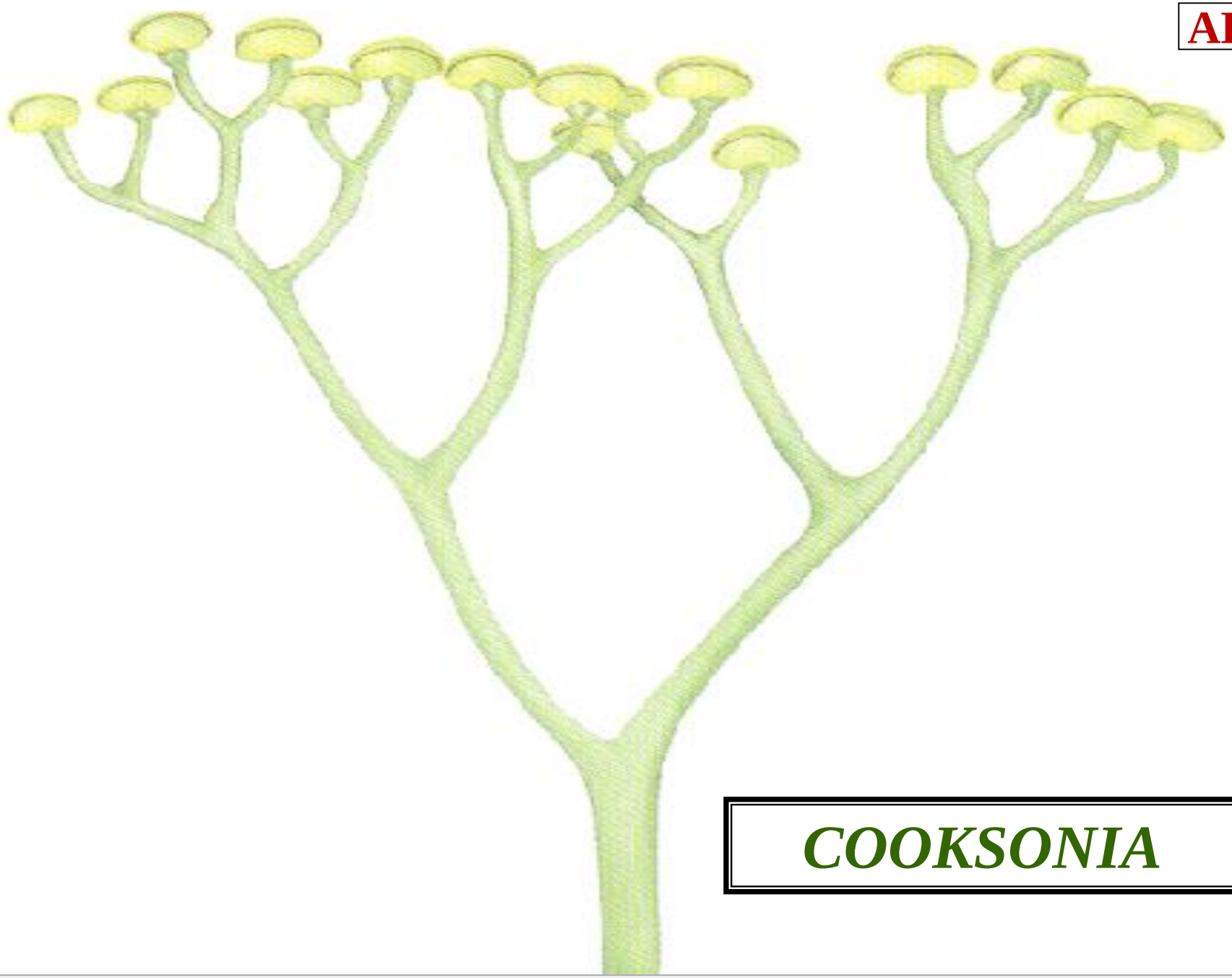
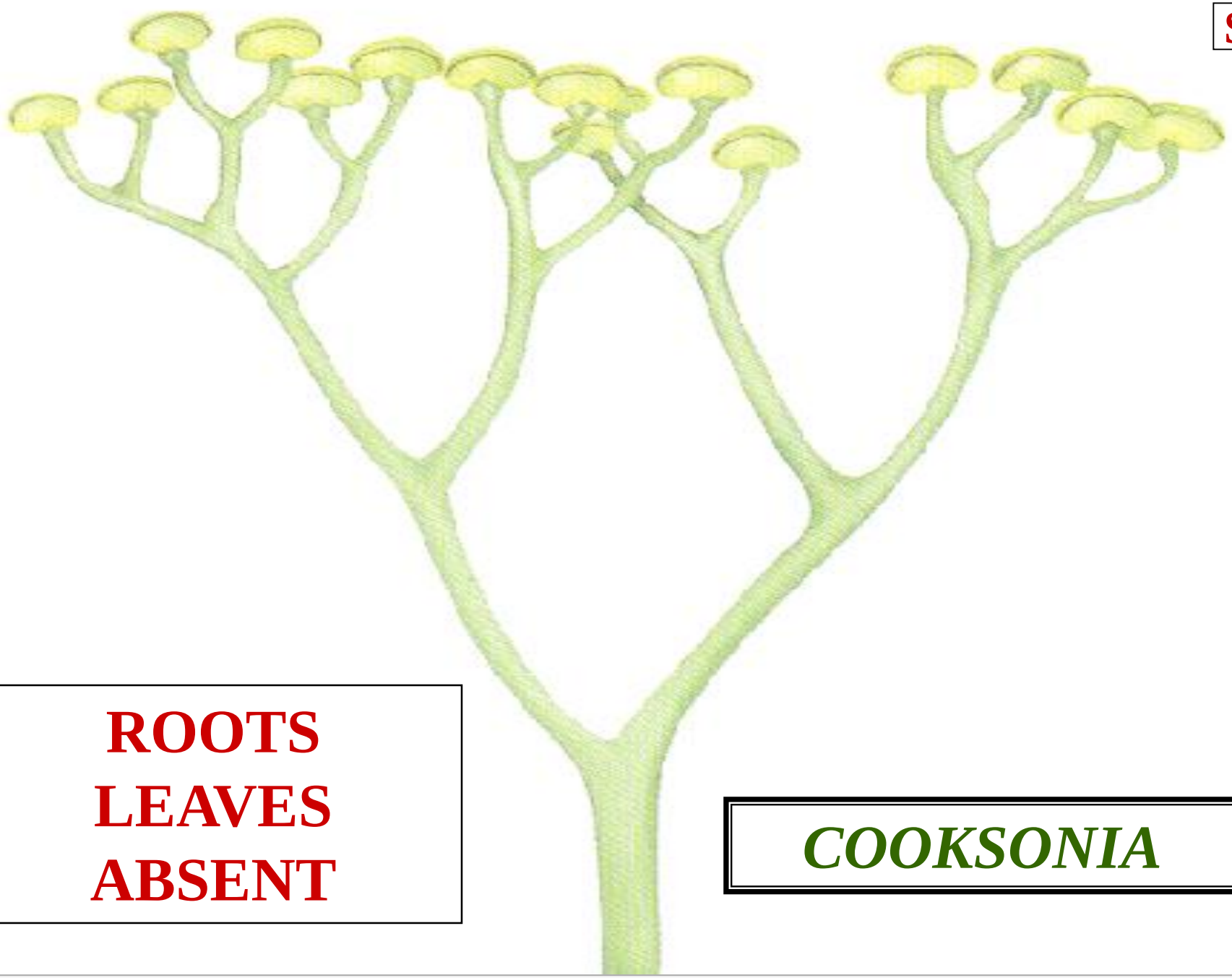
# ORGANS

AB



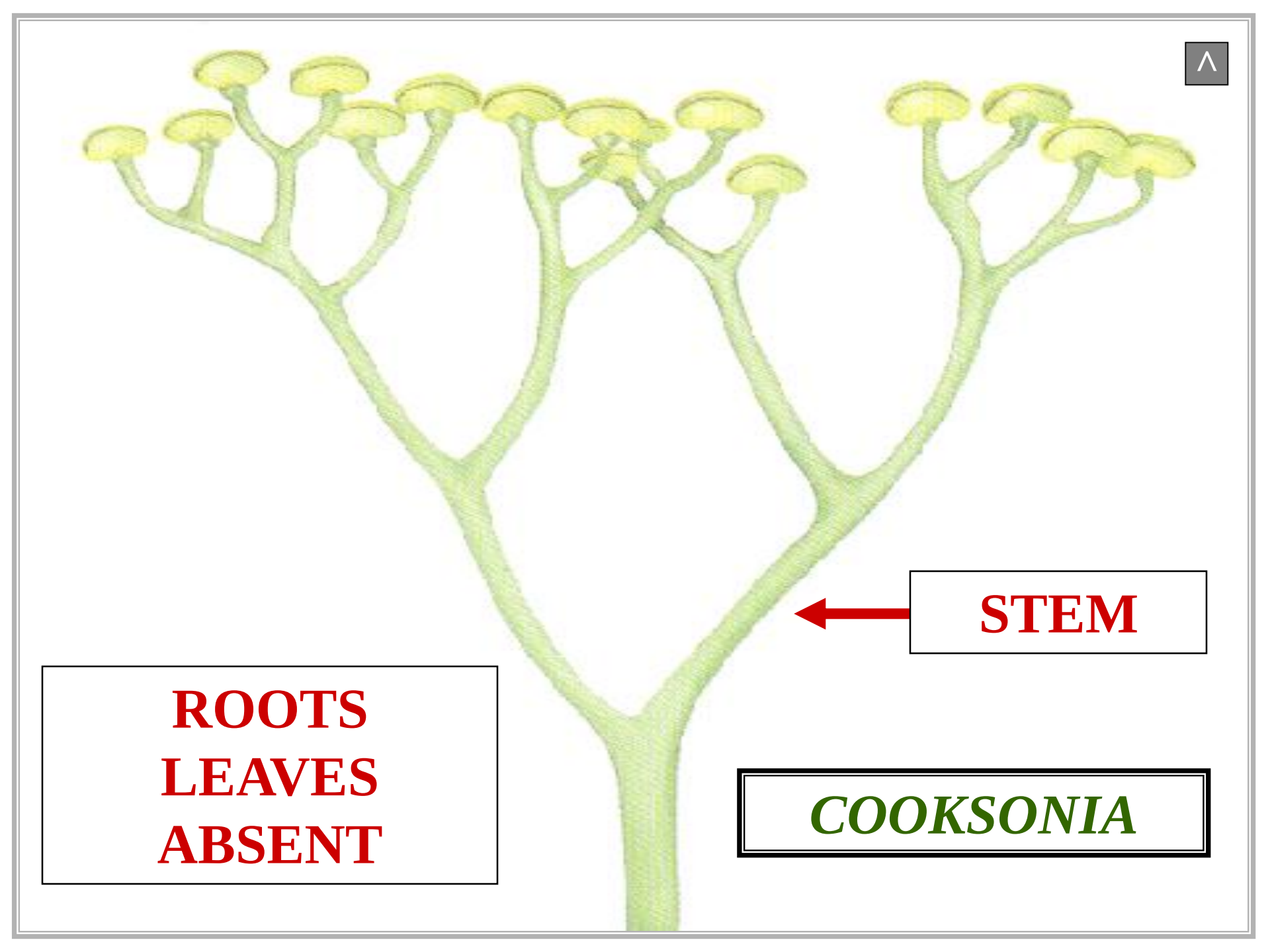
***COOKSONIA***

S



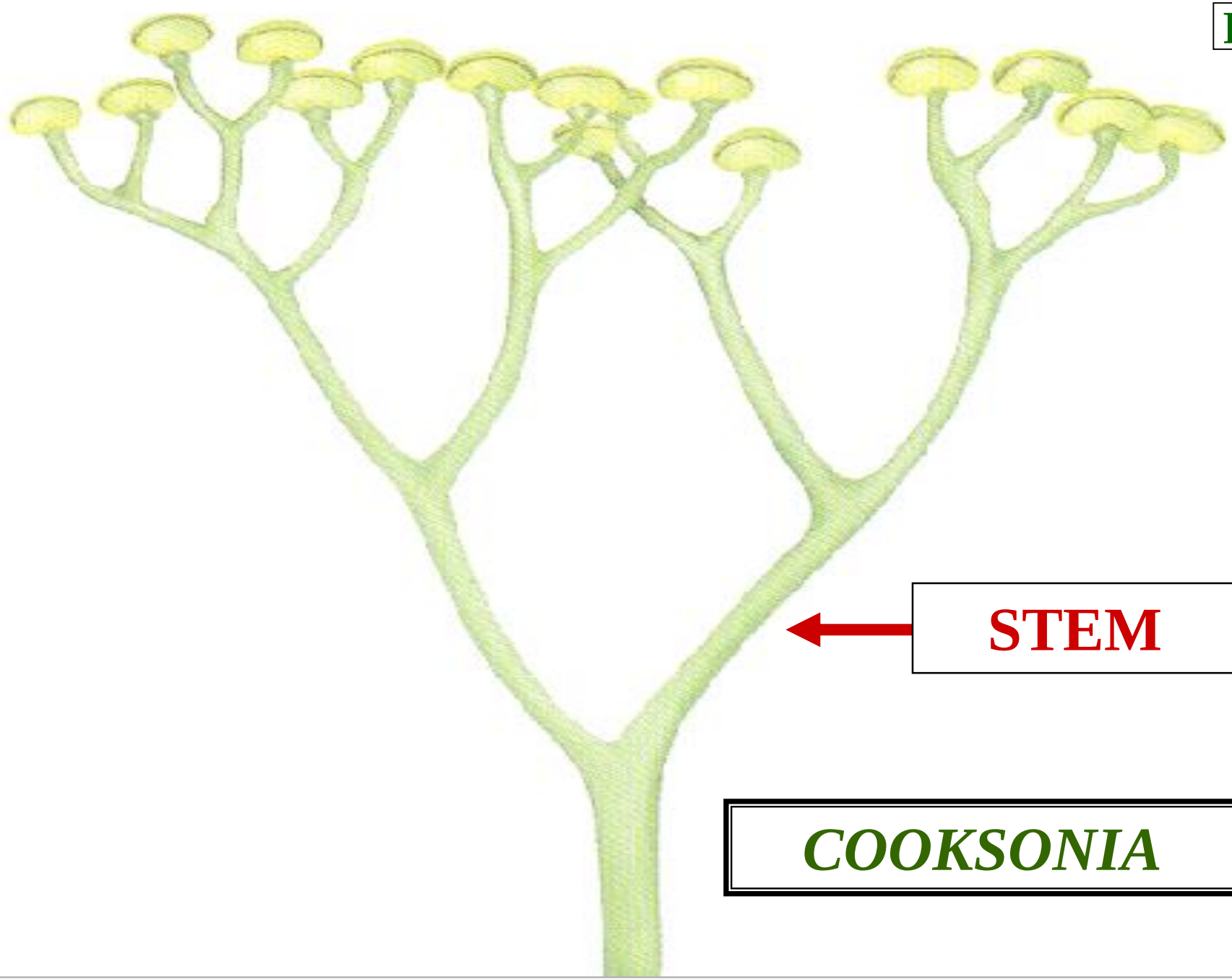
**ROOTS**
**LEAVES**
**ABSENT**

***COOKSONIA***


STEM
ROOTS
LEAVES
ABSENT
COOKSONIA

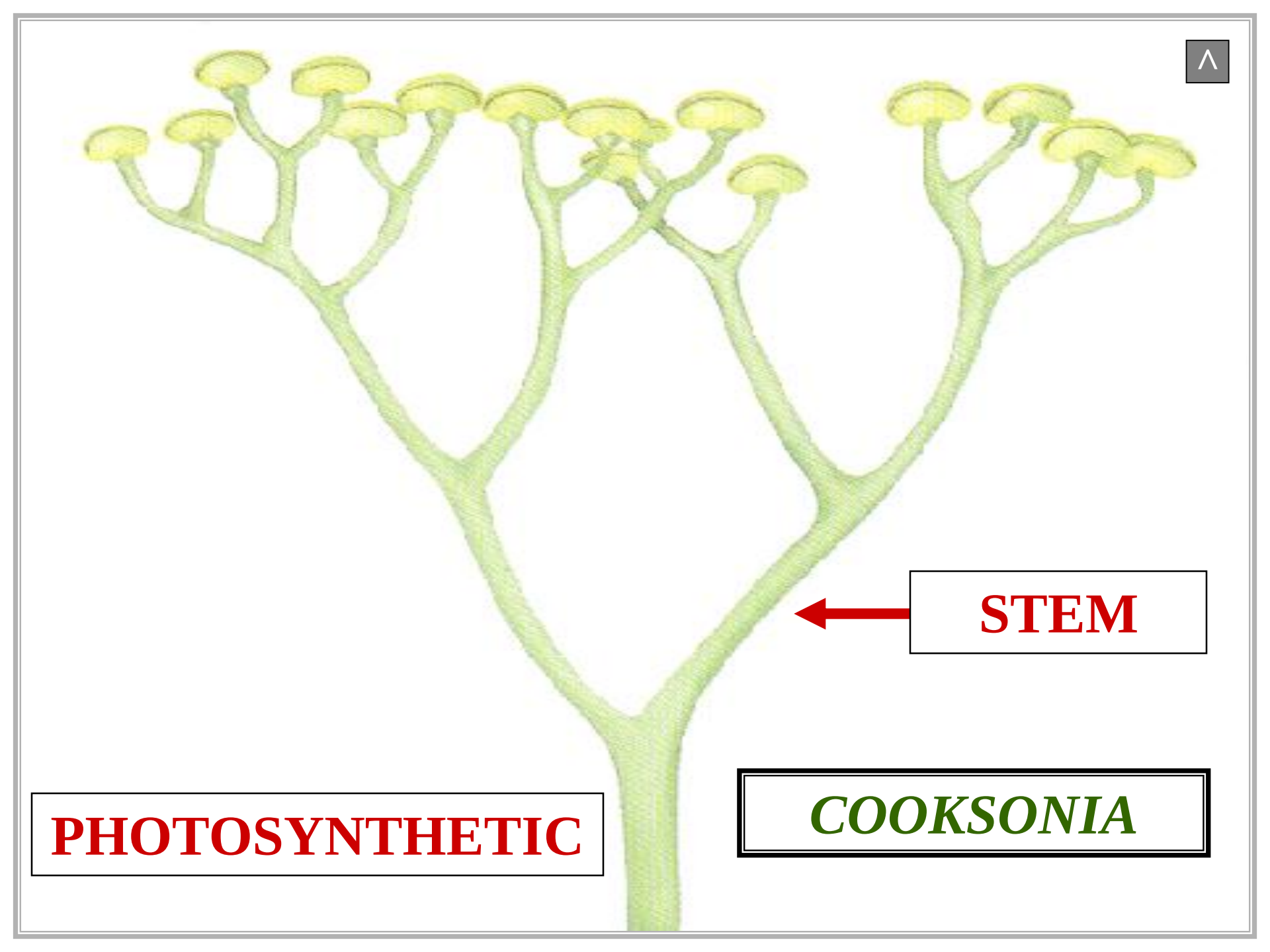
# STEM

P

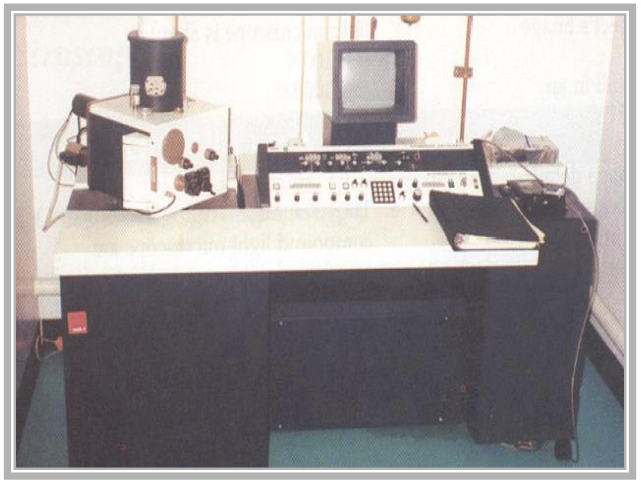


STEM

*COOKSONIA*


STEM
PHOTOSYNTHETIC
COOKSONIA

# STEM ANATOMY



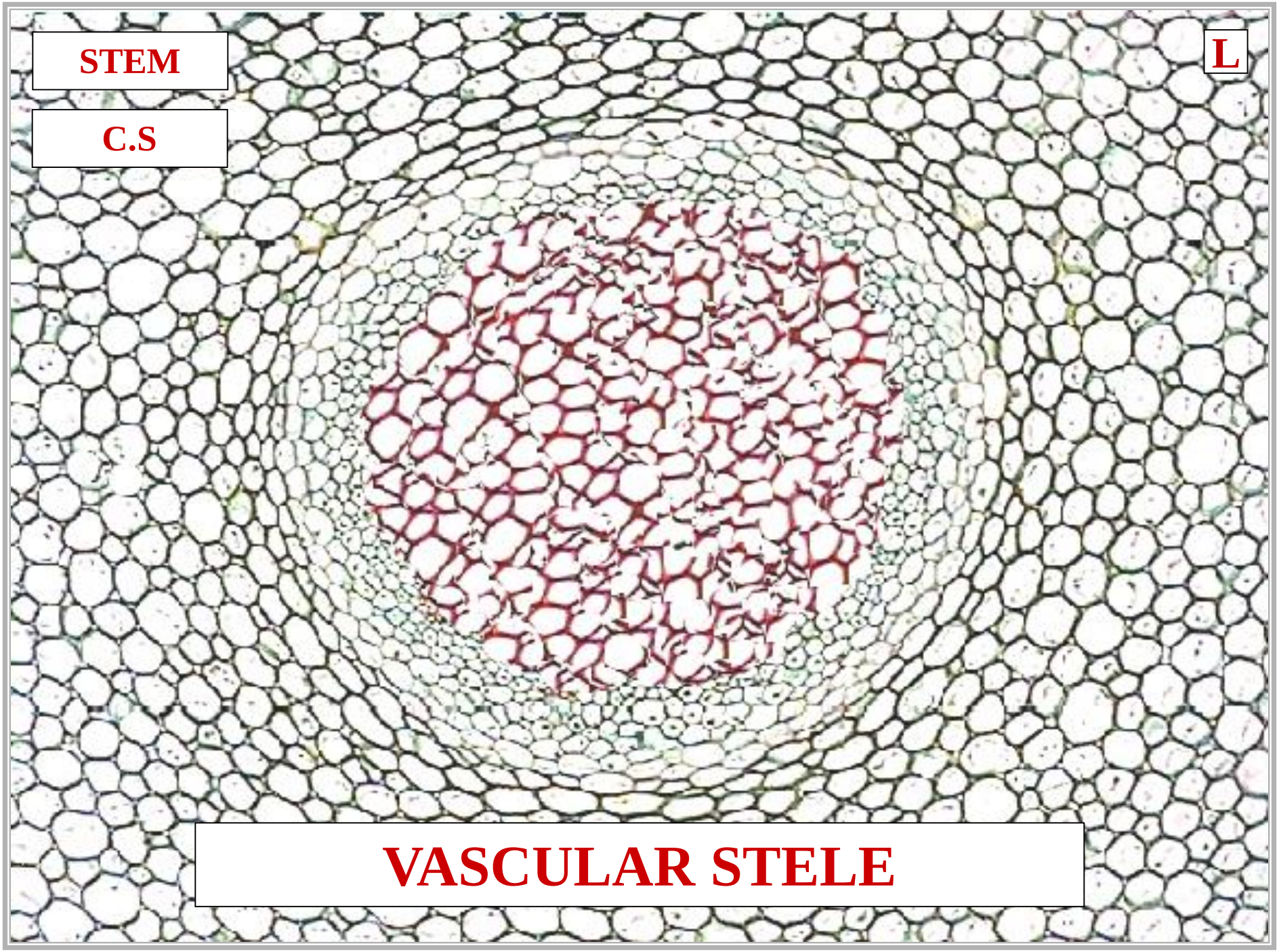
STEM

*COOKSONIA*

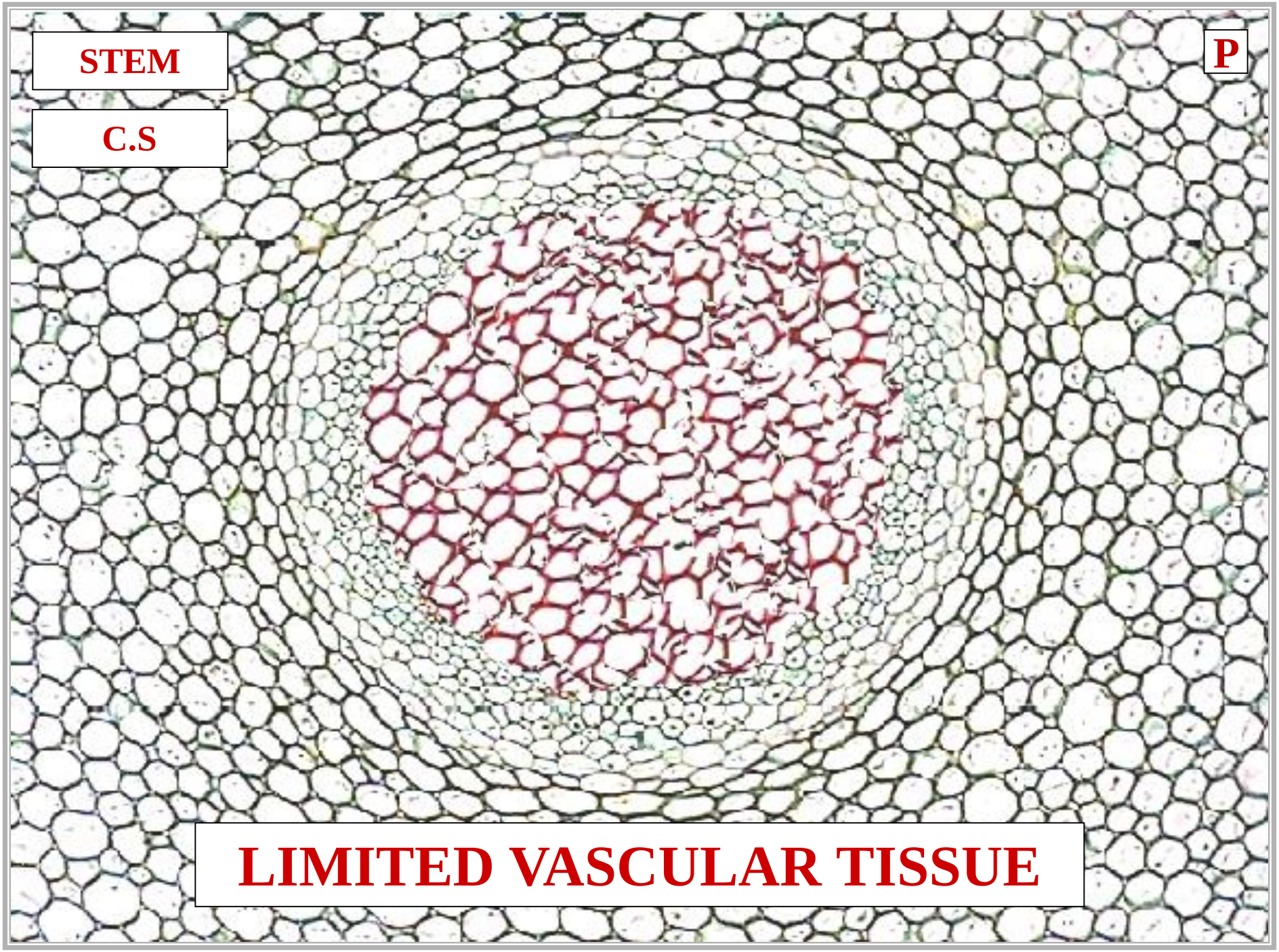
STEM

C.S

L



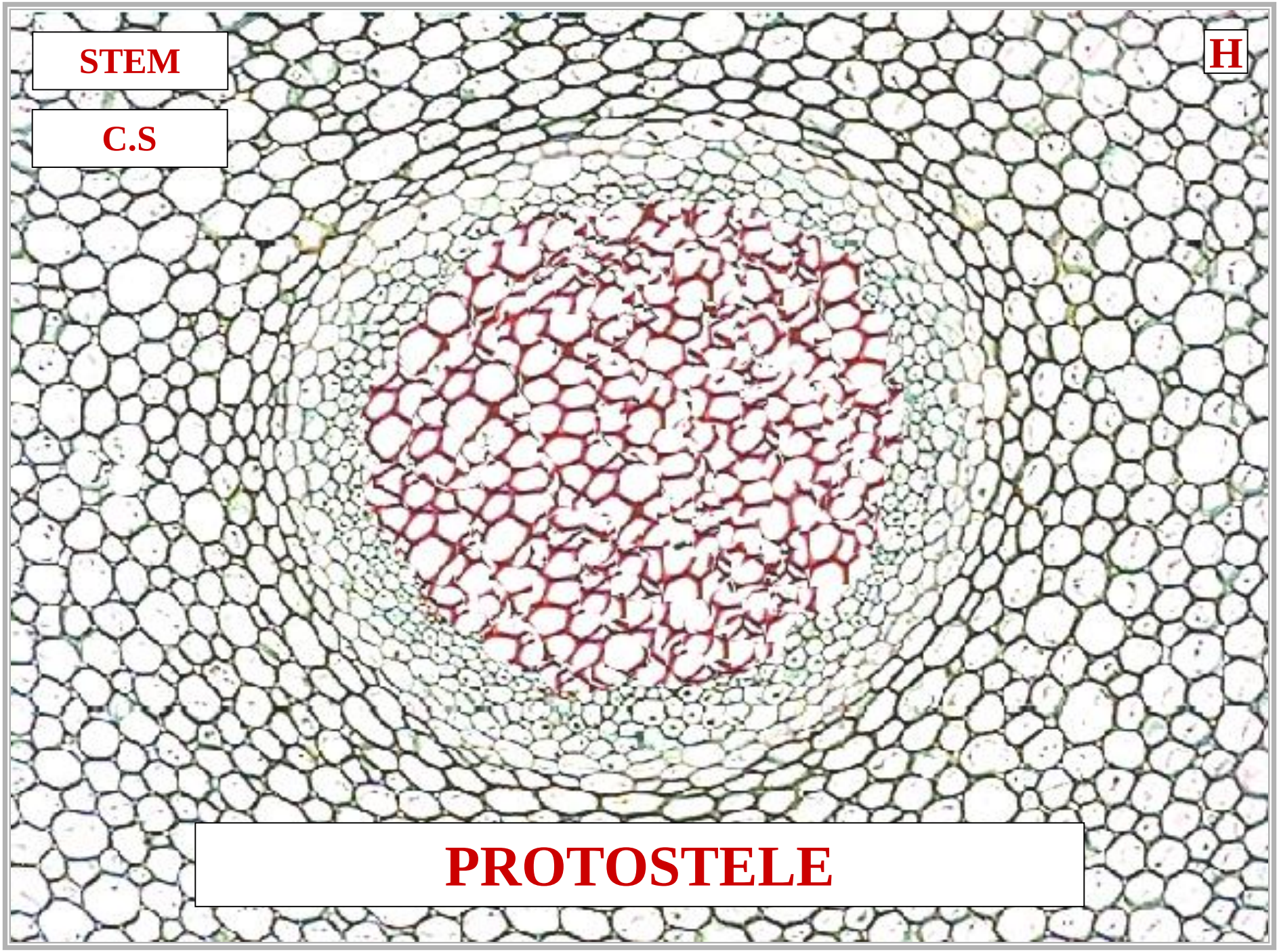
# VASCULAR STELE


STEM
C.S
P
LIMITED VASCULAR TISSUE

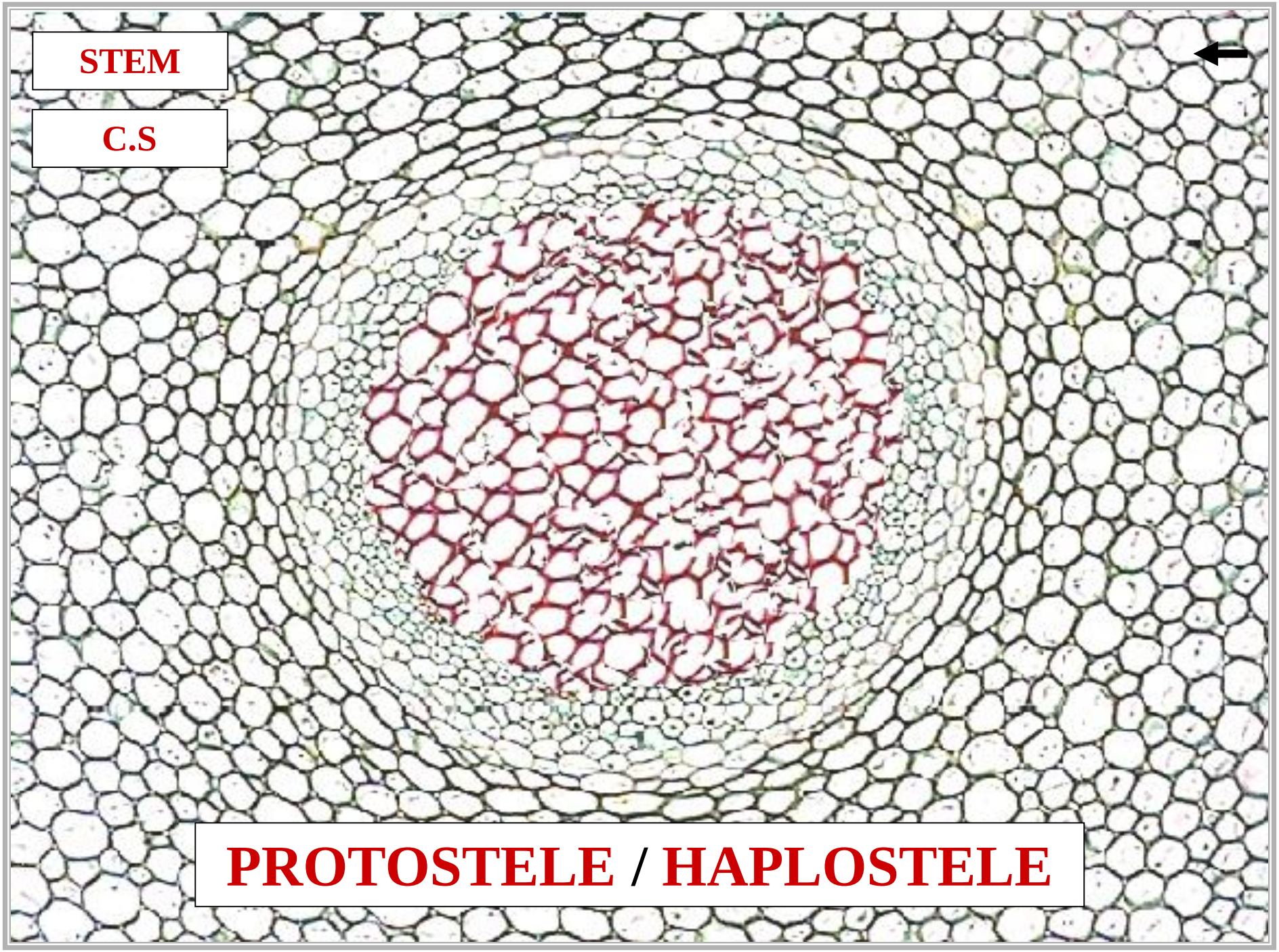
STEM

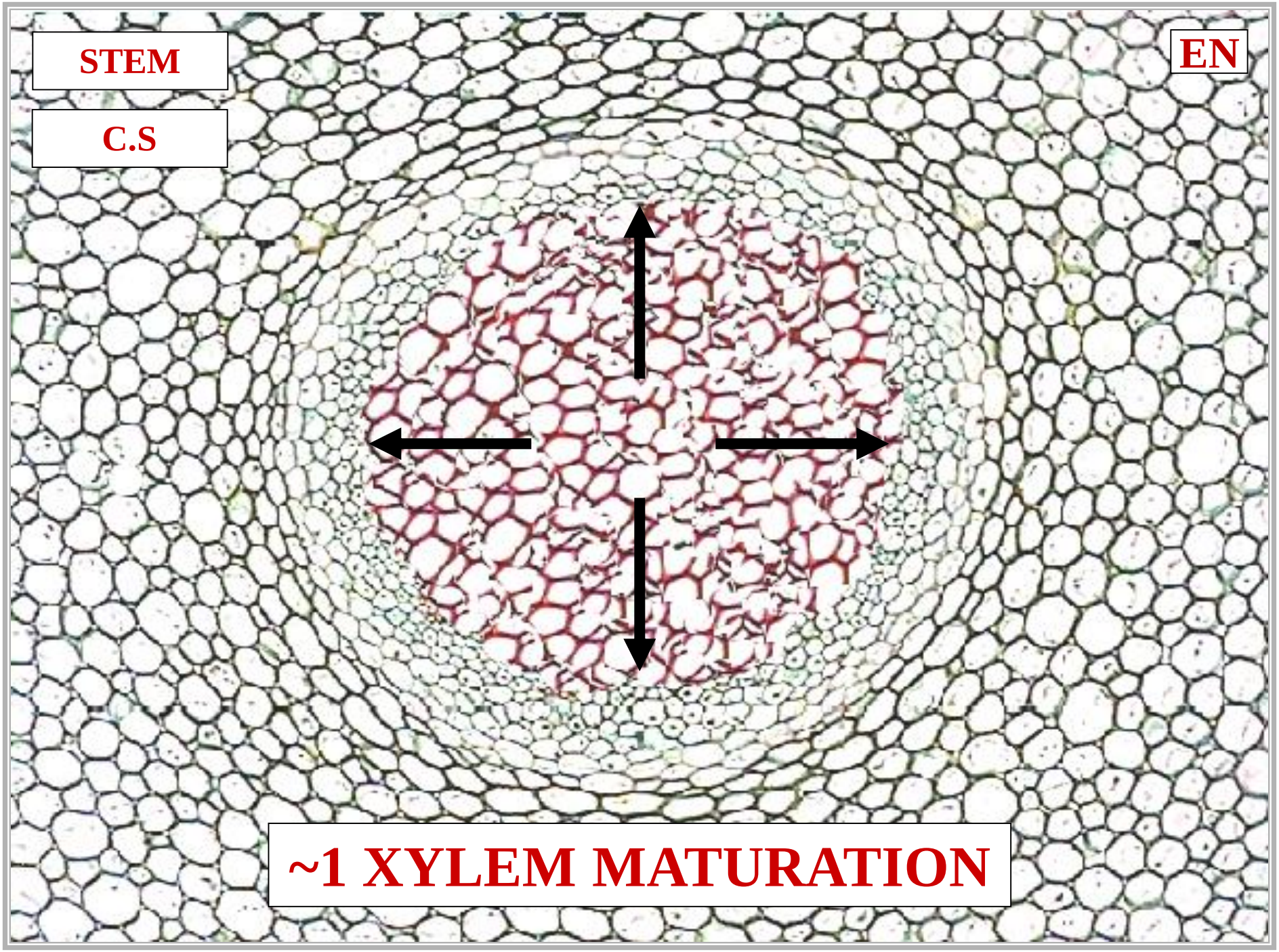
C.S

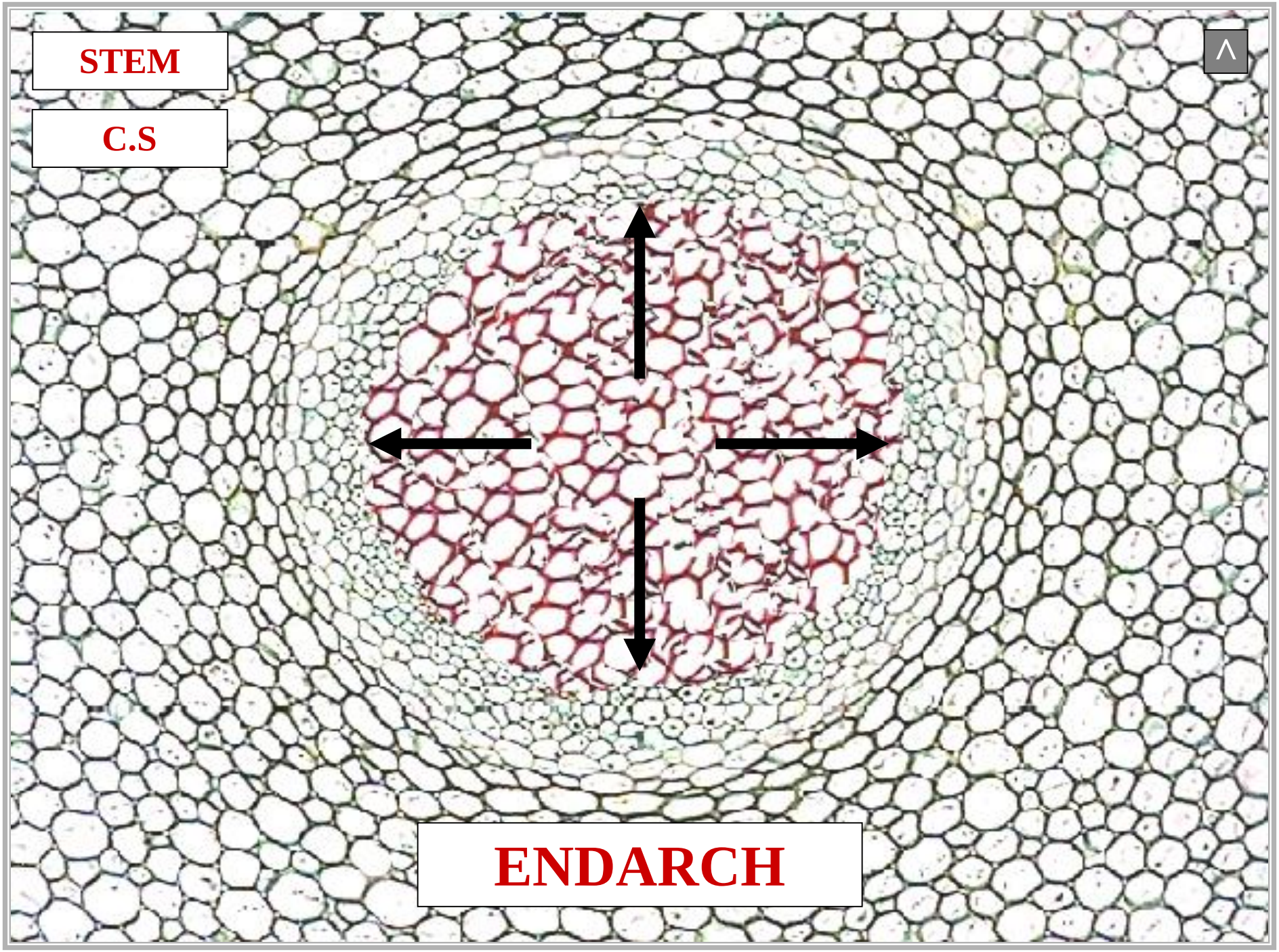
H



# PROTOSTELE

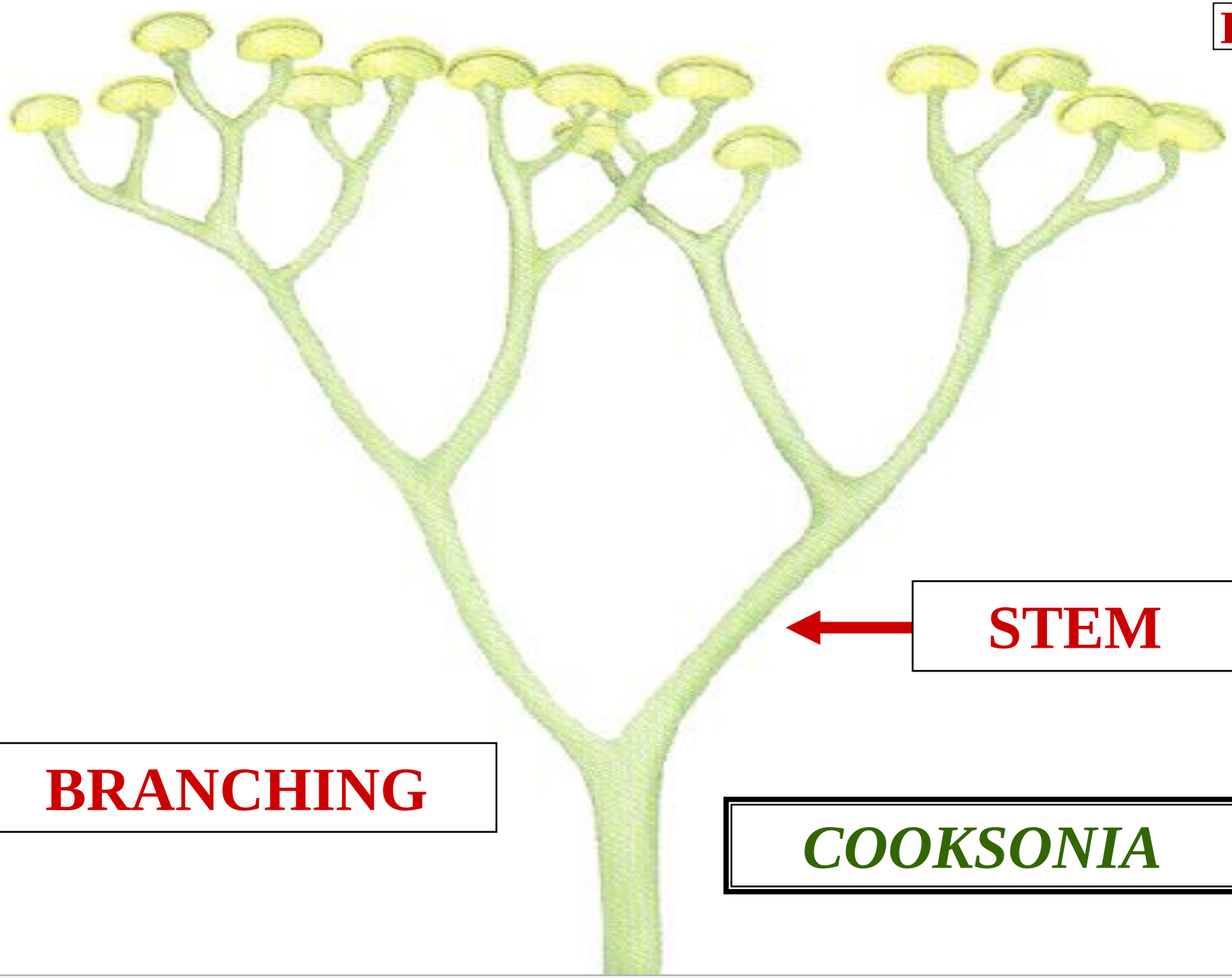

STEM
C.S
PROTOSTELE / HAPLOSTELE


STEM
C.S
EN
~1 XYLEM MATURATION


STEM
C.S
ENDARCH

# STEM MORPHOLOGY

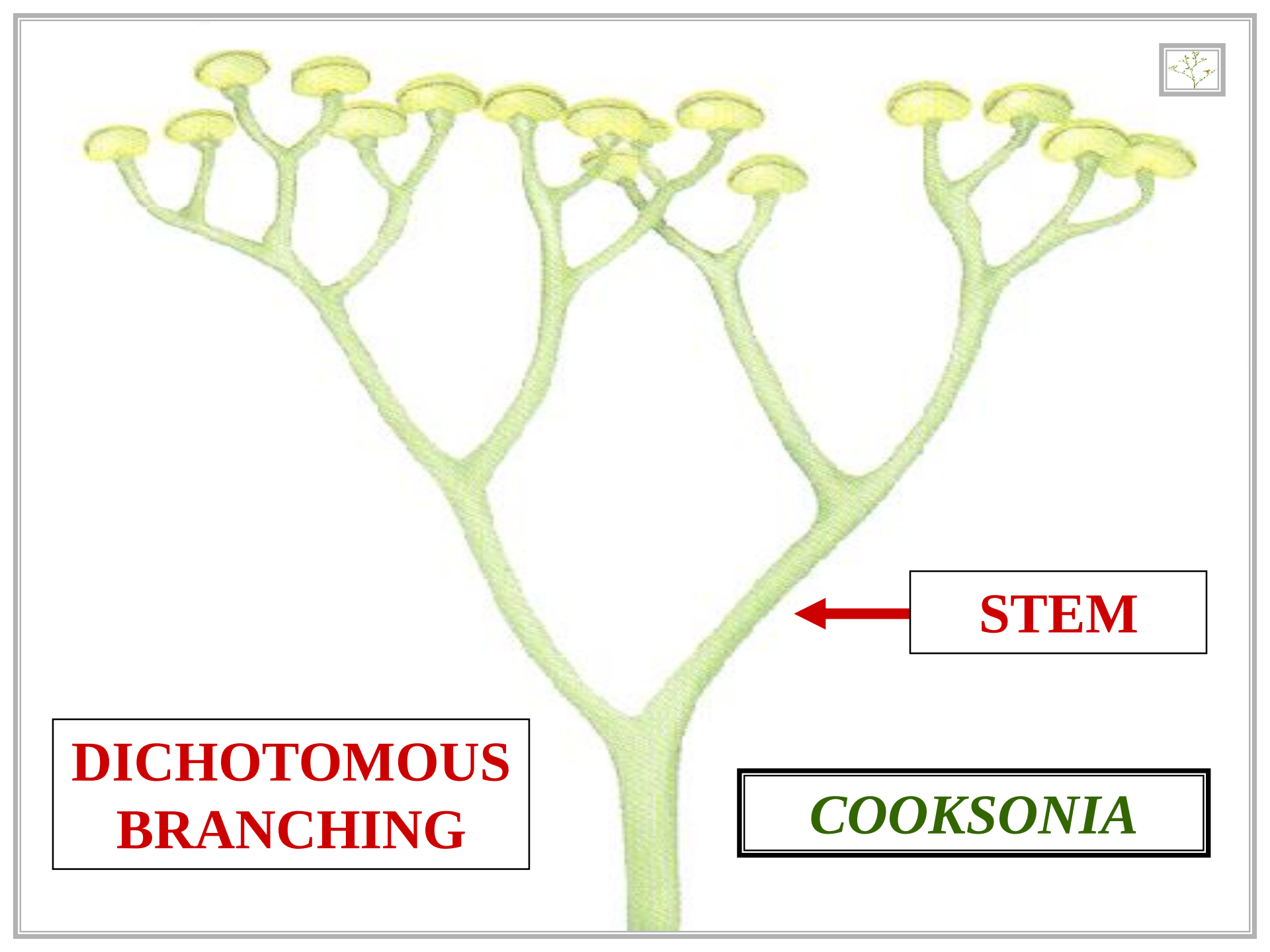
D



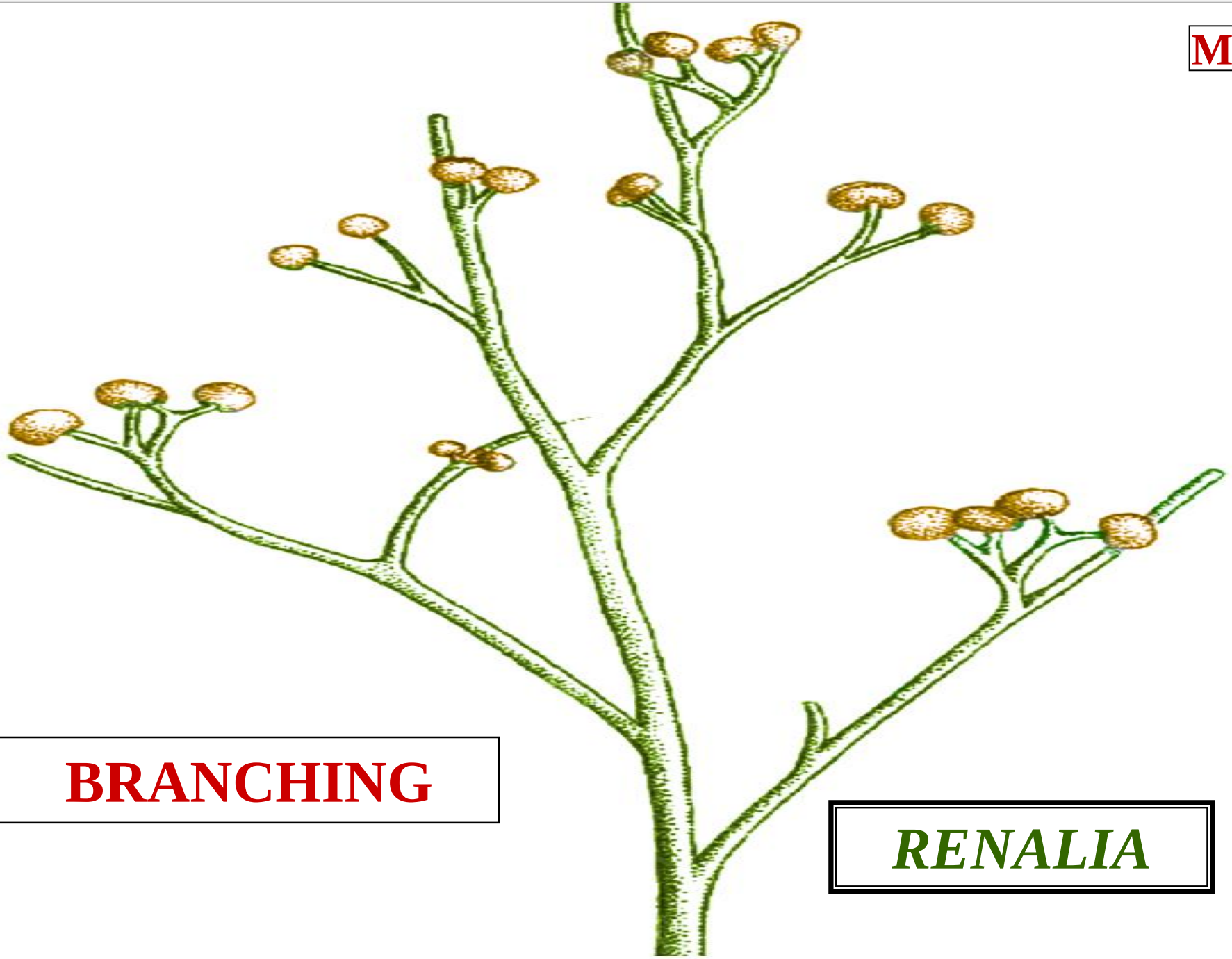
STEM

BRANCHING

*COOKSONIA*

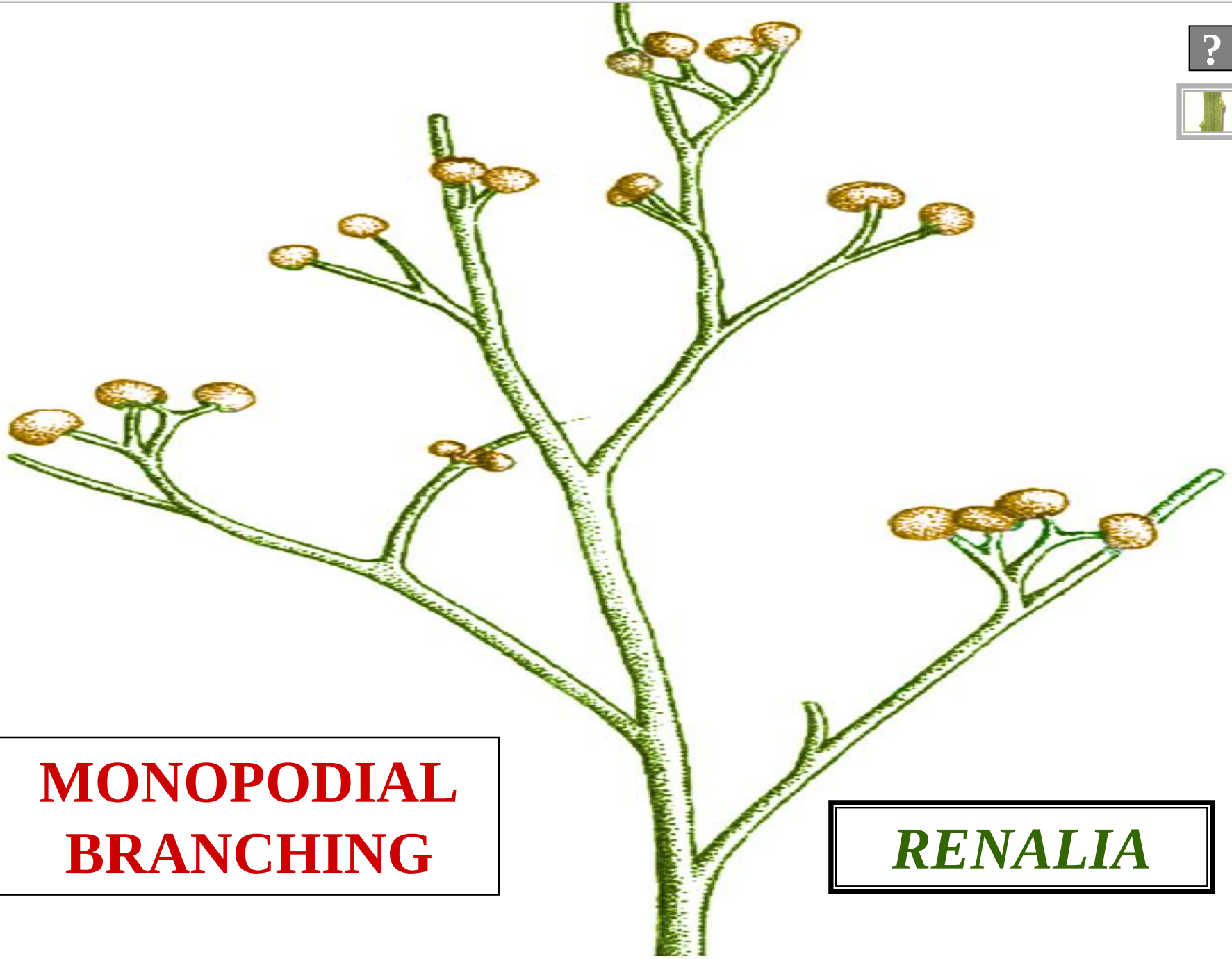

STEM
DICHOTOMOUS BRANCHING
COOKSONIA

M



# BRANCHING

***RENALIA***

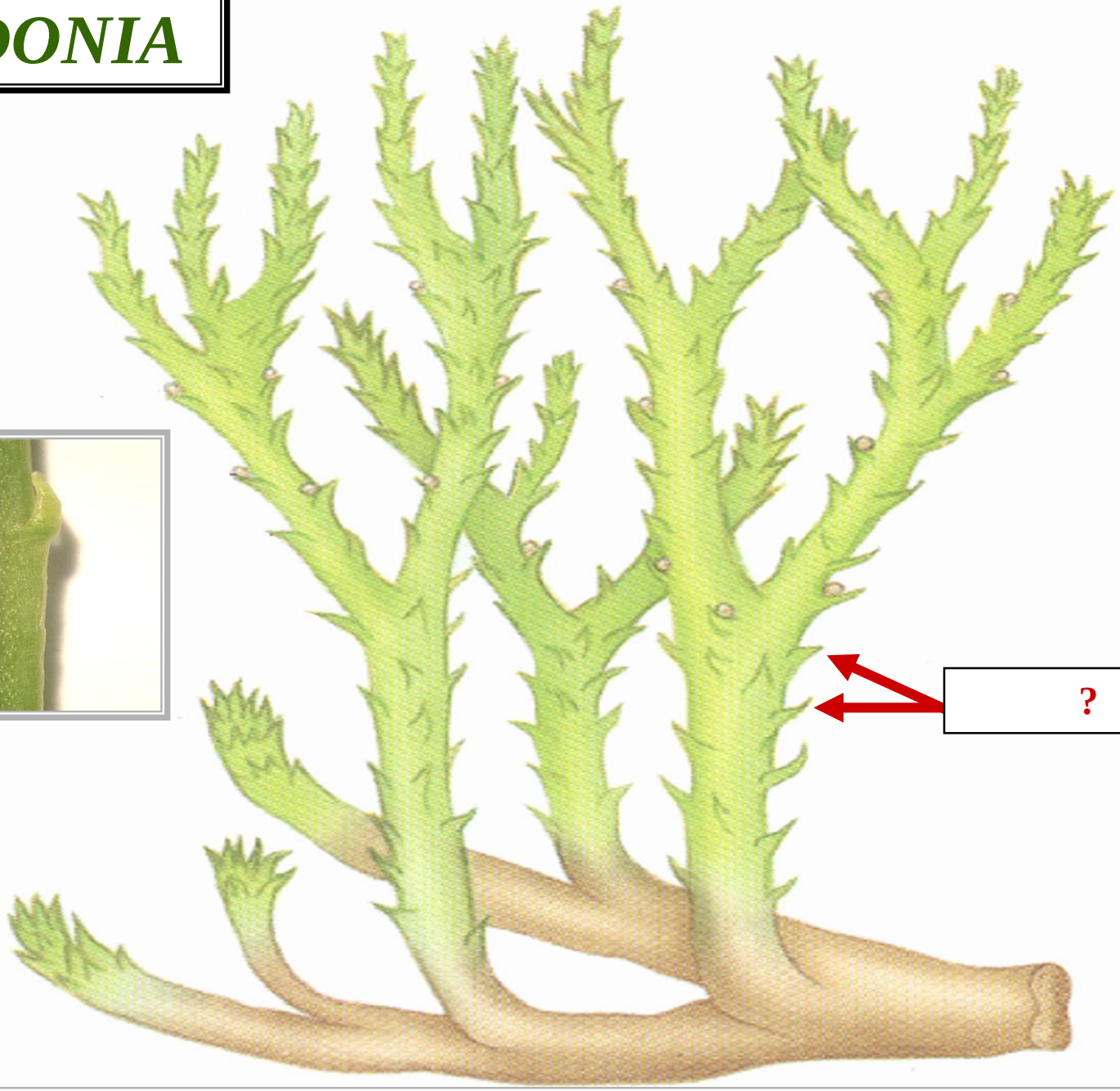


# MONOPODIAL BRANCHING

***RENALIA***

# *SAWDONIA*

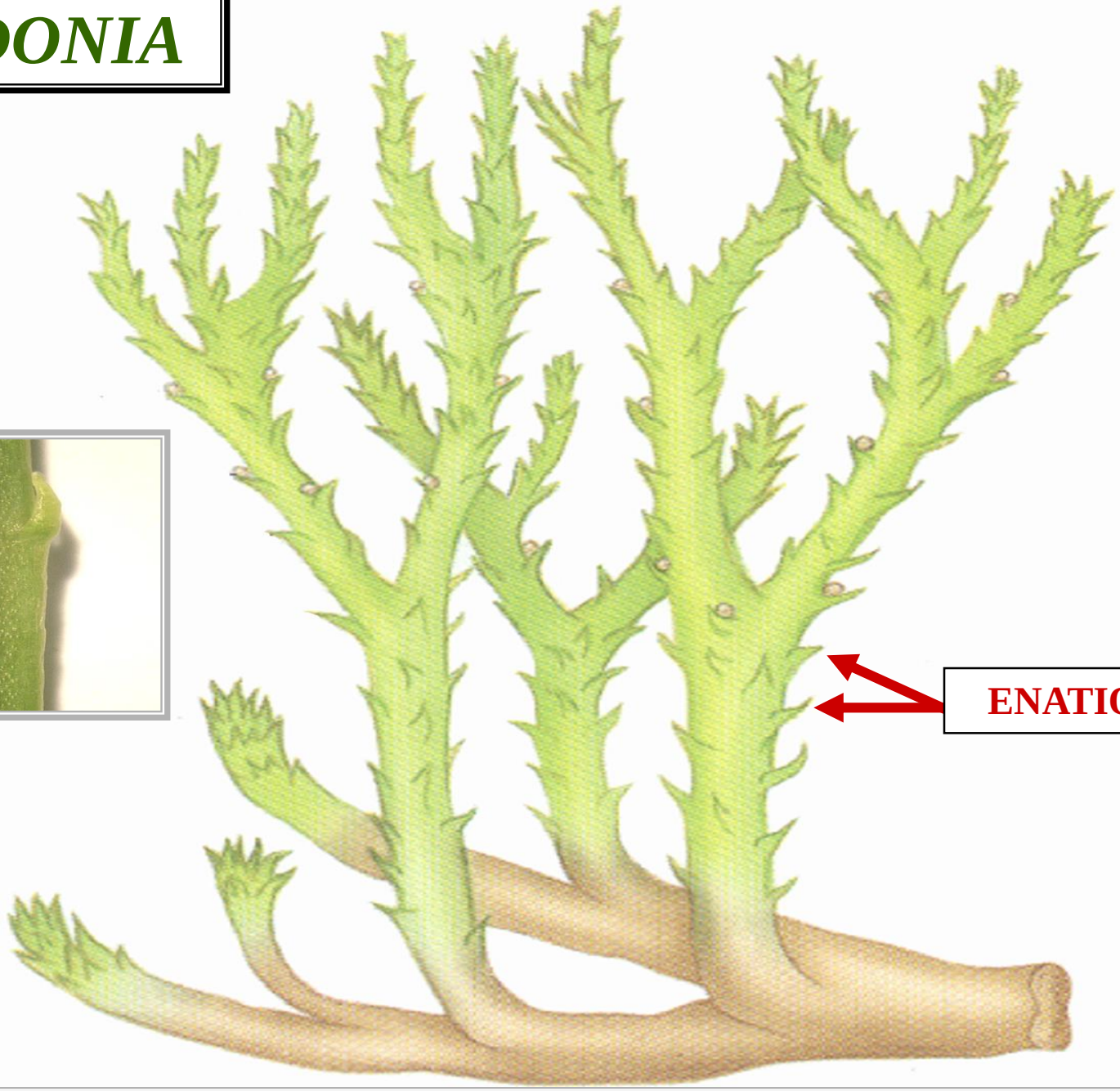
E



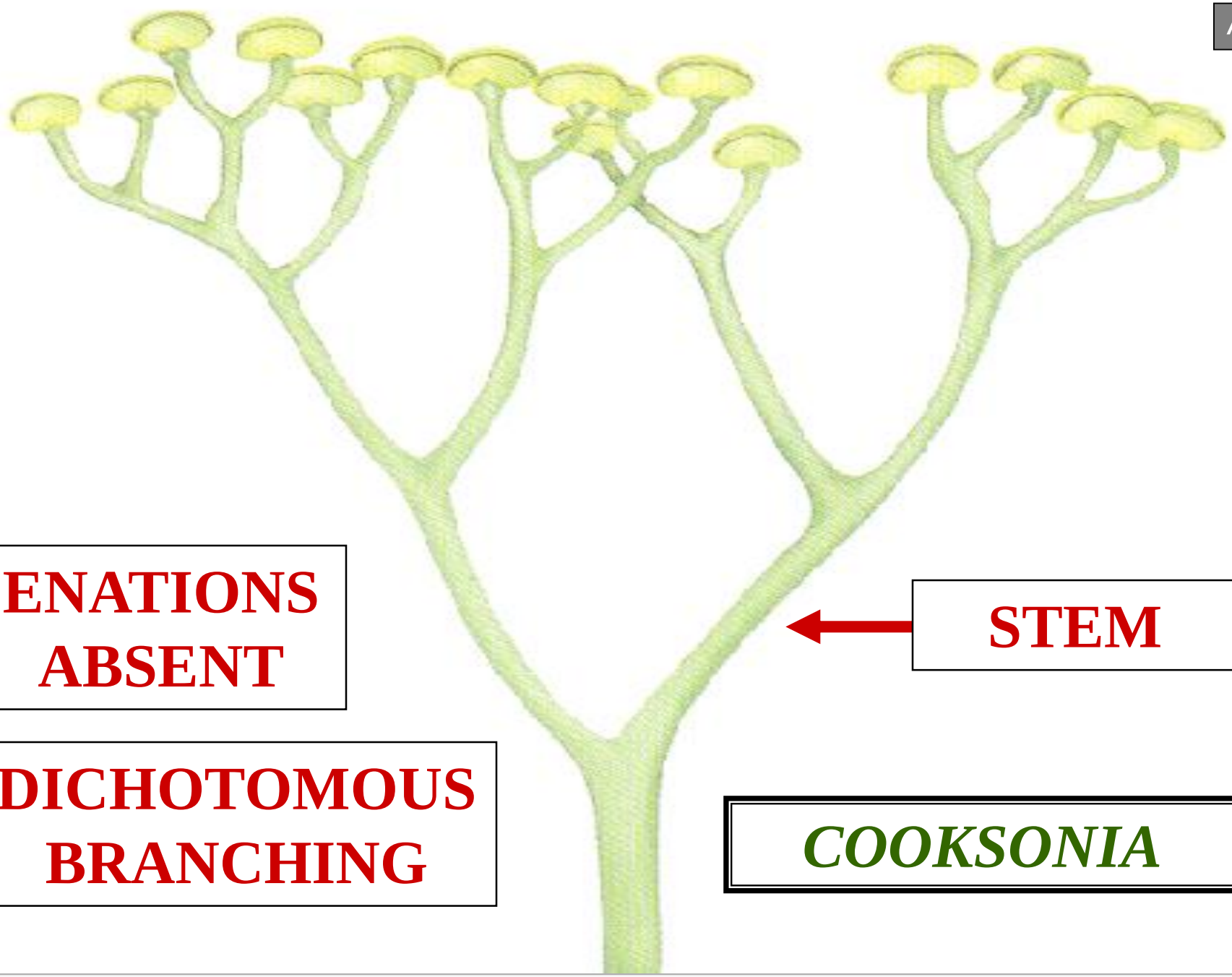
?

# *SAWDONIA*

AB

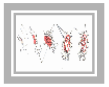


ENATIONS

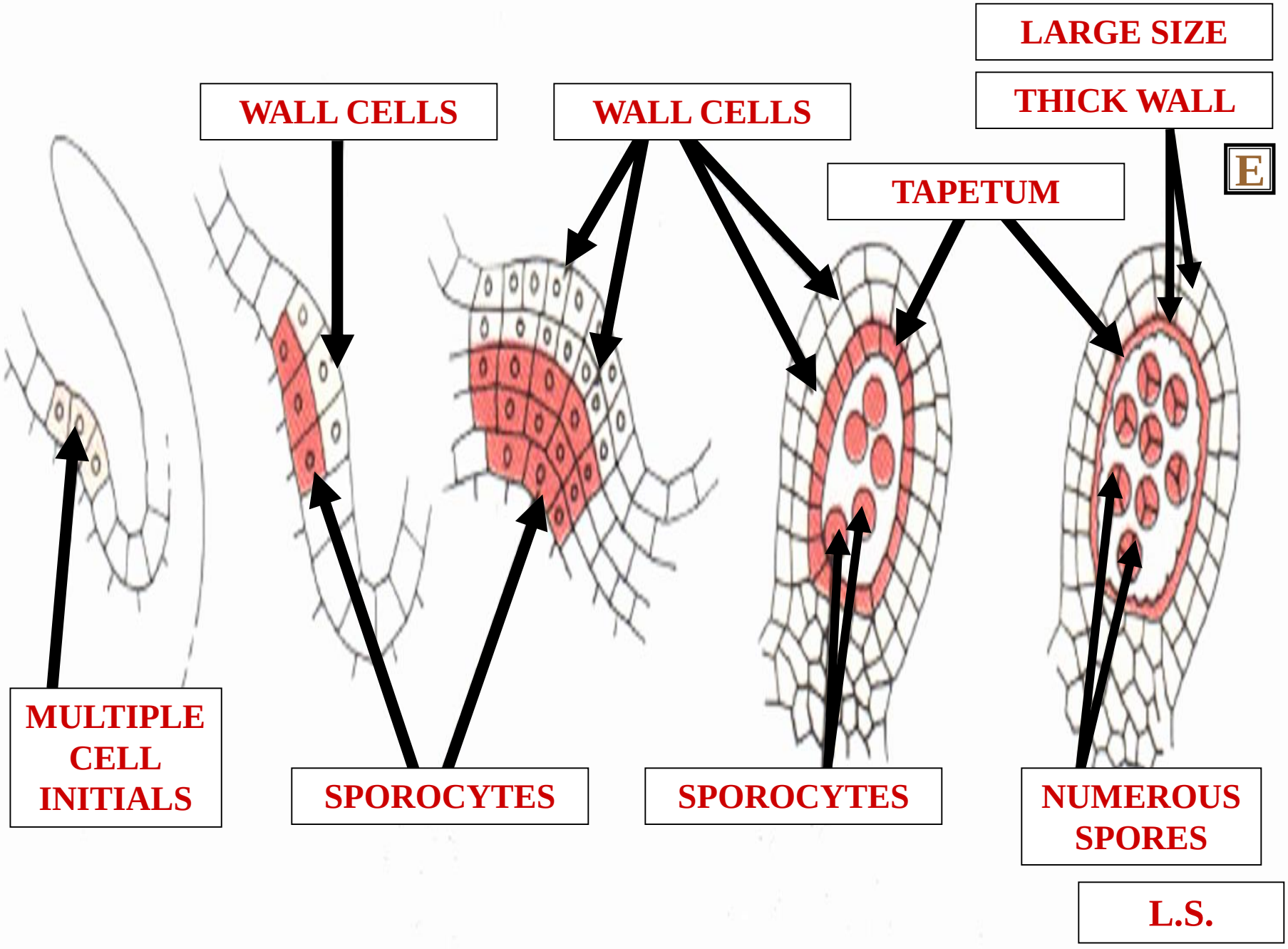

ENATIONS ABSENT
STEM
DICHOTOMOUS BRANCHING
COOKSONIA

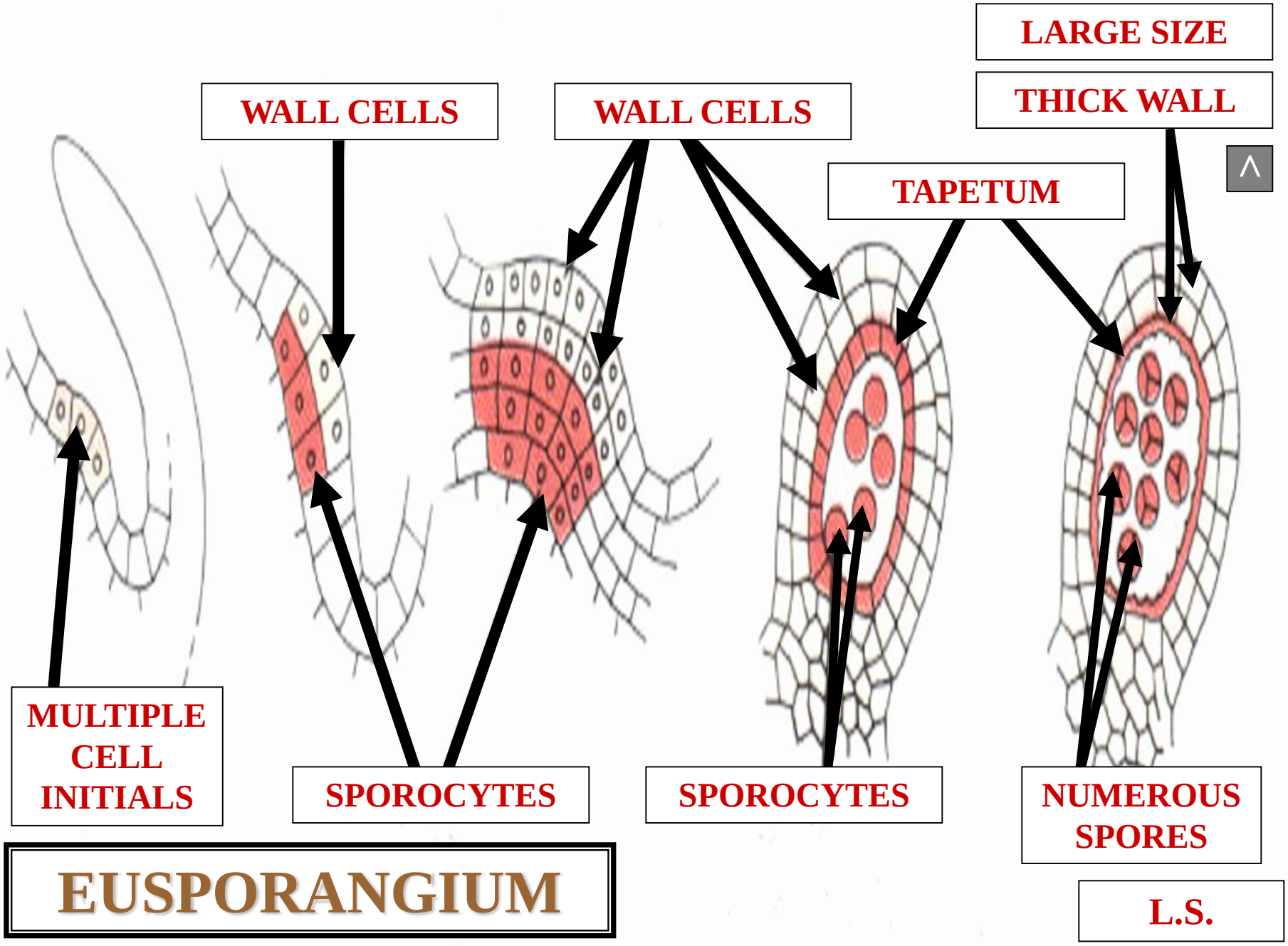
# SPORANGIUM

SPORANGIUM

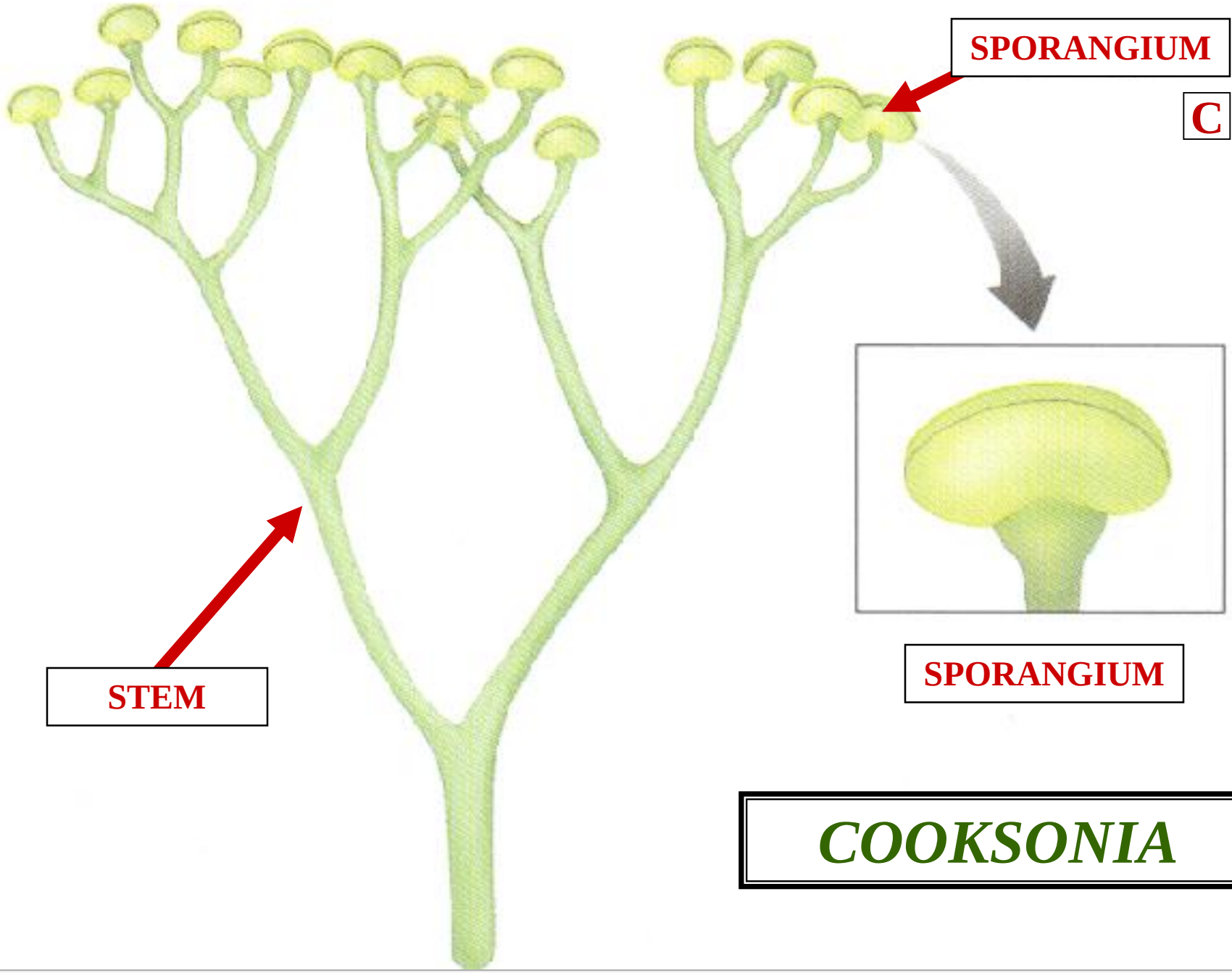


# *COOKSONIA*


LARGE SIZE
THICK WALL
E
WALL CELLS
WALL CELLS
TAPETUM
MULTIPLE CELL INITIALS
SPOROCYTES
SPOROCYTES
NUMEROUS SPORES
L.S.


LARGE SIZE
THICK WALL
WALL CELLS
WALL CELLS
TAPETUM
MULTIPLE CELL INITIALS
SPOROCYTES
SPOROCYTES
NUMEROUS SPORES
EUSPORANGIUM
L.S.

# SPORANGIUM POSITION

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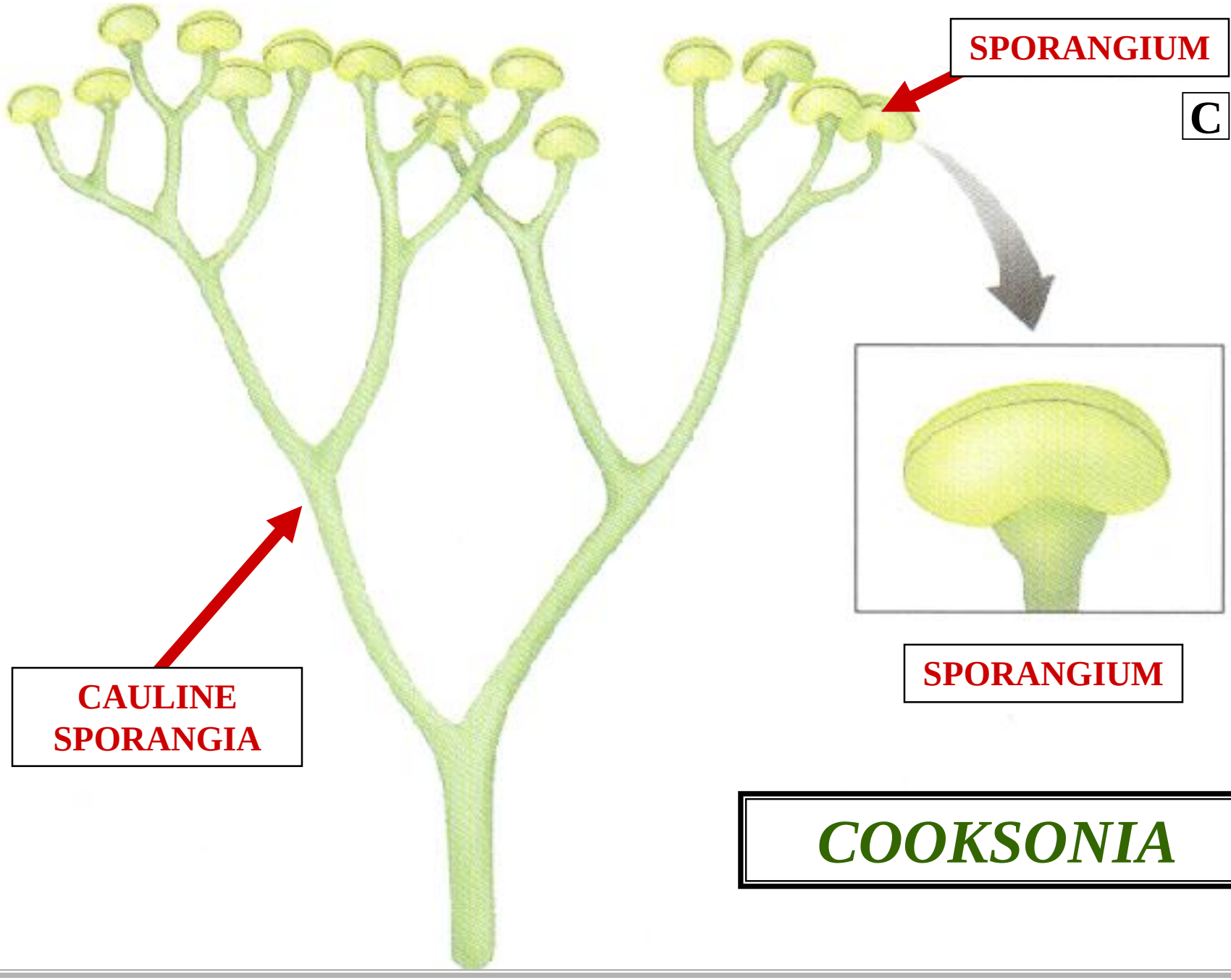
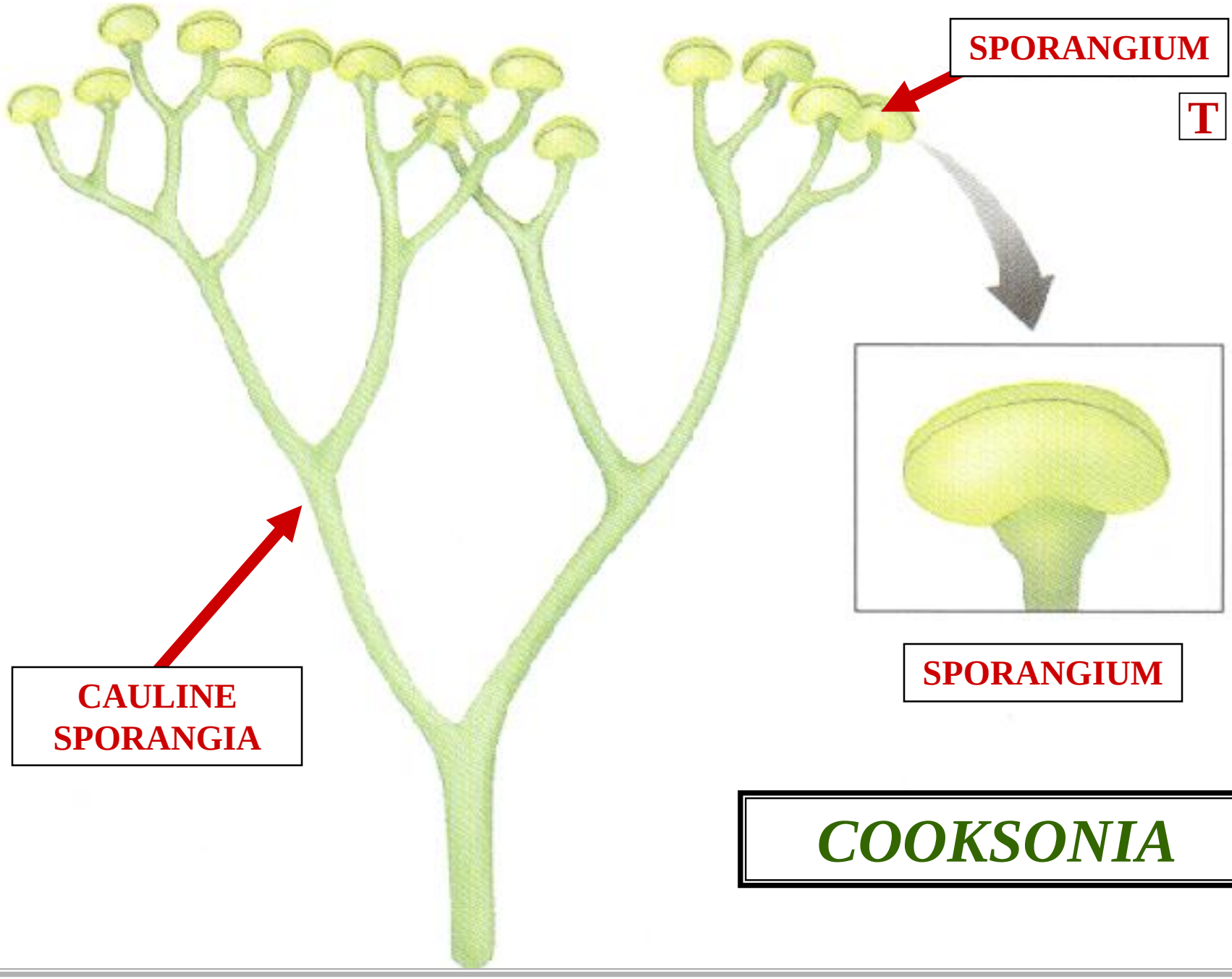

SPORANGIUM
C
SPORANGIUM
CAULINE
SPORANGIA
COOKSONIA

# CAULINE SPORANGIUM

# CAULINE SPORANGIUM

# STEM DERIVED SPORANGIUM

# CAULINE SPORANGIUM


SPORANGIUM
T
SPORANGIUM
CAULINE
SPORANGIA
COOKSONIA

SPORANGIUM

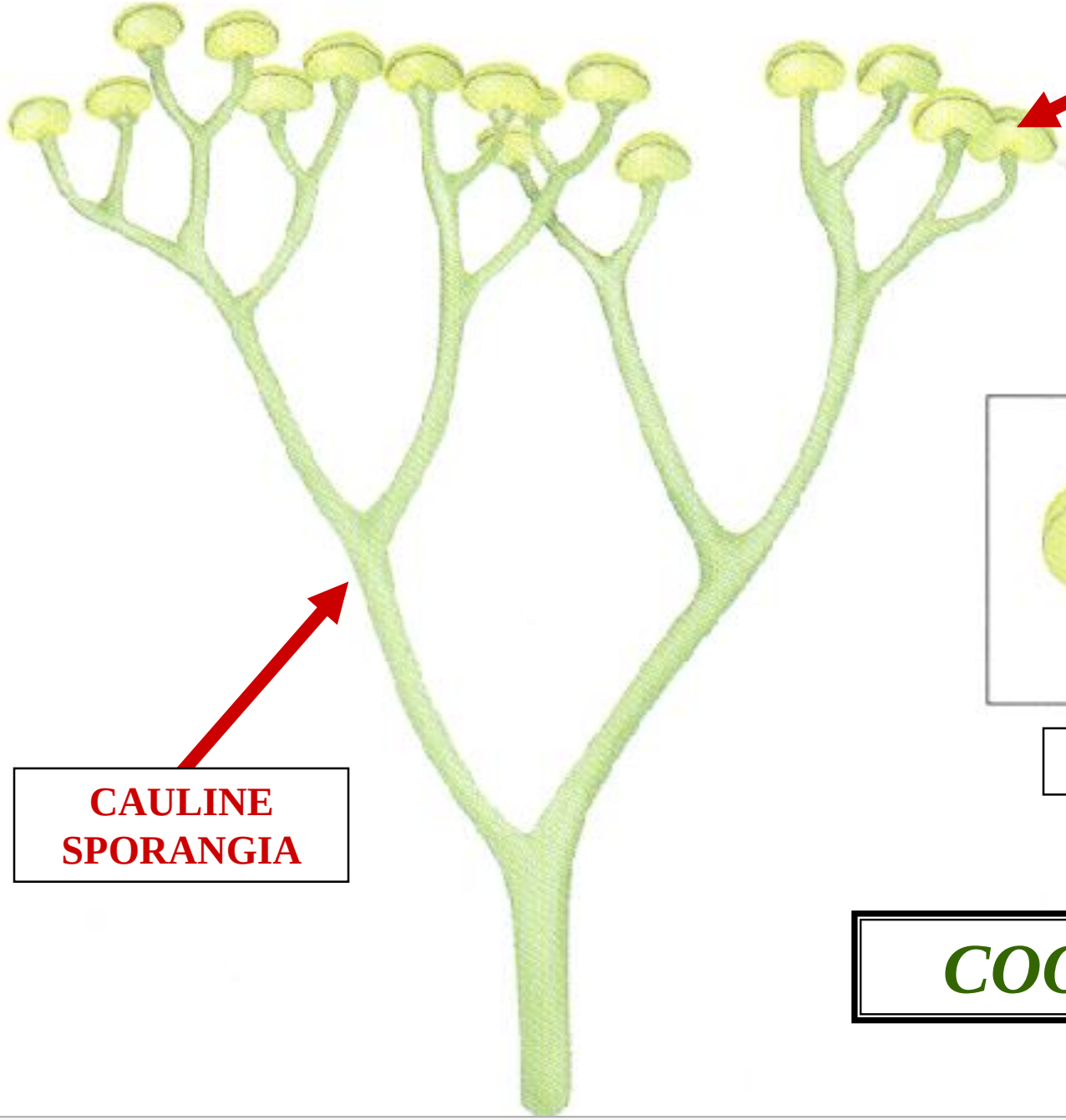
TERMINAL

SPORANGIUM

CAULINE SPORANGIA

# *COOKSONIA*

# SPORANGIUM SHAPE



SPORANGIUM

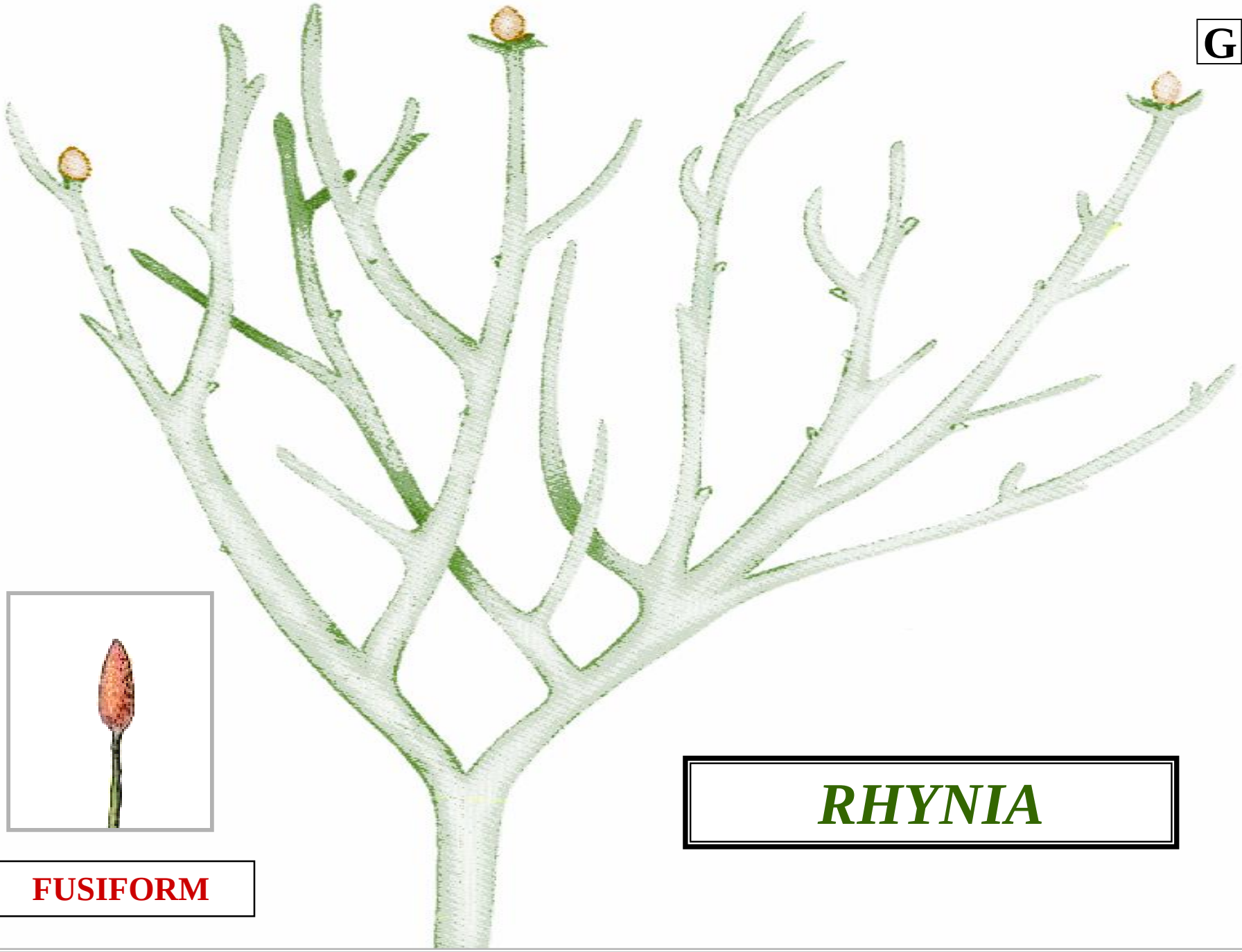
F

GLOBOSE

CAULINE SPORANGIA

# *COOKSONIA*

G





FUSIFORM

***RHYNIA***

# GLOBOSE SPORANGIUM

# GLOBOSE SPORANGIUM

# ROUND SHAPED SPORANGIUM

# GLOBOSE SPORANGIUM

F

SPORANGIUM

GLOBOSE

CAULINE SPORANGIA

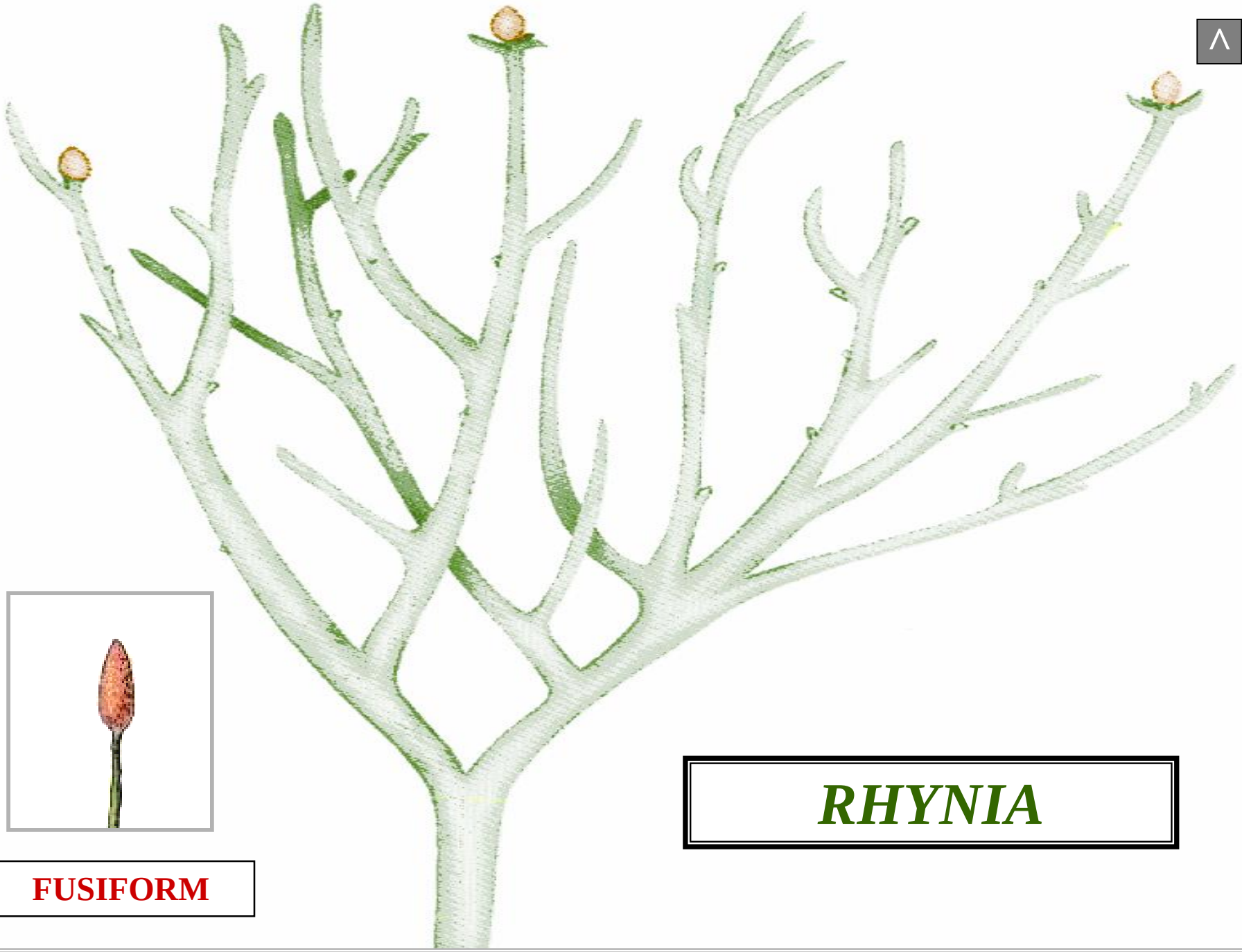
# *COOKSONIA*

# FUSIFORM SPORANGIUM

# FUSIFORM SPORANGIUM

# TEAR SHAPED SPORANGIUM

FUSIFORM SPORANGIUM



# *RHYNIA*



**FUSIFORM**

D

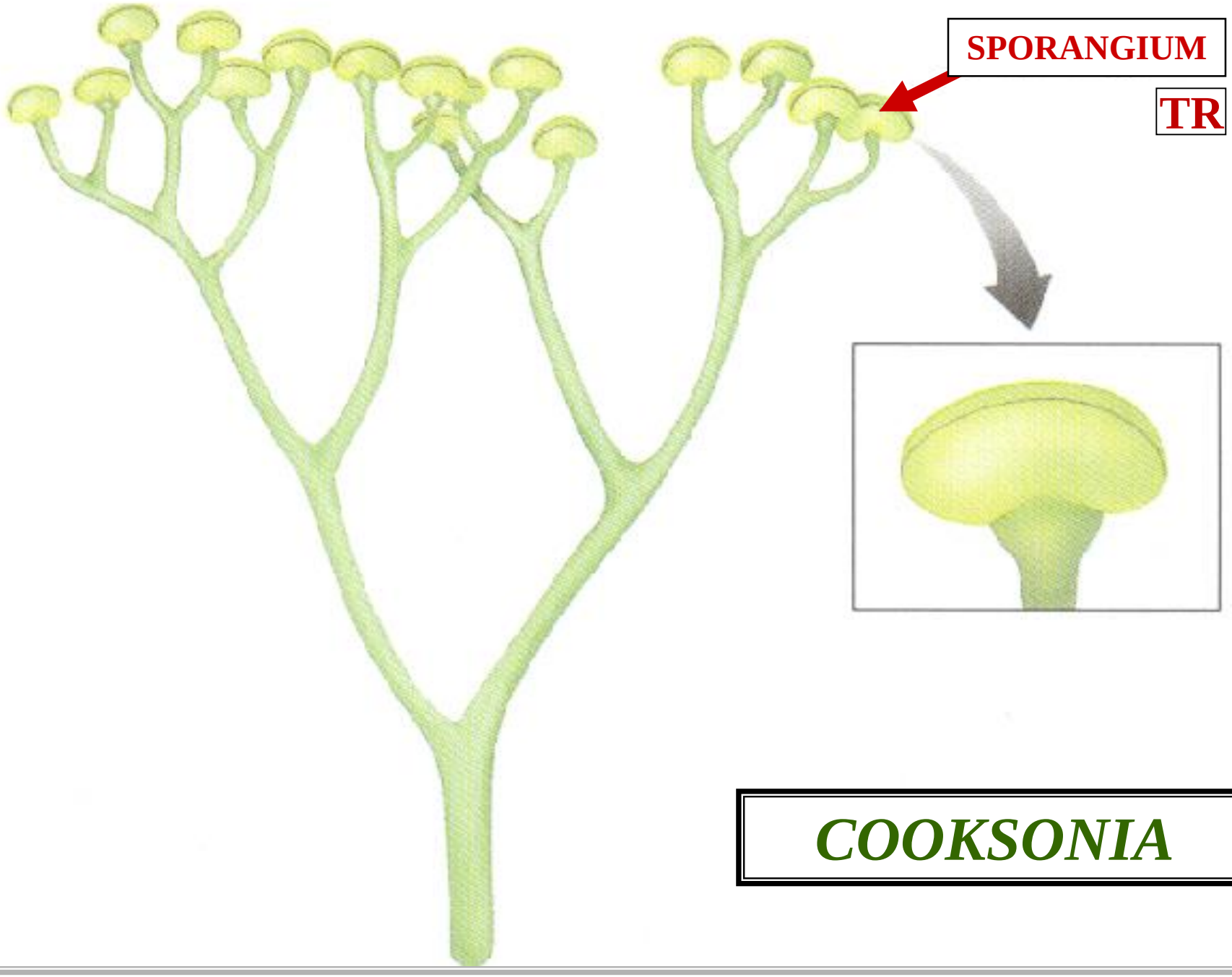
# SPORANGIUM DEHISCENCE

# DEHISCENCE

# DEHISCENCE

# SPORANGIUM OPENING PATTERN

DEHISCENCE

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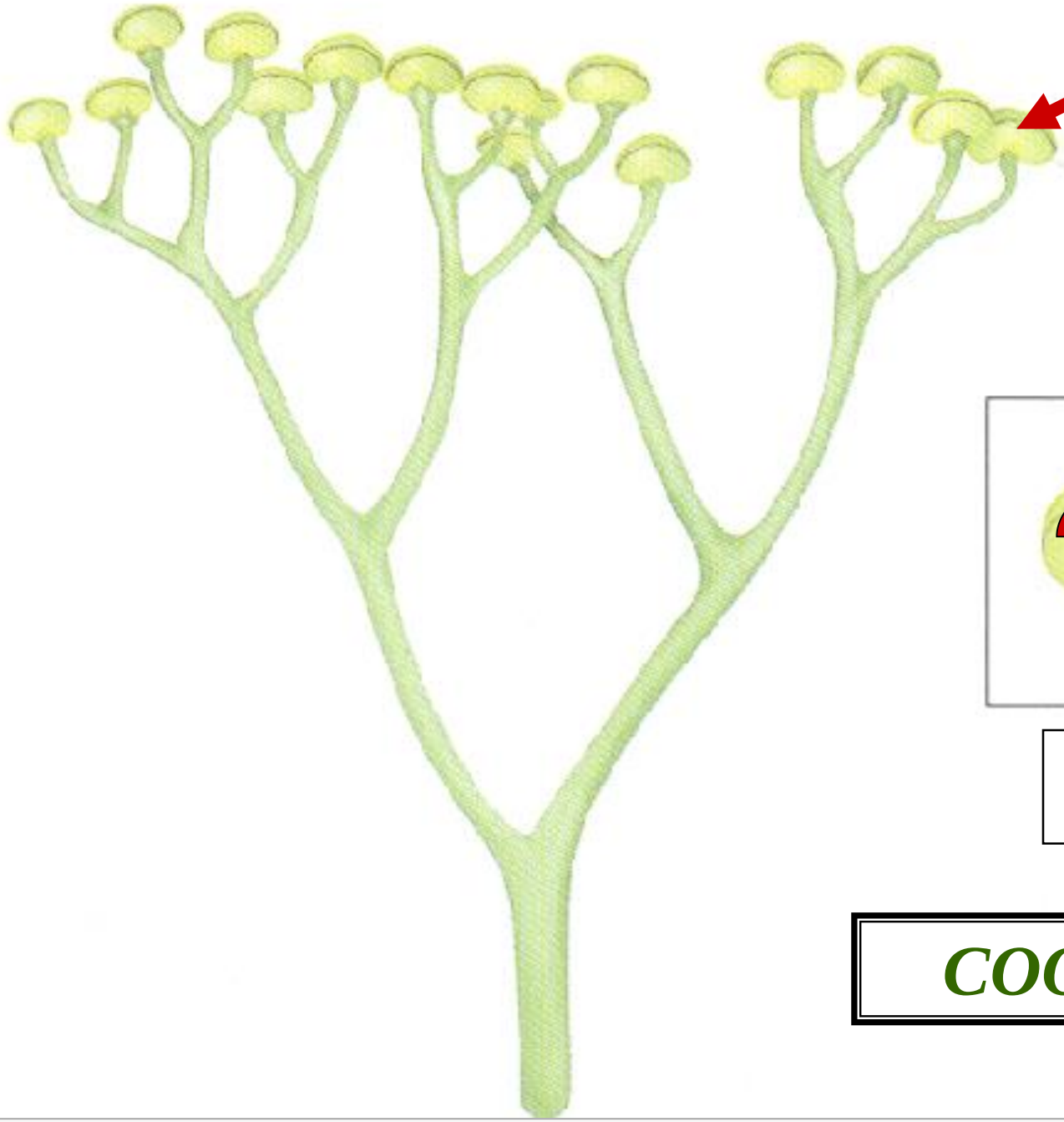
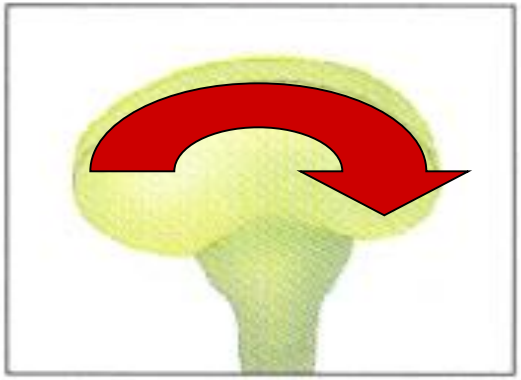


SPORANGIUM

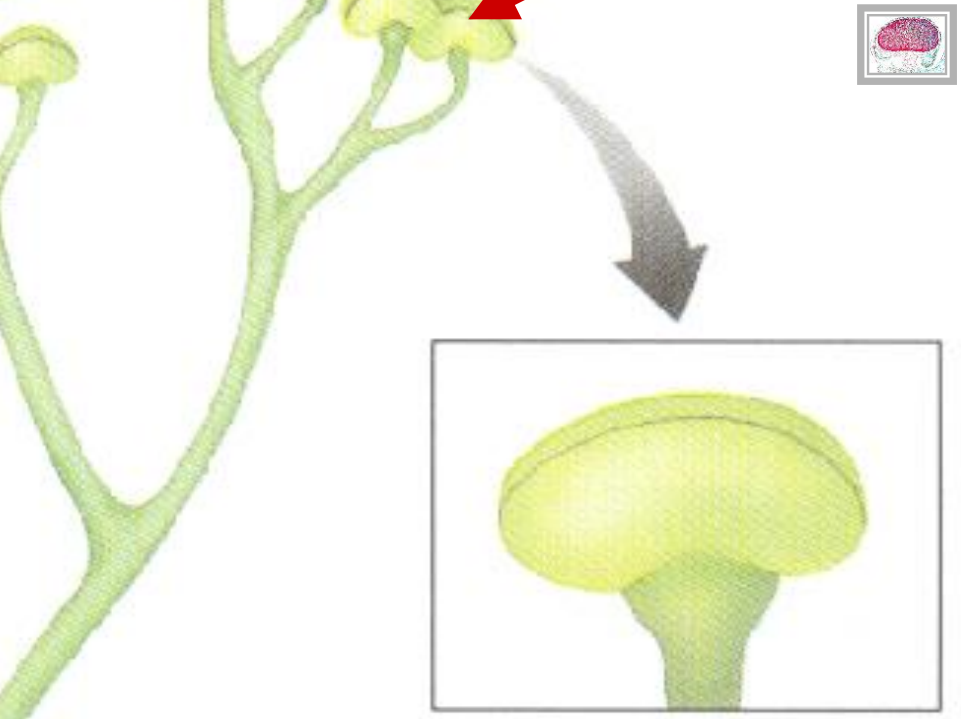


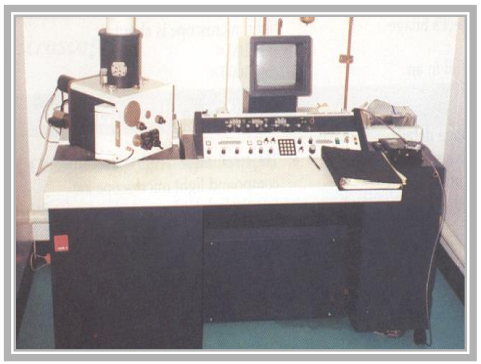
TRANSVERSE DEHISCENCE

# *COOKSONIA*

# REPRODUCTION

SPORANGIUM





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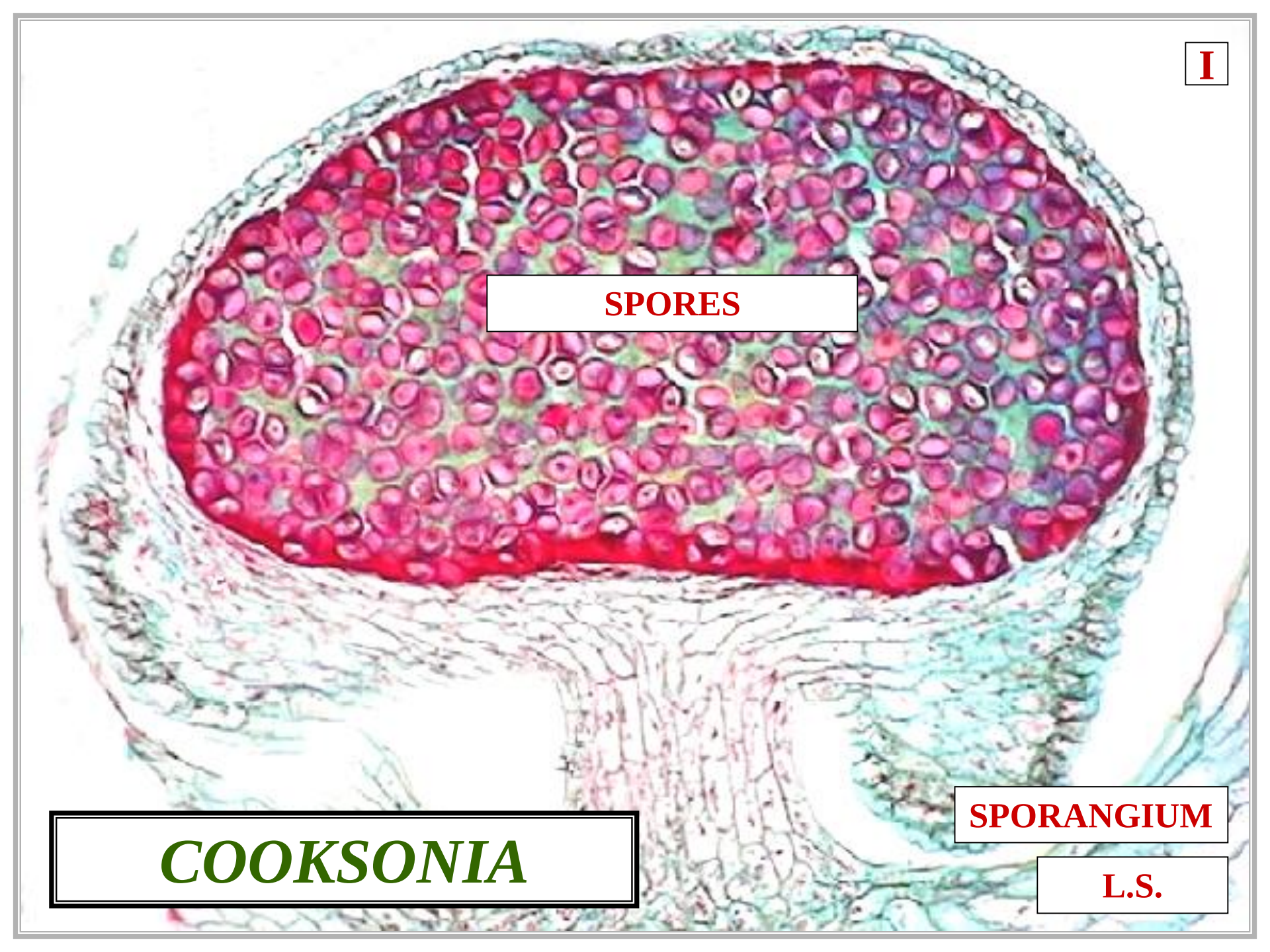


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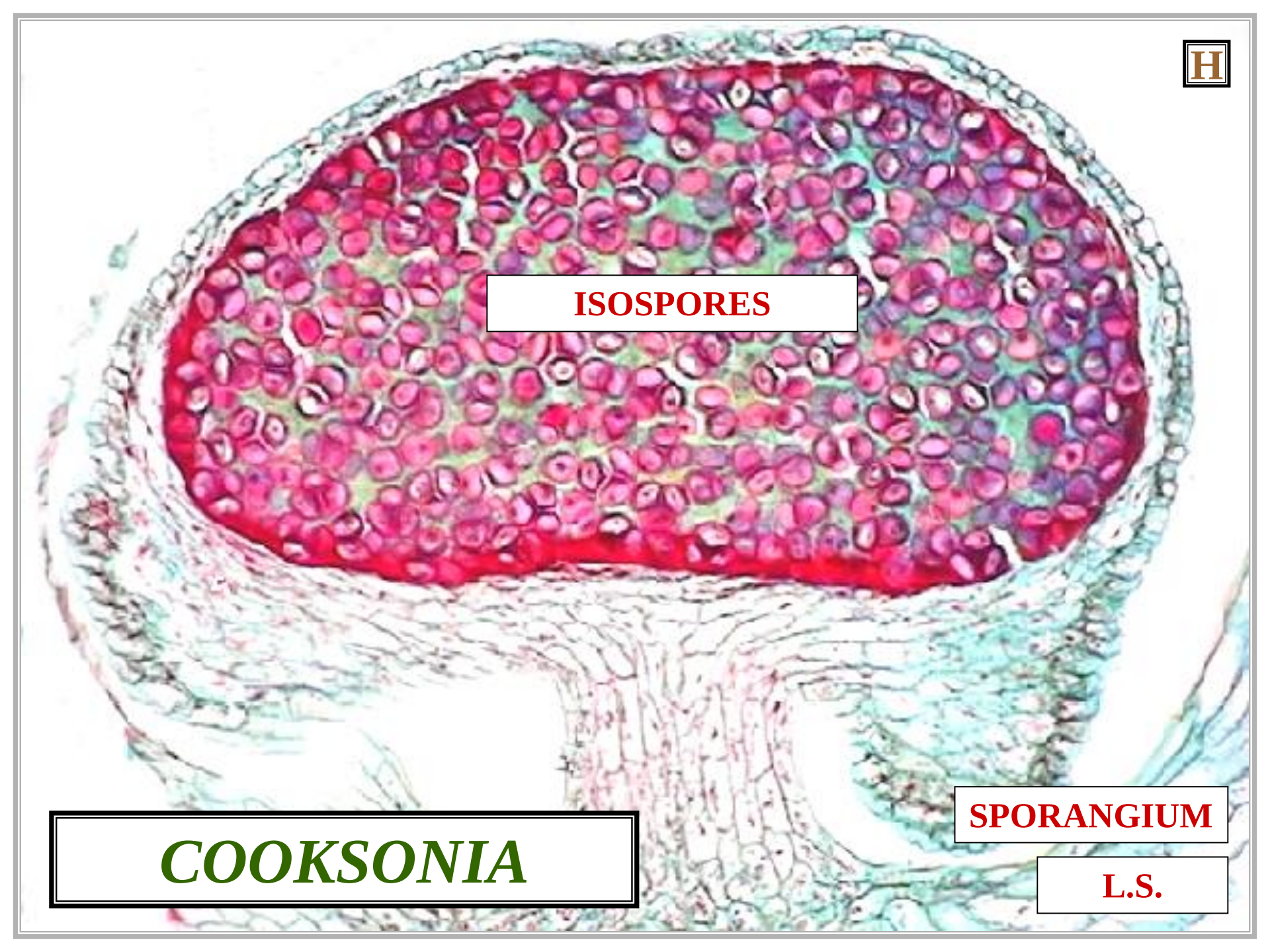
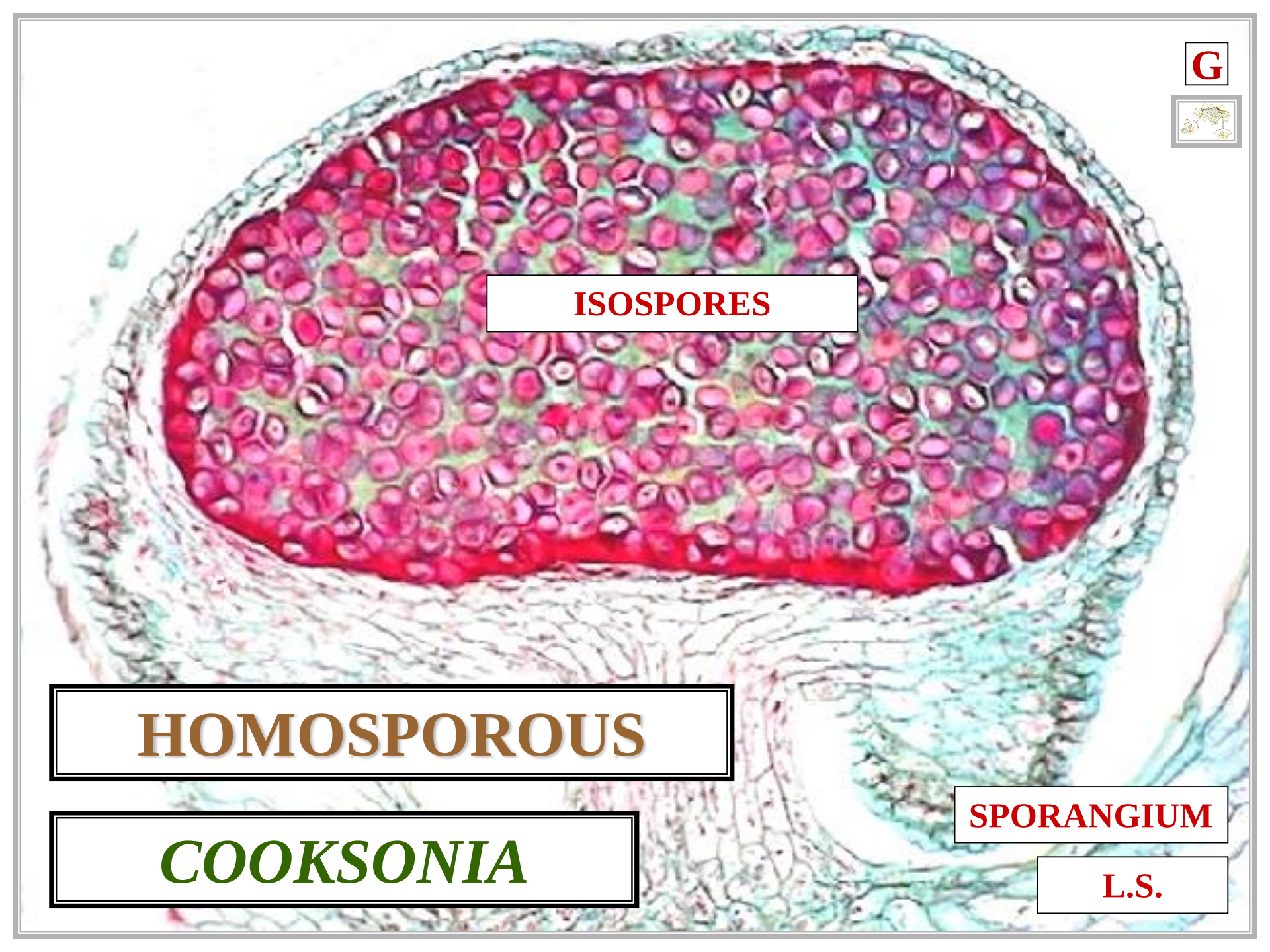
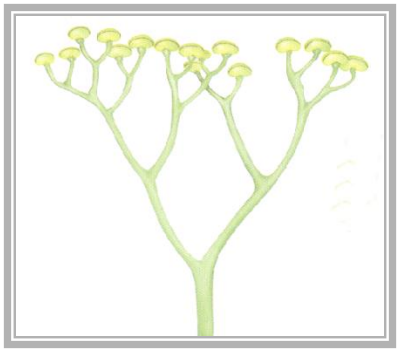

H
ISOSPORES
SPORANGIUM
L.S.
COOKSONIA

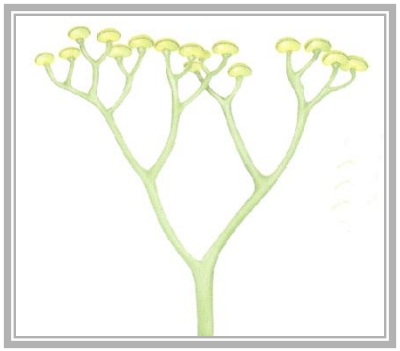

G
ISOSPORES
HOMOSPOROUS
COOKSONIA
SPORANGIUM
L.S.

EX



GAMEOTPHYTE

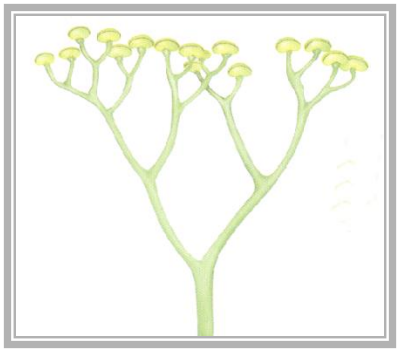
# *COOKSONIA*



B

EXOSPORIC

# *COOKSONIA*



ARCHEGONIA

ANTHERIDIA

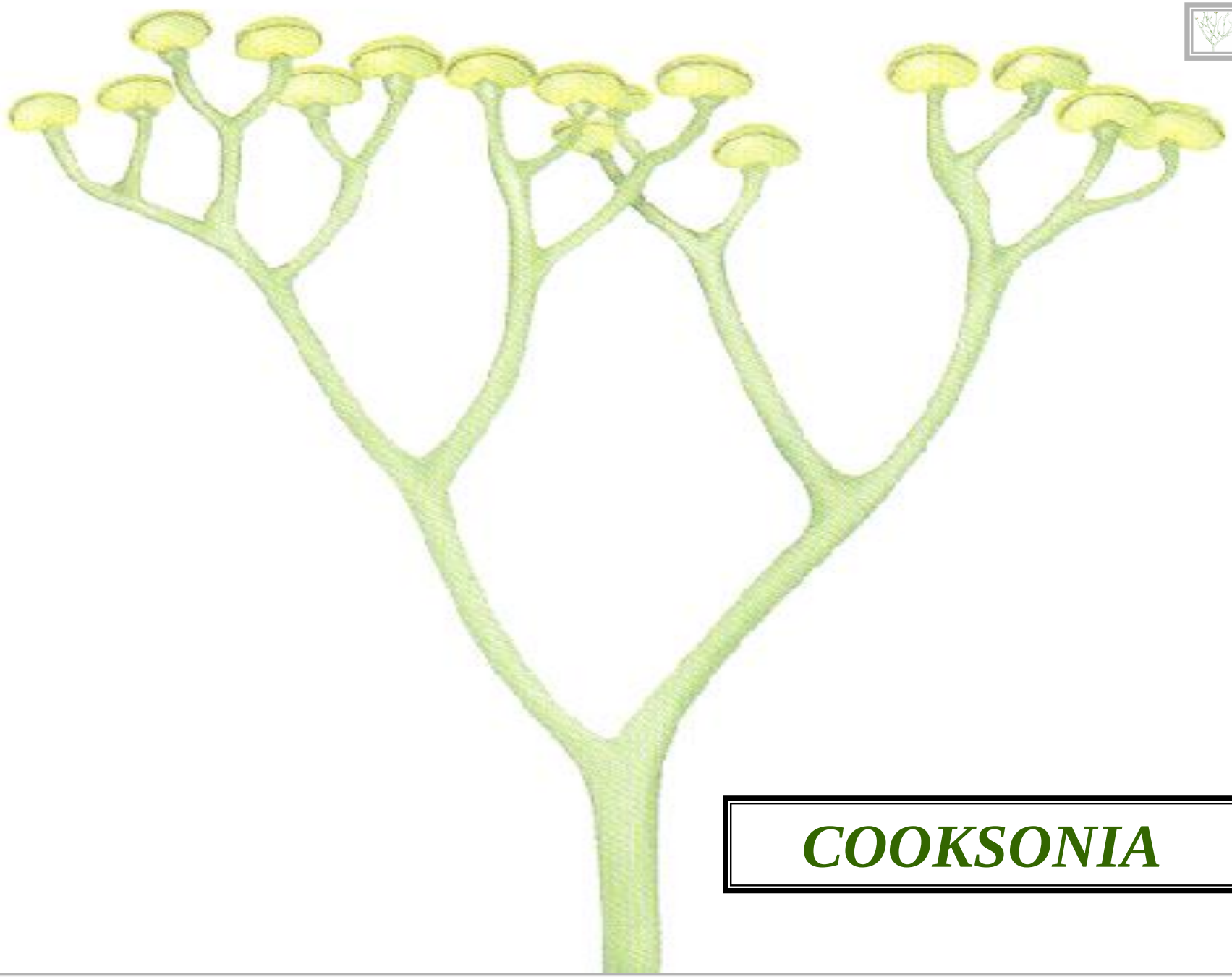
BISEXUAL

EGG

SPERM

# *COOKSONIA*

# REPRESENTATIVE GENERA



# *COOKSONIA*

# *RHYNIA*

RENALIA

# PHYLOGENETIC RELATIONSHIP

C

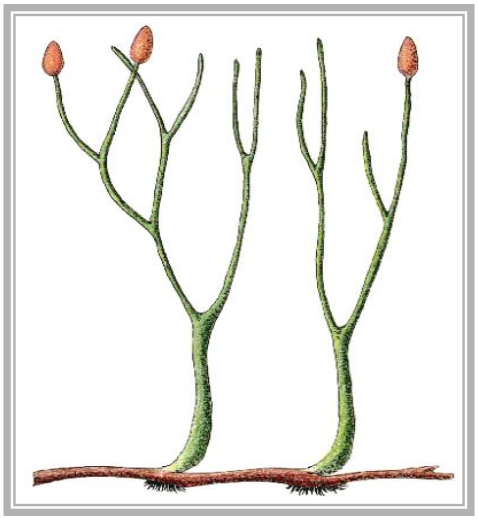
# RHYNIOPHYTE EVOLUTION

*PARKA*

# RHYNIOPHYTE EVOLUTION

CHAROPHYTE

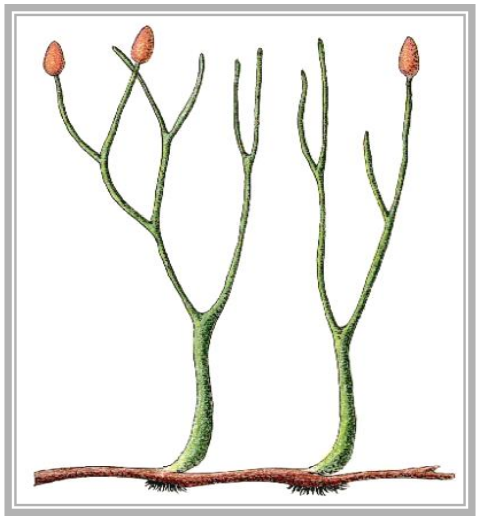
# RHYNIOPHYTE EVOLUTION



**CHAROPHYTE**

***AGLAOPHYTON***

# RHYNIOPHYTE EVOLUTION

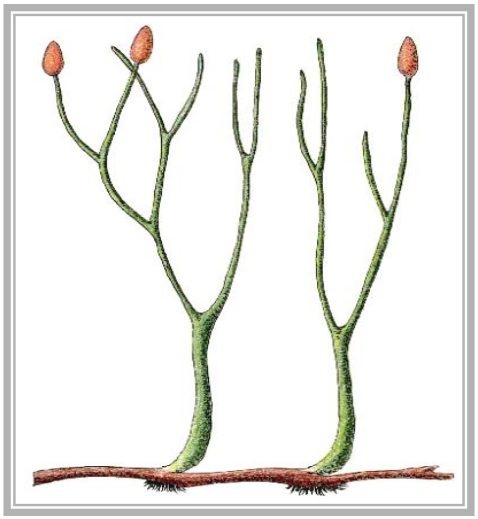


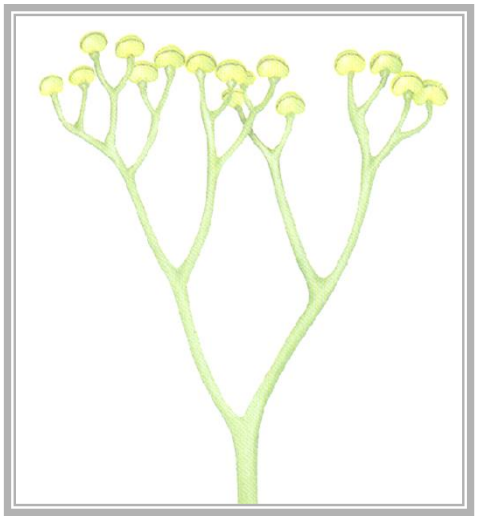
**CHAROPHYTE**

**PROEMBRYOPHYTE**

***AGLAOPHYTON***

# RHYNIOPHYTE EVOLUTION





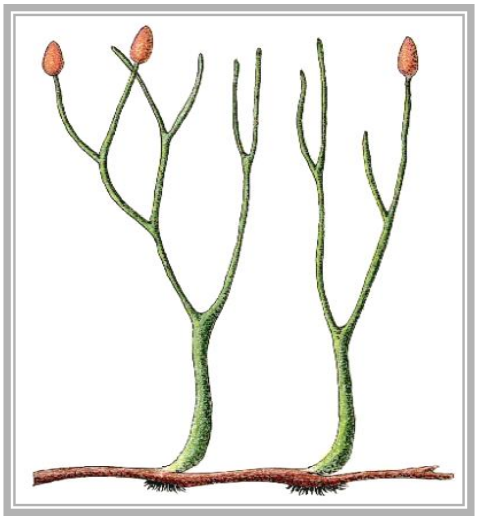
**CHAROPHYTE**

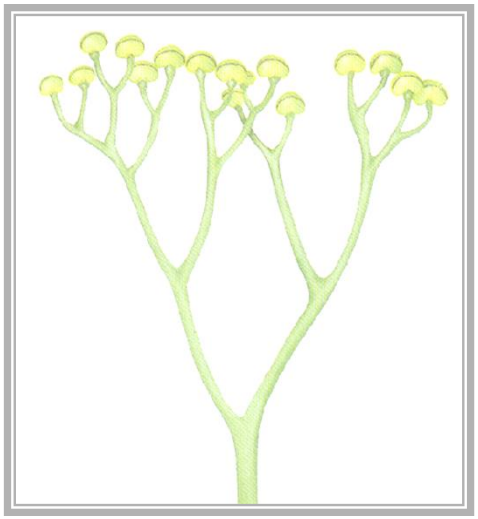
**PROEMBRYOPHYTE**

***AGLAOPHYTON***

**EMBRYOPHYTE**

# RHYNIOPHYTE EVOLUTION





**CHAROPHYTE**

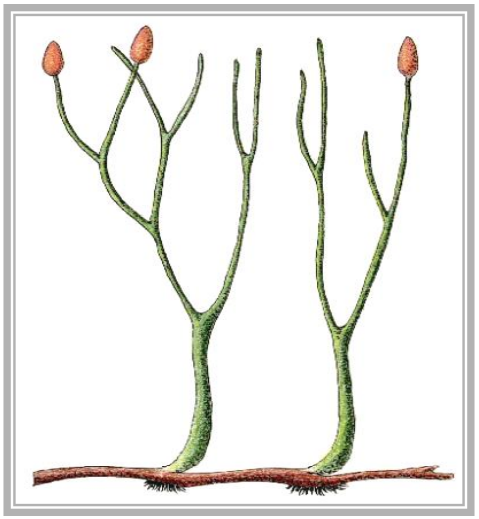
**PROEMBRYOPHYTE**

***AGLAOPHYTON***

**TRACHEOPHYTE**

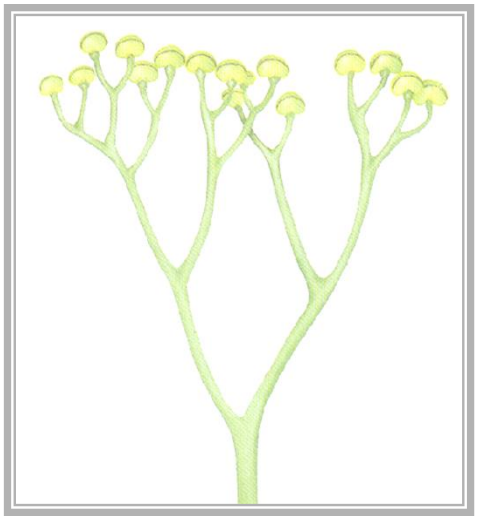
# RHYNIOPHYTE EVOLUTION

CHAROPHYTE

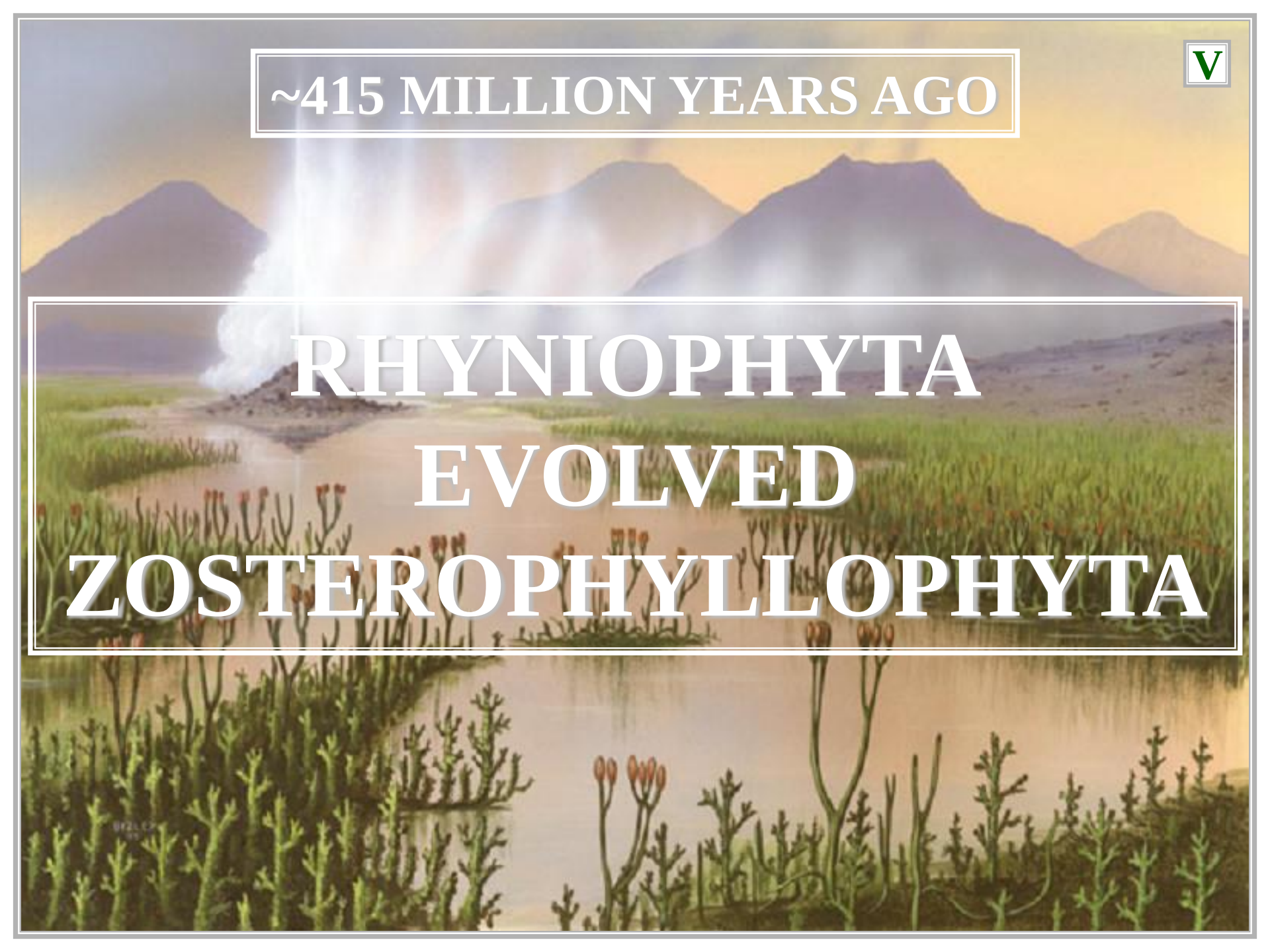


PROEMBRYOPHYTE

*AGLAOPHYTON*



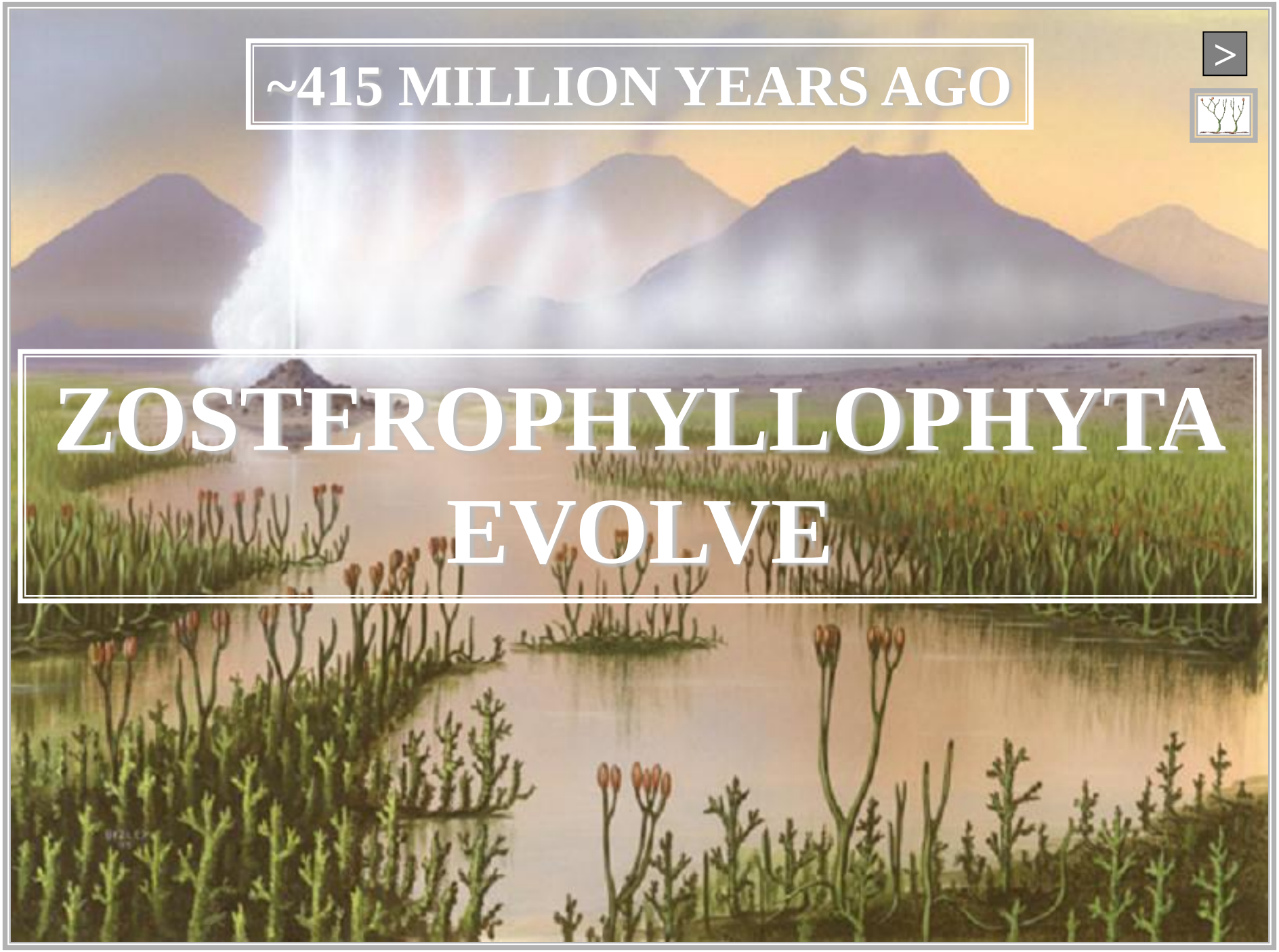
RHYNIOPHYTE


~415 MILLION YEARS AGO
V
RHYNIOPHYTA
EVOLVED
ZOSTEROPHYLLOPHYTA

# VASCULAR PLANT EVOLUTION

# ~415

# MILLION YEARS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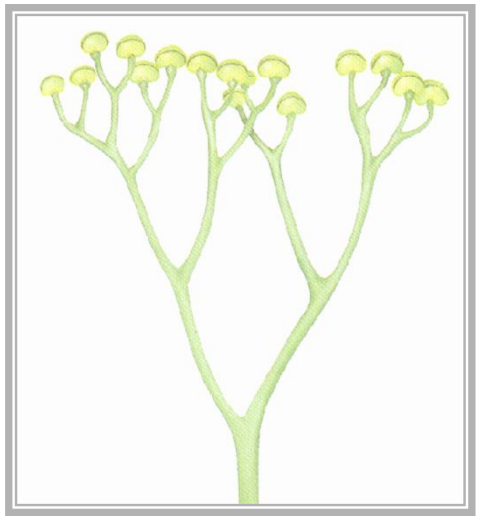
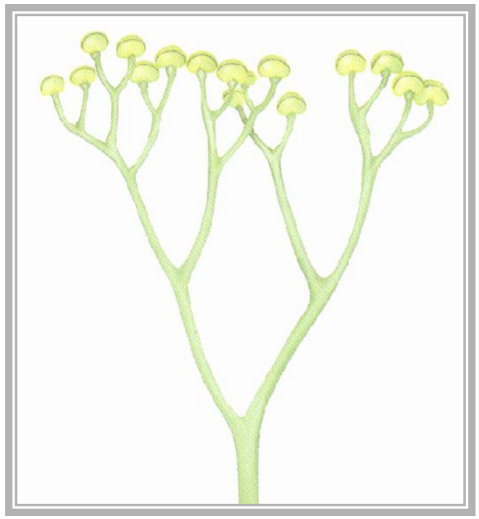
ZOSTEROPHYLLOPHYTA EVOLVE

# ZOSTEROPHYTE EVOLUTION



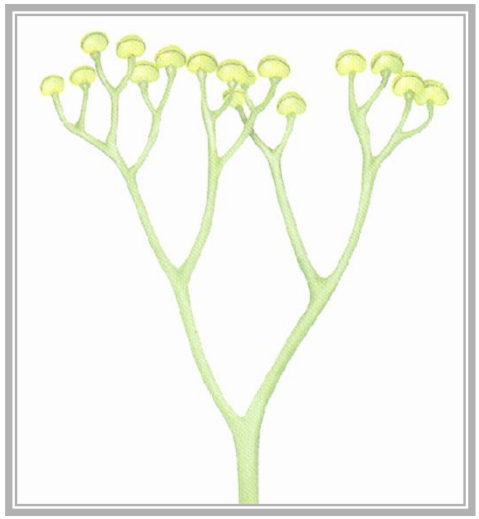
COOKSONIA

# ZOSTEROPHYTE EVOLUTION



**RHYNIOPHYTE**

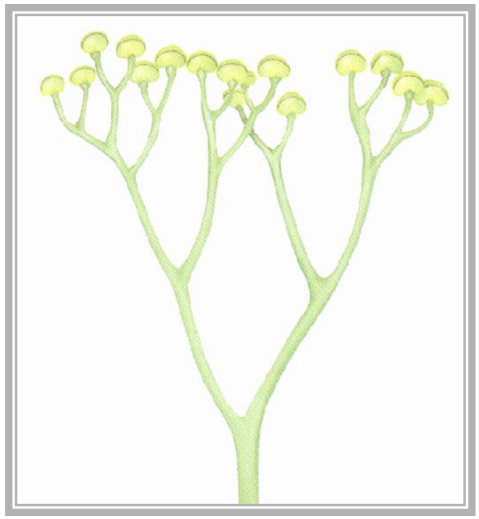
# ZOSTEROPHYTE EVOLUTION



**RHYNIOPHYTE**

***RENALIA***

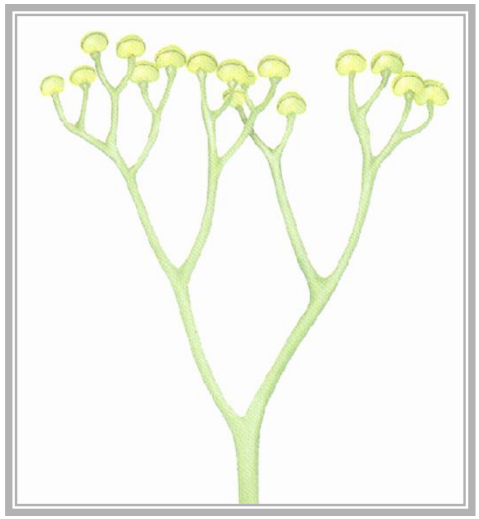
# ZOSTEROPHYTE EVOLUTION



RHYNIOPHYTE

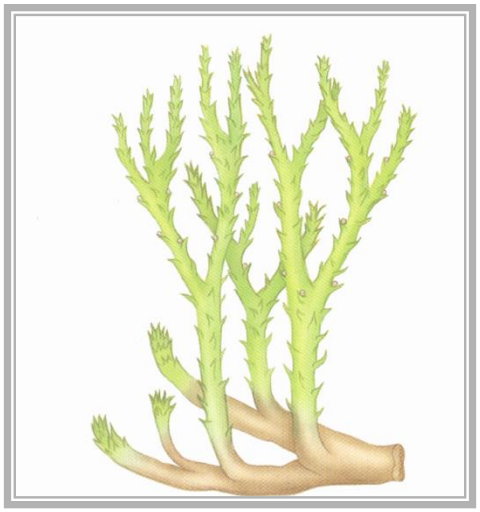
RHYNIOPHYTE

# ZOSTEROPHYTE EVOLUTION



RHYNIOPHYTE

RHYNIOPHYTE



ZOSTEROPHYTE

# PHYLUM
# ZOSTEROPHYLLOPHYTA

EXTINCT
PHYLUM

# PHYLUM
# ZOSTEROPHYLLOPHYTA

EXTINCT
PHYLUM

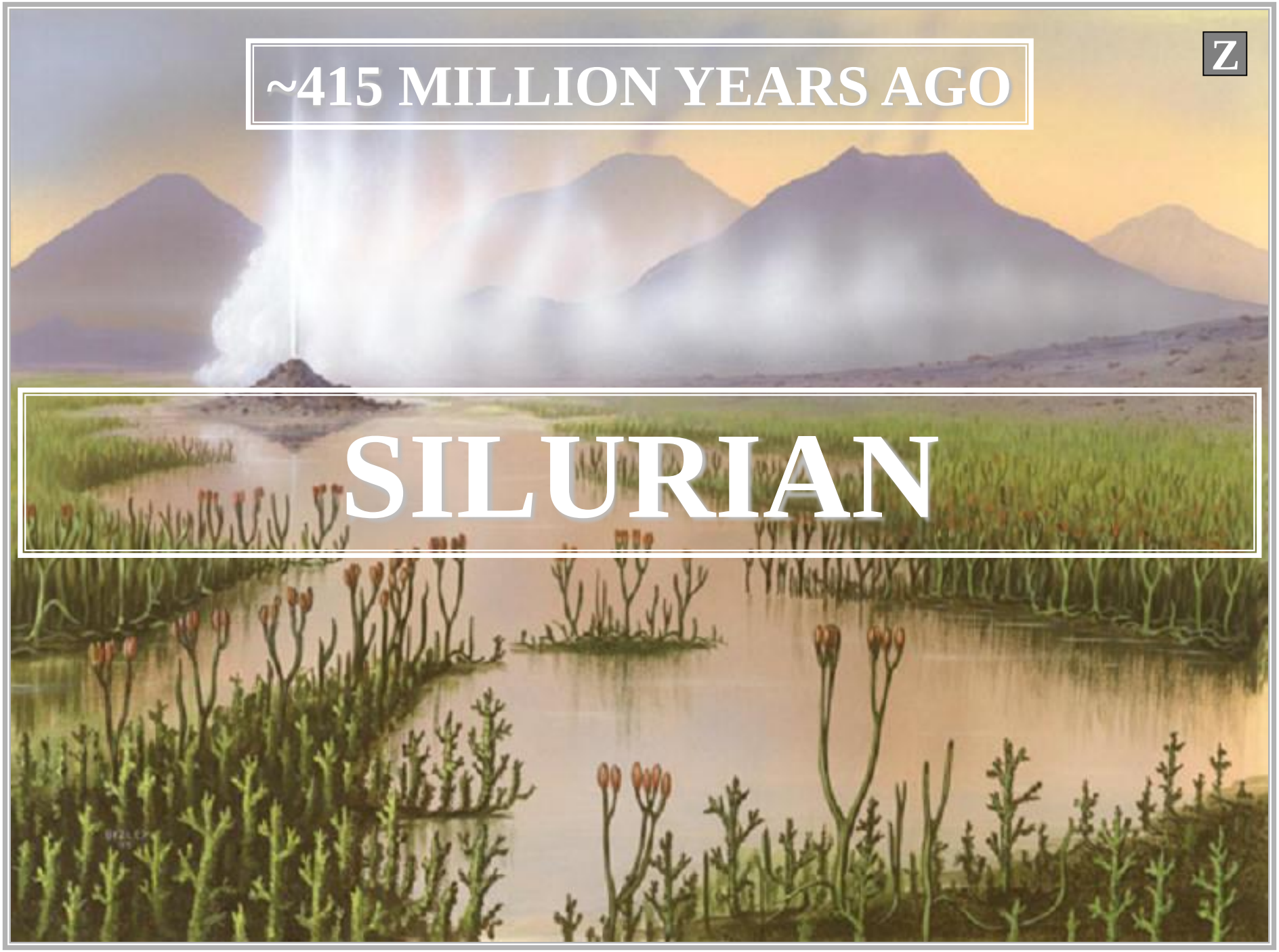
# COMMON NAME

# ZOSTEROPHYTES

# FOSSIL RECORD

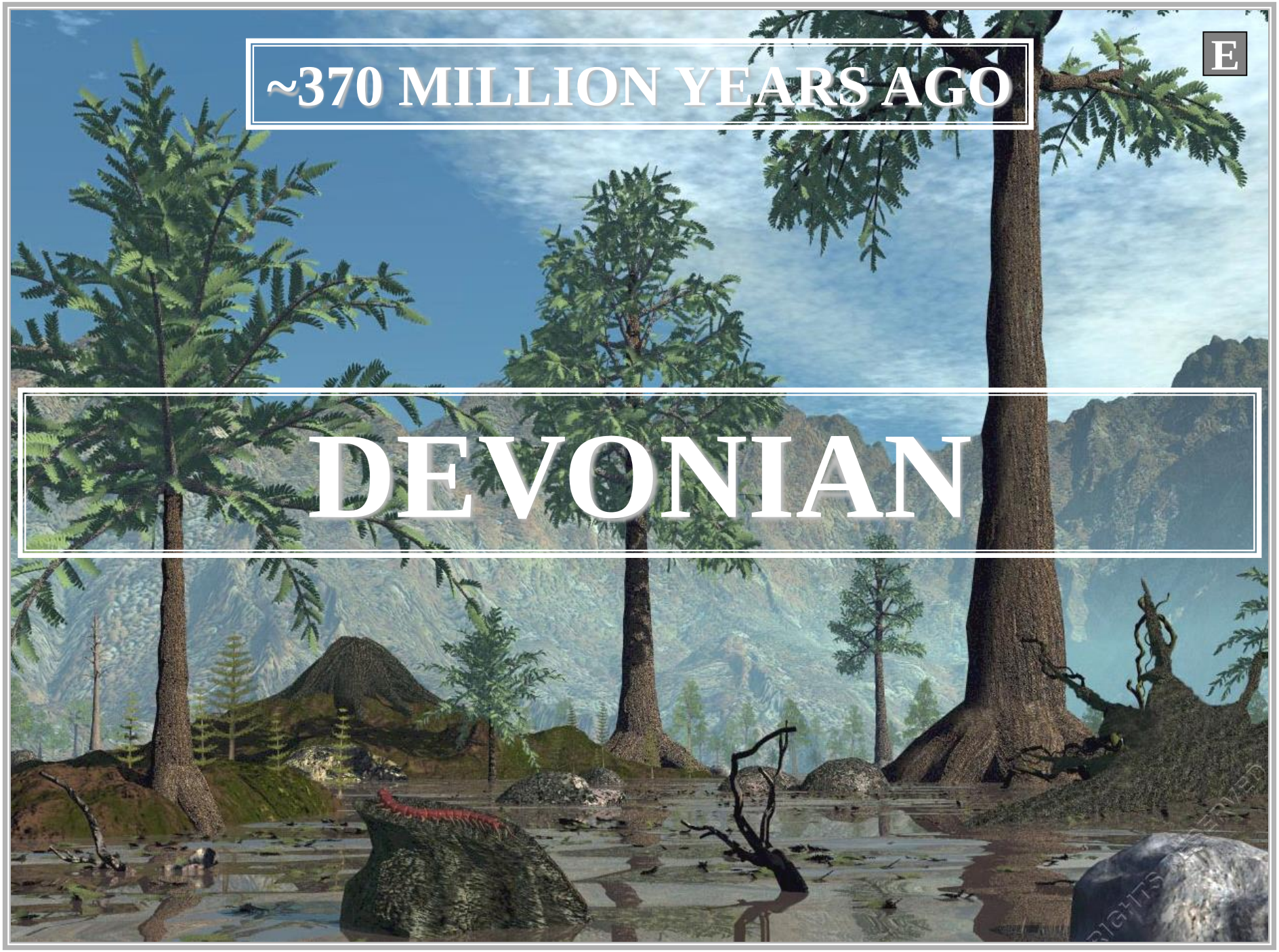
# ~415

# MILLION YEARS


~415 MILLION YEARS AGO
Z
SILURIAN

~415 MILLION YEARS AGO
ZOSTEROPHYTES EVOLVE

# ~370
# MILLION YEARS


~370 MILLION YEARS AGO
E
DEVONIAN

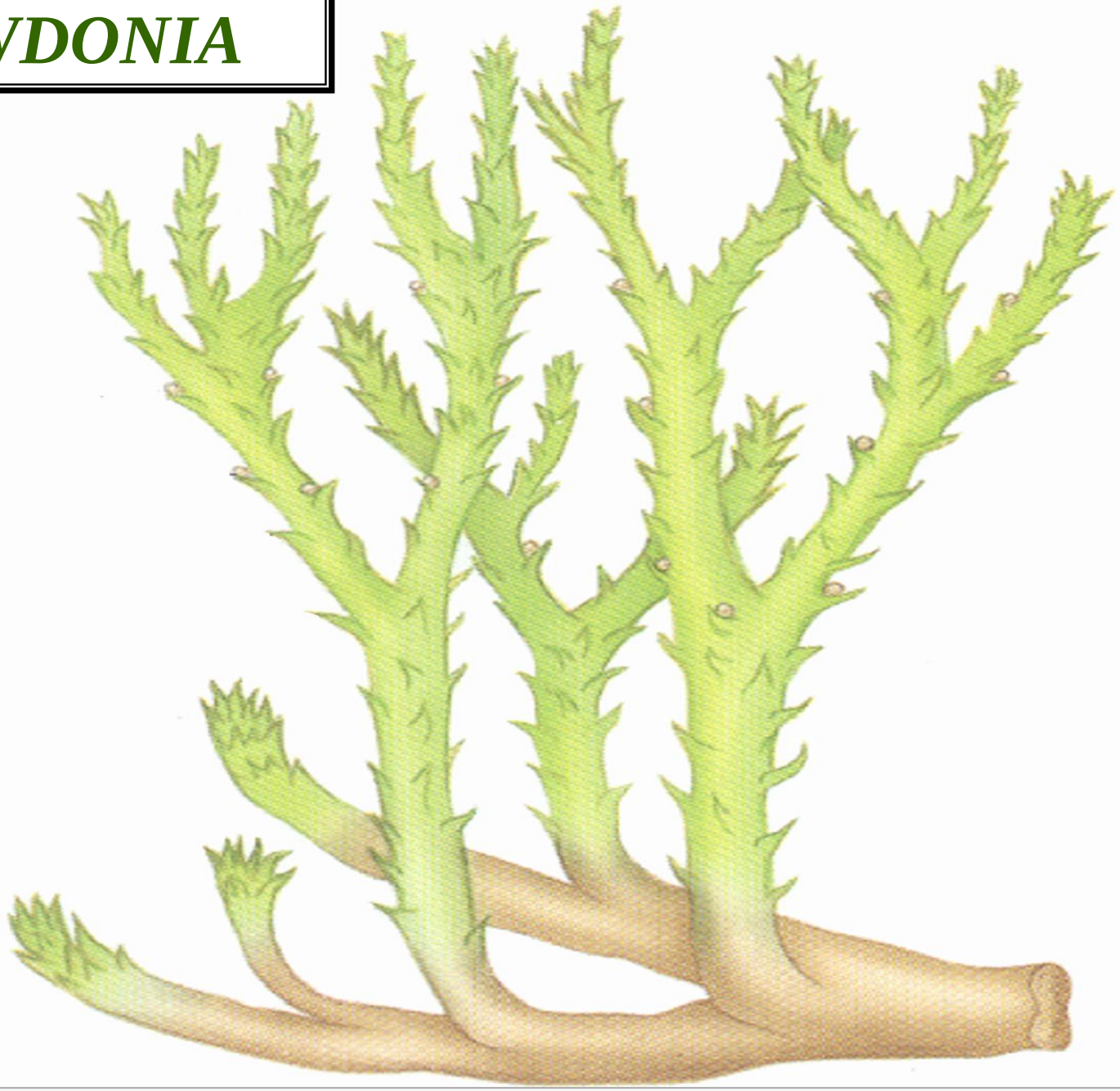
~370 MILLION YEARS AGO
ZOSTEROPHYTES
EXTINCT

# GENERAL CHARACTERS

# ORGANS

# *SAWDONIA*

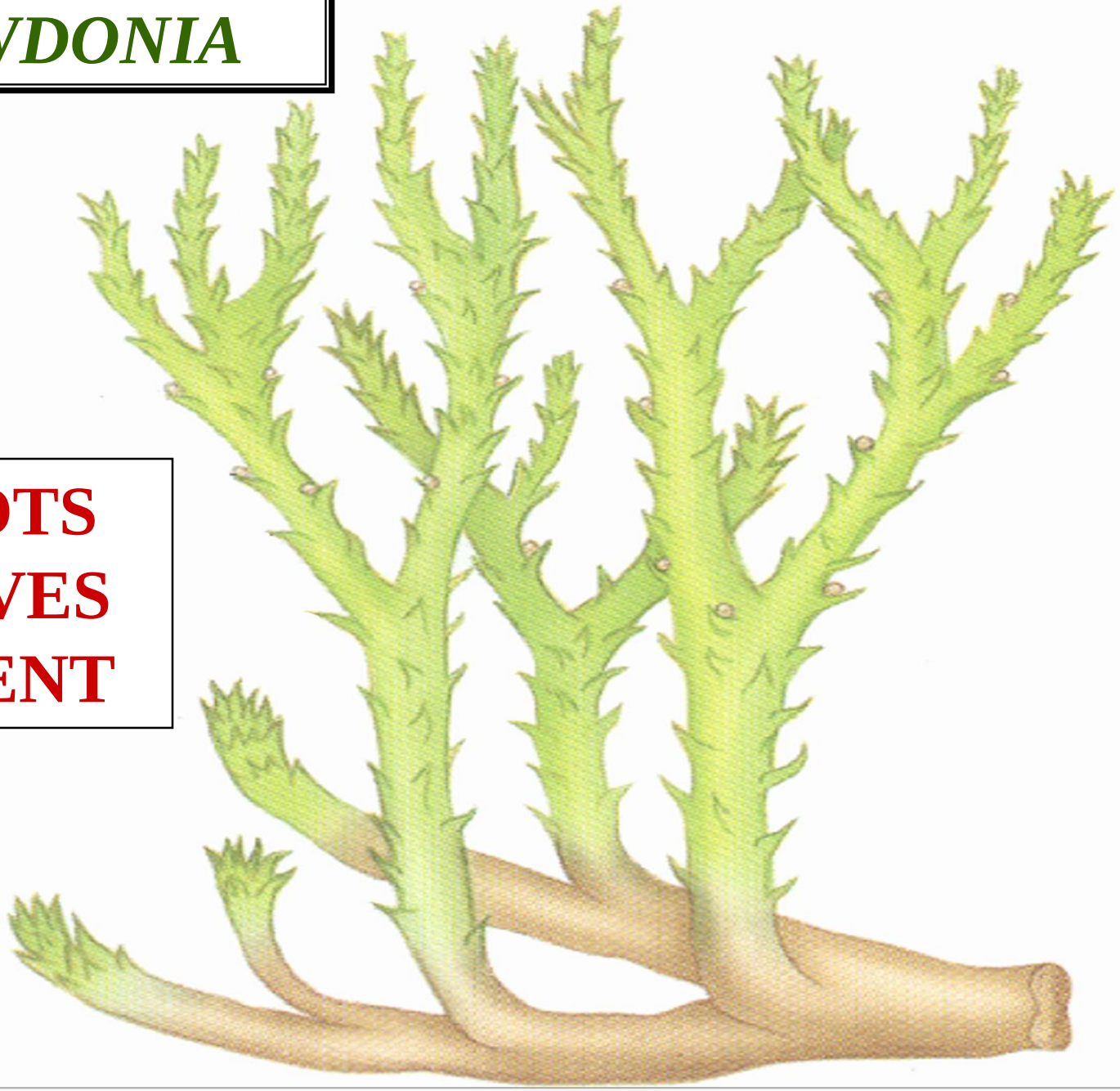
AB



# *SAWDONIA*

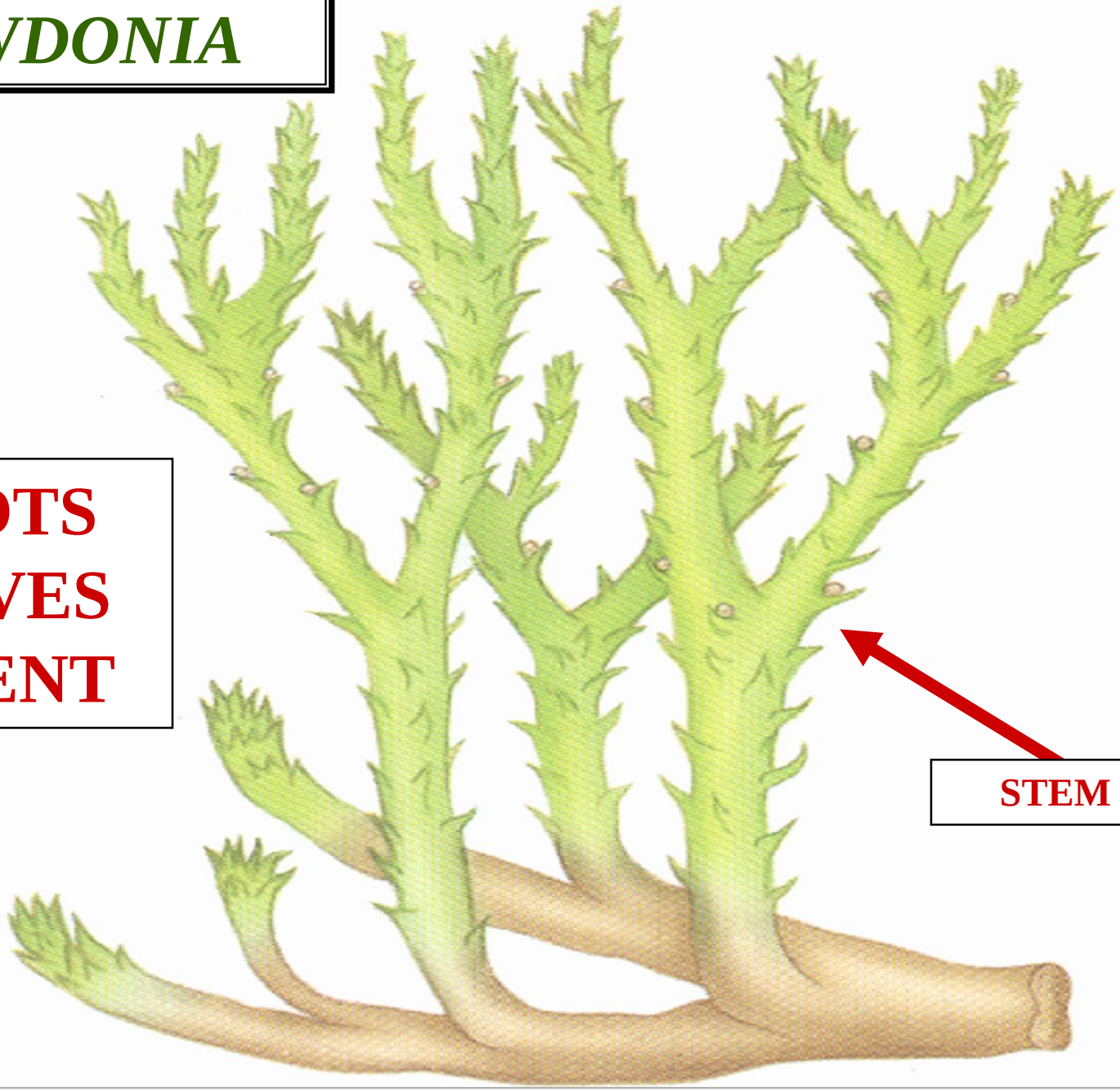
S

**ROOTS**
**LEAVES**
**ABSENT**



# *SAWDONIA*

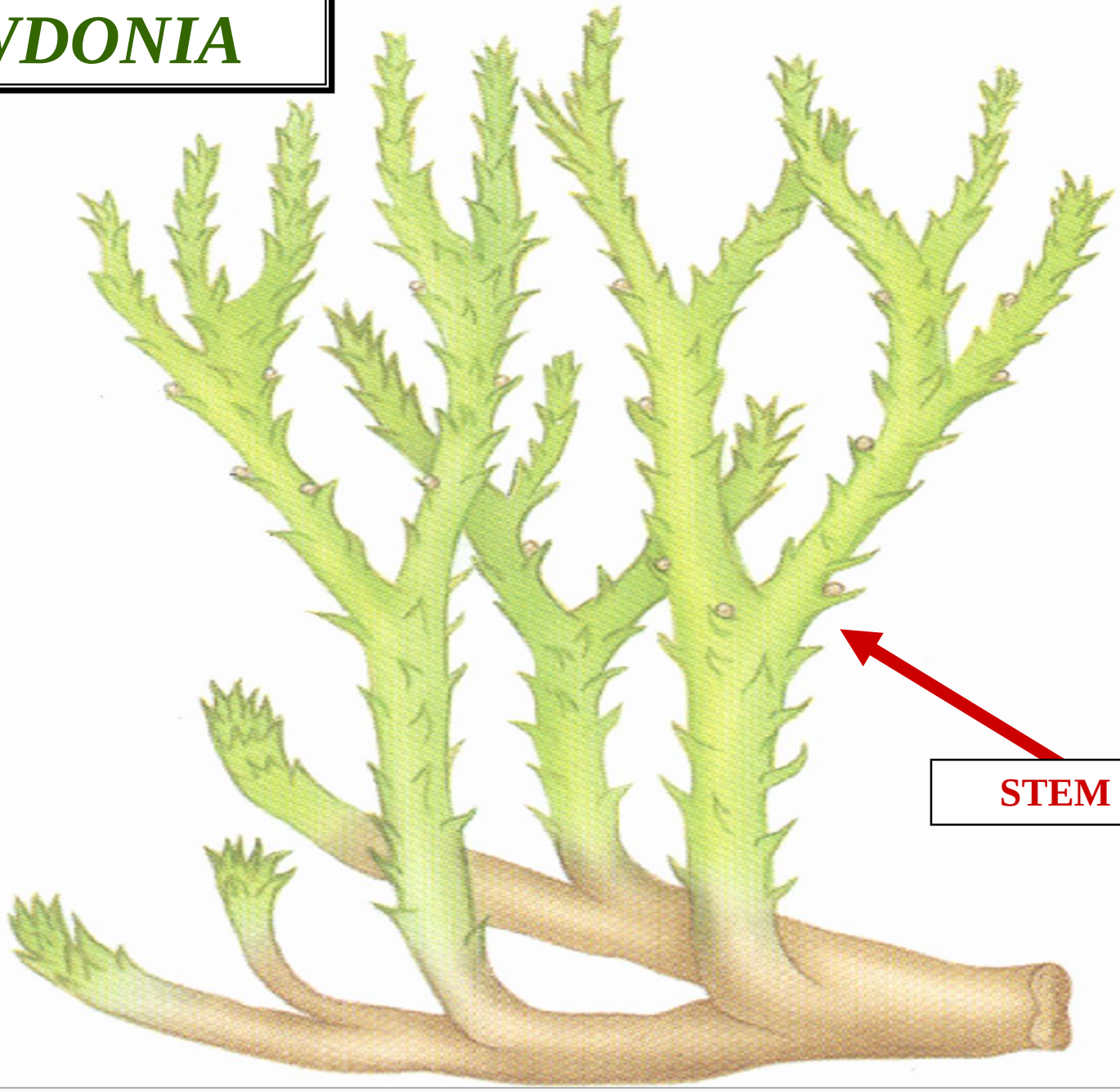
**ROOTS**
**LEAVES**
**ABSENT**



# STEM

# *SAWDONIA*

P



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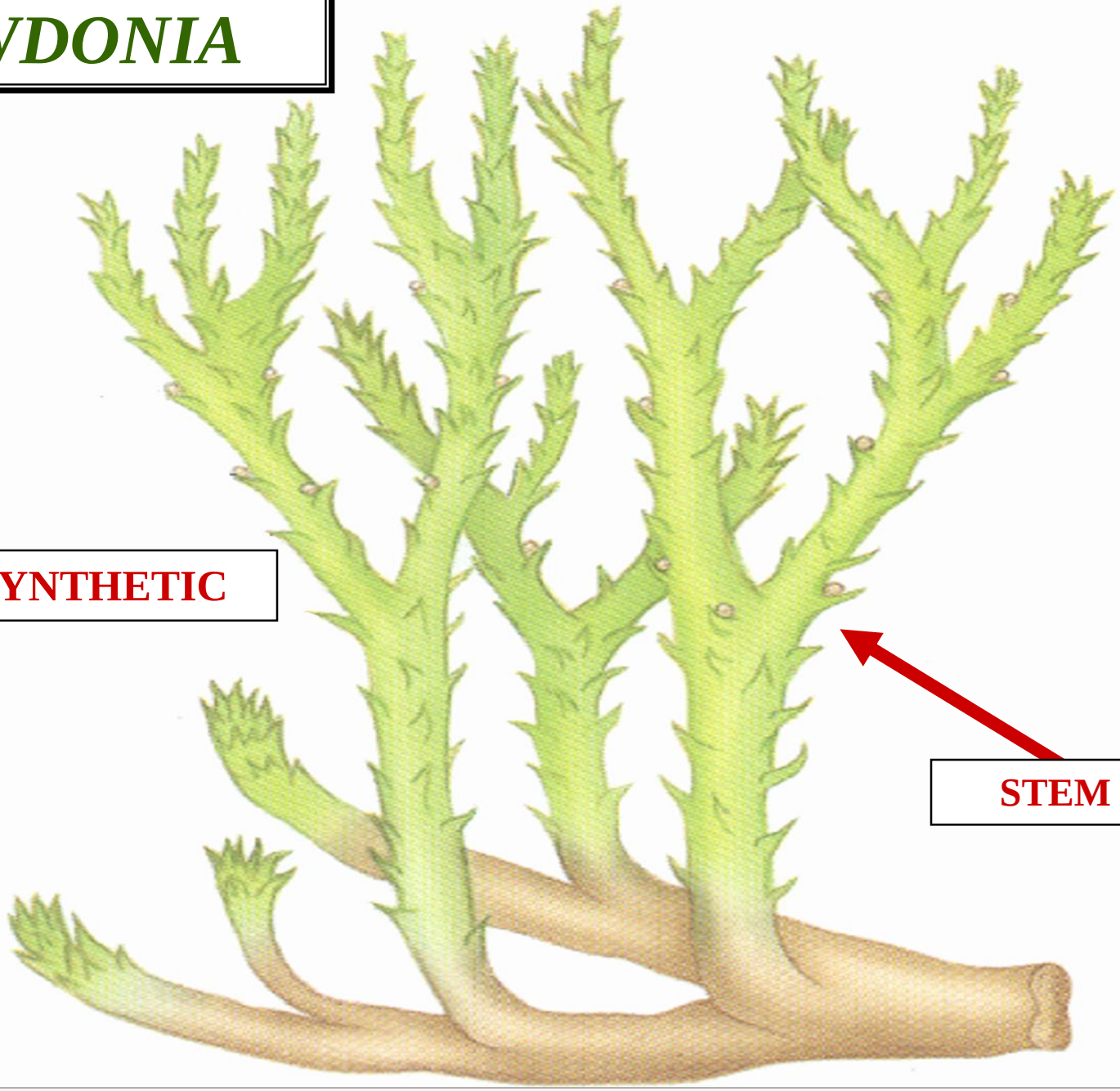
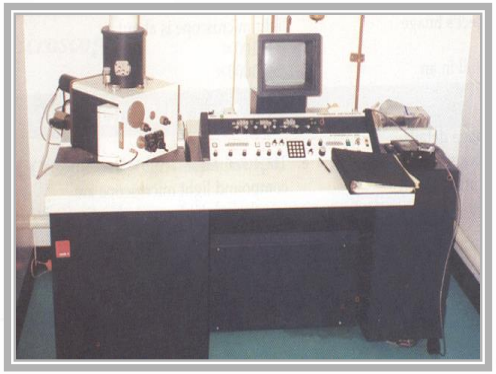


**PHOTOSYNTHETIC**

**STEM**

# STEM ANATOMY

# *SAWDONIA*

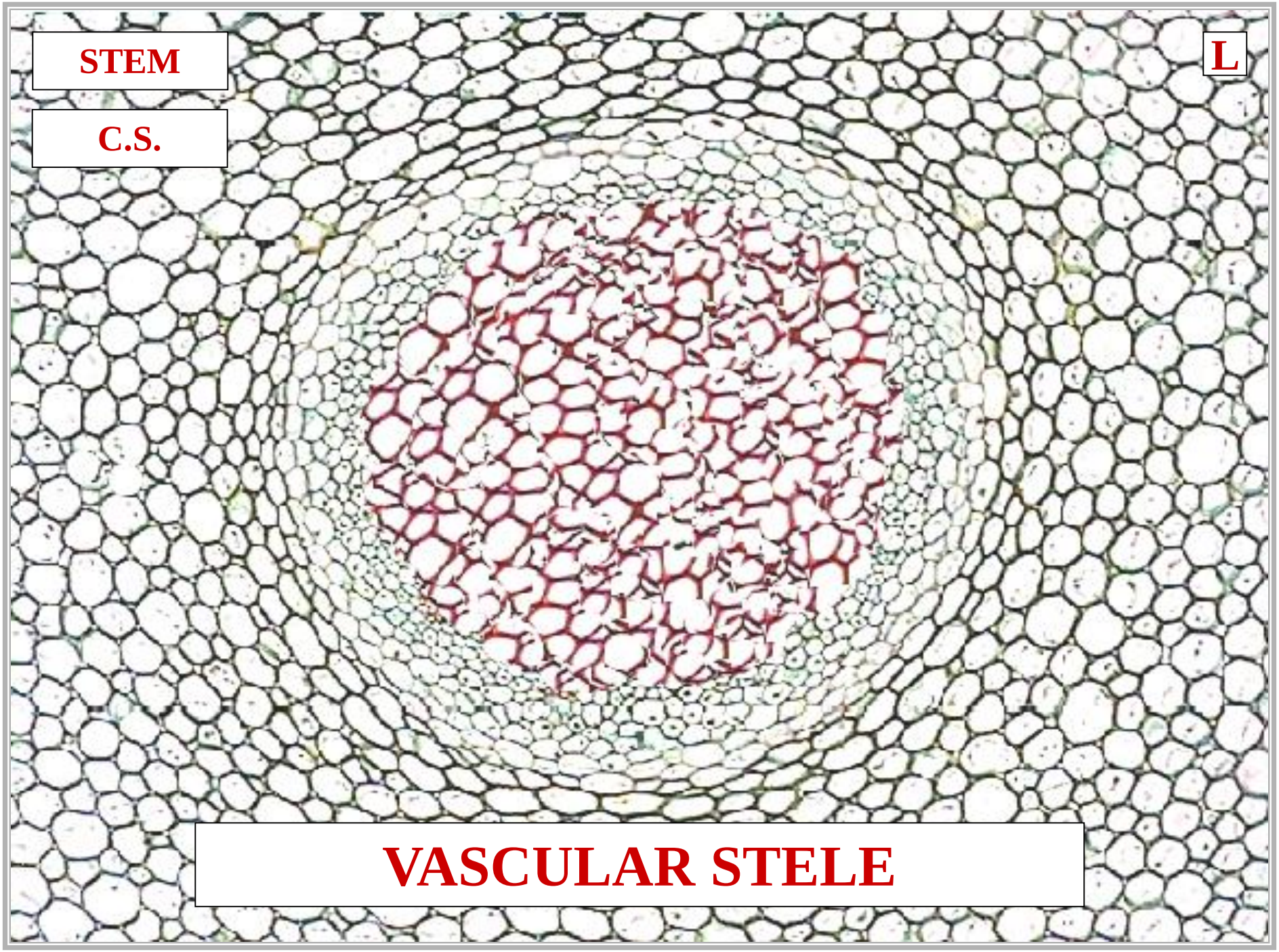


STEM

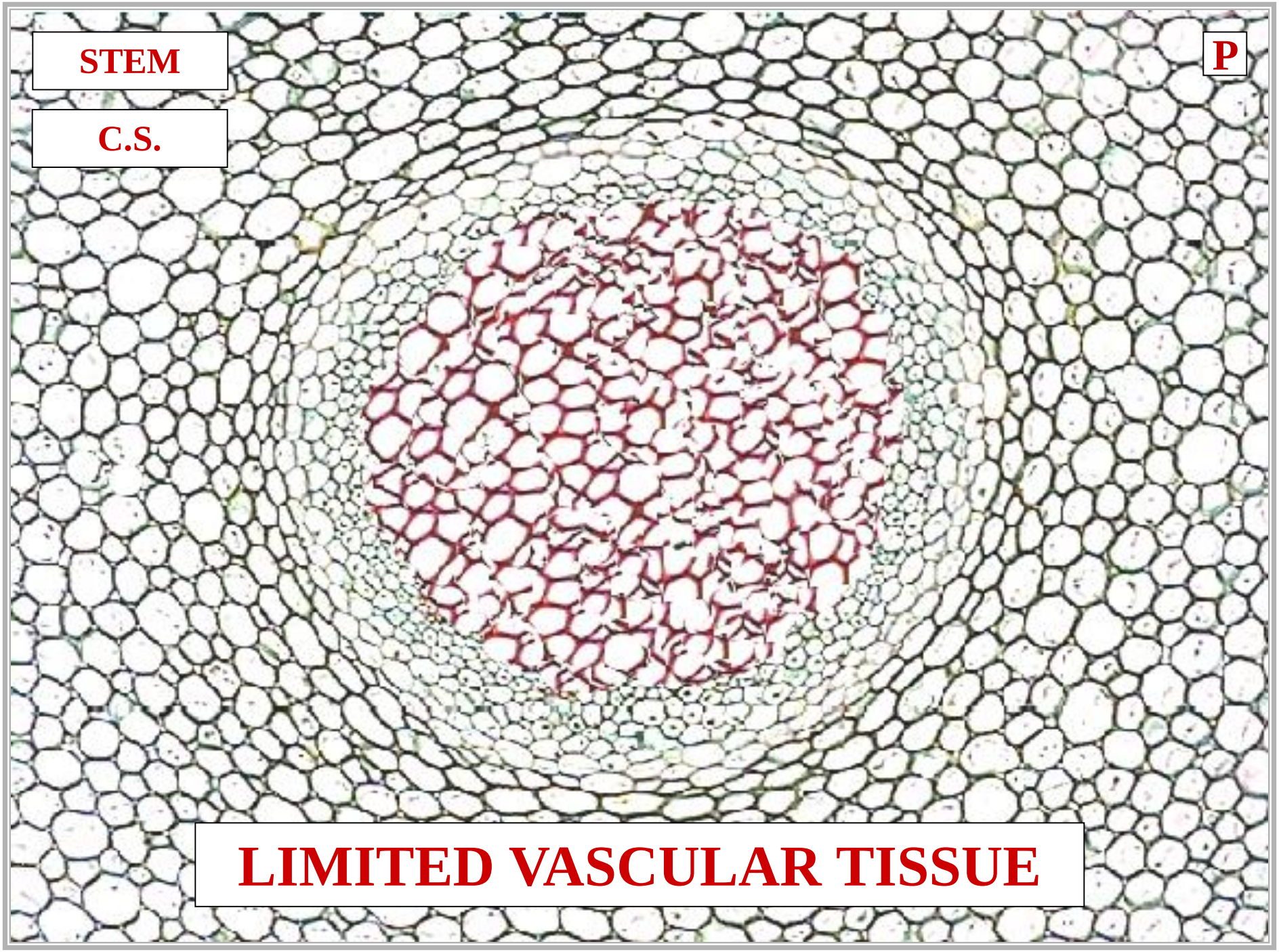
STEM

C.S.

L



# VASCULAR STELE


STEM
C.S.
P
LIMITED VASCULAR TISSUE