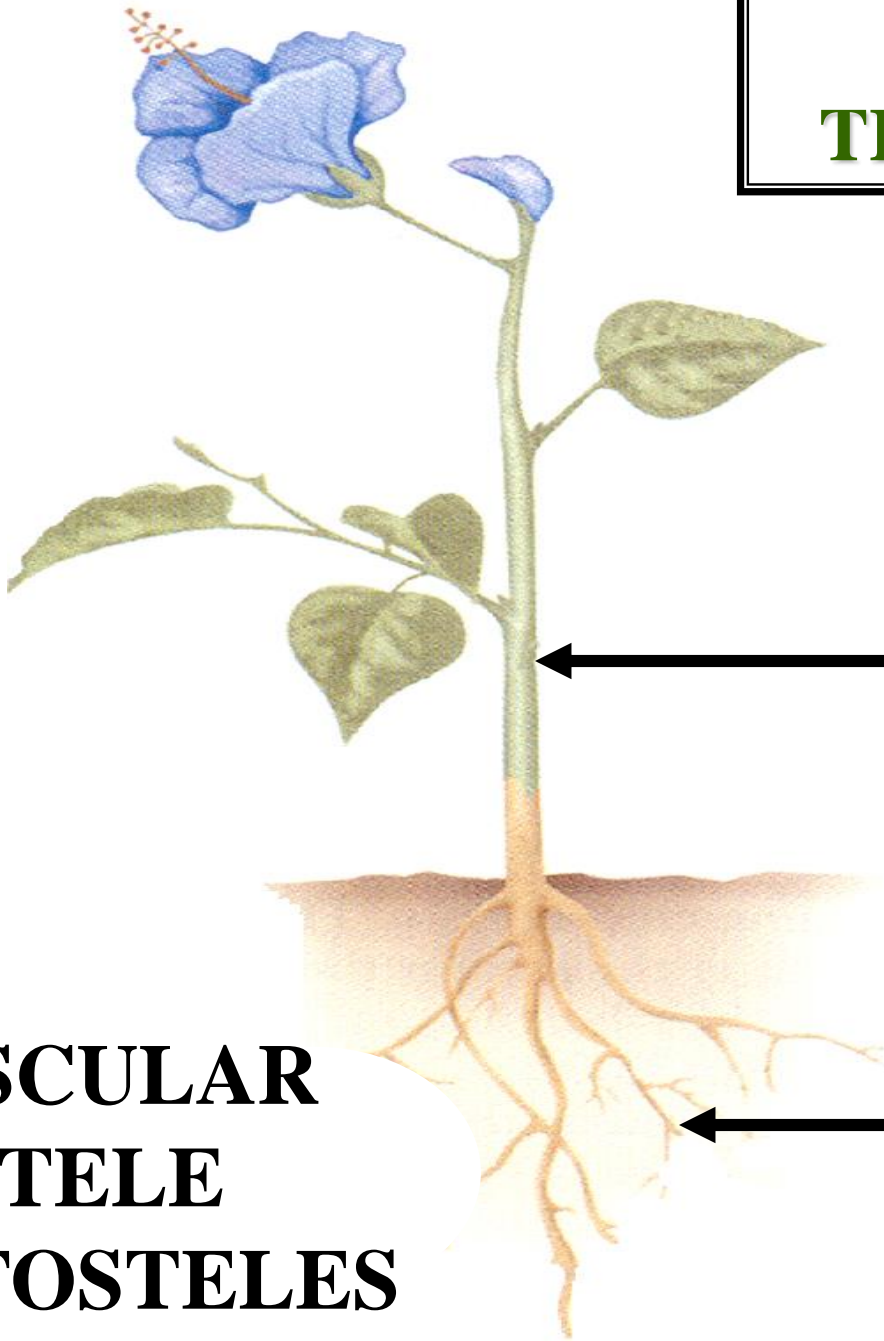
**STEM**

**ROOT**



**C.S.**

# TYPICAL TRACHEOPHYTE



**STEM**

**ROOT**

**VASCULAR  
STELE  
PROTOSTELES**

# PROTOSTELE TYPES

# **PROTOSTELE TYPES**

**HAPLOSTELE**

**PROTOSTELE  
TYPES**



# **PROTOSTELE TYPES**

**HAPLOSTELE**

**ACTINOSTELE**

# **PROTOSTELE TYPES**

# **PROTOSTELE TYPES**



**HAPLOSTELE  
ACTINOSTELE  
PLECTOSTELE**

**PROTOSTELE  
TYPES**

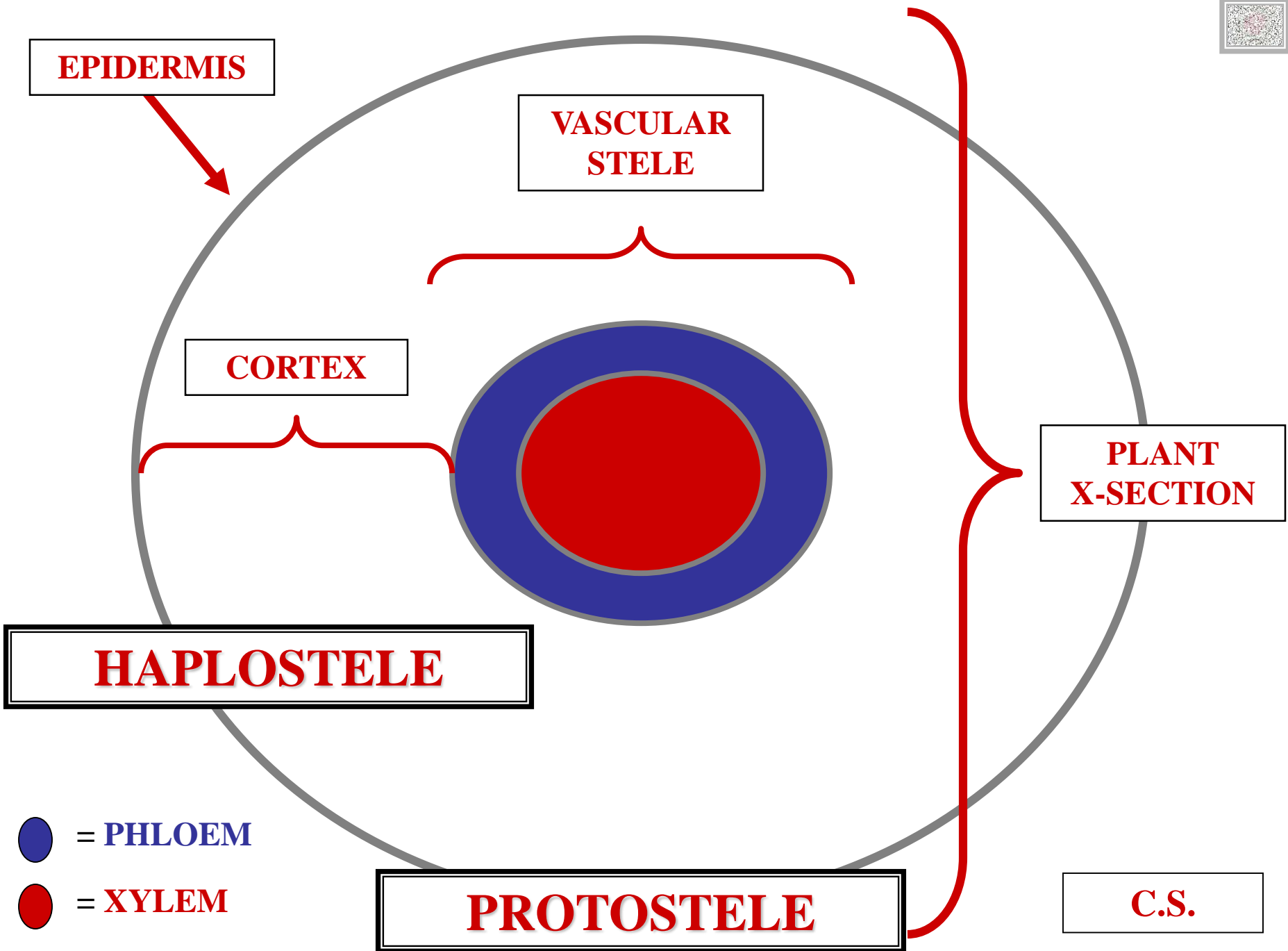
**HAPLOSTELE**

**PROTOSTELE  
HAPLOSTELE**



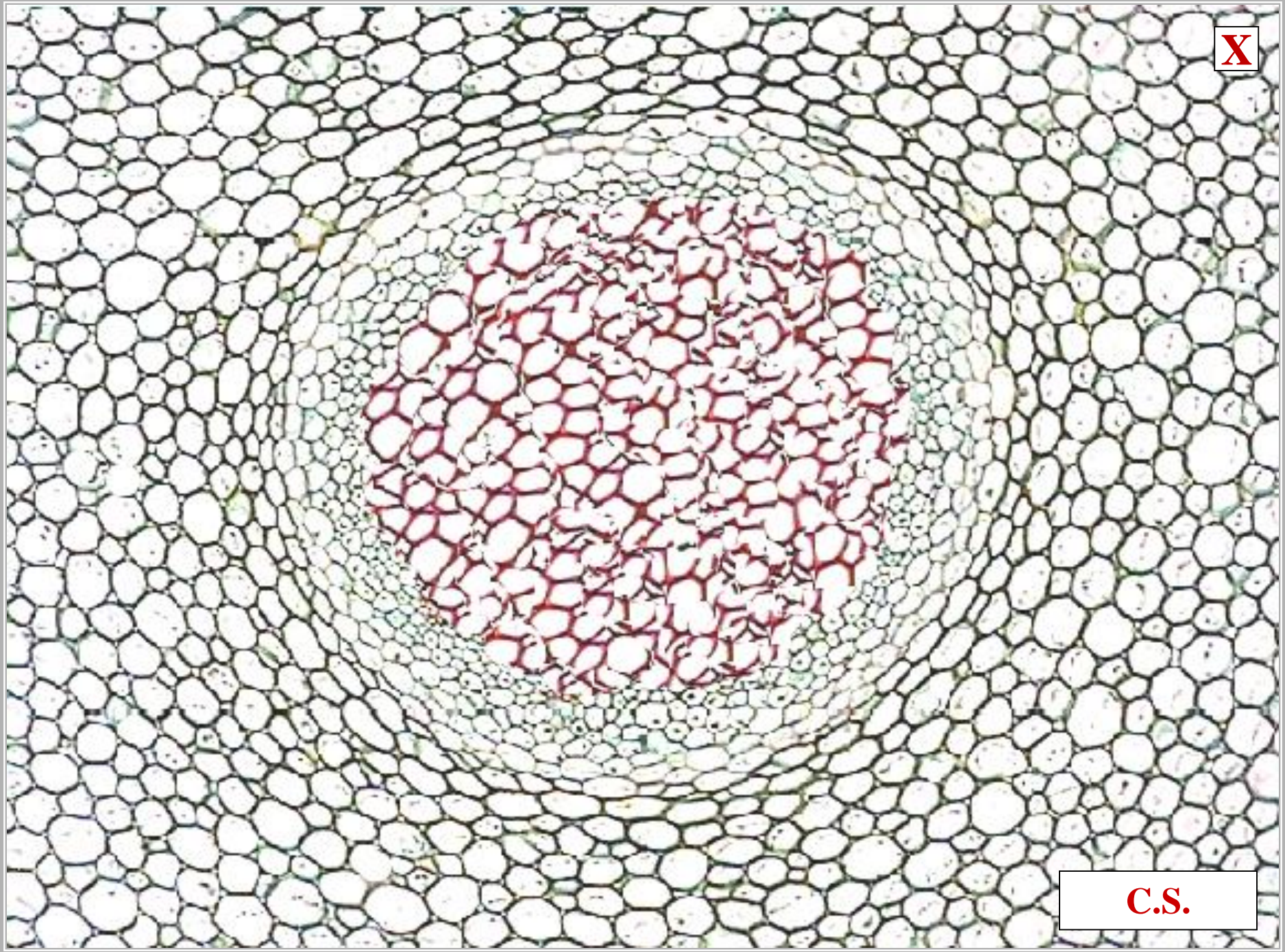
**XYLEM ROUND**

**PROTOSTELE  
TYPES**





X



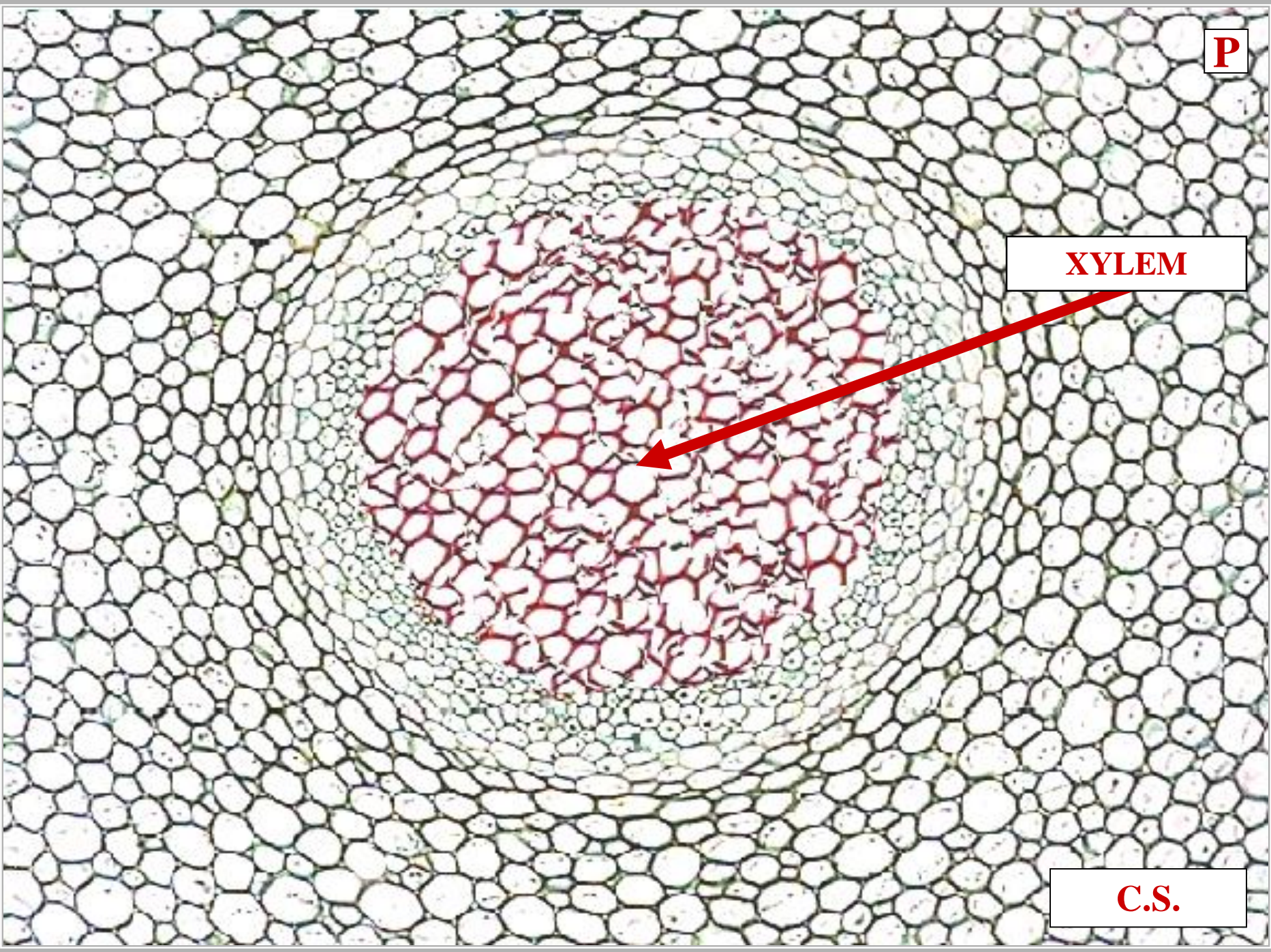
C.S.



**P**

**XYLEM**

**C.S.**



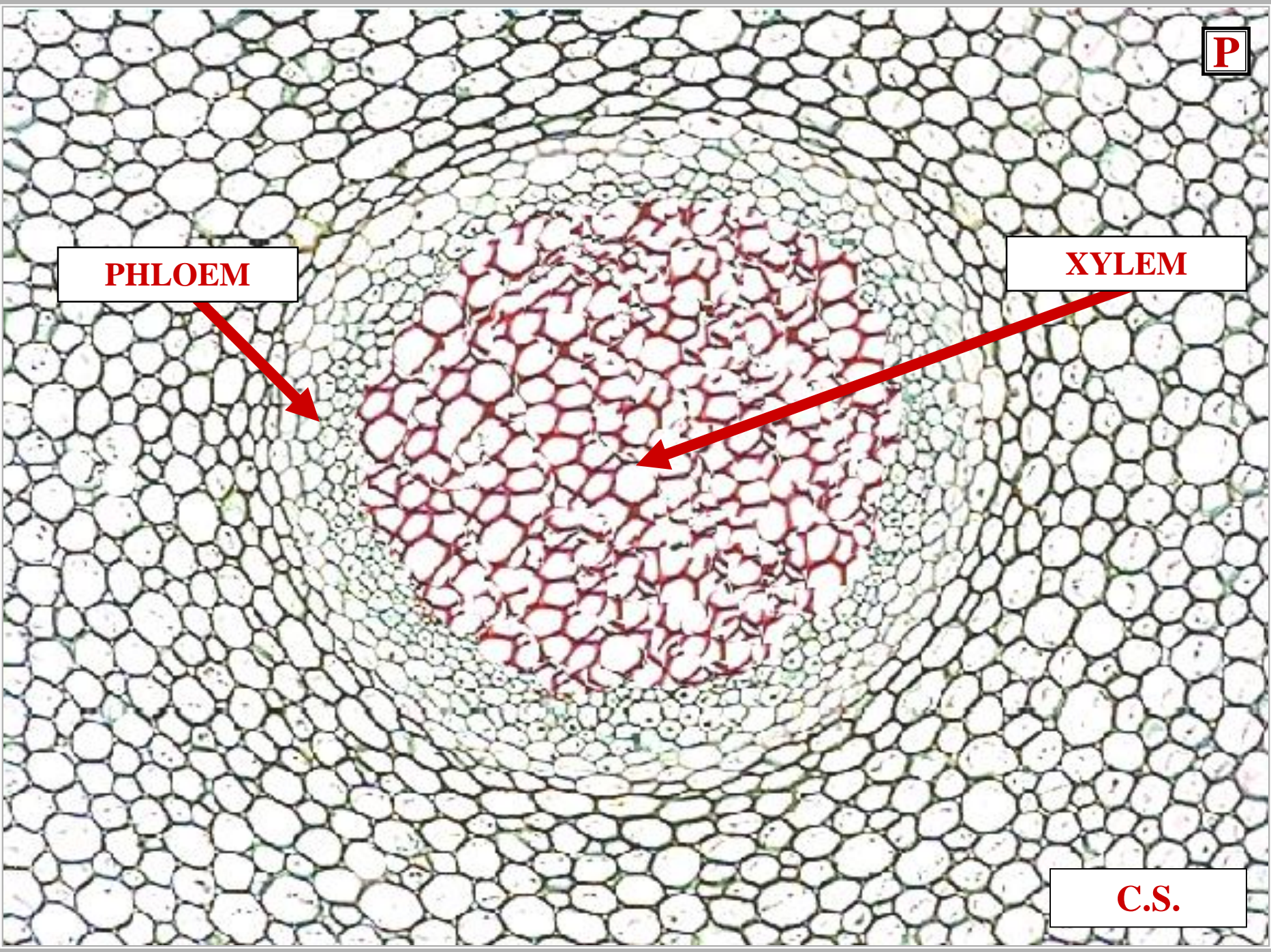


**P**

**PHLOEM**

**XYLEM**

**C.S.**

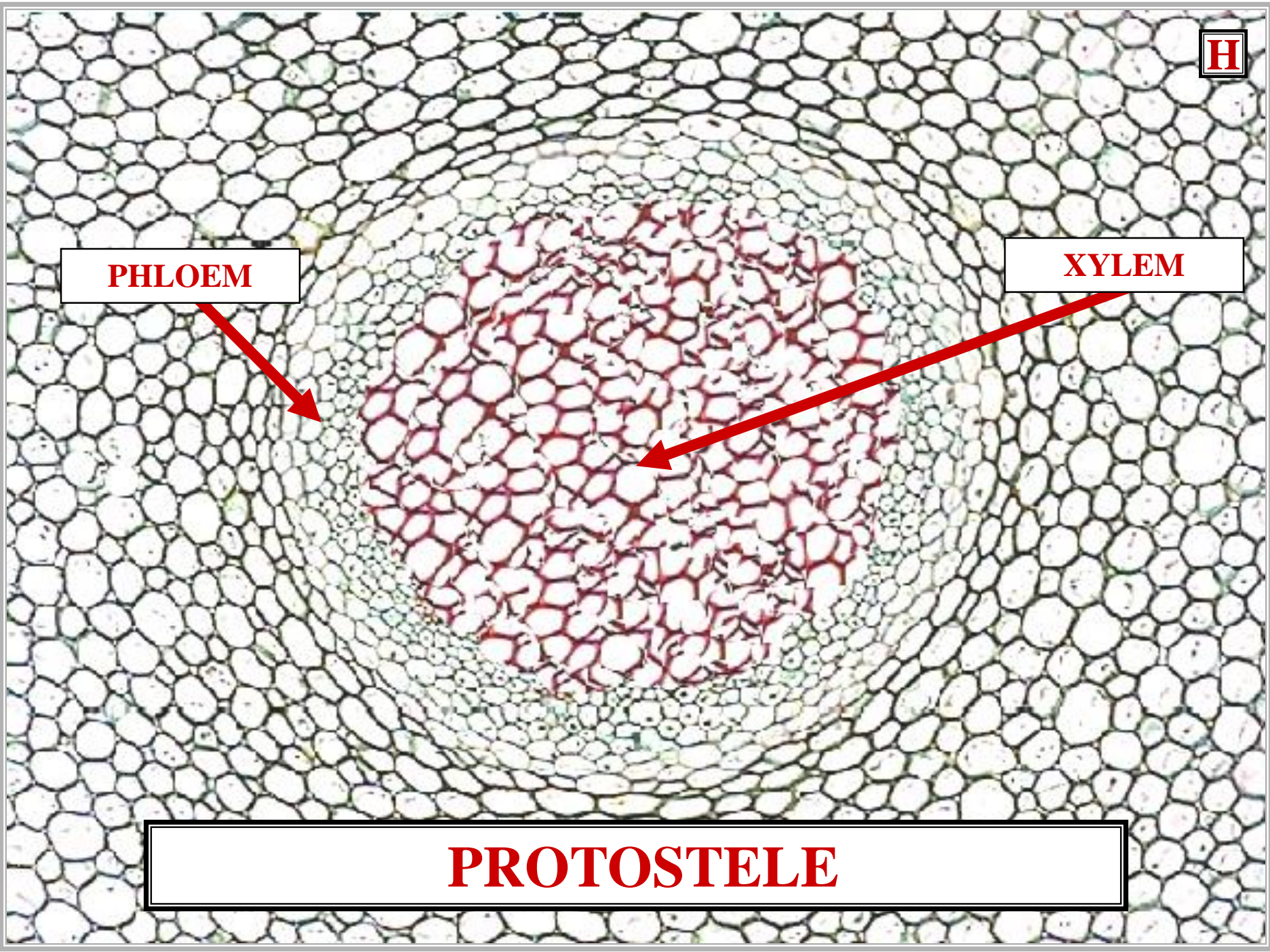




**PHLOEM**

**XYLEM**

**PROTOSTELE**





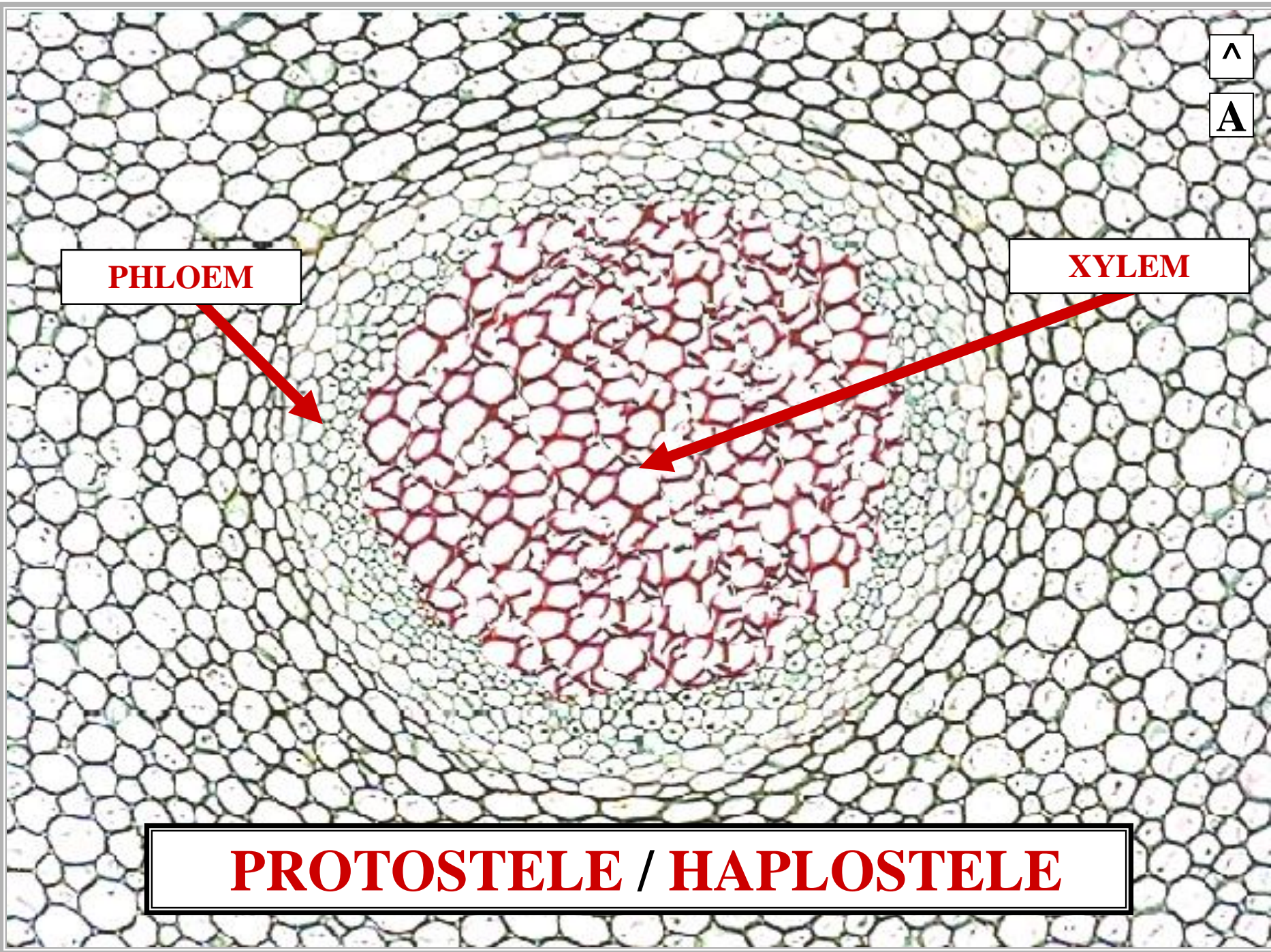
^

A

**PHLOEM**

**XYLEM**

**PROTOSTELE / HAPLOSTELE**



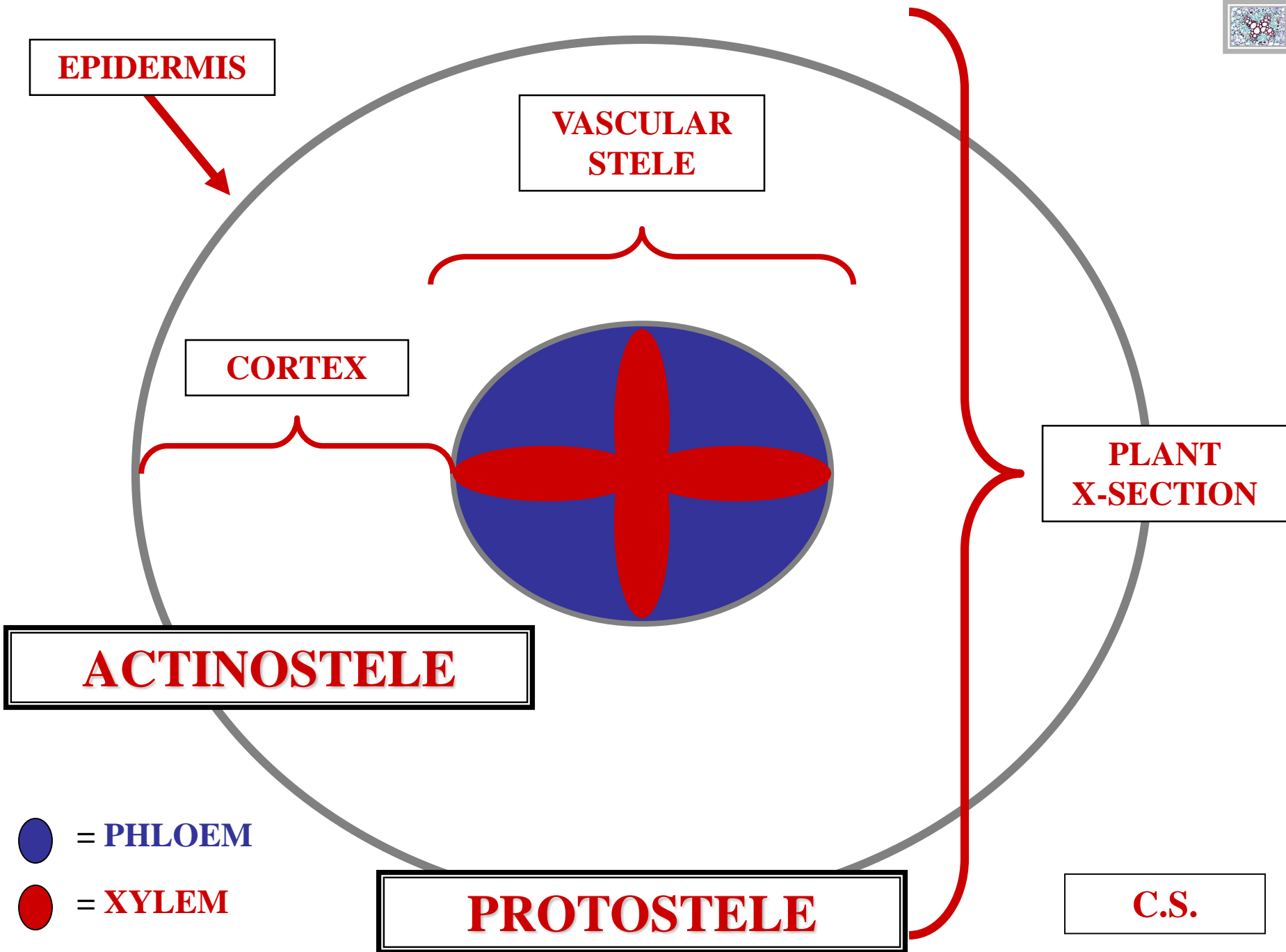
**ACTINOSTELE**

**PROTOSTELE  
ACTINOSTELE**



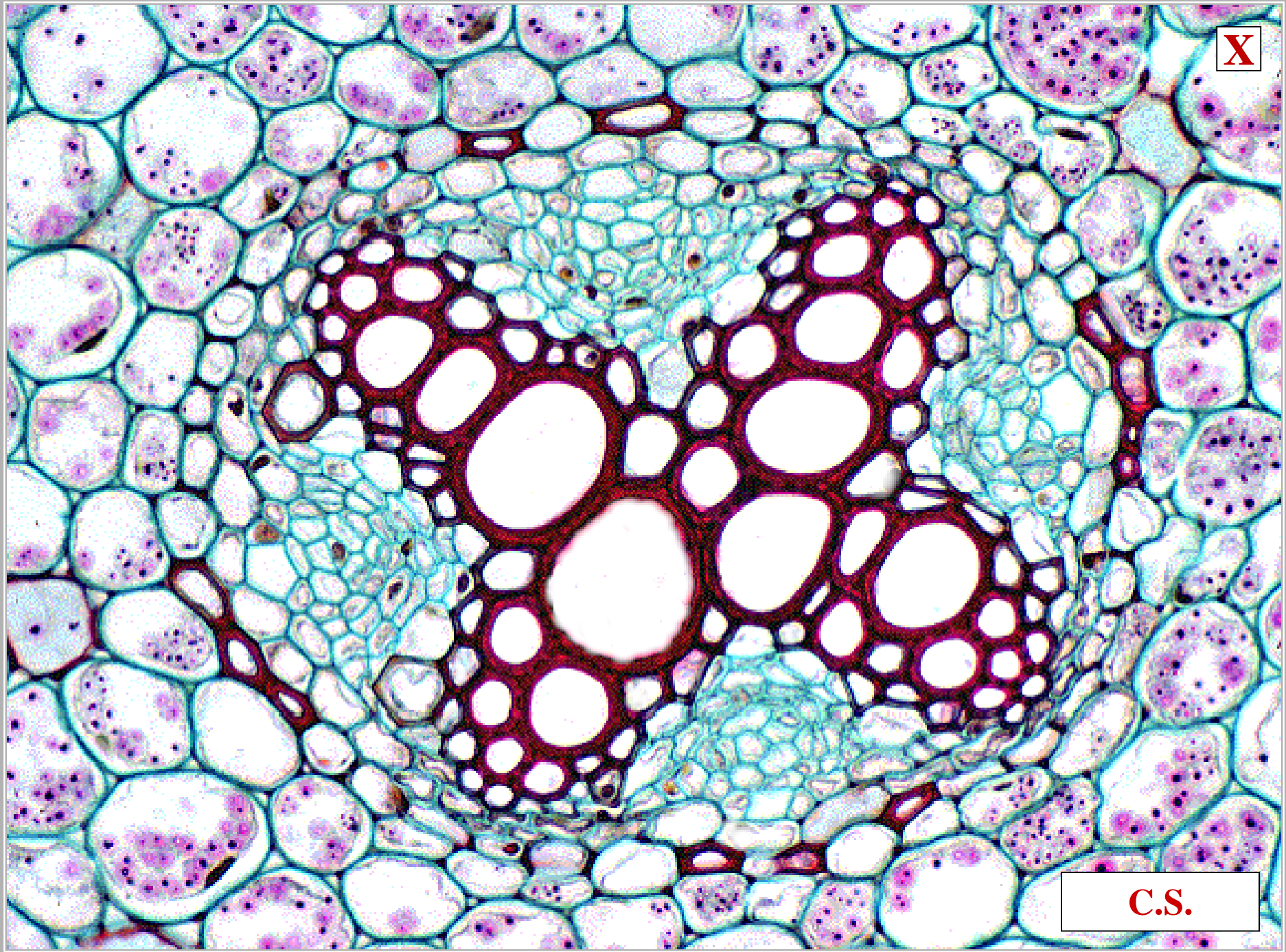
**XYLEM RIDGED**

**PROTOSTELE  
ACTINOSTELE**





X

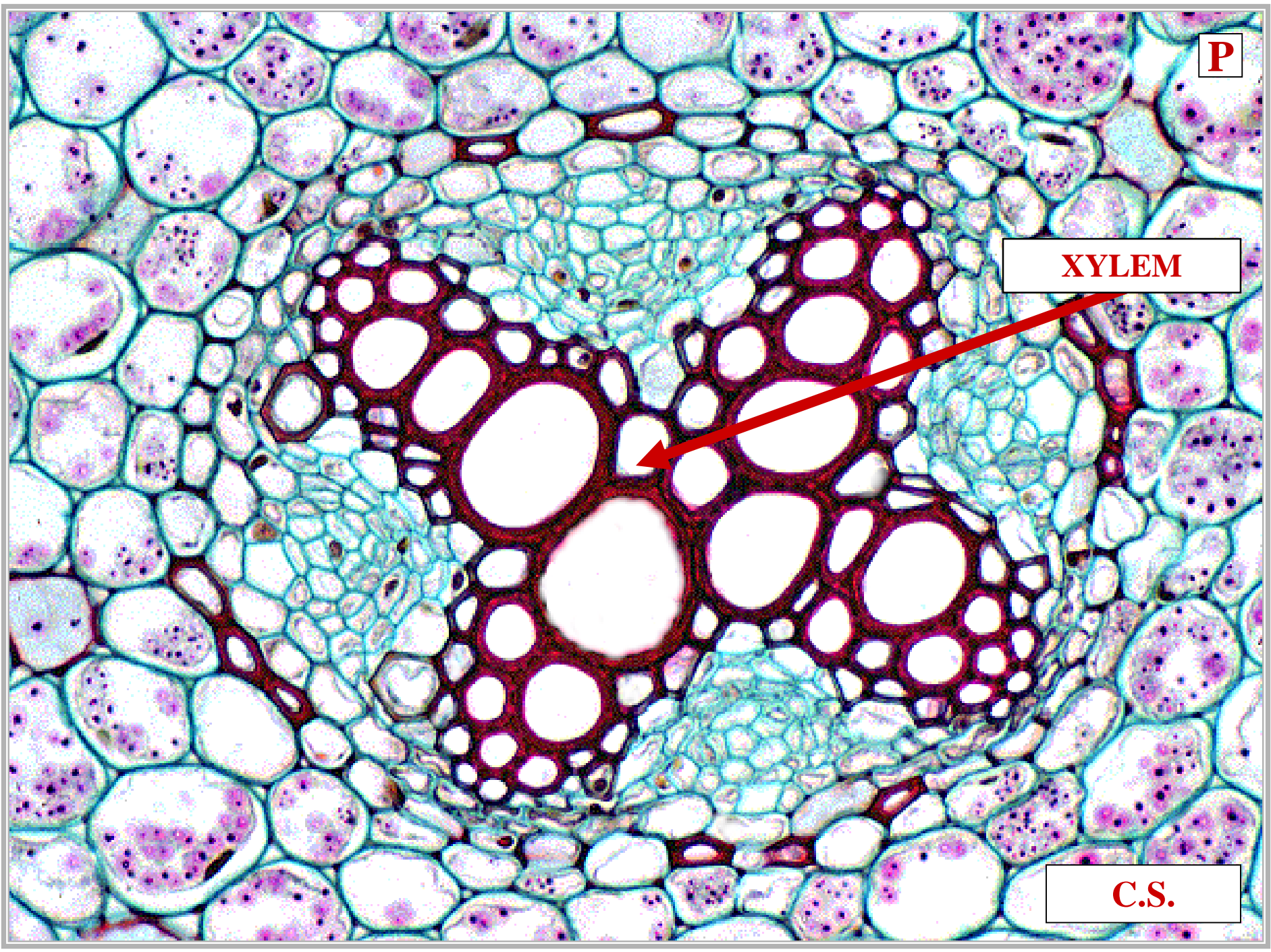


C.S.

**P**

**XYLEM**

**C.S.**

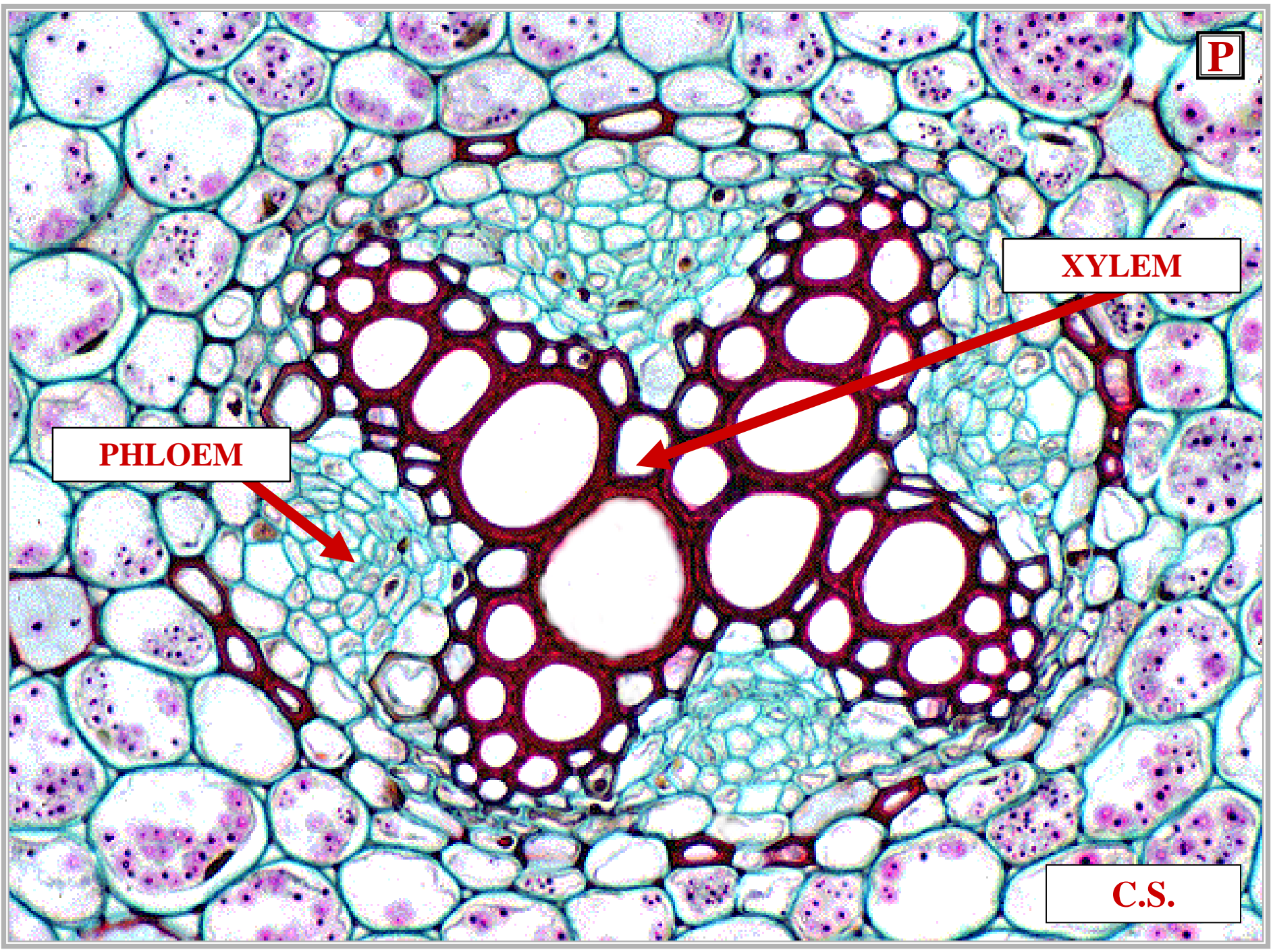


**P**

**XYLEM**

**PHLOEM**

**C.S.**

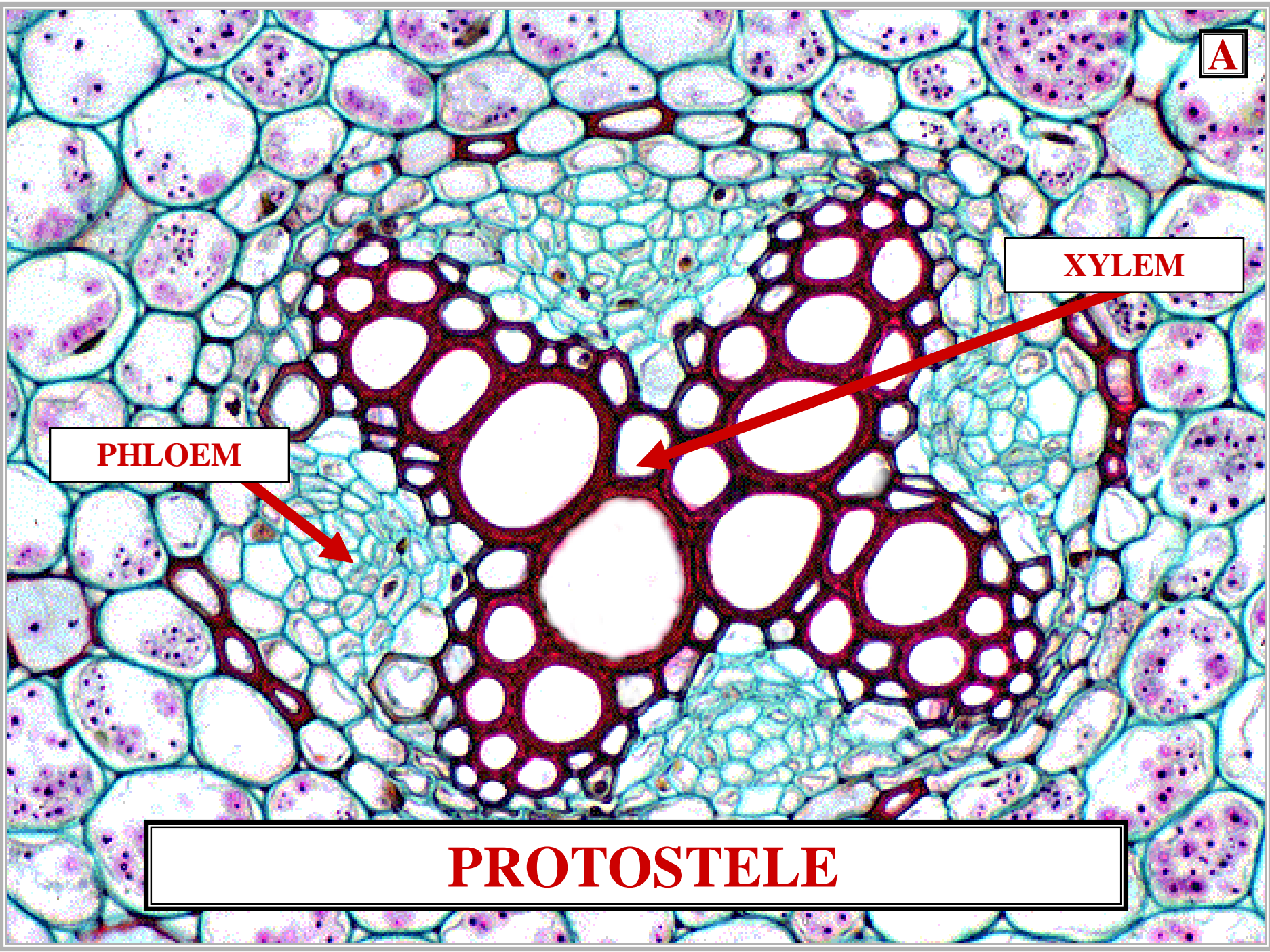


**A**

**XYLEM**

**PHLOEM**

**PROTOSTELE**



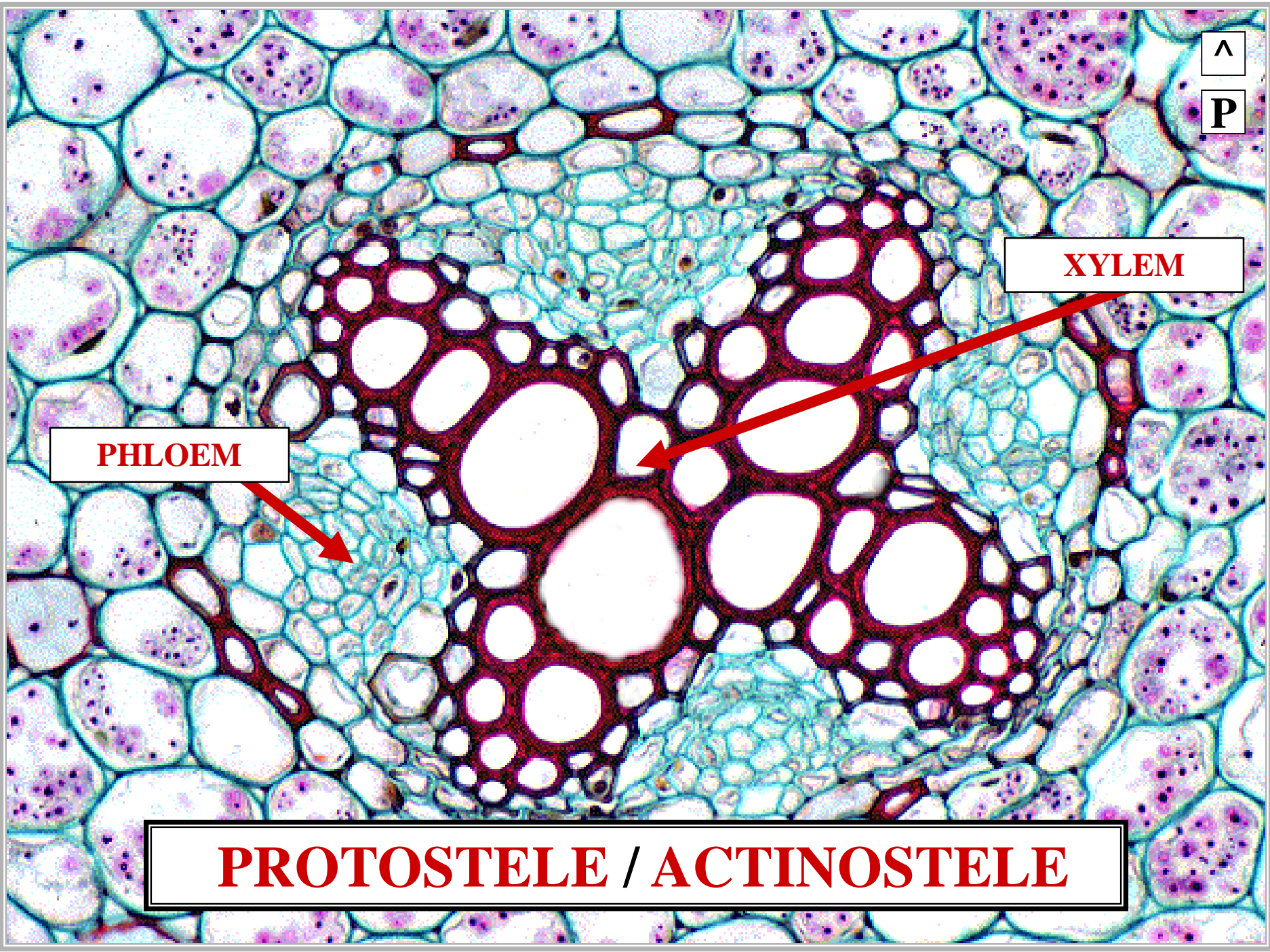
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P

**XYLEM**

**PHLOEM**

**PROTOSTELE / ACTINOSTELE**



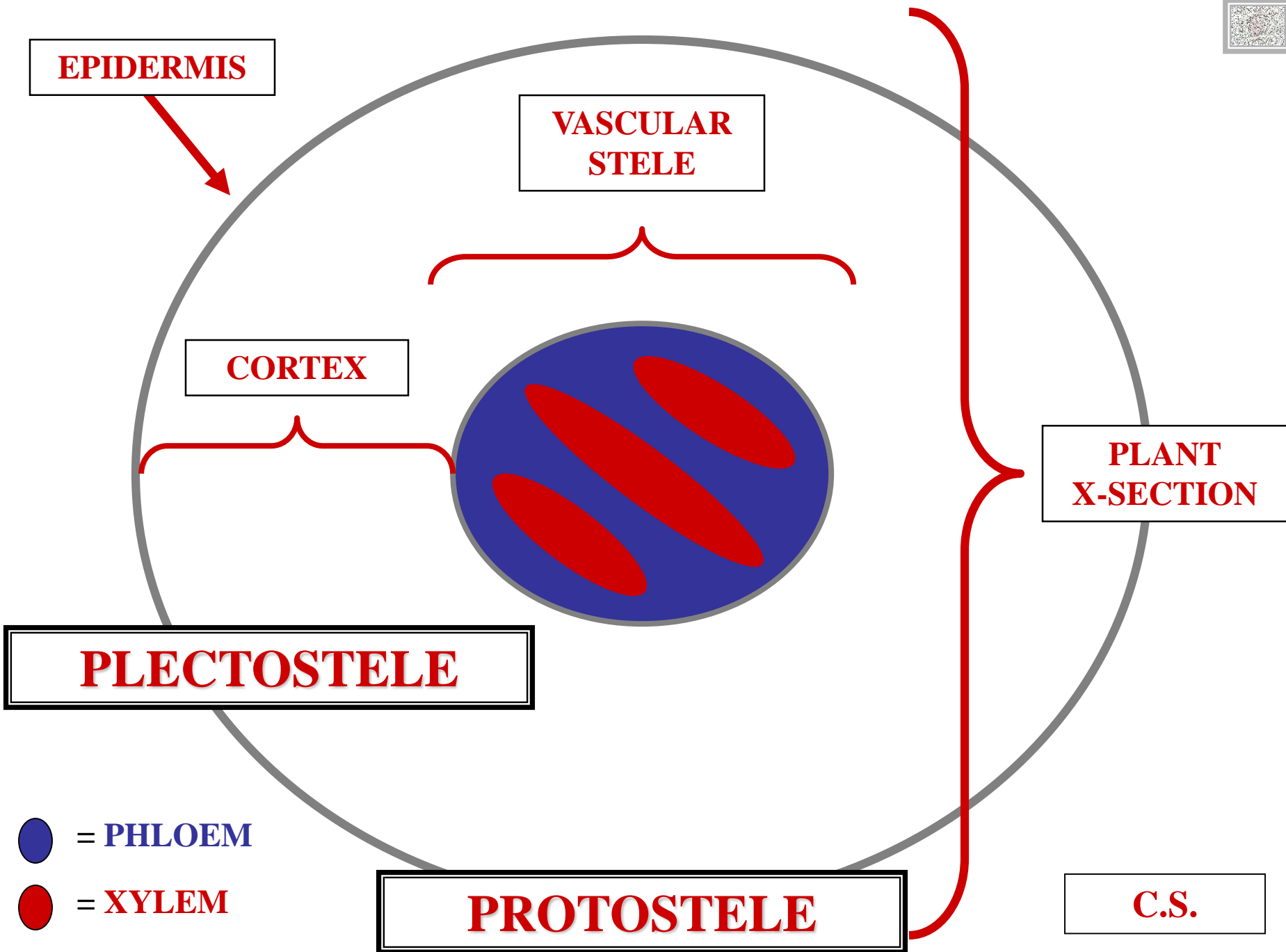
**PLECTOSTELE**

**PROTOSTELE**  
**PLECTOSTELE**



**XYLEM & PHLOEM**  
**INTERSPERSED**

**PROTOSTELE**  
**PLECTOSTELE**



**EPIDERMIS**

**VASCULAR STELE**

**CORTEX**

**PLANT X-SECTION**

**PLECTOSTELE**

**PROTOSTELE**

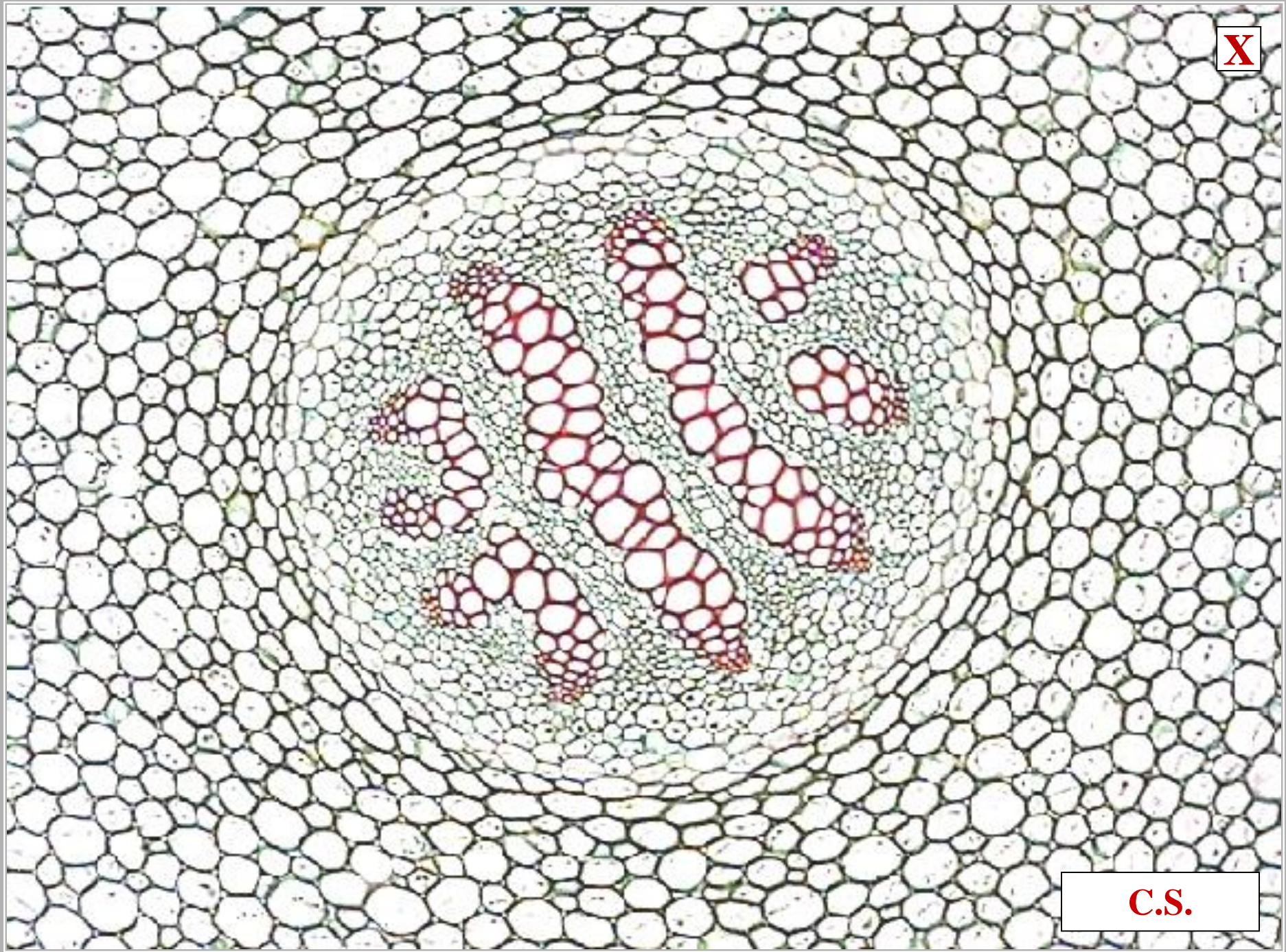
**C.S.**

**= PHLOEM**

**= XYLEM**



X



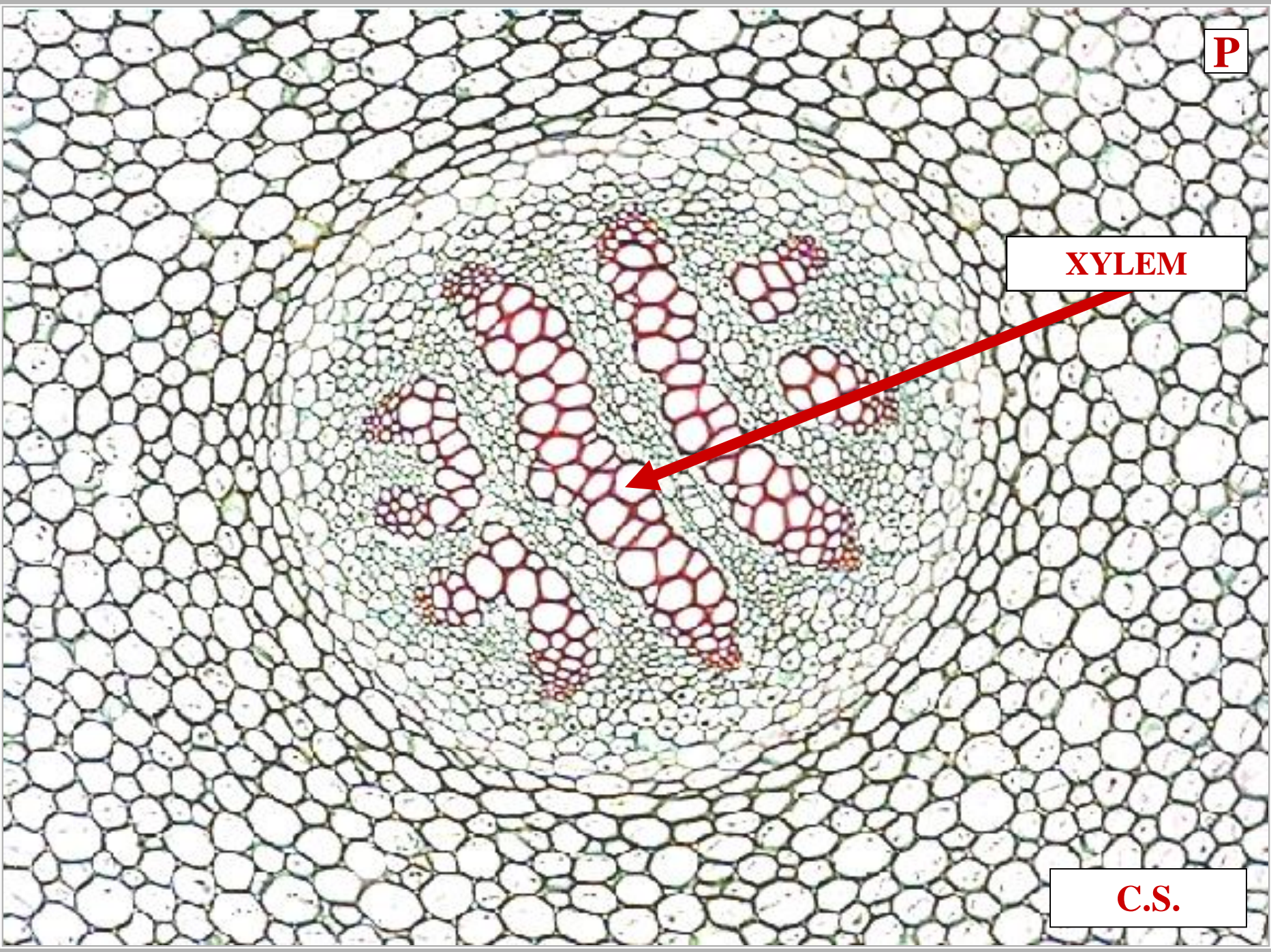
C.S.



**P**

**XYLEM**

**C.S.**



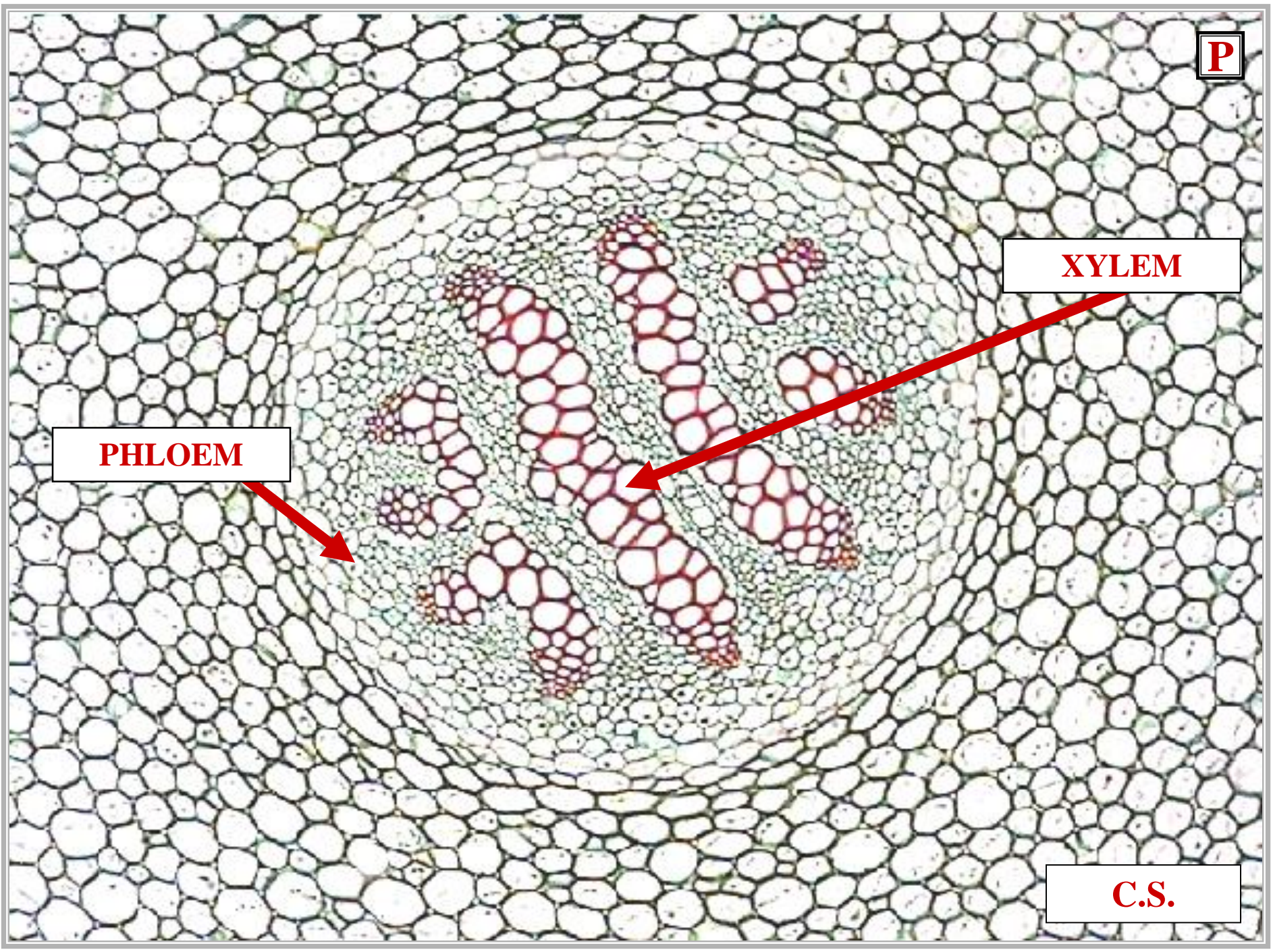


**P**

**XYLEM**

**PHLOEM**

**C.S.**



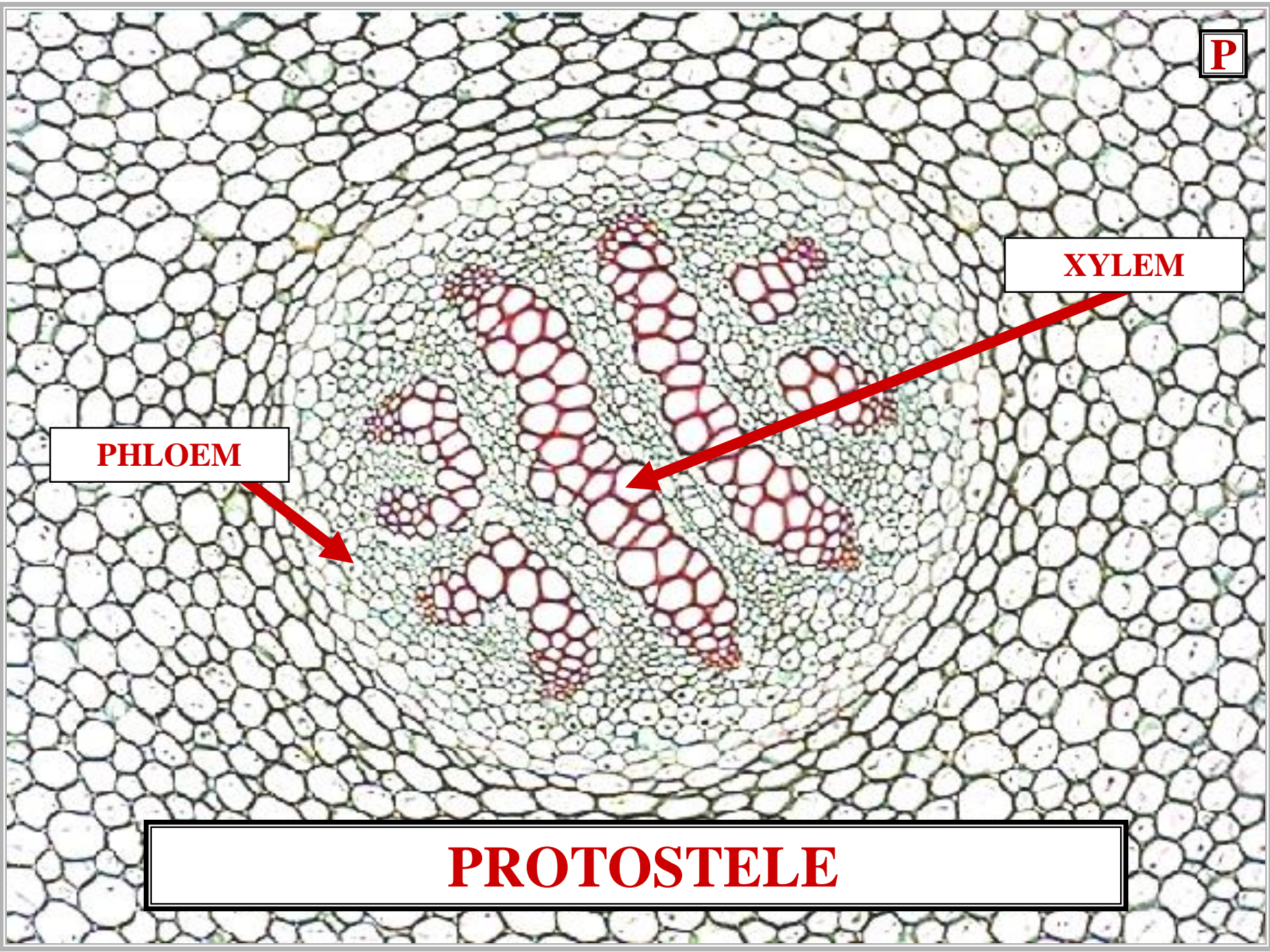


**P**

**XYLEM**

**PHLOEM**

**PROTOSTELE**



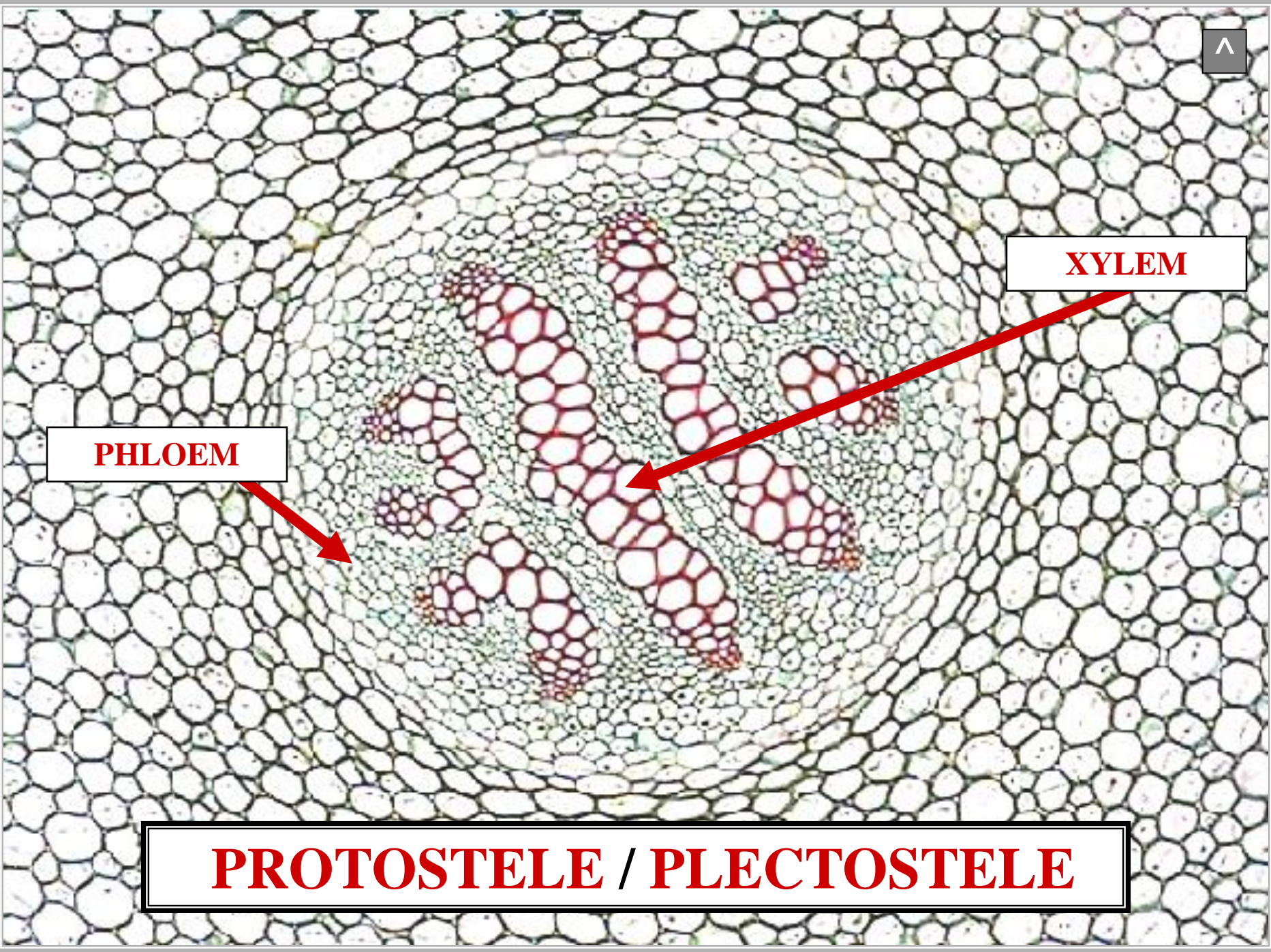




**XYLEM**

**PHLOEM**

**PROTOSTELE / PLECTOSTELE**



# SIPHONOSTELES

**SIPHONOSTELE**

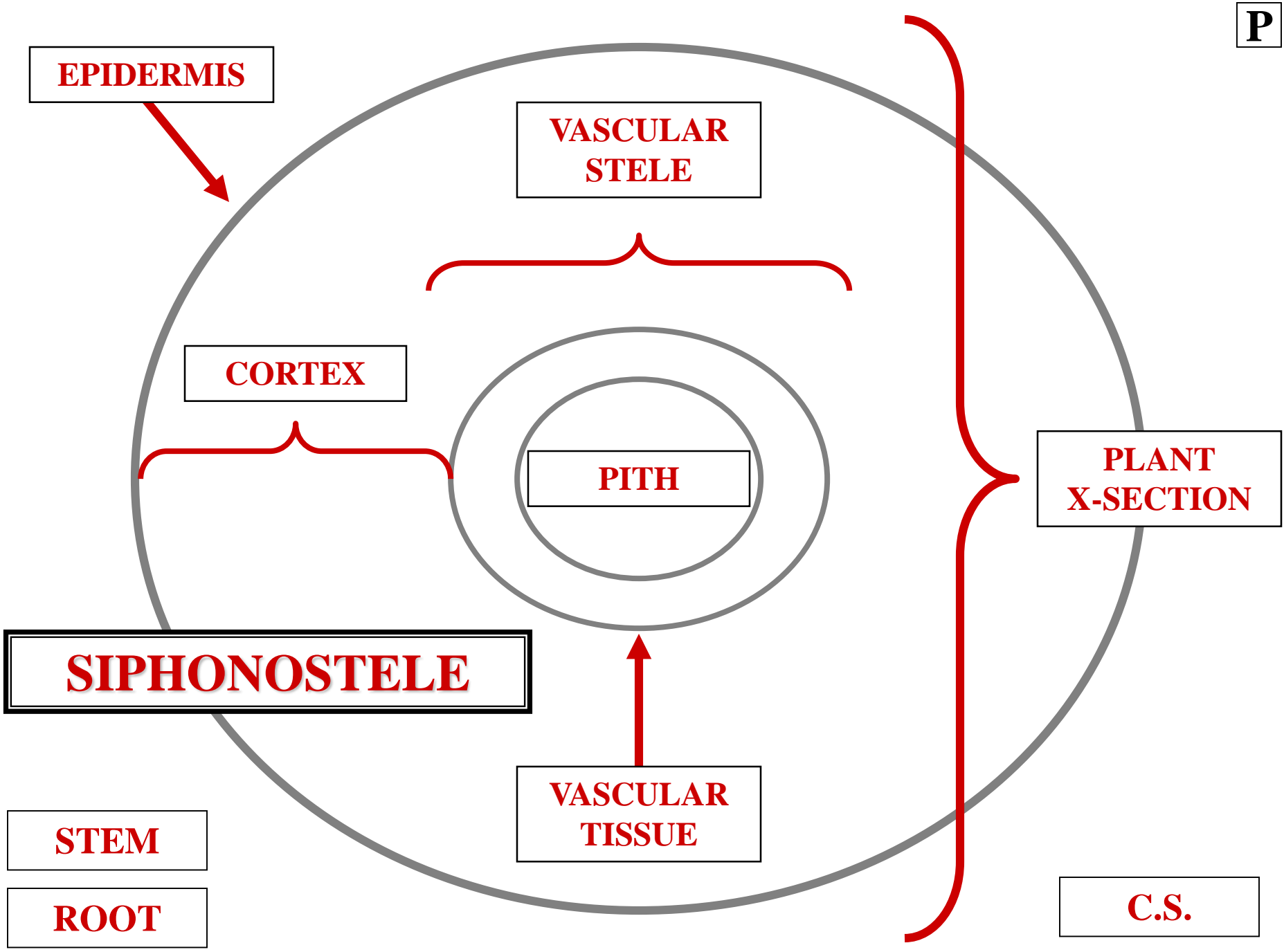
# VASCULAR STELE SIPHONOSTELE



XYLEM & PHLOEM  
SURROUND PITH

VASCULAR STELE  
SIPHONOSTELE





**PITH**

**VASCULAR STELE**  
**PITH**



**CENTER**  
**STEM OR ROOT**

**VASCULAR STELE**  
**PITH**

**VASCULAR STELE  
PITH**

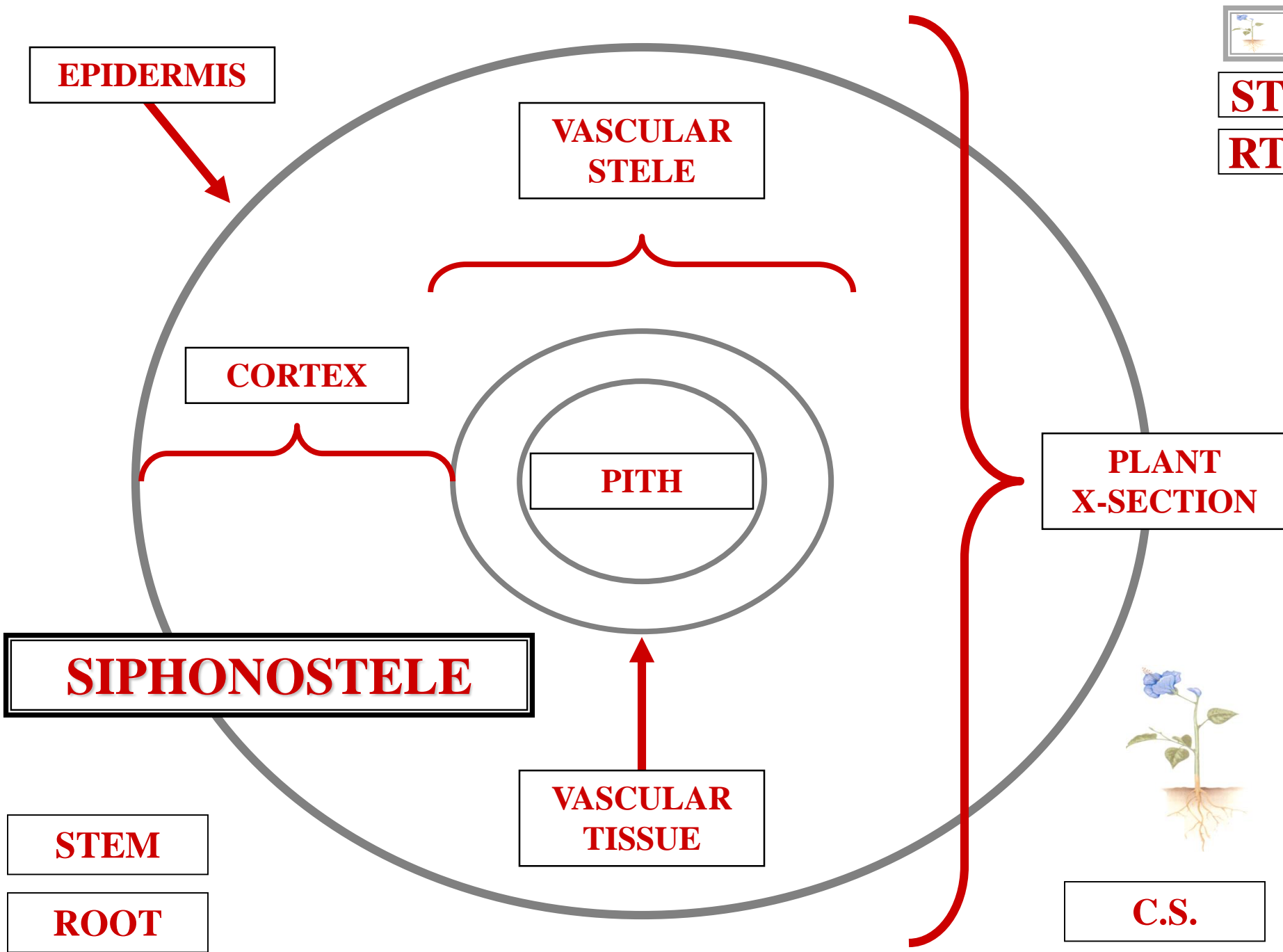


**CENTER  
STEM OR ROOT**

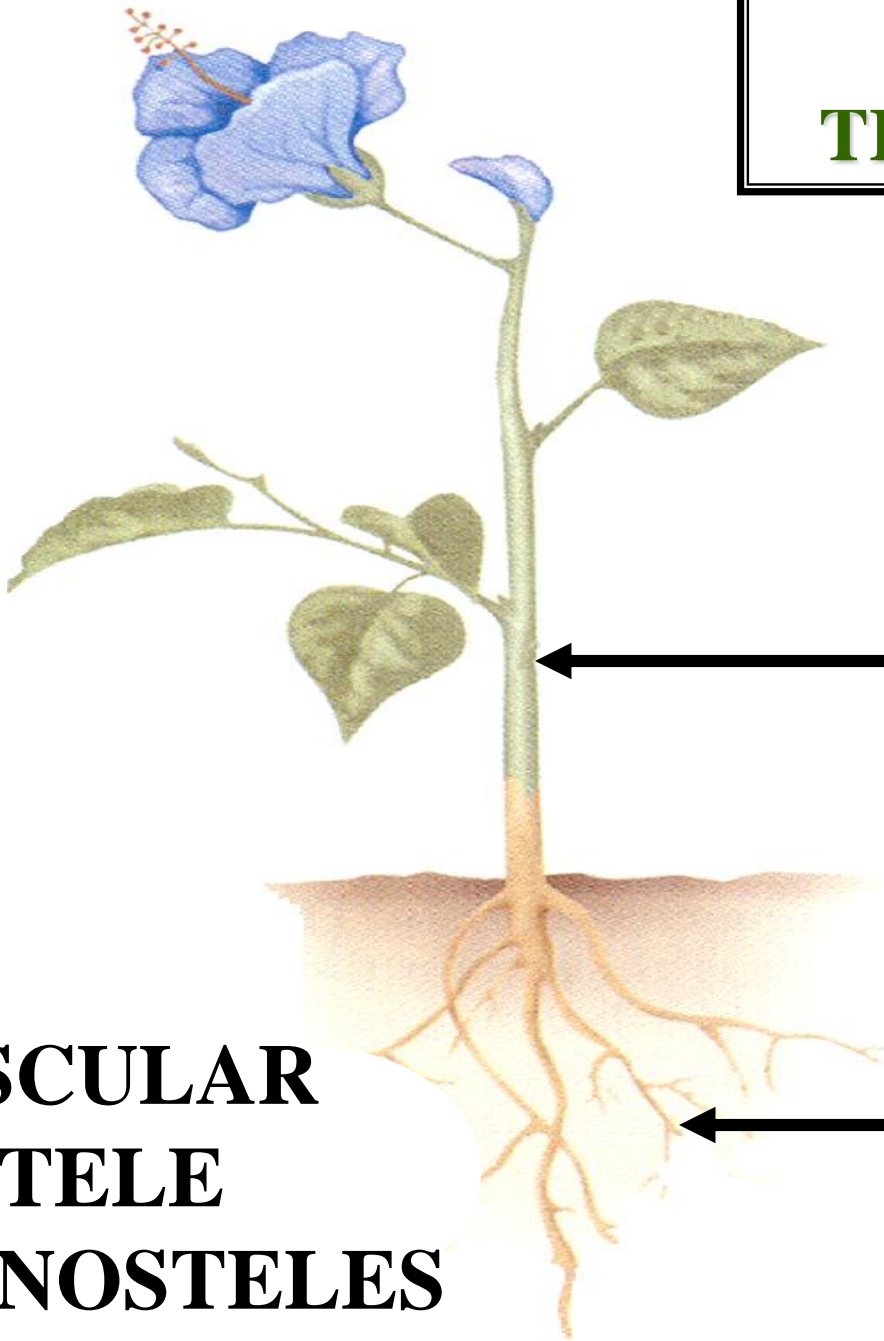
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**CONSIST  
PARENCHYMA CELLS**

**VASCULAR STELE  
PITH**



**TYPICAL  
TRACHEOPHYTE**



**STEM**

**ROOT**

**VASCULAR  
STELE**

**SIPHONOSTELES**

# SIPHONOSTELE TYPES

# **SIPHONOSTELE TYPES**

**ECTOPHLOIC**

# **SIPHONOSTELE TYPES**



# **SIPHONOSTELE TYPES**

**ECTOPHLOIC  
AMPHIPHOLIC**

**SIPHONOSTELE  
TYPES**

# SIPHONOSTELE TYPES

ECTOPHLOIC  
AMPHIPHOLIC  
EUSTELE

# SIPHONOSTELE TYPES

**ECTOPHLOIC**

**SIPHONOSTELE  
ECTOPHOLIC**



**PHLOEM OUTSIDE XYLEM**

**SIPHONOSTELE  
ECTOPHOLIC**



**EPIDERMIS**

**VASCULAR STELE**

**CORTEX**

**PITH**

**PLANT X-SECTION**

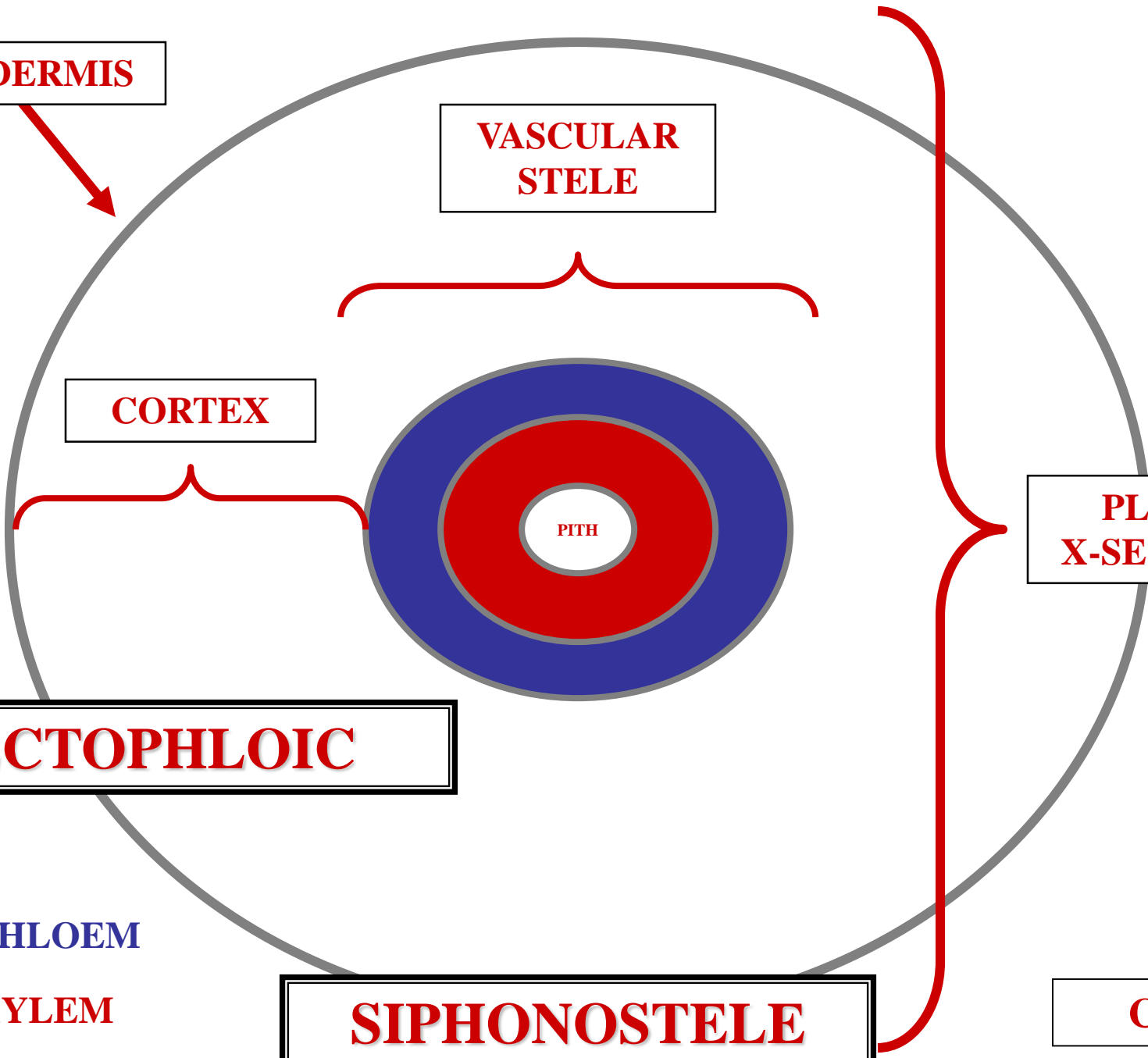
**ECTOPHLOIC**

**SIPHONOSTELE**

**C.S.**

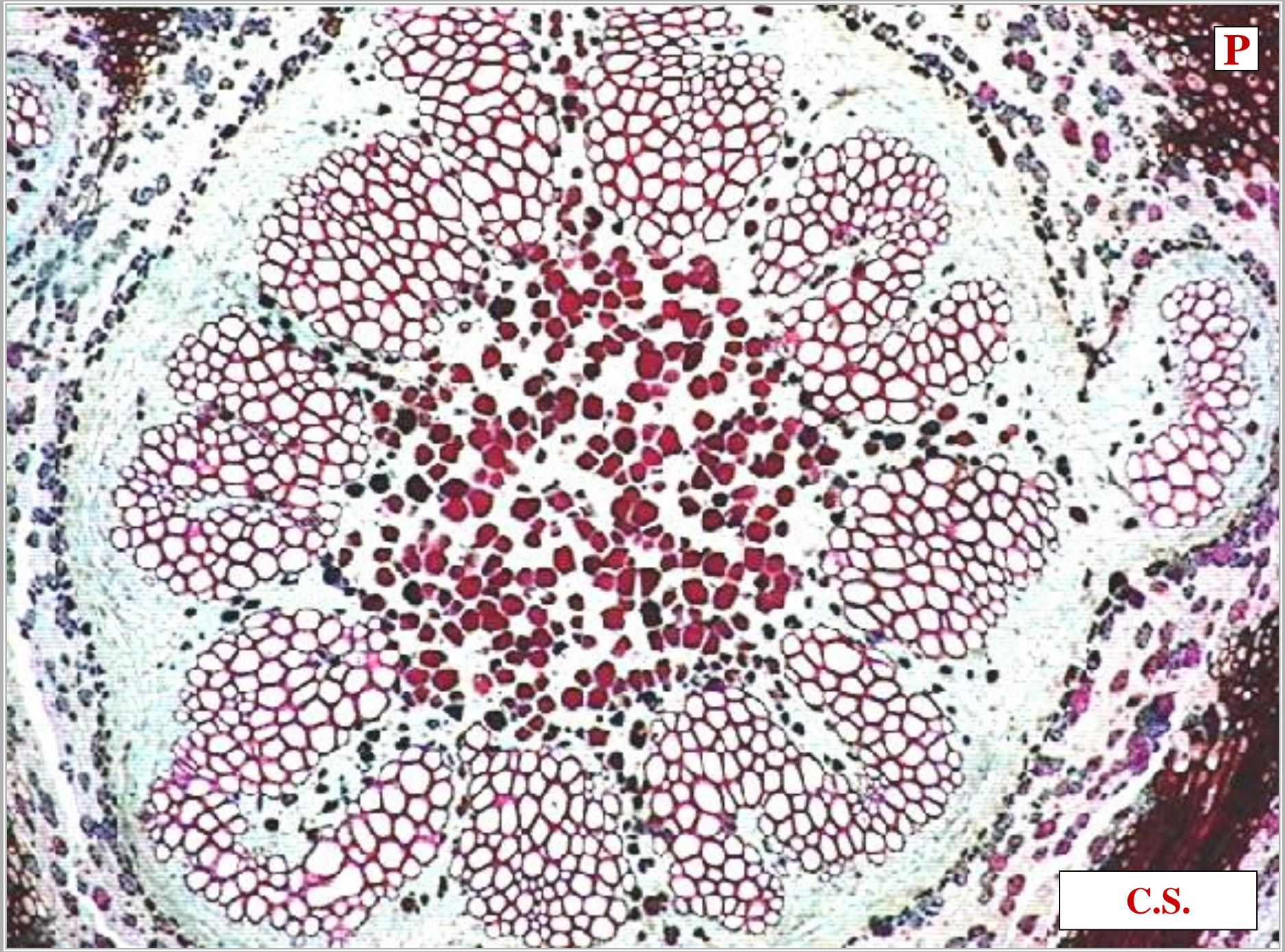
**= PHLOEM**

**= XYLEM**



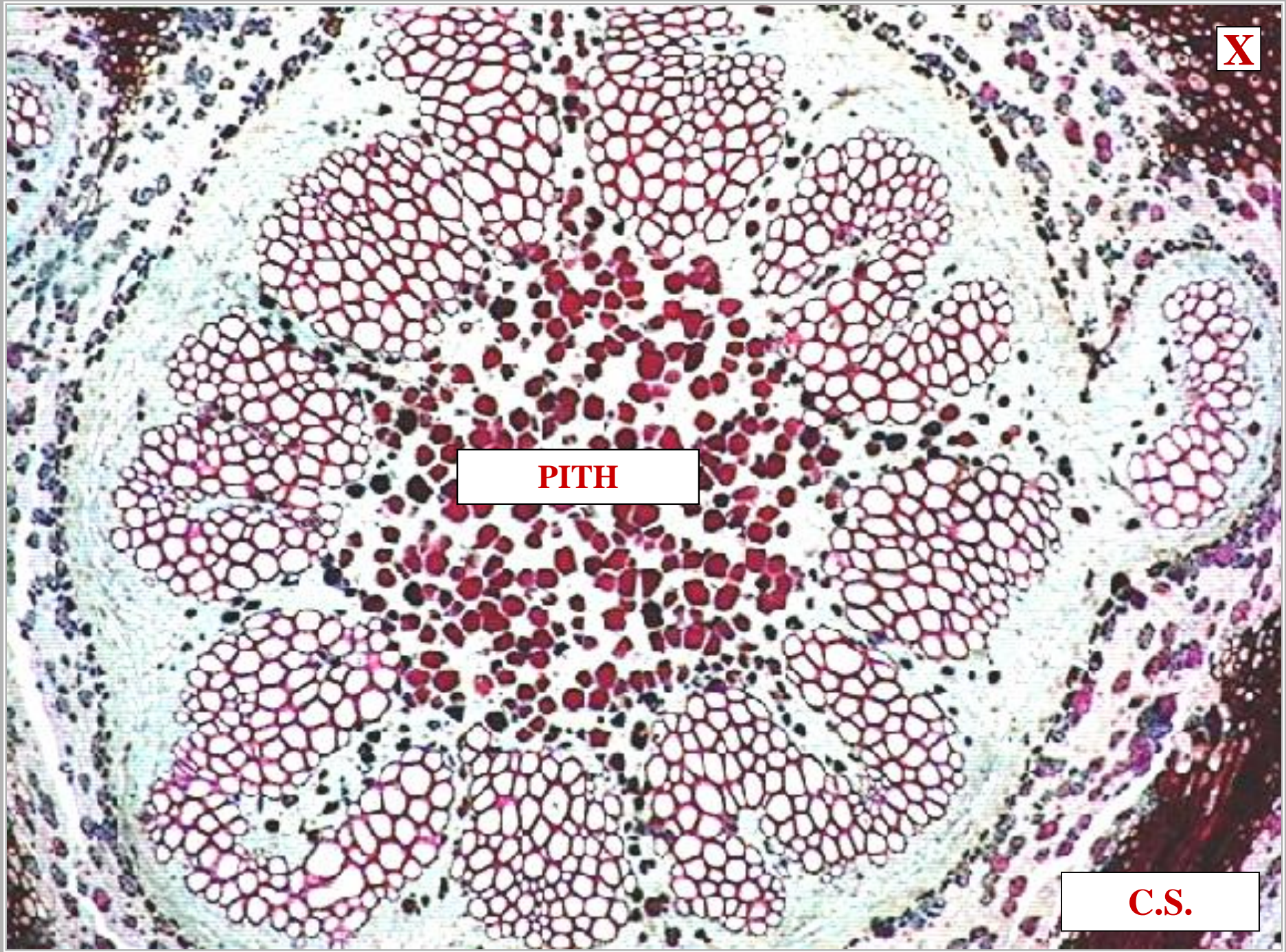


P



C.S.





**PITH**

**C.S.**

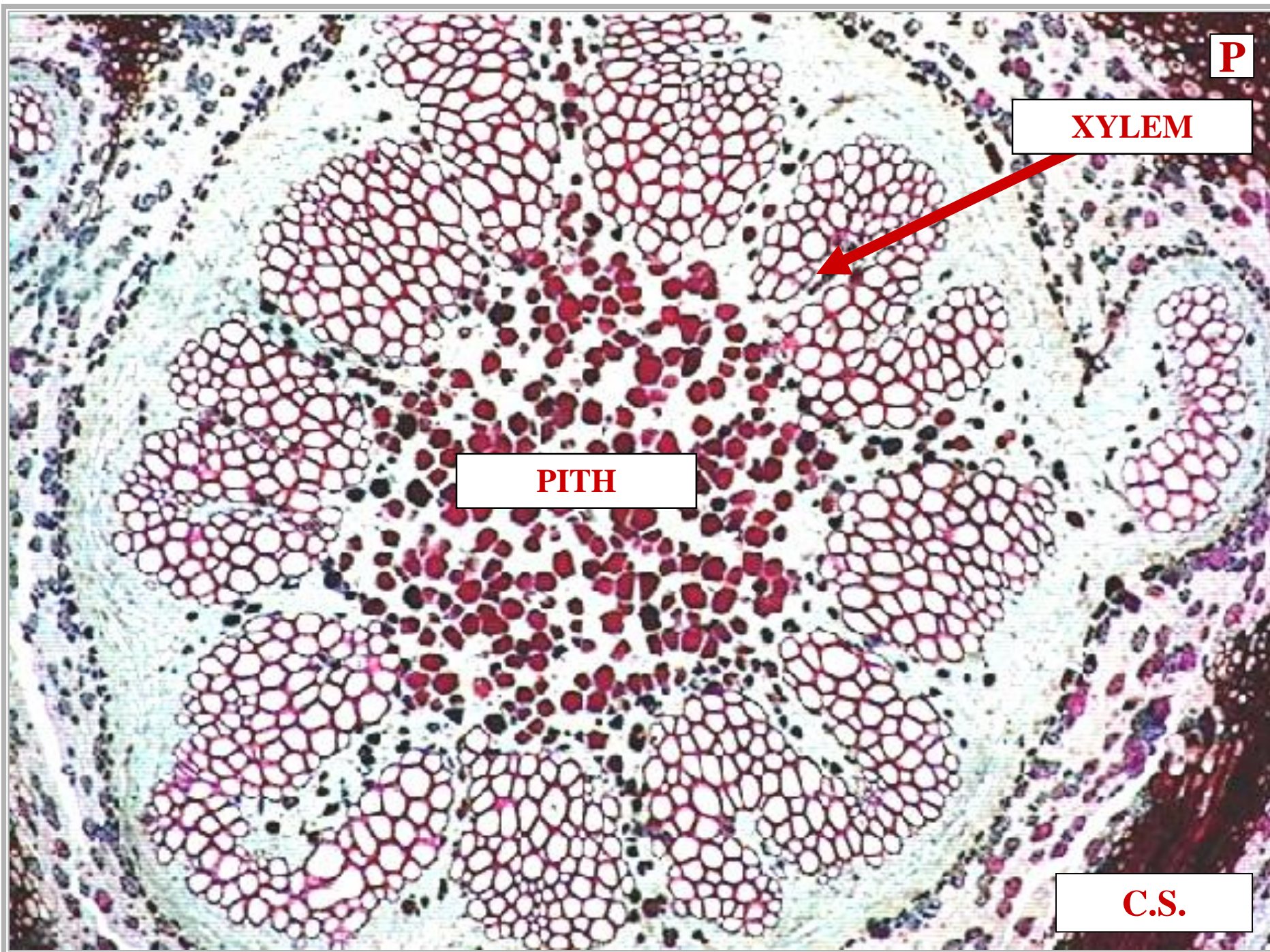


**P**

**XYLEM**

**PITH**

**C.S.**



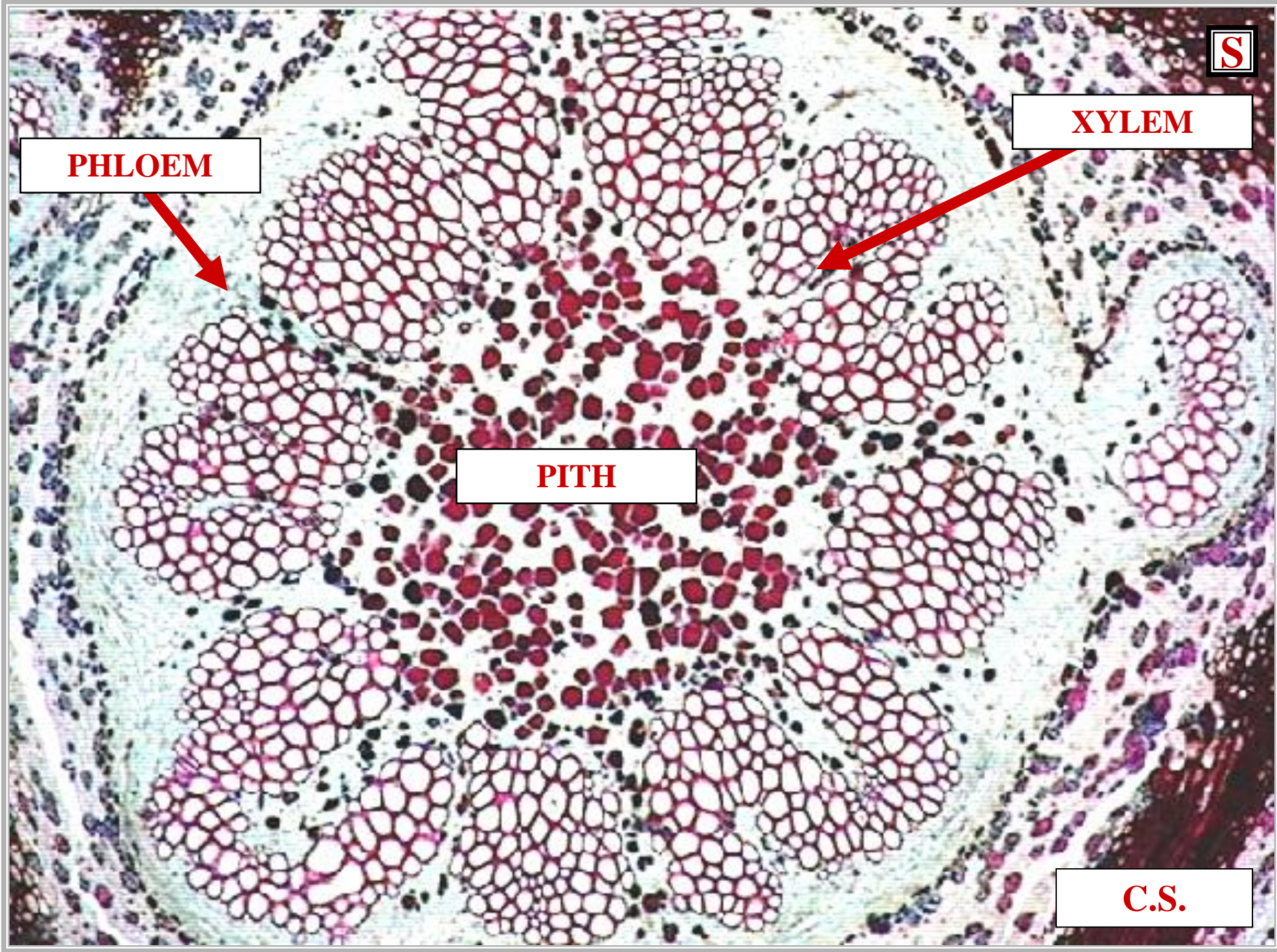


**PHLOEM**

**XYLEM**

**PITH**

**C.S.**



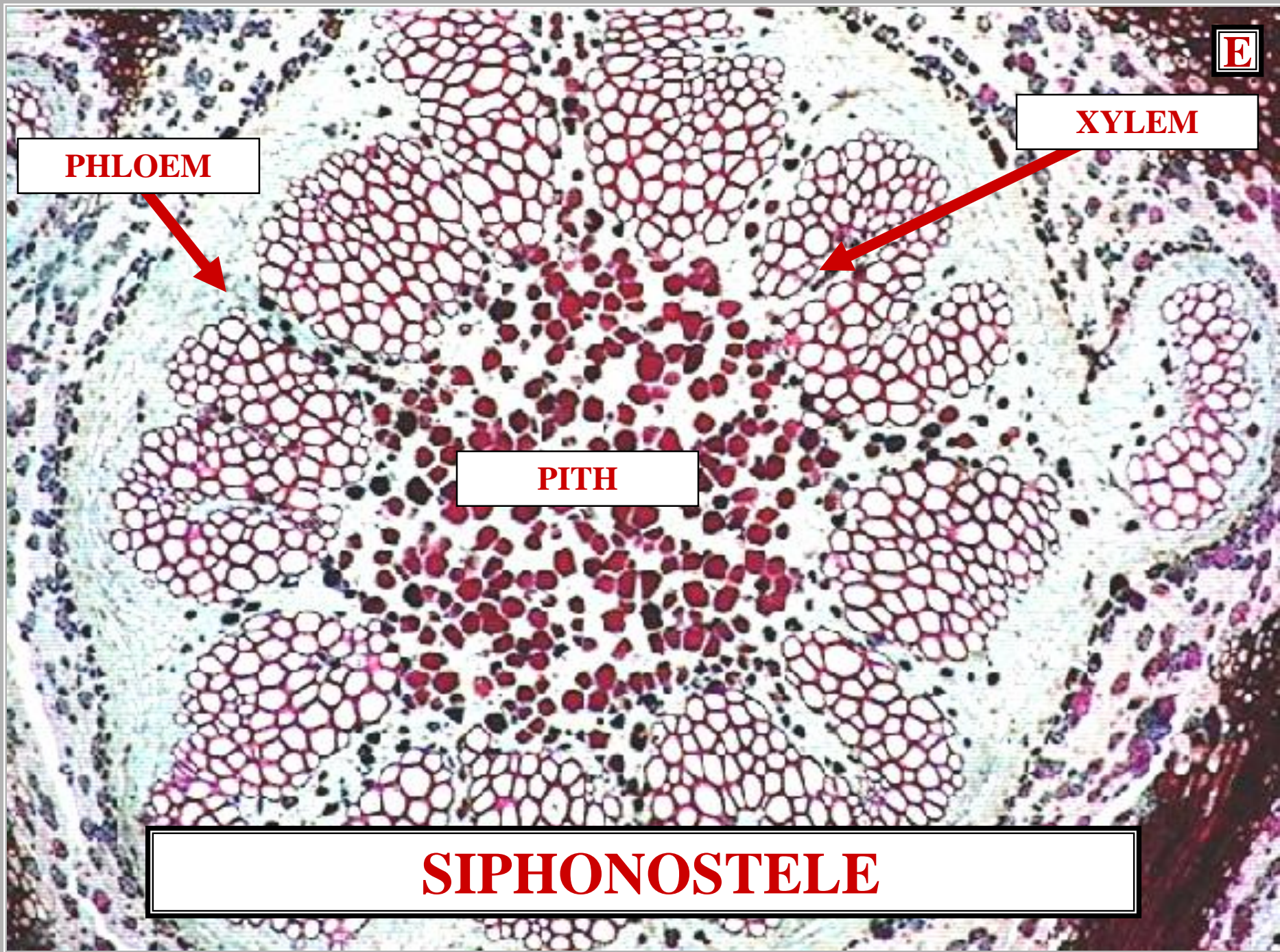


**PHLOEM**

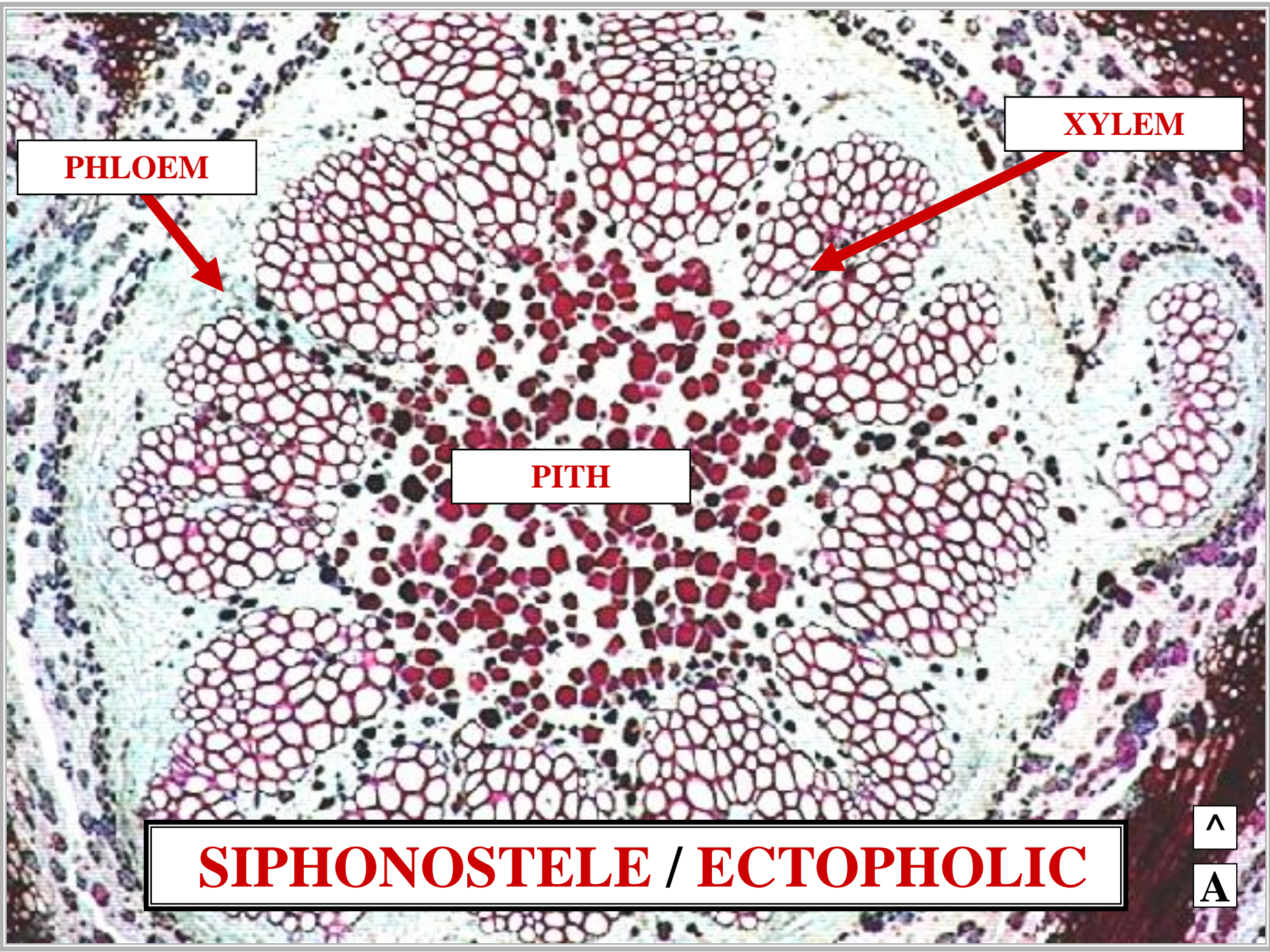
**XYLEM**

**PITH**

**SIPHONOSTELE**







**PHLOEM**

**XYLEM**

**PITH**

**SIPHONOSTELE / ECTOPHOLIC**

^

A

**AMPHIPHOLIC**

**SIPHONOSTELE  
AMPHIPHLOIC**



**PHLOEM  
OUTSIDE AND INSIDE  
XYLEM**

**SIPHONOSTELE  
AMPHIPHLOIC**



**EPIDERMIS**



**VASCULAR STELE**



**CORTEX**



**PITH**

**PLANT X-SECTION**



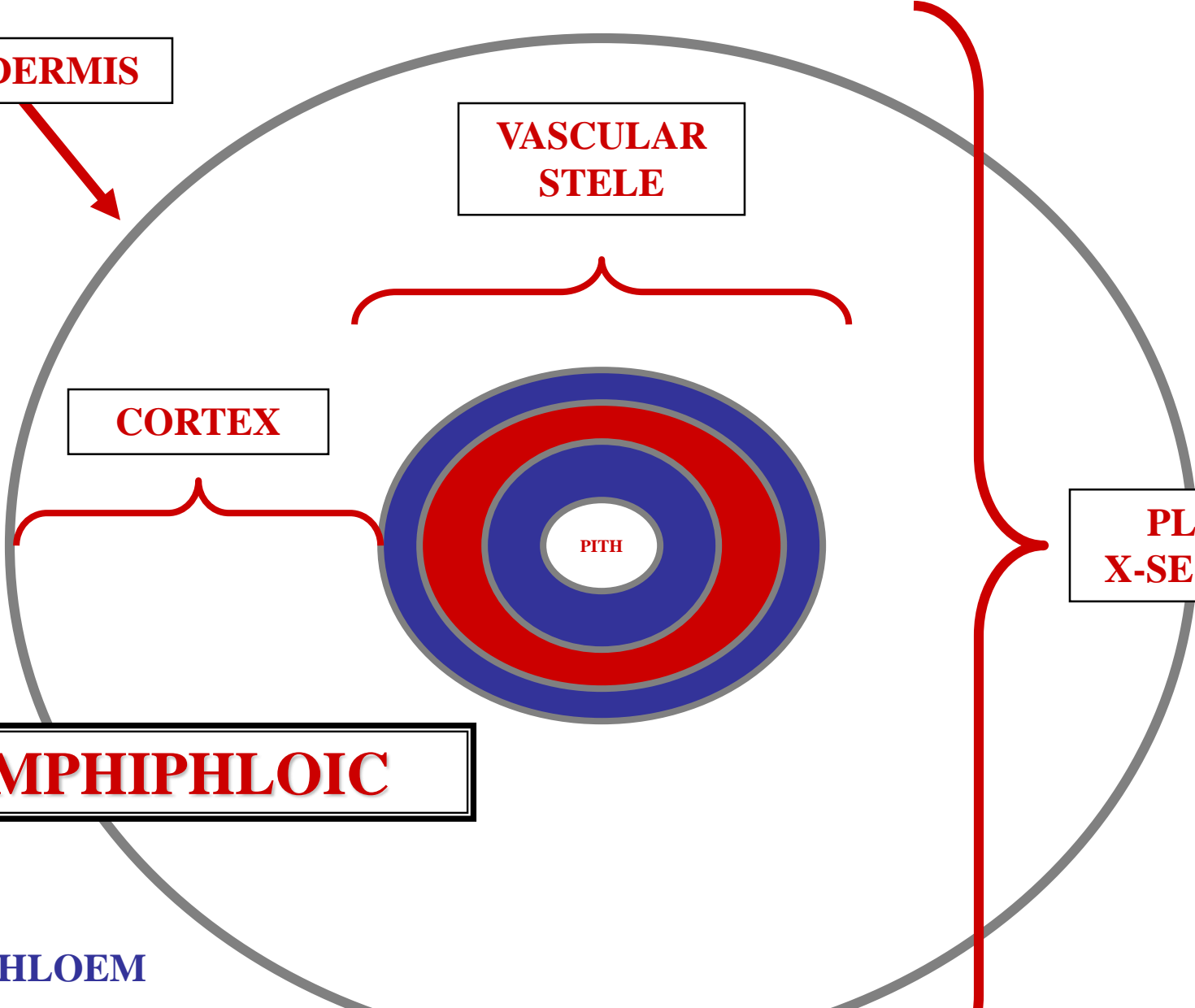
**AMPHIPHLOIC**

**● = PHLOEM**

**● = XYLEM**

**SIPHONOSTELE**

**C.S.**





**P**

**C.S.**

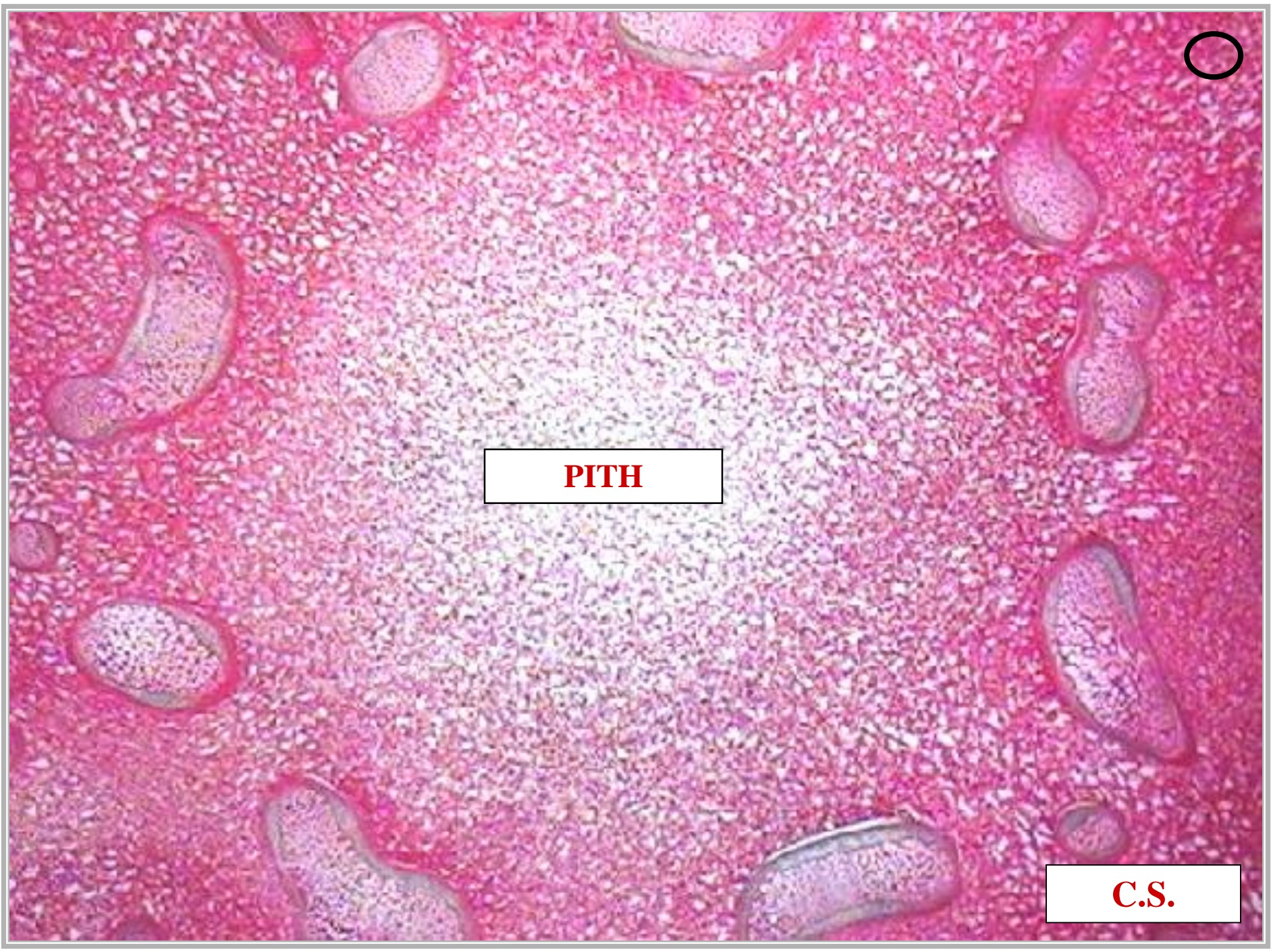






**PITH**

**C.S.**



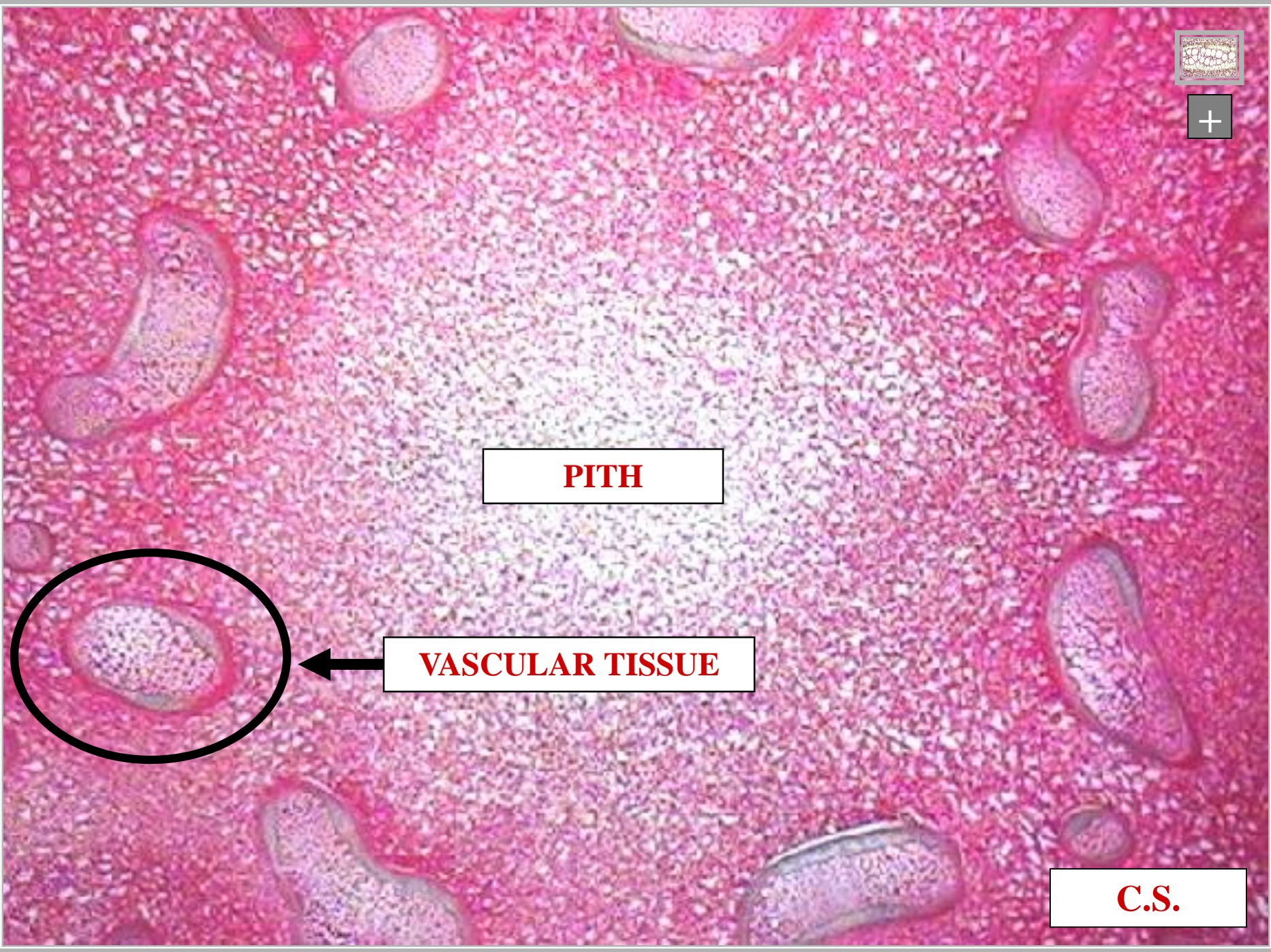




**PITH**

**VASCULAR TISSUE**

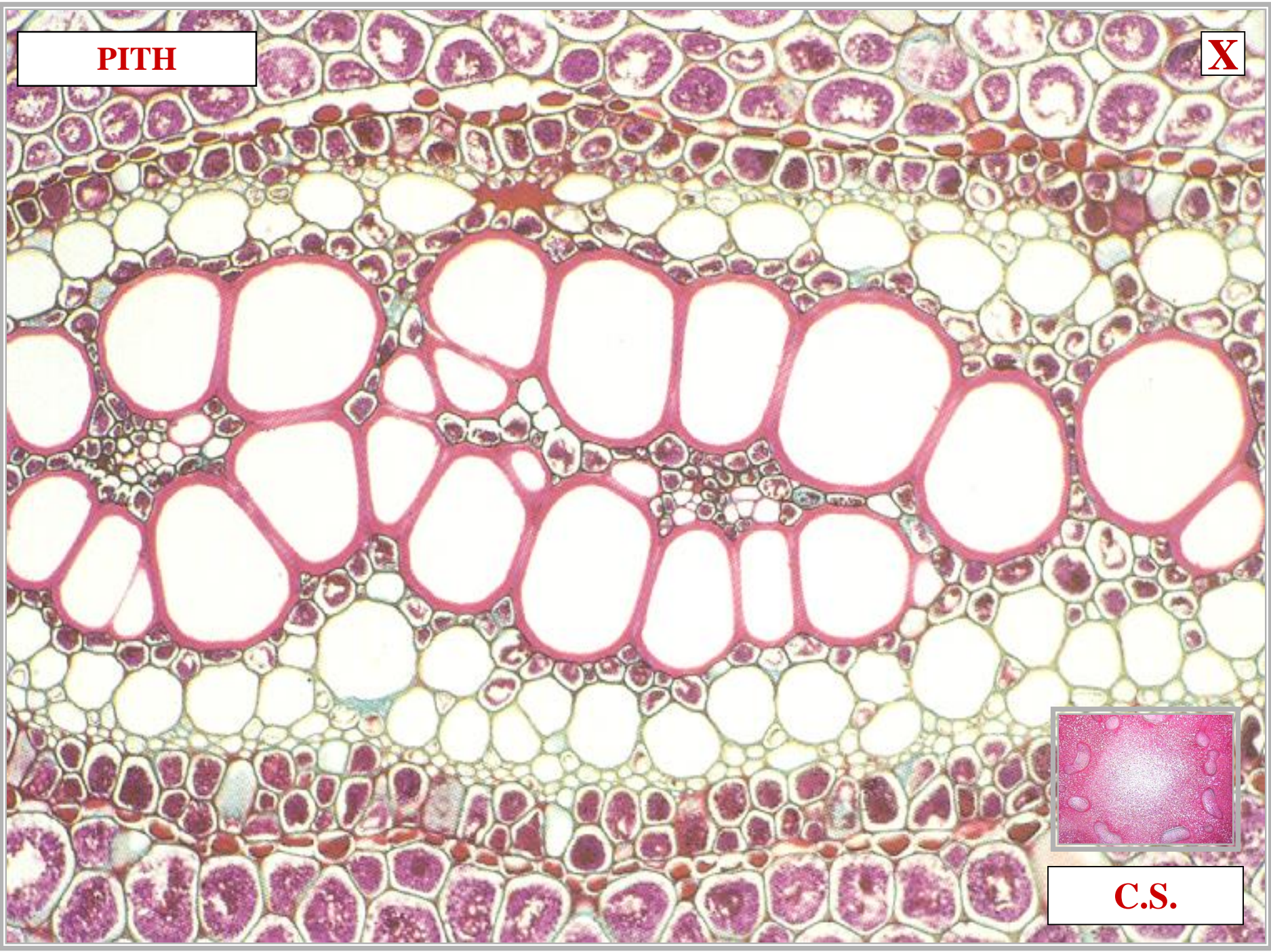
**C.S.**





**PITH**

**X**



**C.S.**

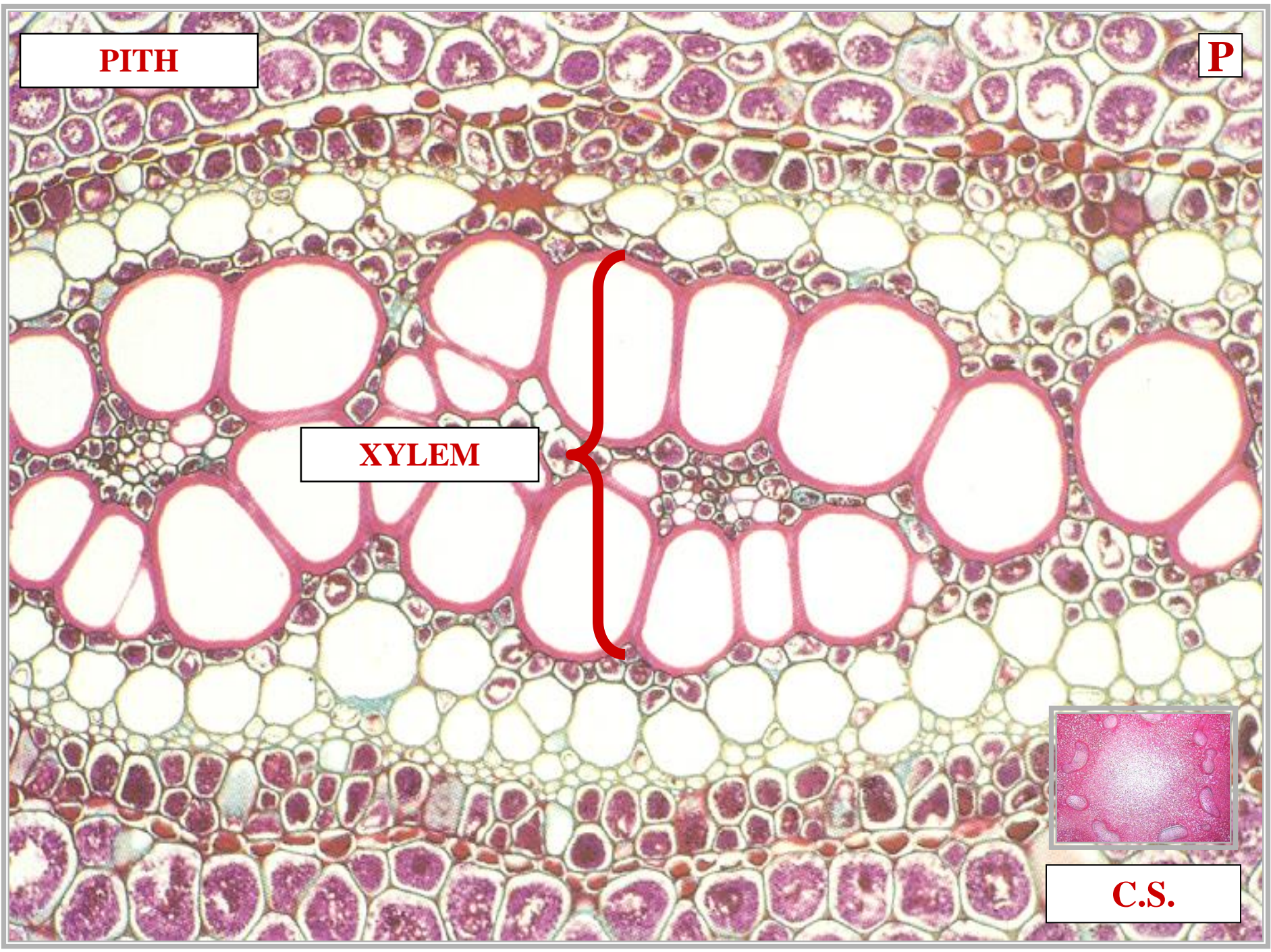


**PITH**

**P**

**XYLEM**

**C.S.**





**S**

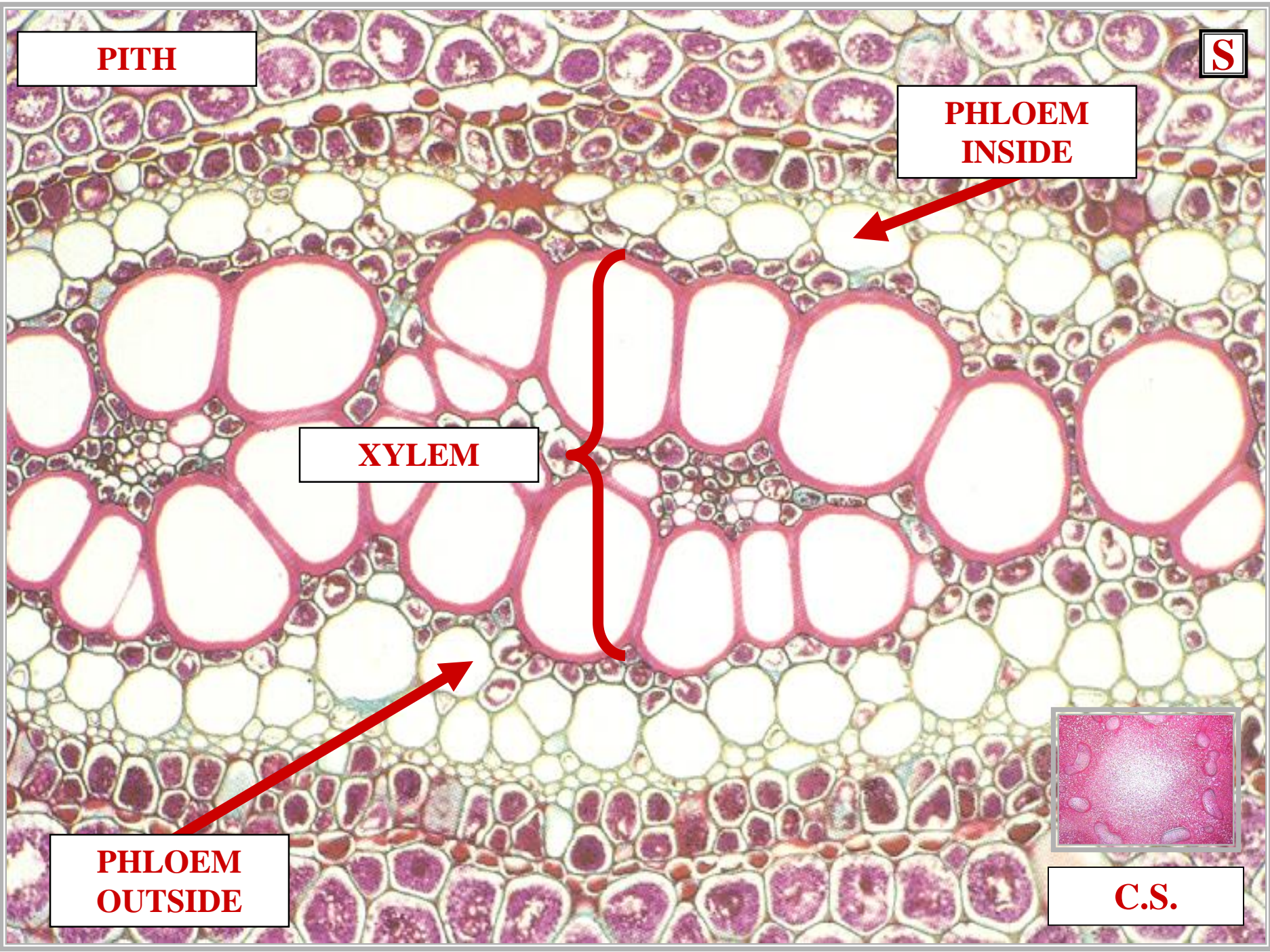
**PITH**

**PHLOEM  
INSIDE**

**XYLEM**

**PHLOEM  
OUTSIDE**

**C.S.**





**A**

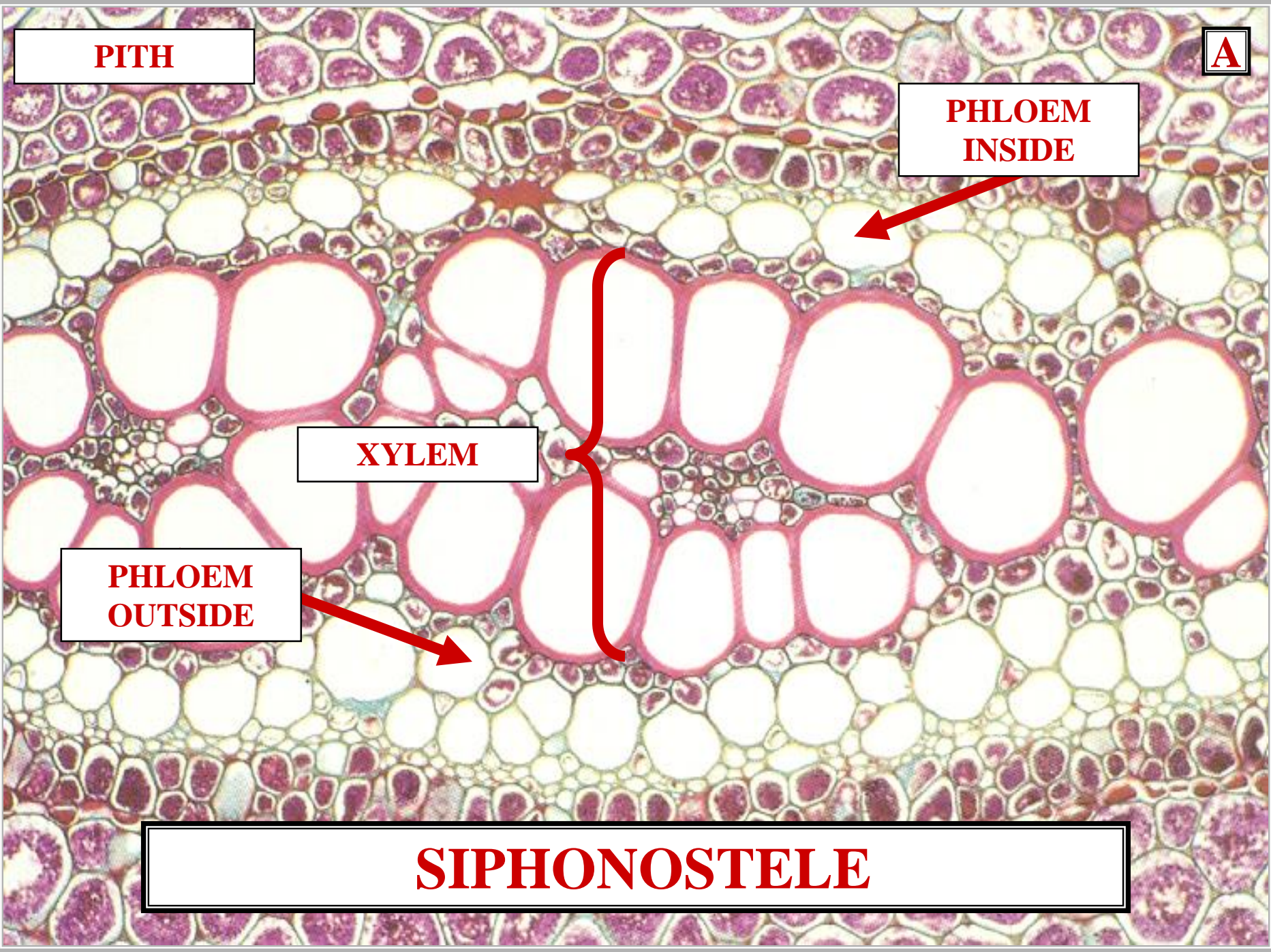
**PITH**

**PHLOEM  
INSIDE**

**XYLEM**

**PHLOEM  
OUTSIDE**

**SIPHONOSTELE**





**PITH**

**PHLOEM  
INSIDE**

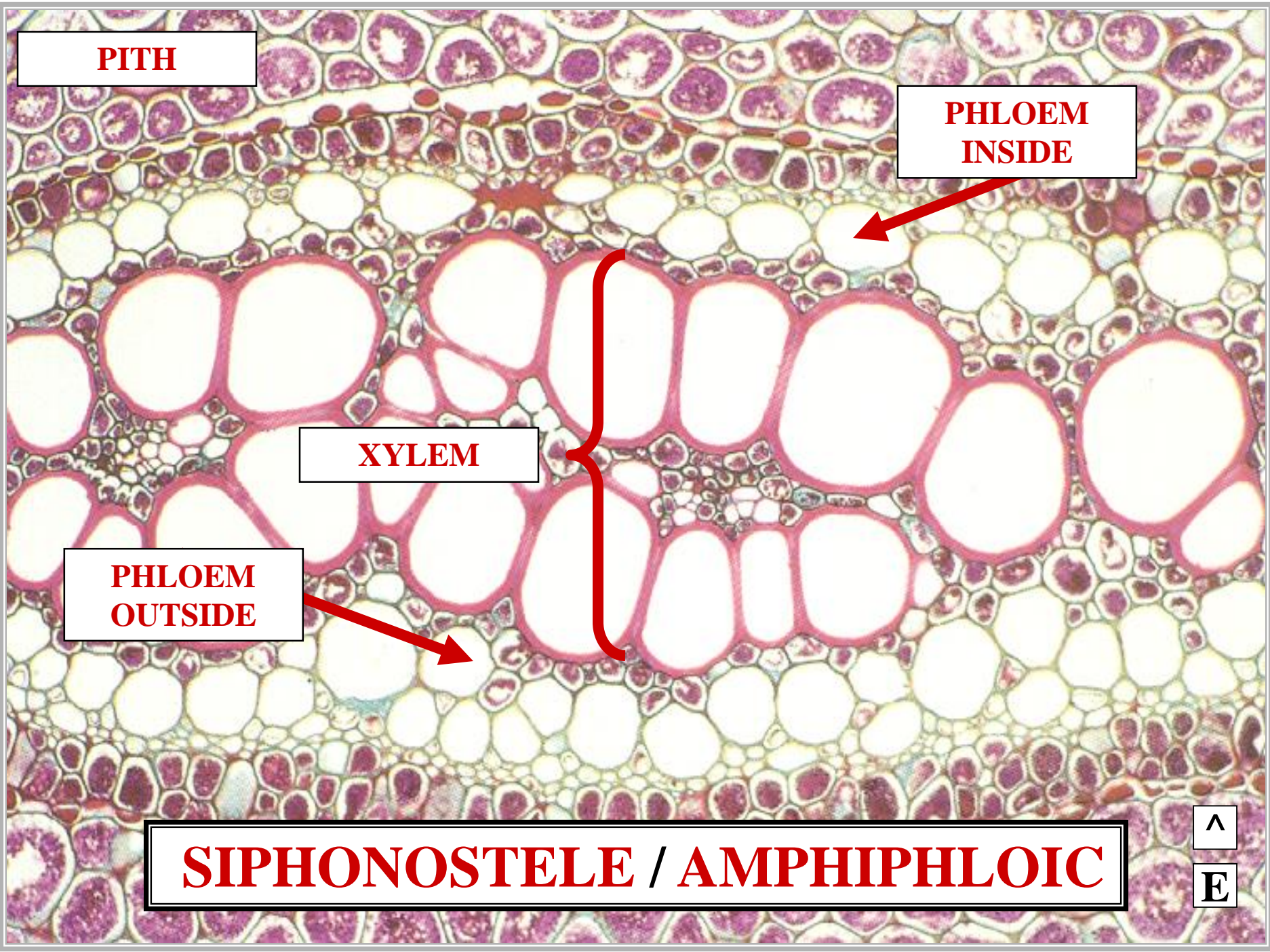
**XYLEM**

**PHLOEM  
OUTSIDE**

**SIPHONOSTELE / AMPHIPHLOIC**

^

E





**EUSTELE**

**SIPHONOSTELE  
EUSTELE**



**CONCENTRIC  
VASCULAR BUNDLES**

**SIPHONOSTELE  
EUSTELE**