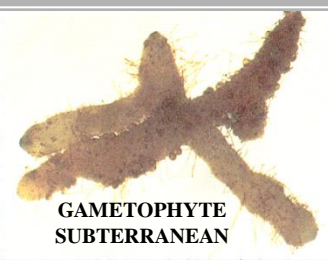


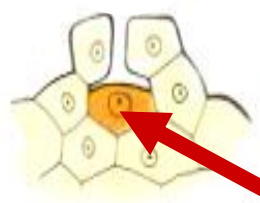
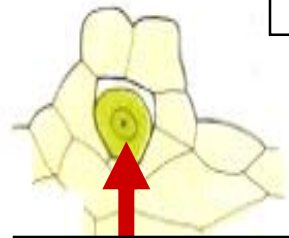
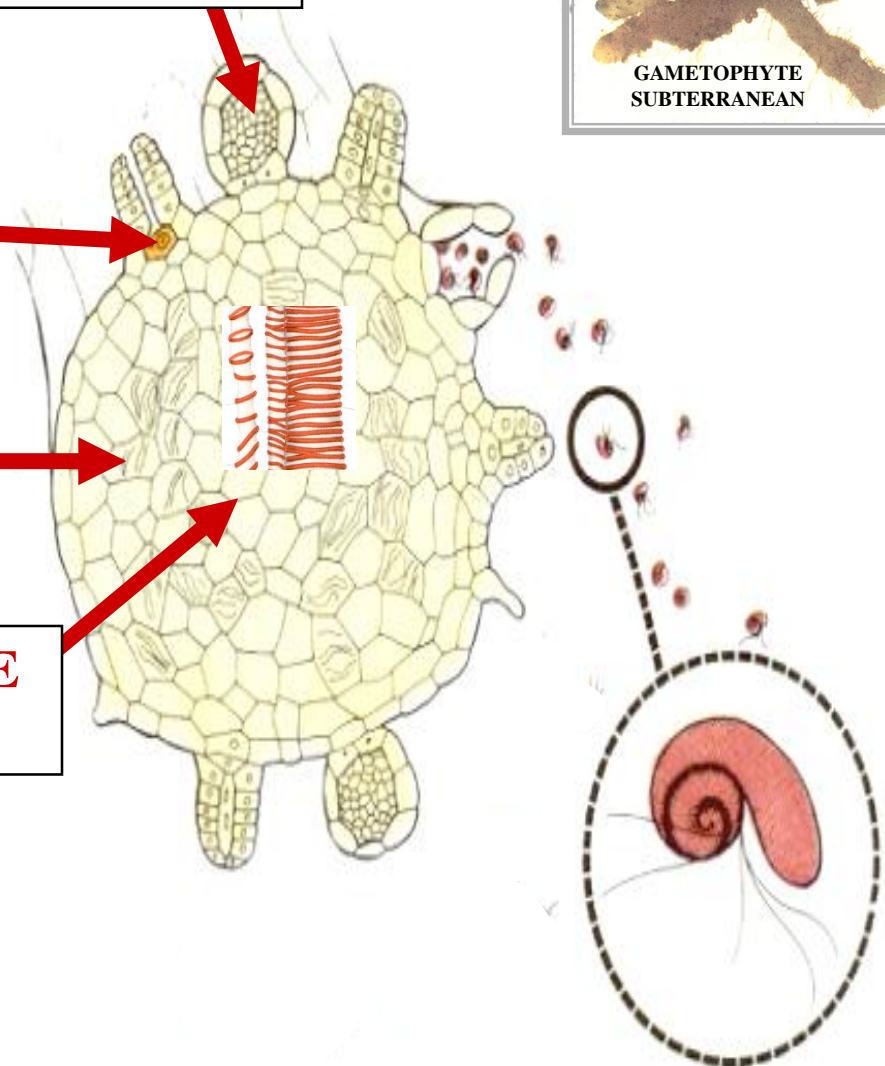
GAMETOPHYTE

MITOSIS



GAMETANGIA

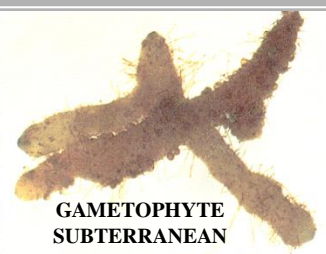
**VASCULAR TISSUE
PRESENT**



SPERM

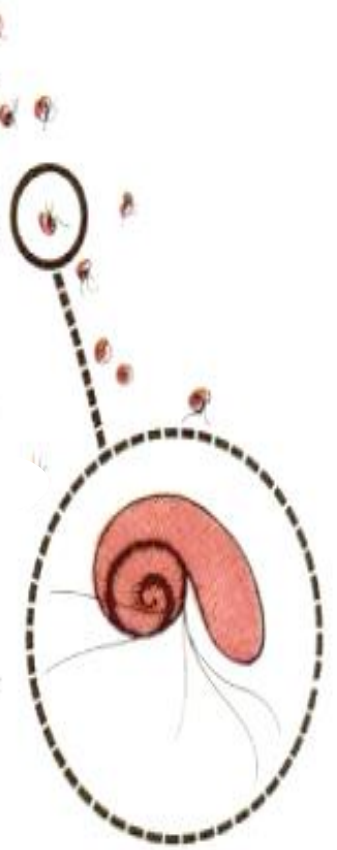
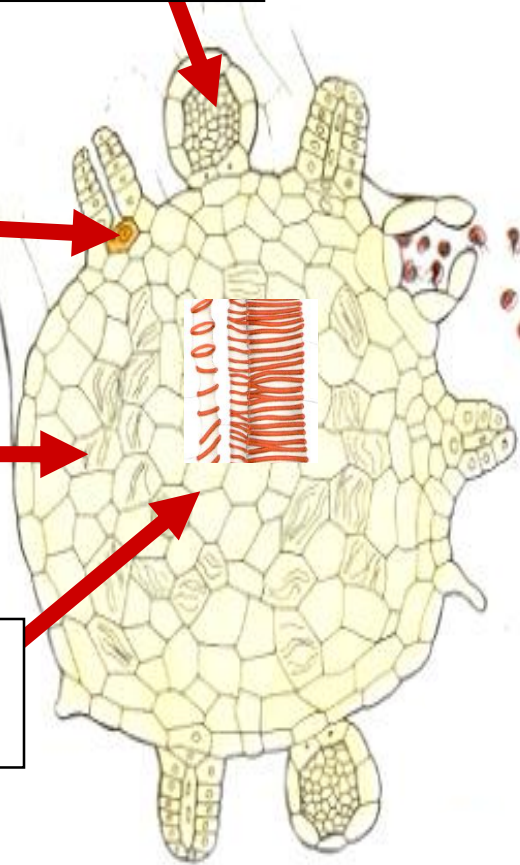
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MITOSIS

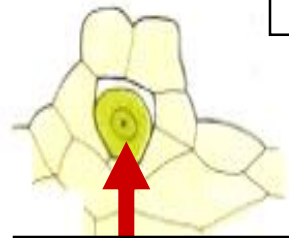


GAMETANGIA

**VASCULAR TISSUE
PRESENT**

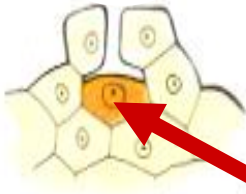
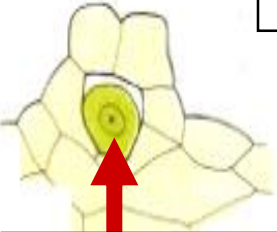
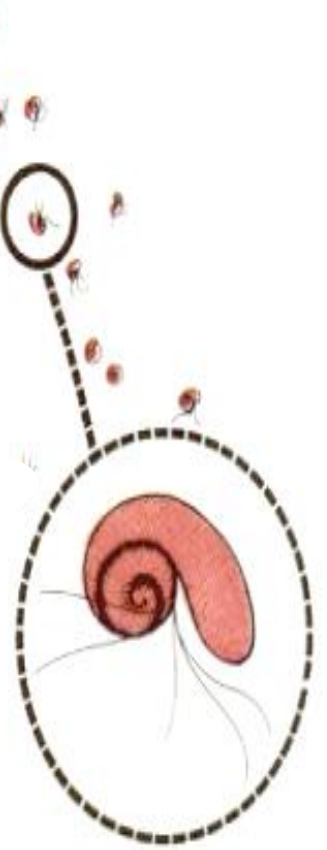
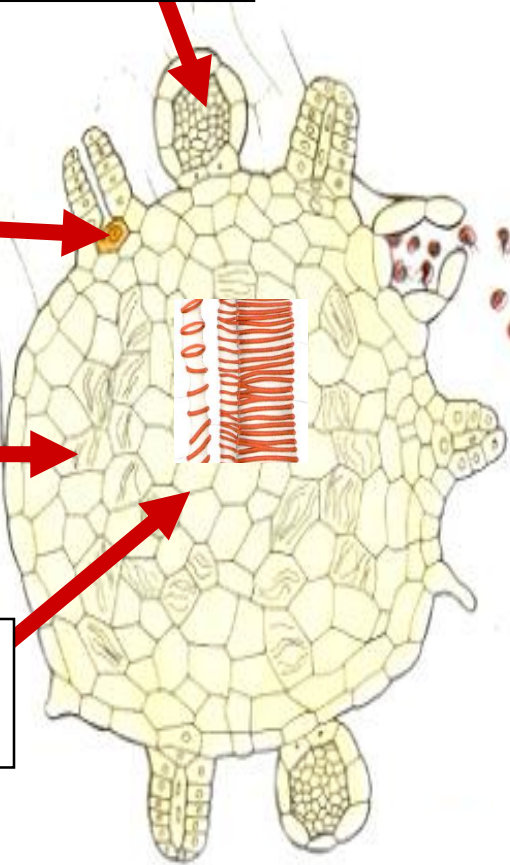
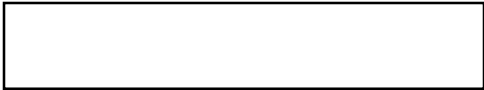
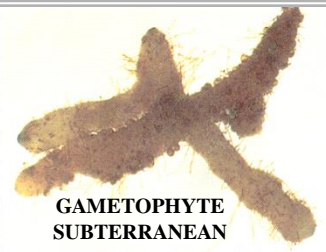


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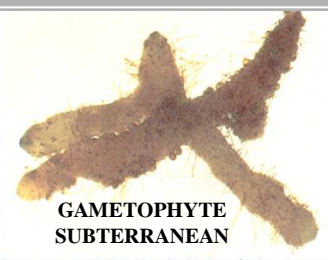
GAMETOPHYTE

MITOSIS



GAMETOPHYTE

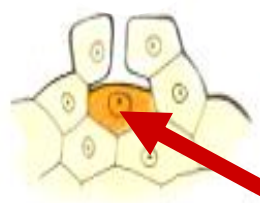
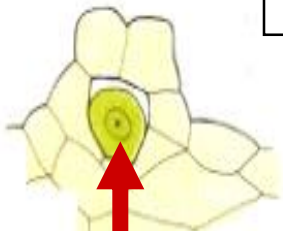
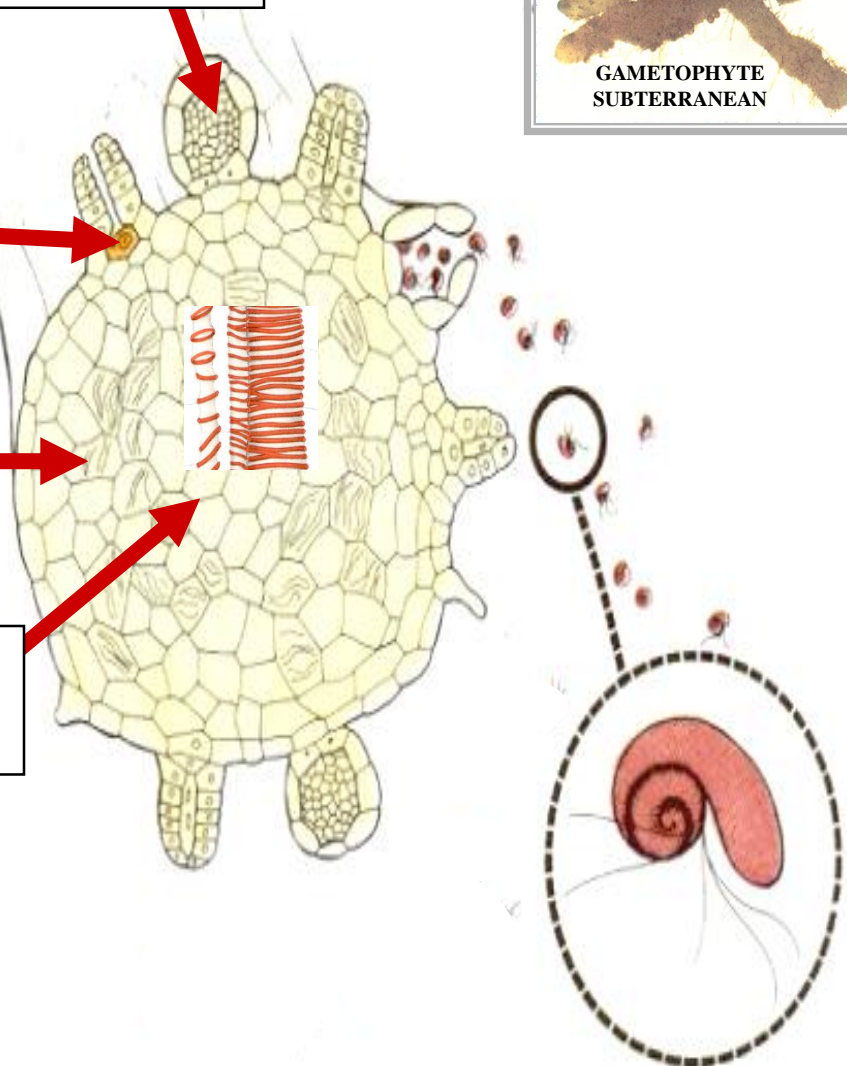
ANTHERIDIUM



ARCHEGONIUM

GAMETANGIA

**VASCULAR TISSUE
PRESENT**



SPERM

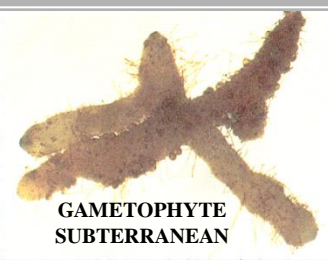
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GAMETOPHYTE

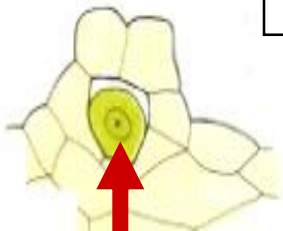
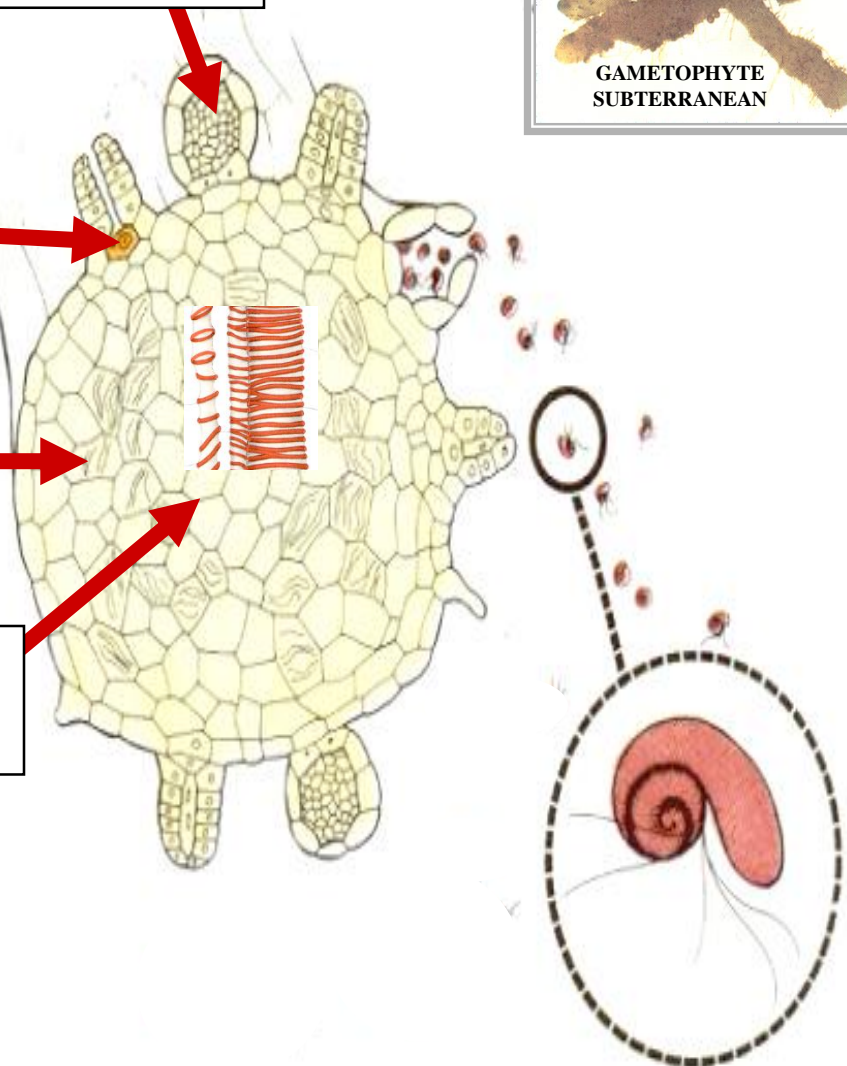
ANTHERIDIUM



OOCYTE

GAMETANGIA

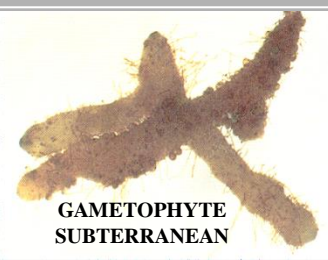
**VASCULAR TISSUE
PRESENT**



SPERM

GAMETOPHYTE

ANTHERIDIUM

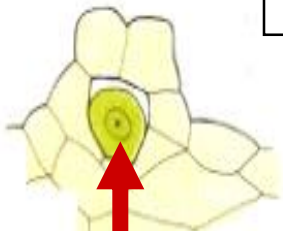
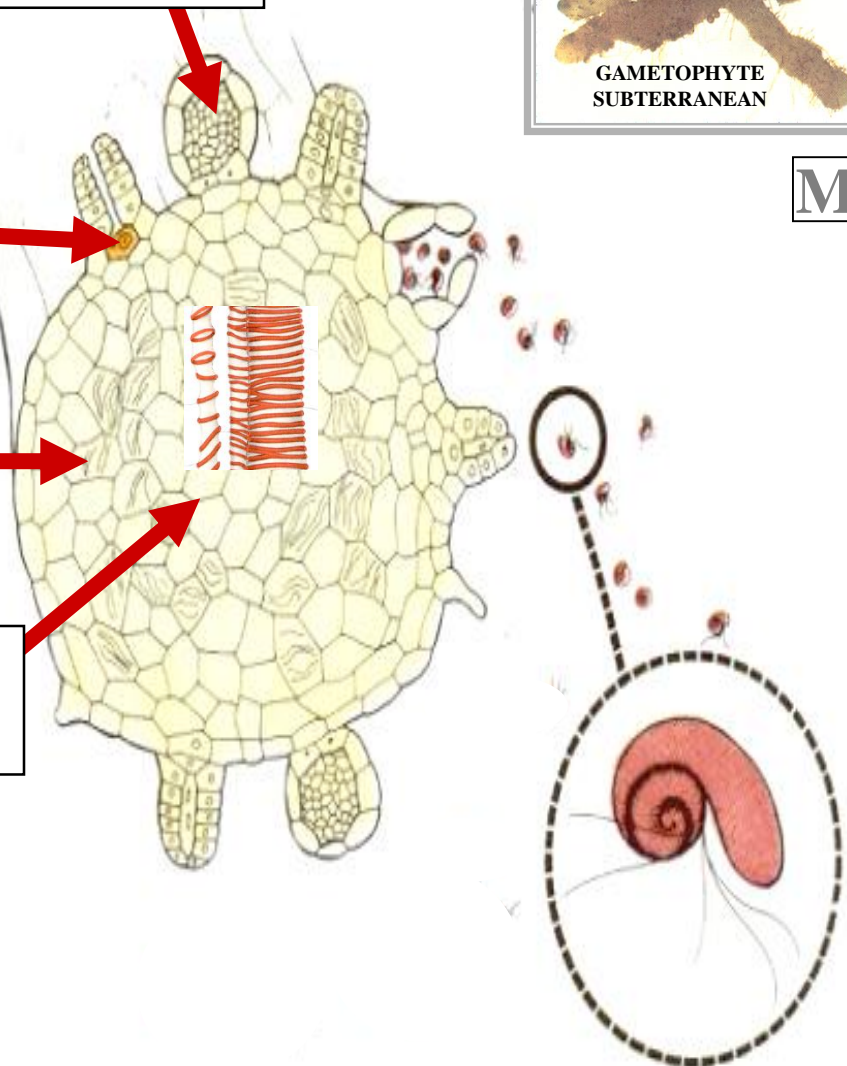


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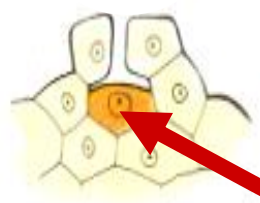
1N

GAMETANGIA

**VASCULAR TISSUE
PRESENT**



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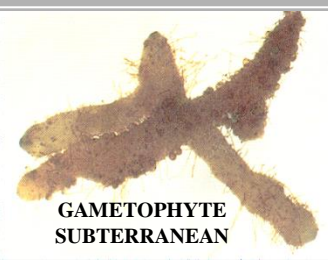


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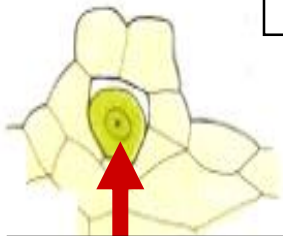
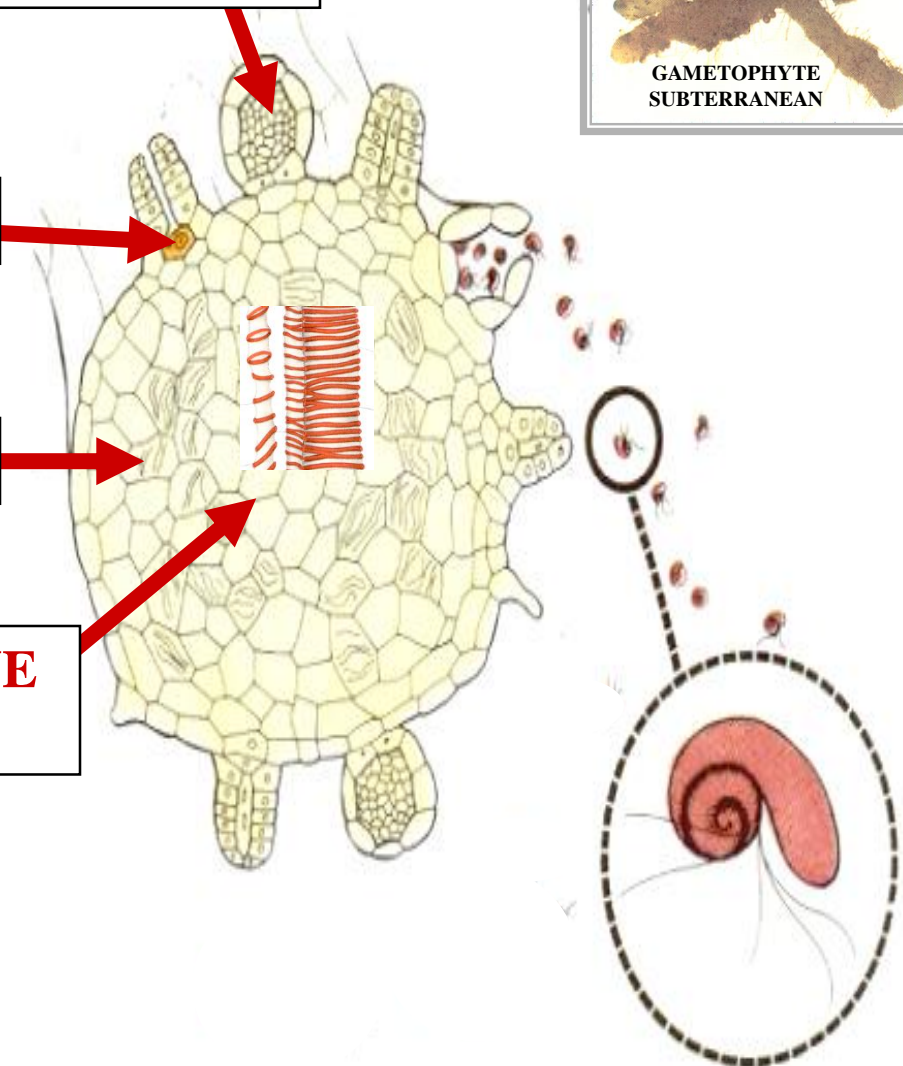
ANTHERIDIUM



MITOSIS

GAMETANGIA

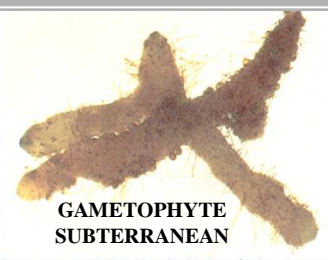
**VASCULAR TISSUE
PRESENT**



SPERM

GAMETOPHYTE

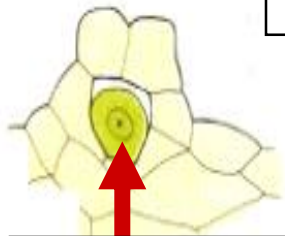
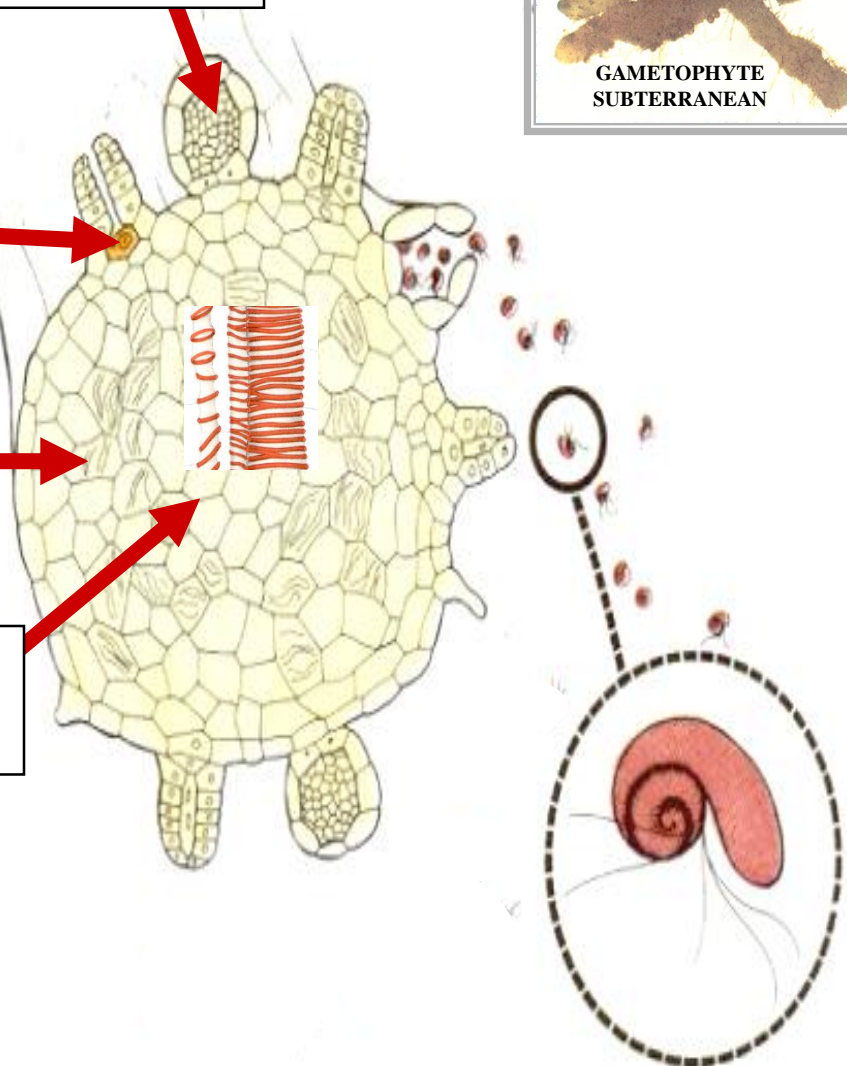
ANTHERIDIUM



EGG

GAMETANGIA

**VASCULAR TISSUE
PRESENT**

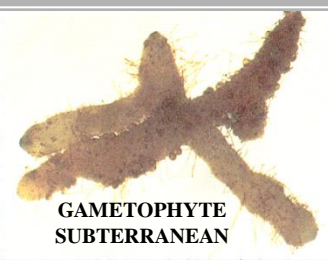


EGG

SPERM

GAMETOPHYTE

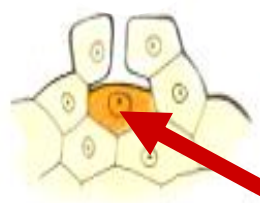
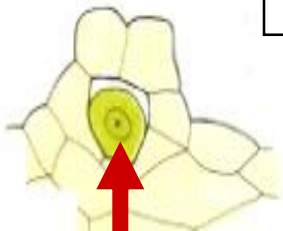
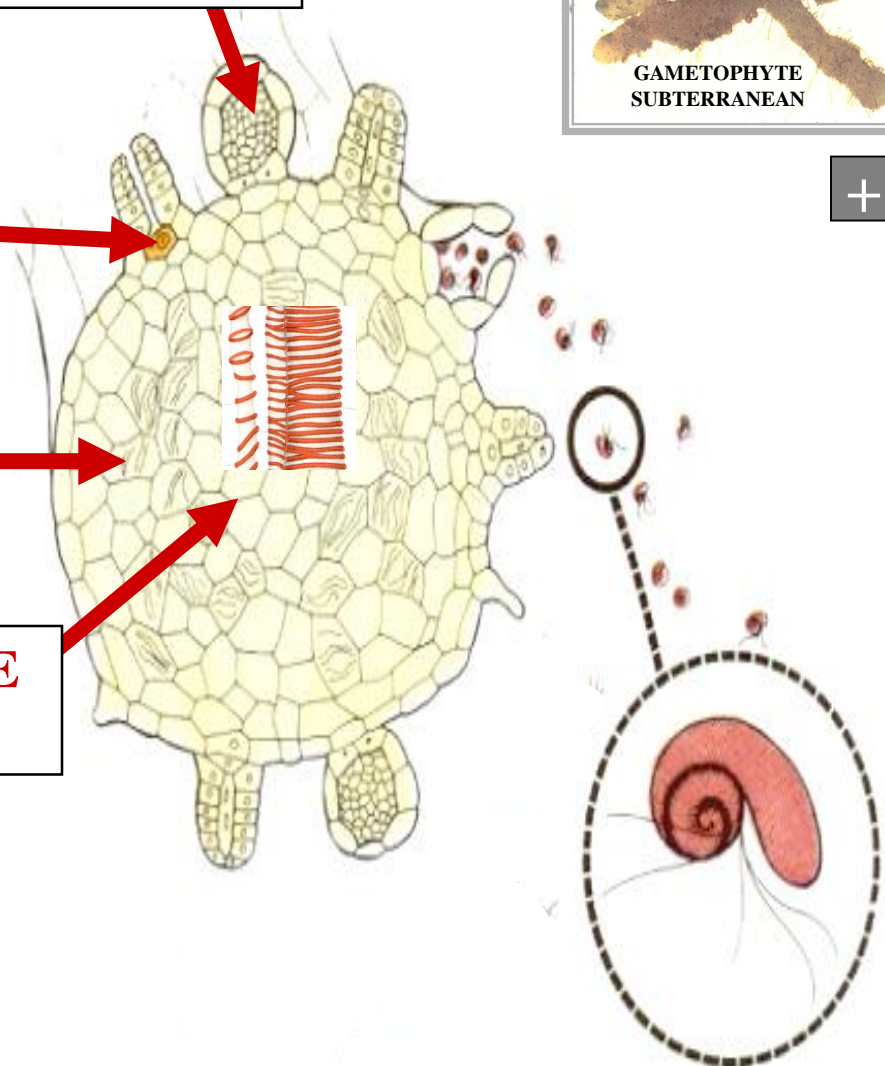
ANTHERIDIUM



ARCHEGONIA

GAMETANGIA

**VASCULAR TISSUE
PRESENT**

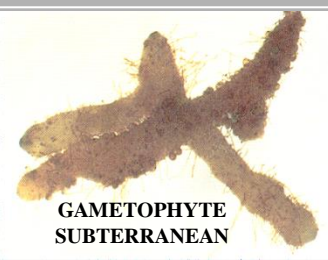


1N

SPERM

GAMETOPHYTE

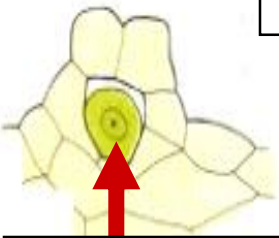
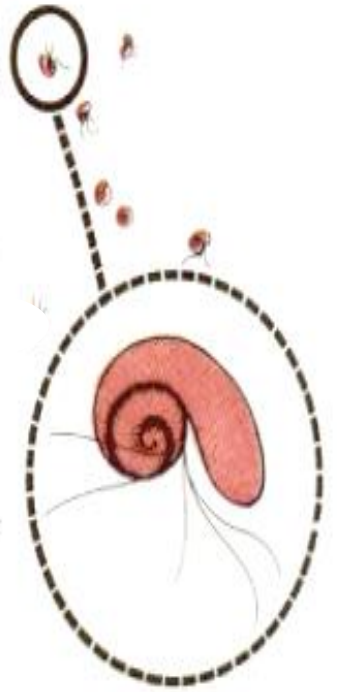
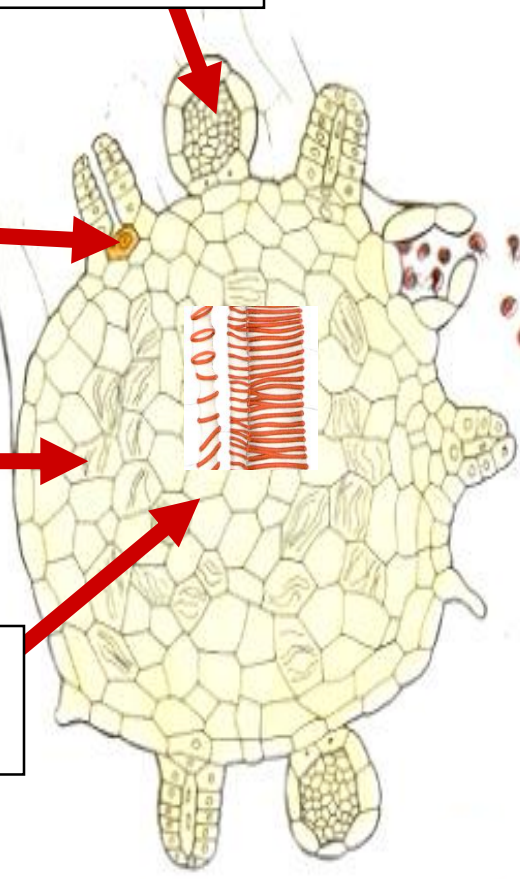
ANTHERIDIUM



ARCHEGONIA

GAMETANGIA

**VASCULAR TISSUE
PRESENT**



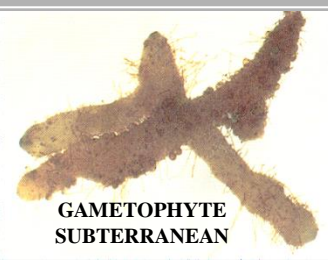
EGG

SPERM



GAMETOPHYTE

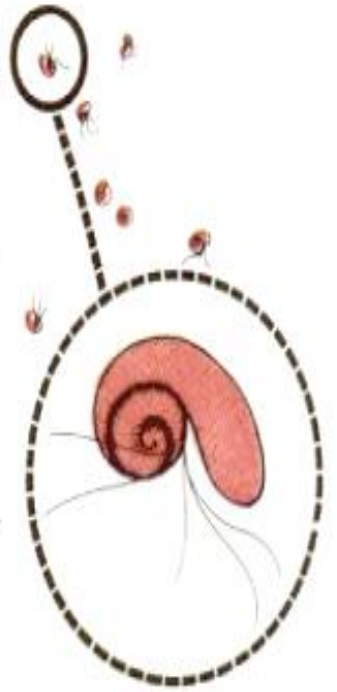
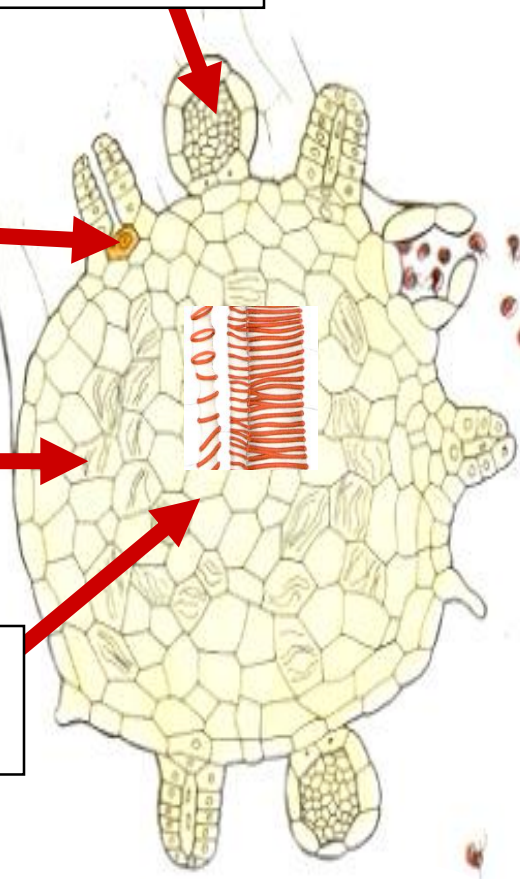
ANTHERIDIUM



ARCHEGONIA

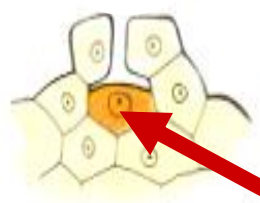
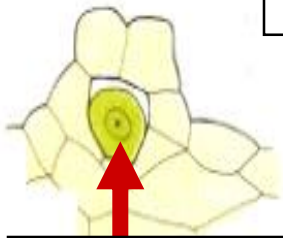
GAMETANGIA

**VASCULAR TISSUE
PRESENT**



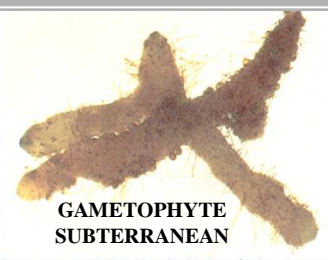
EGG

SPERM



GAMETOPHYTE

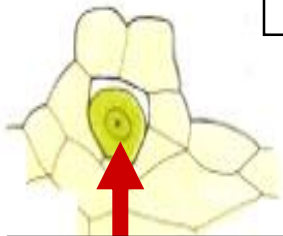
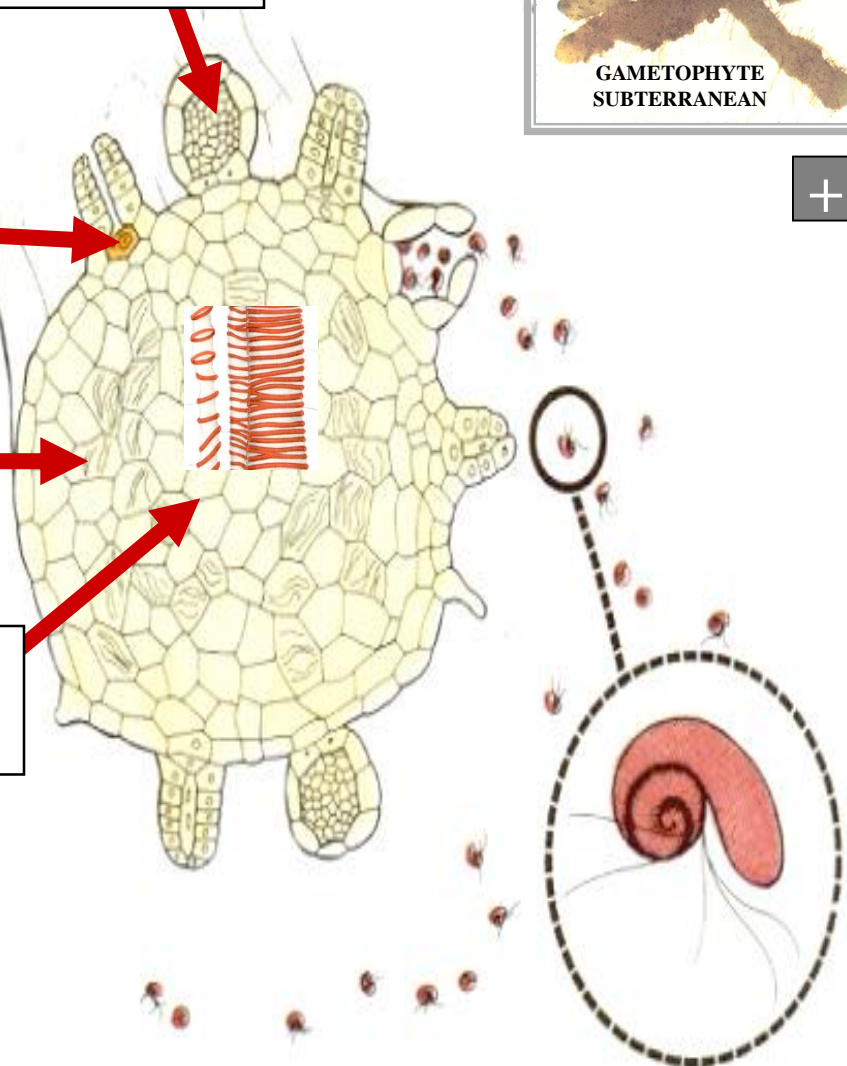
ANTHERIDIUM



ARCHEGONIA

GAMETANGIA

**VASCULAR TISSUE
PRESENT**

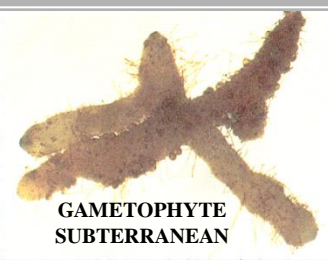


EGG

SPERM

GAMETOPHYTE

ANTHERIDIUM

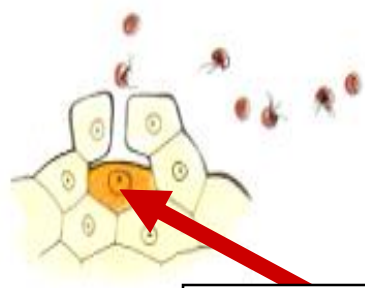
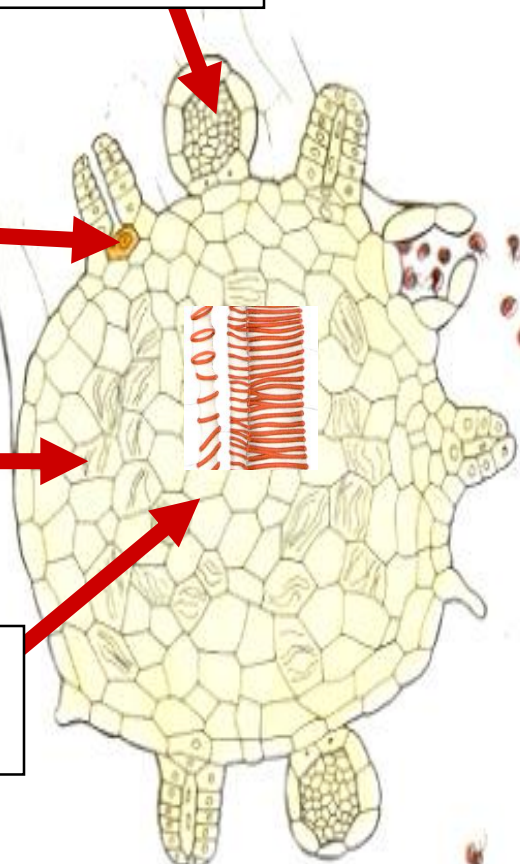


S

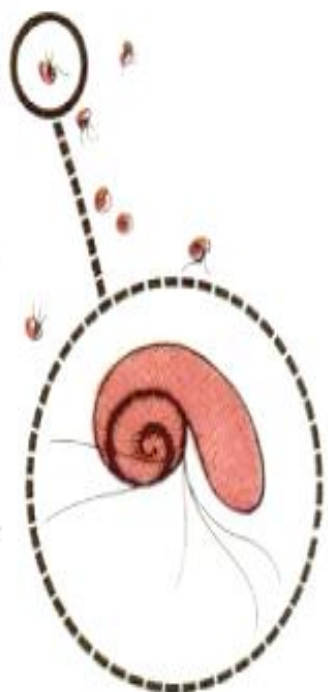
ARCHEGONIA

GAMETANGIA

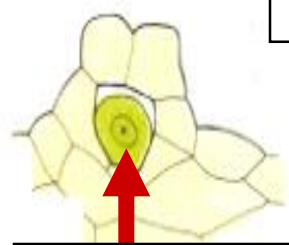
**VASCULAR TISSUE
PRESENT**



EGG



SPERM

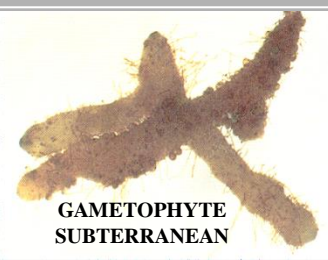


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GAMETOPHYTE

ANTHERIDIUM



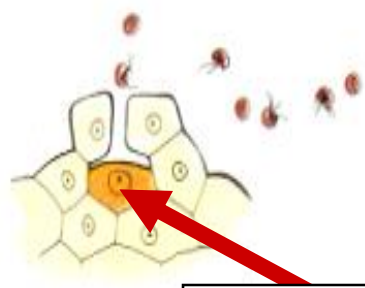
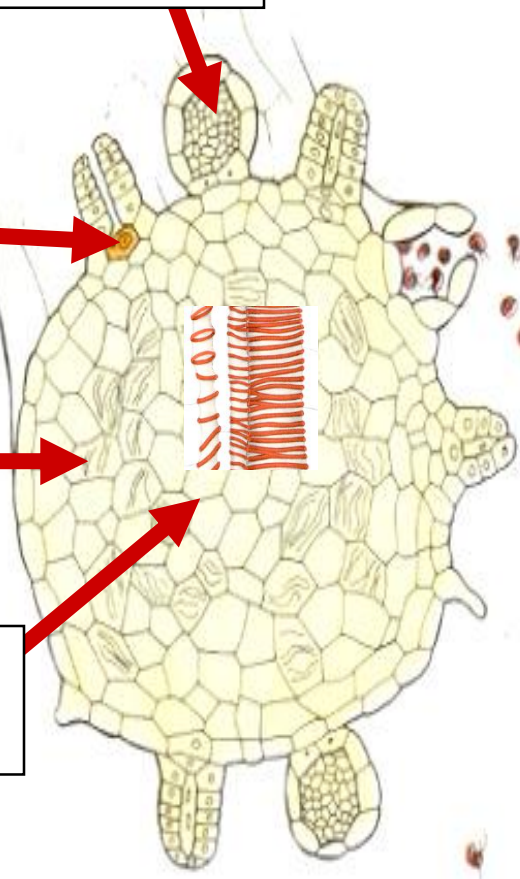
**GAMETOPHYTE
SUBTERRANEAN**



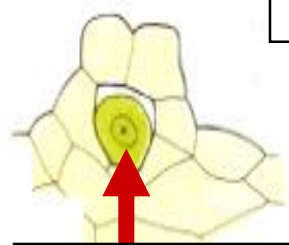
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GAMETANGIA

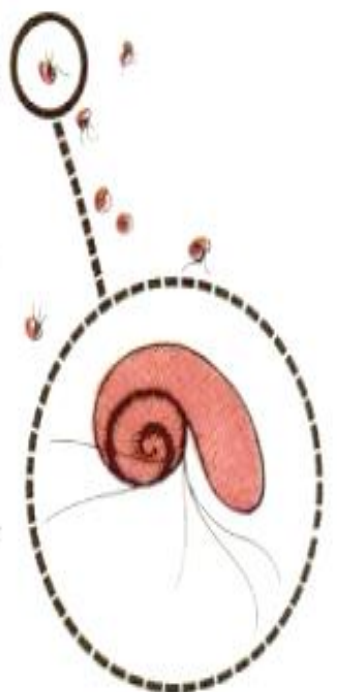
**VASCULAR TISSUE
PRESENT**



EGG



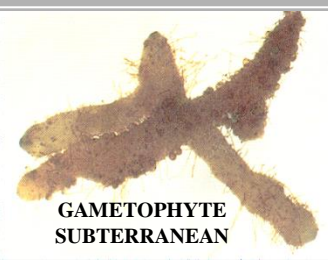
SYNGAMY



SPERM

GAMETOPHYTE

ANTHERIDIUM



ARCHEGONIA

GAMETANGIA

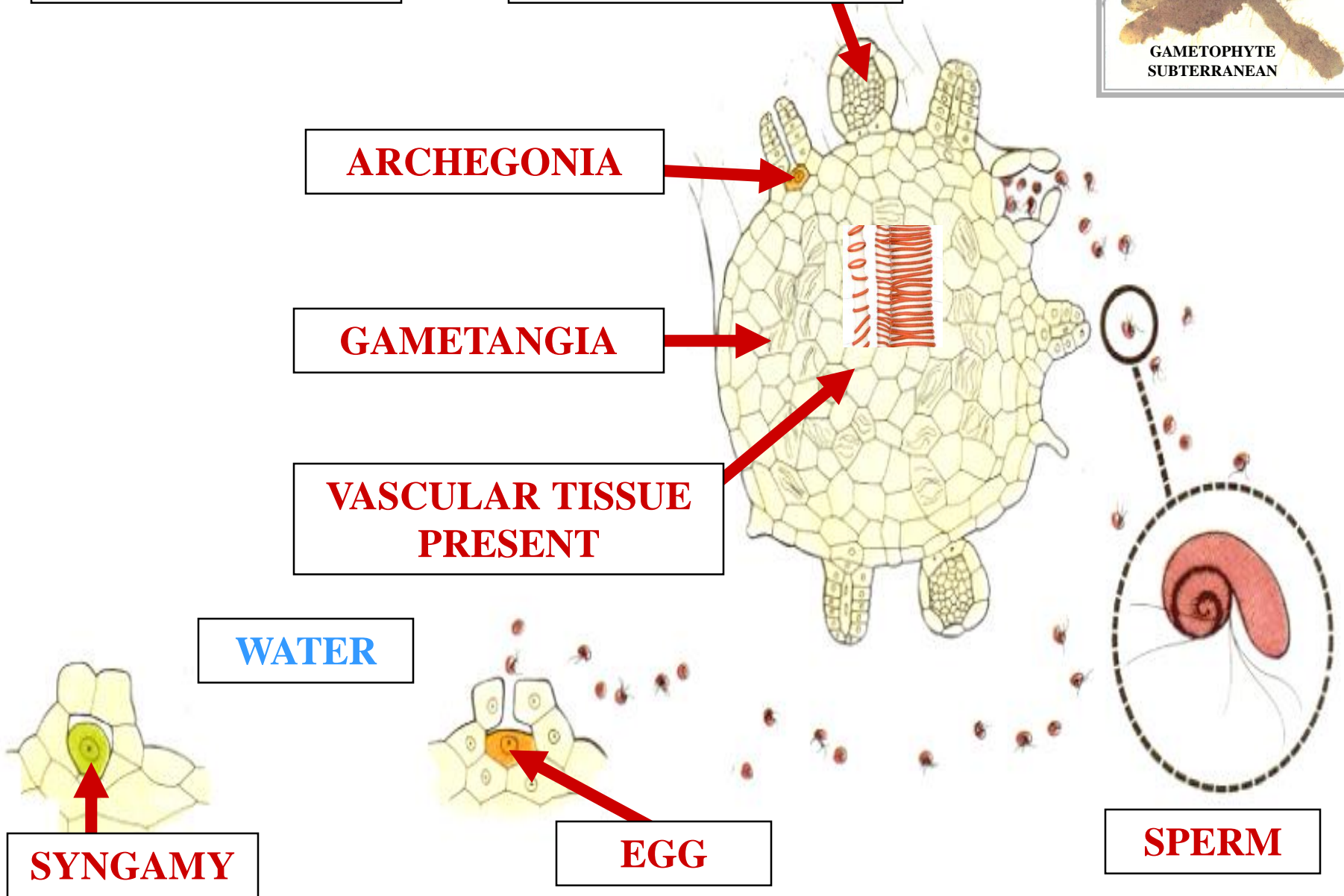
**VASCULAR TISSUE
PRESENT**

WATER

SYNGAMY

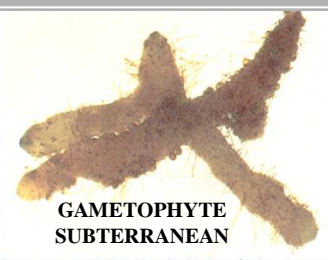
EGG

SPERM



GAMETOPHYTE

ANTHERIDIUM



ARCHEGONIA

GAMETANGIA

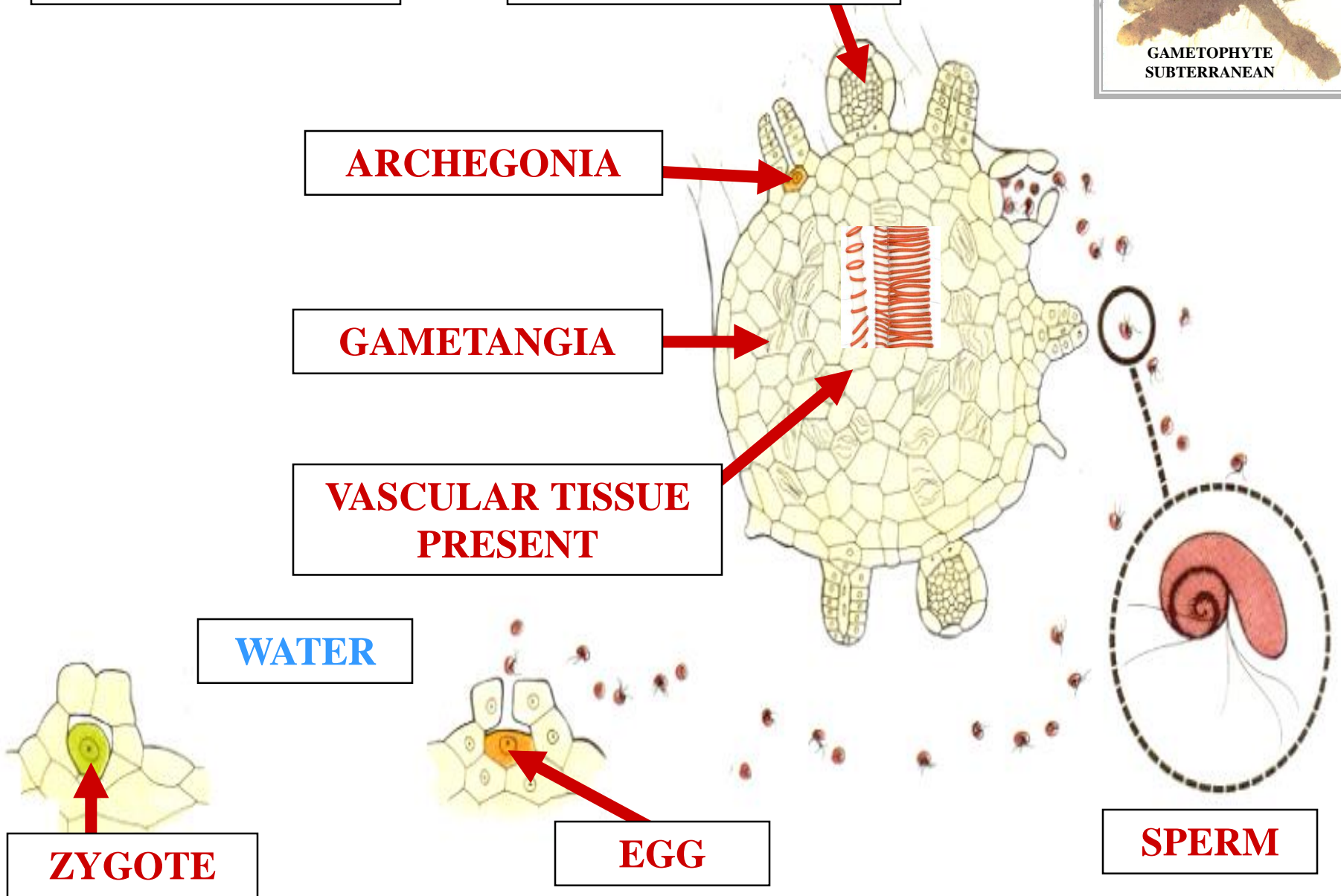
**VASCULAR TISSUE
PRESENT**

WATER

ZYGOTE

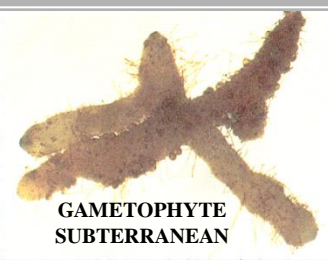
EGG

SPERM



GAMETOPHYTE

ANTHERIDIUM



M

ARCHEGONIA

GAMETANGIA

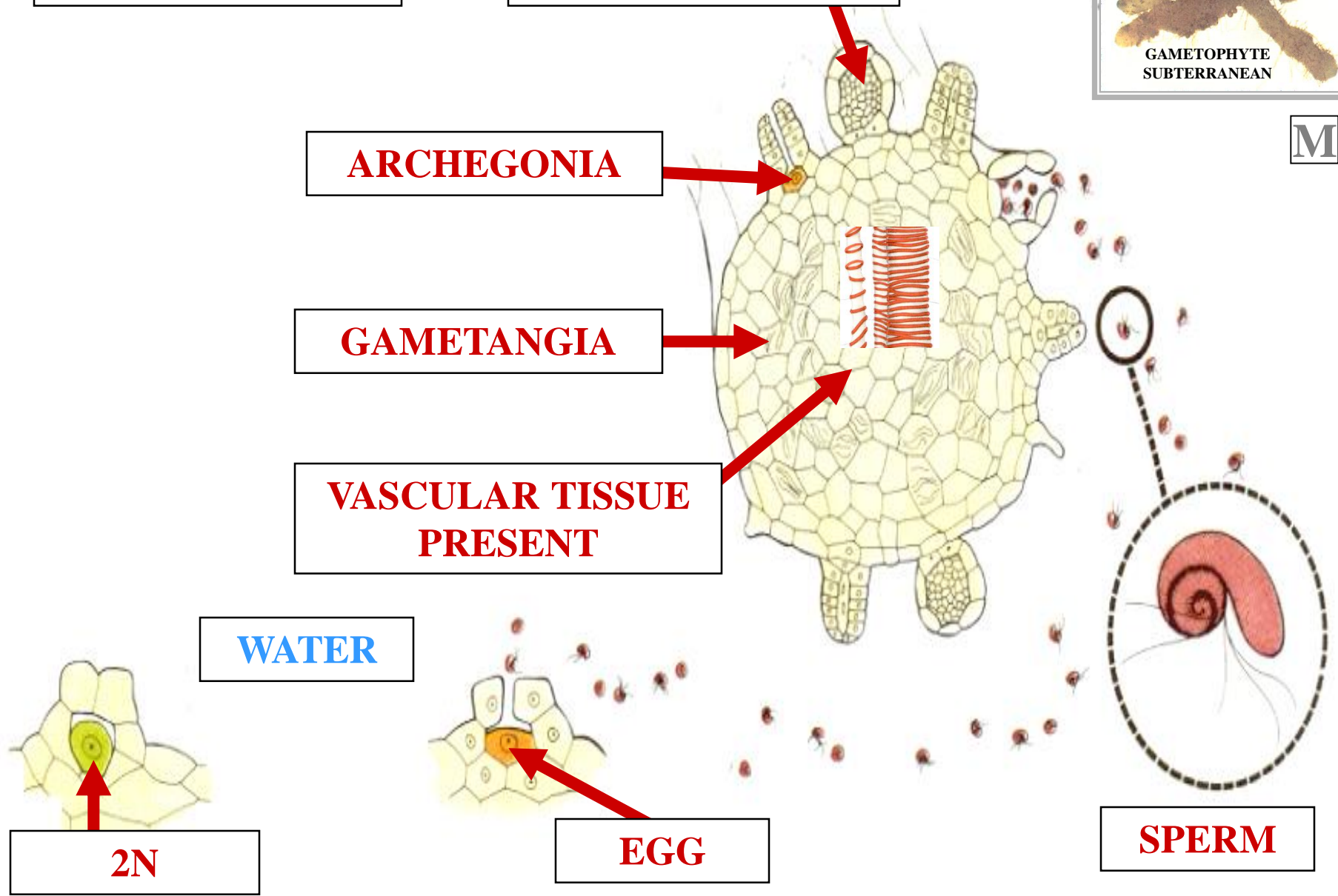
**VASCULAR TISSUE
PRESENT**

WATER

2N

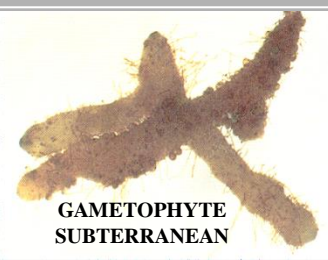
EGG

SPERM



GAMETOPHYTE

ANTHERIDIUM



ARCHEGONIA

GAMETANGIA

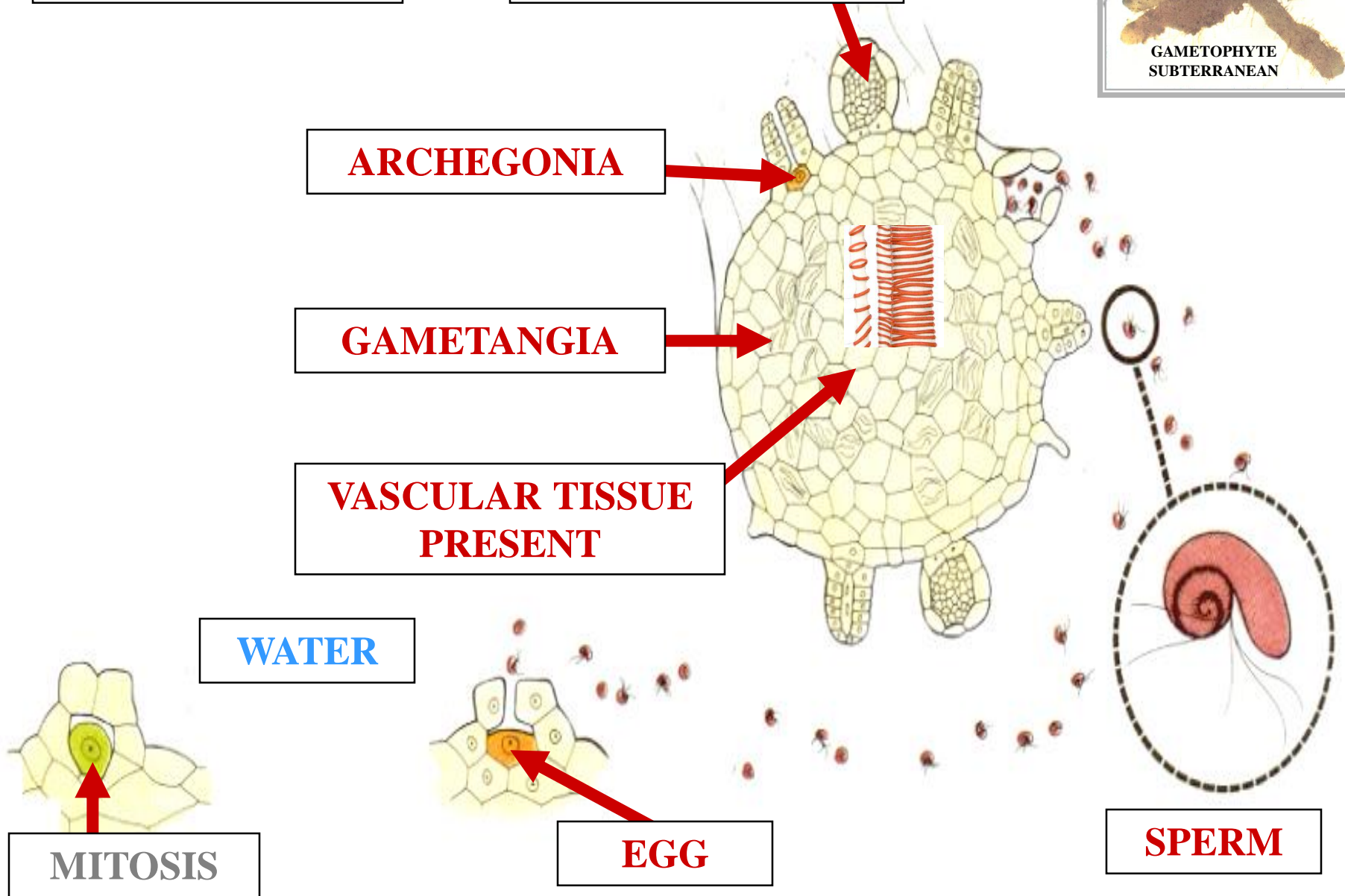
**VASCULAR TISSUE
PRESENT**

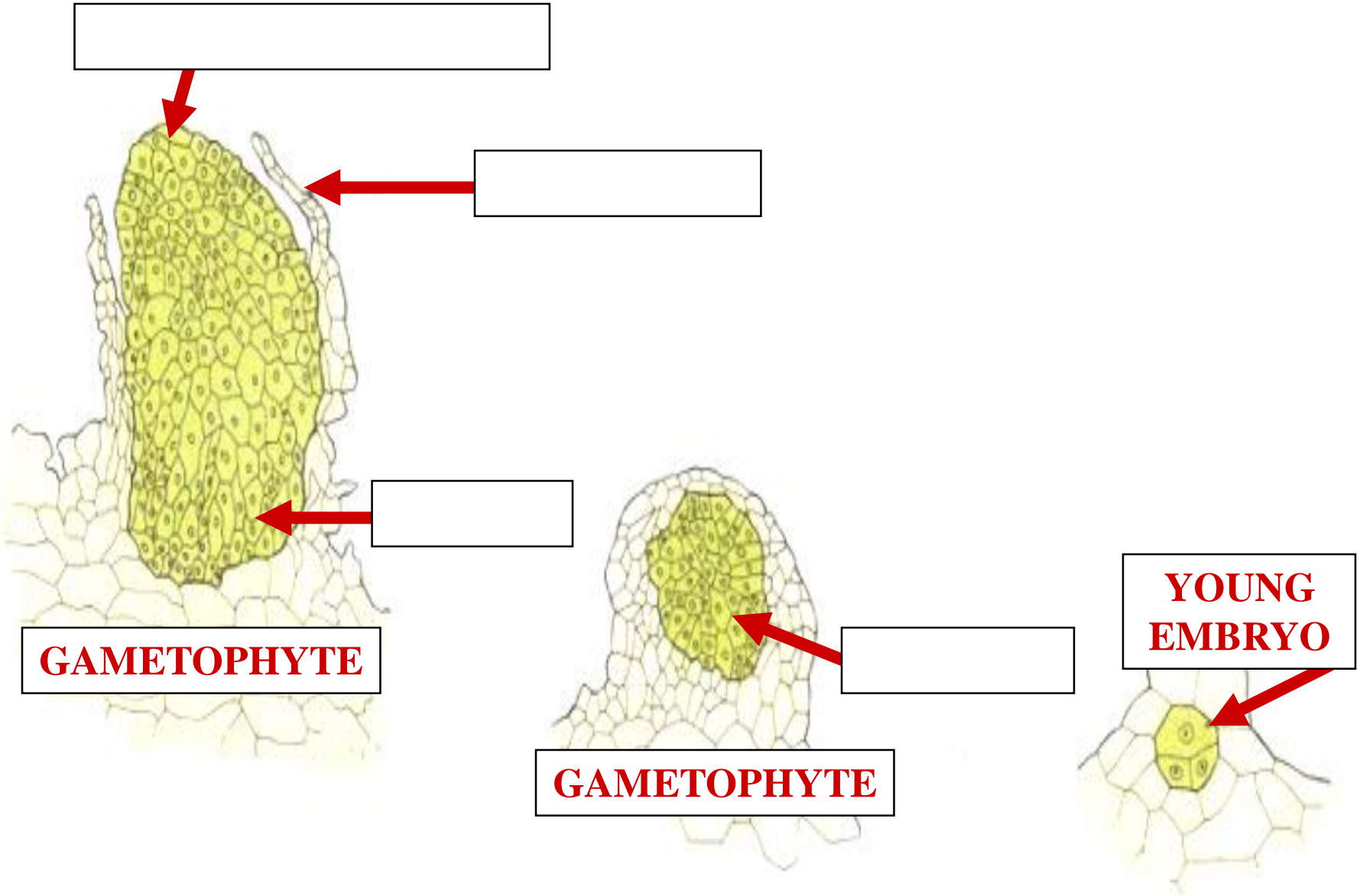
WATER

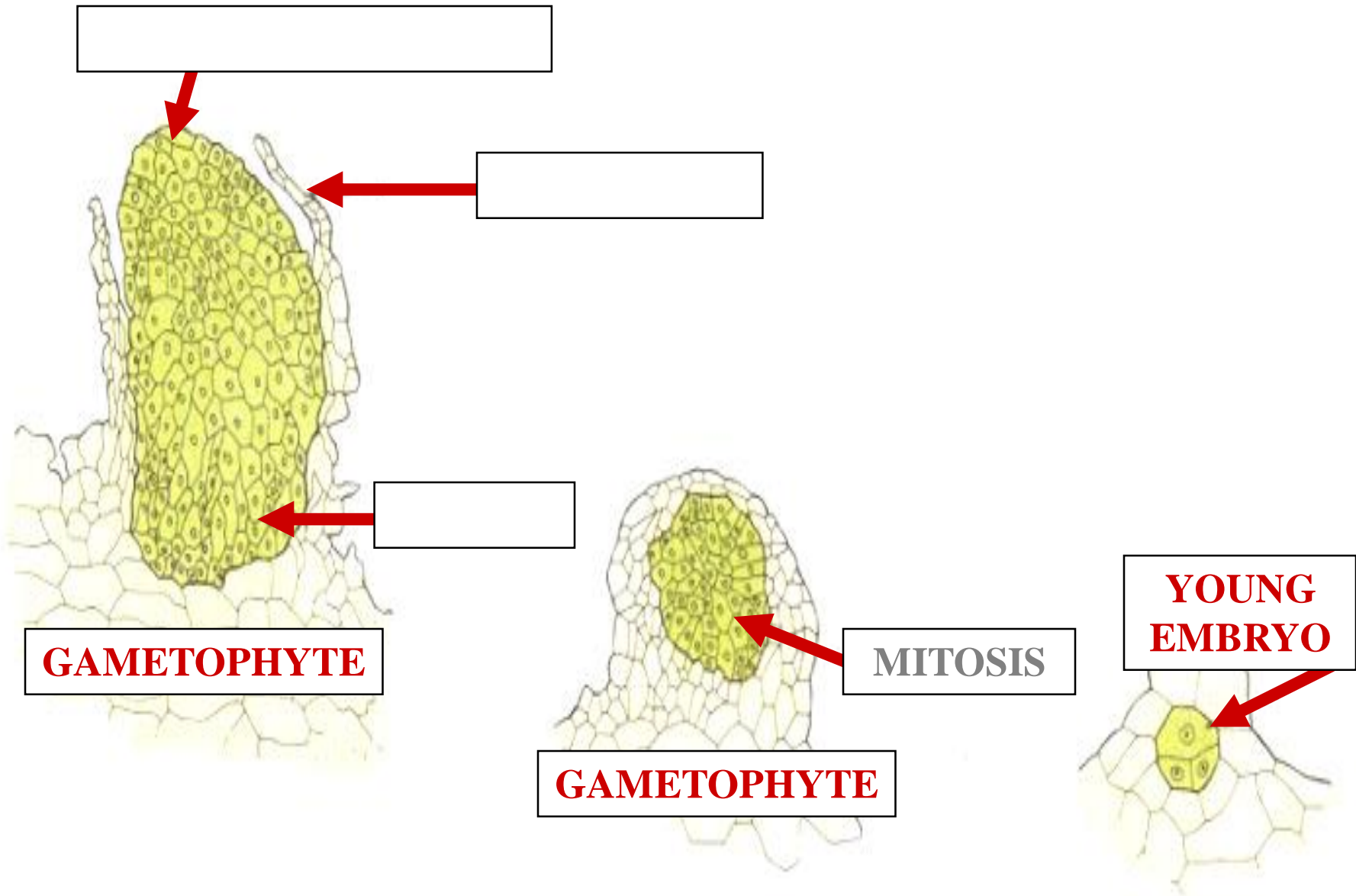
MITOSIS

EGG

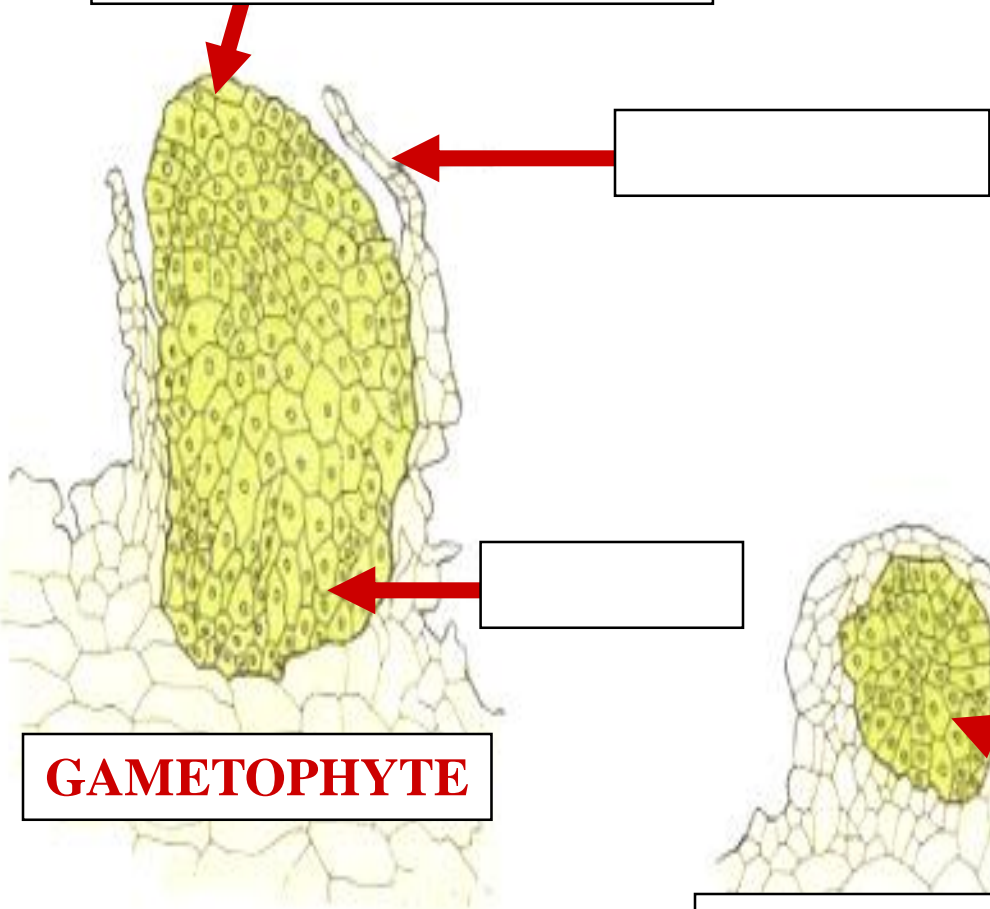
SPERM







YOUNG SPOROPHYTE

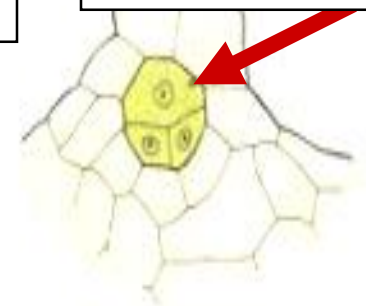


GAMETOPHYTE

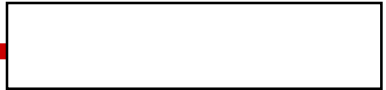
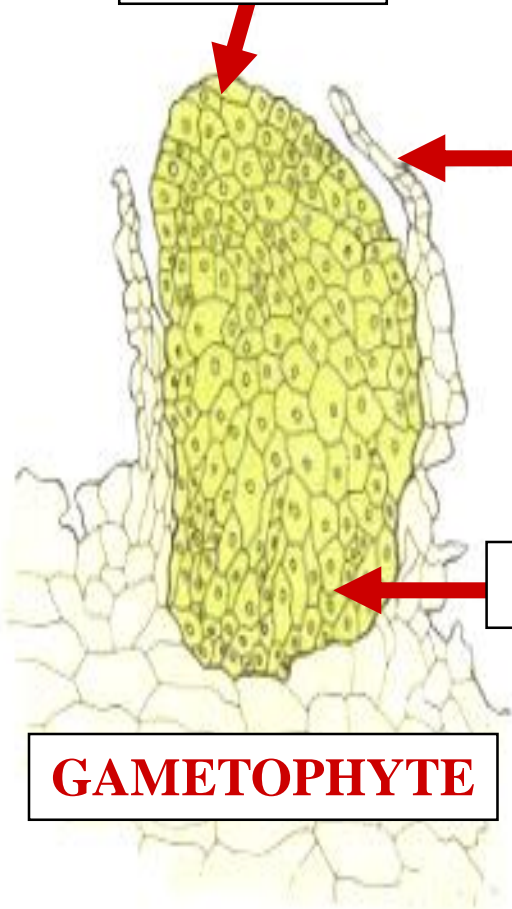
MITOSIS

GAMETOPHYTE

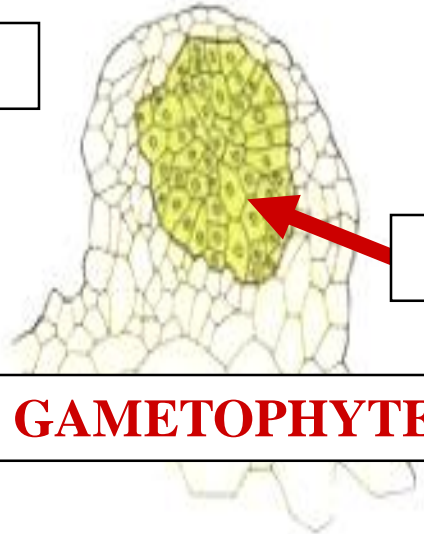
YOUNG EMBRYO



MITOSIS

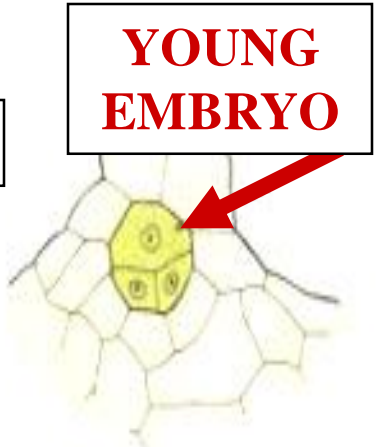


GAMETOPHYTE

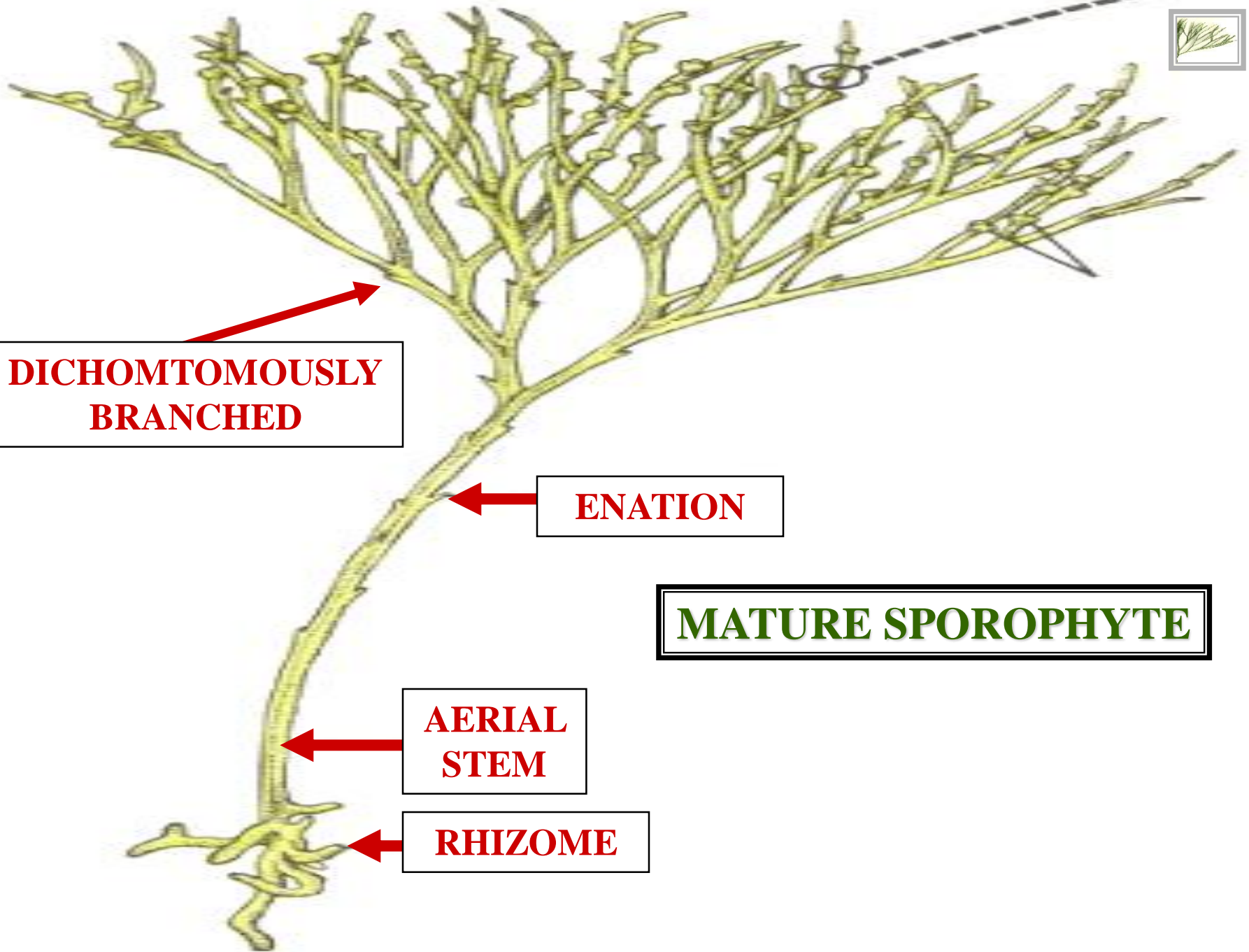


MITOSIS

GAMETOPHYTE



YOUNG EMBRYO



**DICHOTOMOUSLY
BRANCHED**

ENATION

MATURE SPOROPHYTE

**AERIAL
STEM**

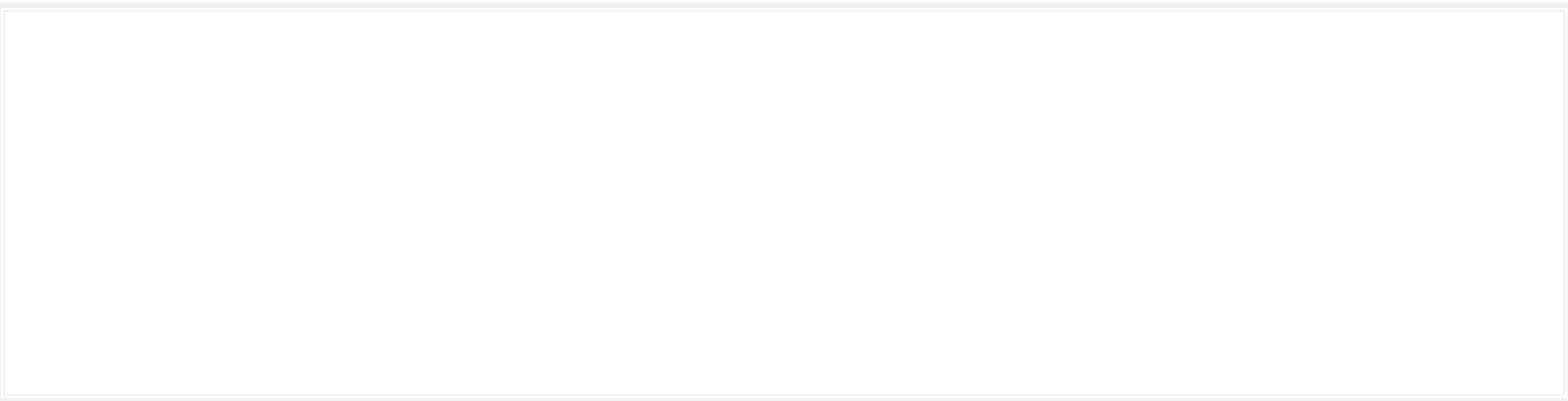
RHIZOME



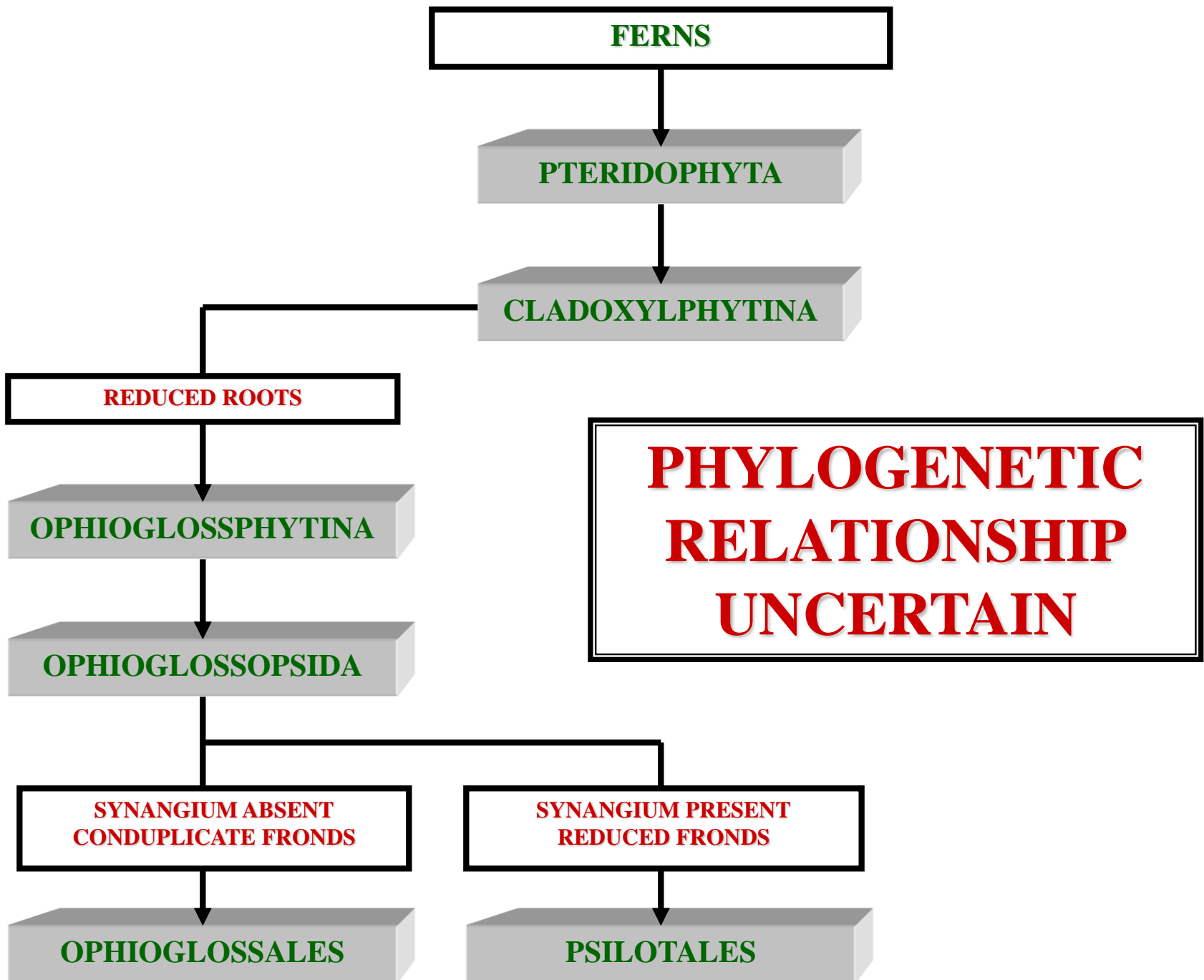
PSILOTUM

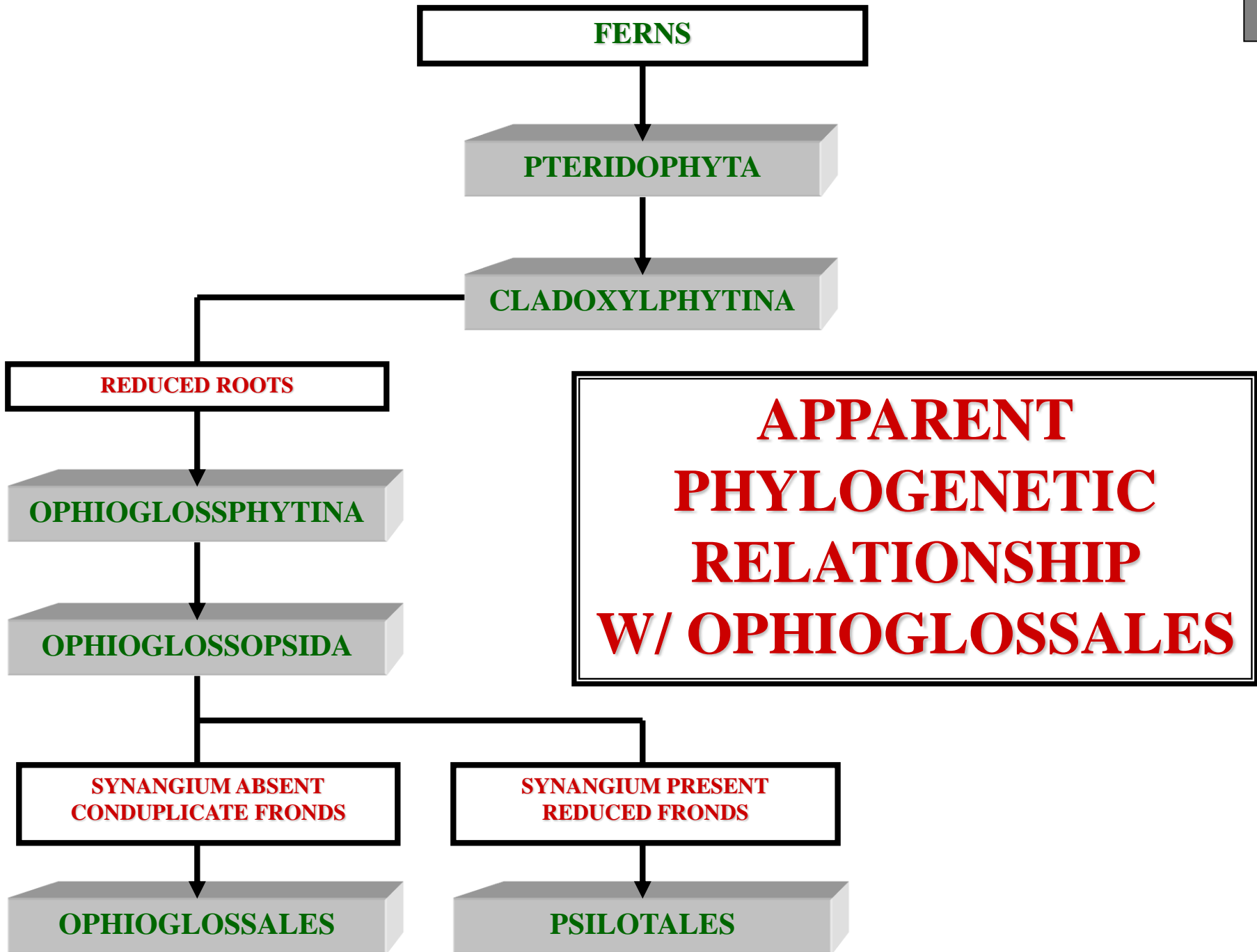


FOSSIL RECORD



PHYLOGENETIC RELATIONSHIP







PTERIDOPHYTA CLASSIFICATION



R

EXTANT
CLASS

EQUISETOPSIDA

EXTANT
CLASS



**EQUISETOPSIDA
RECENTLY
RECOGNIZED
FERNS**



**EQUISETOPSIDA
PREVIOUSLY
ASSIGNED
OWN PHYLUM
SPHENOPHYTA**

SYNONYMS



SPHENOPHYTA

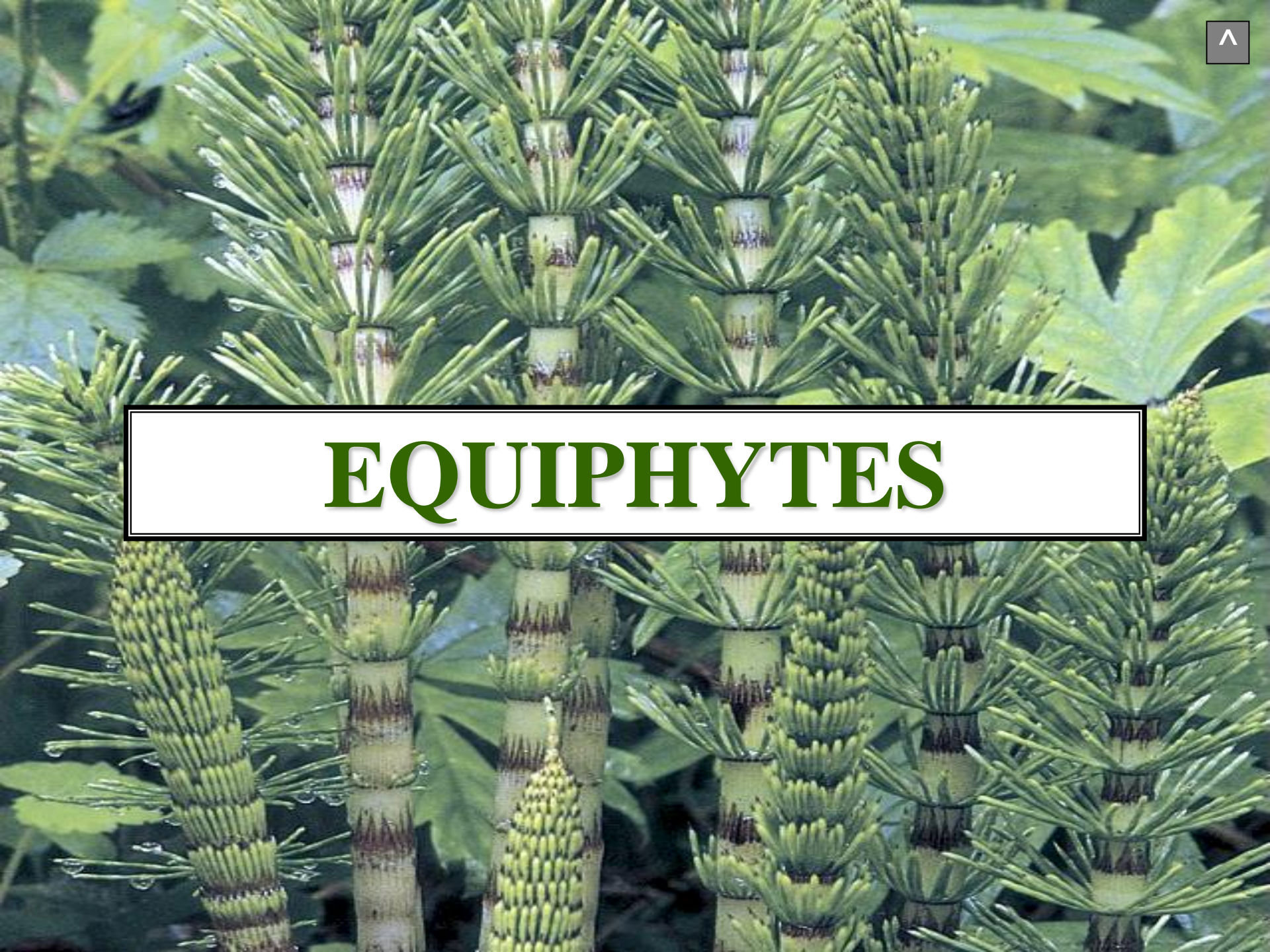
The background of the slide is a close-up photograph of a horsetail plant (Equisetum). The image shows several upright, segmented stems. Each stem is composed of a series of nodes, with small, dark, pointed structures (leaves or bracts) emerging from the nodes. The stems are green and appear to have a slightly fuzzy or scaly texture. The background is filled with more of these plants and some larger, broad green leaves.

ARTHROPHYTA

COMMON NAME



EQUIPHYTES



EQUISETOPSIDA CHARACTERS

EQUISETOPSIDA CHARACTERS

WETLANDS

EQUISETOPSIDA CHARACTERS

**EQUISETOPSIDA
CHARACTERS**

WETLANDS

FROND REDUCED

**EQUISETOPSIDA
CHARACTERS**

EQUISETOPSIDA CHARACTERS

WETLANDS

FROND REDUCED

EUSPORANGIATE

EQUISETOPSIDA CHARACTERS

EQUISETOPSIDA CHARACTERS

WETLANDS

FROND REDUCED

EUSPORANGIATE

NON-SYNANGIATE

EQUISETOPSIDA CHARACTERS

EQUISETOPSIDA CHARACTERS



WETLANDS

FROND REDUCED

EUSPORANGIATE

NON-SYNANGIATE

HOMOSPOROUS

EQUISETOPSIDA CHARACTERS



EQUISETOPSIDA FOSSIL RECORD

~380

MILLION YEARS

~380 MILLION YEARS AGO

E

DEVONIAN

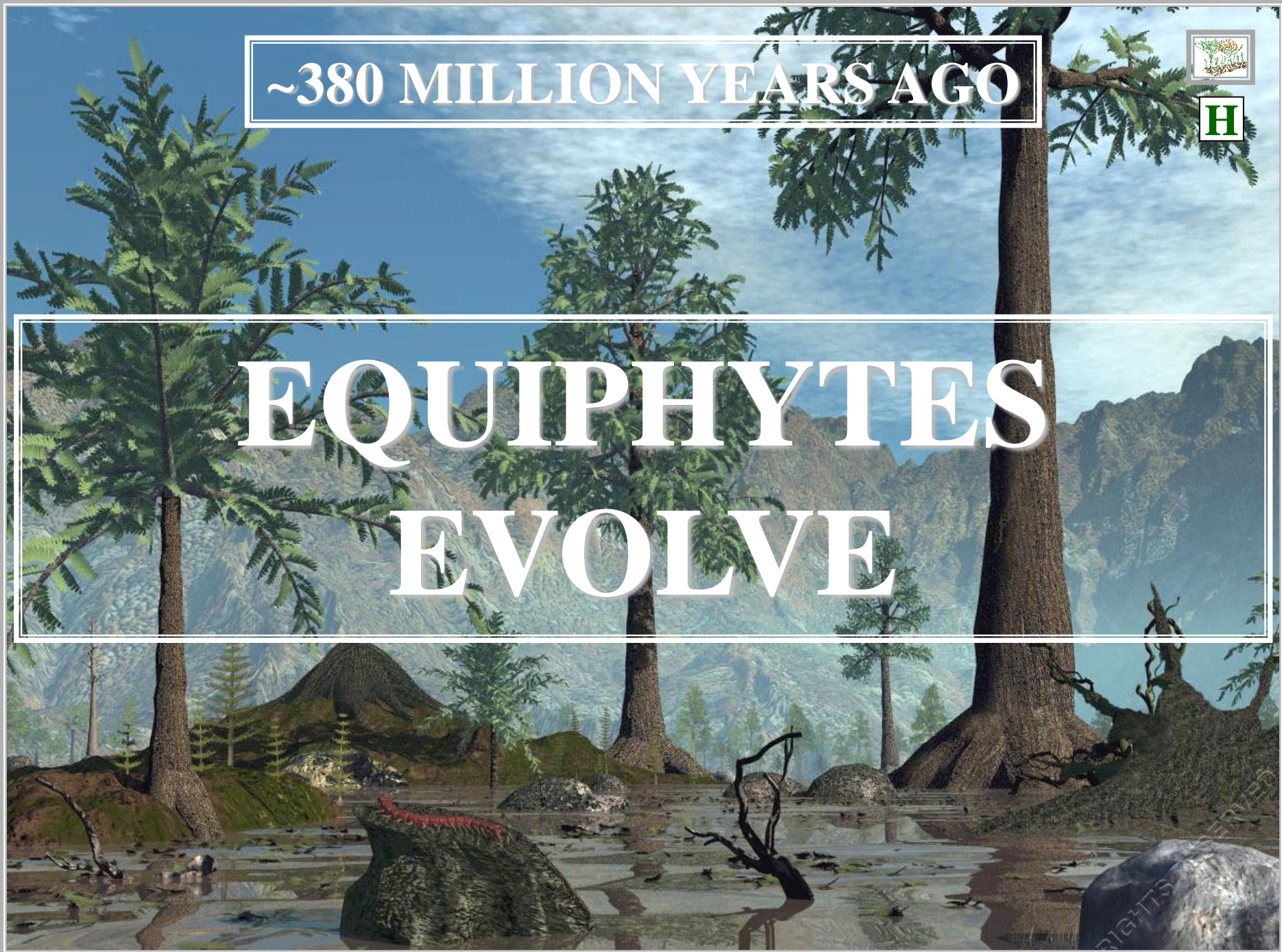


~380 MILLION YEARS AGO

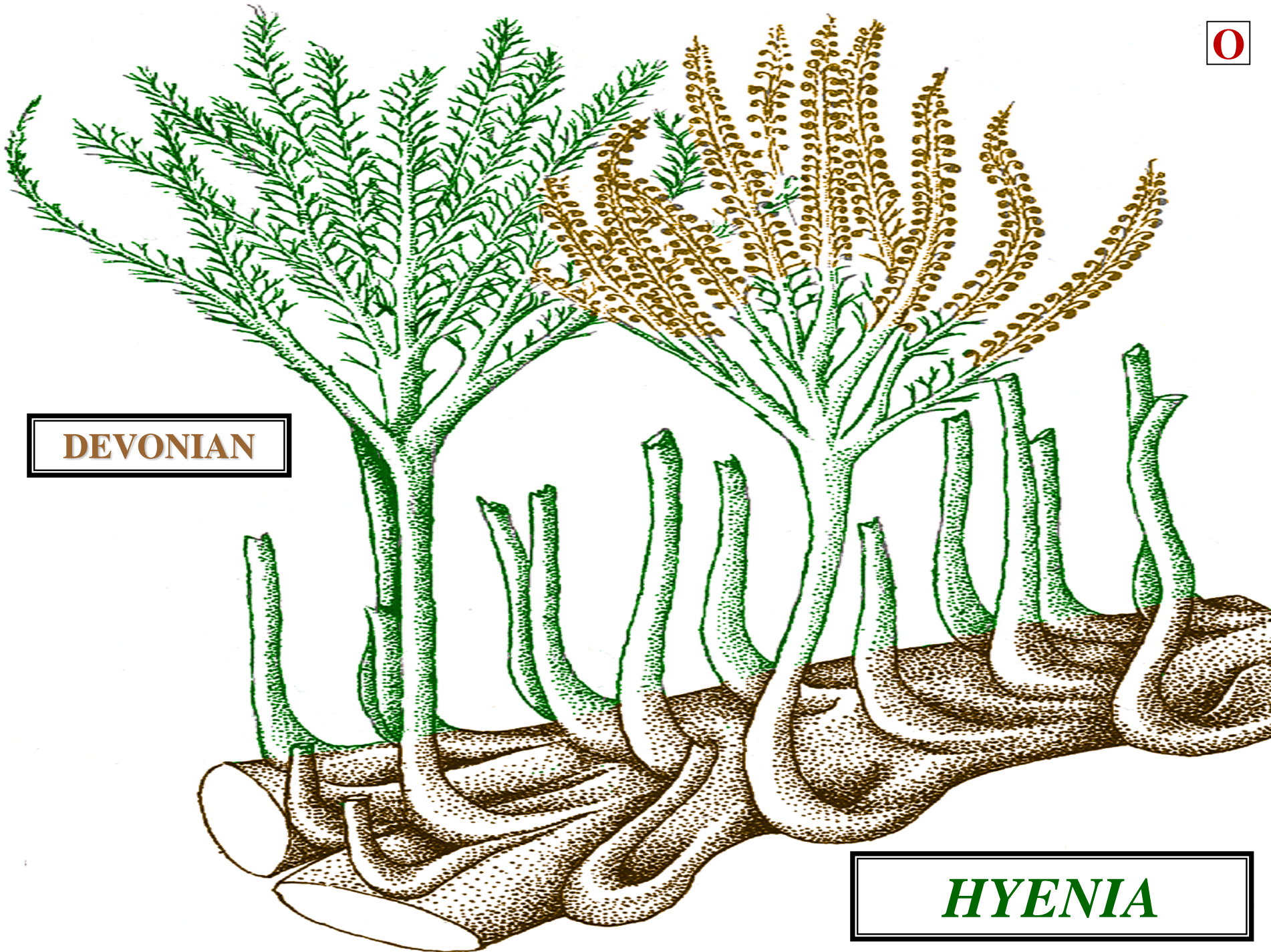


H

EQUIPHYTES EVOLVE



DEVONIAN



HYENIA



**OLDEST
KNOWN
EQUIPHYTE**

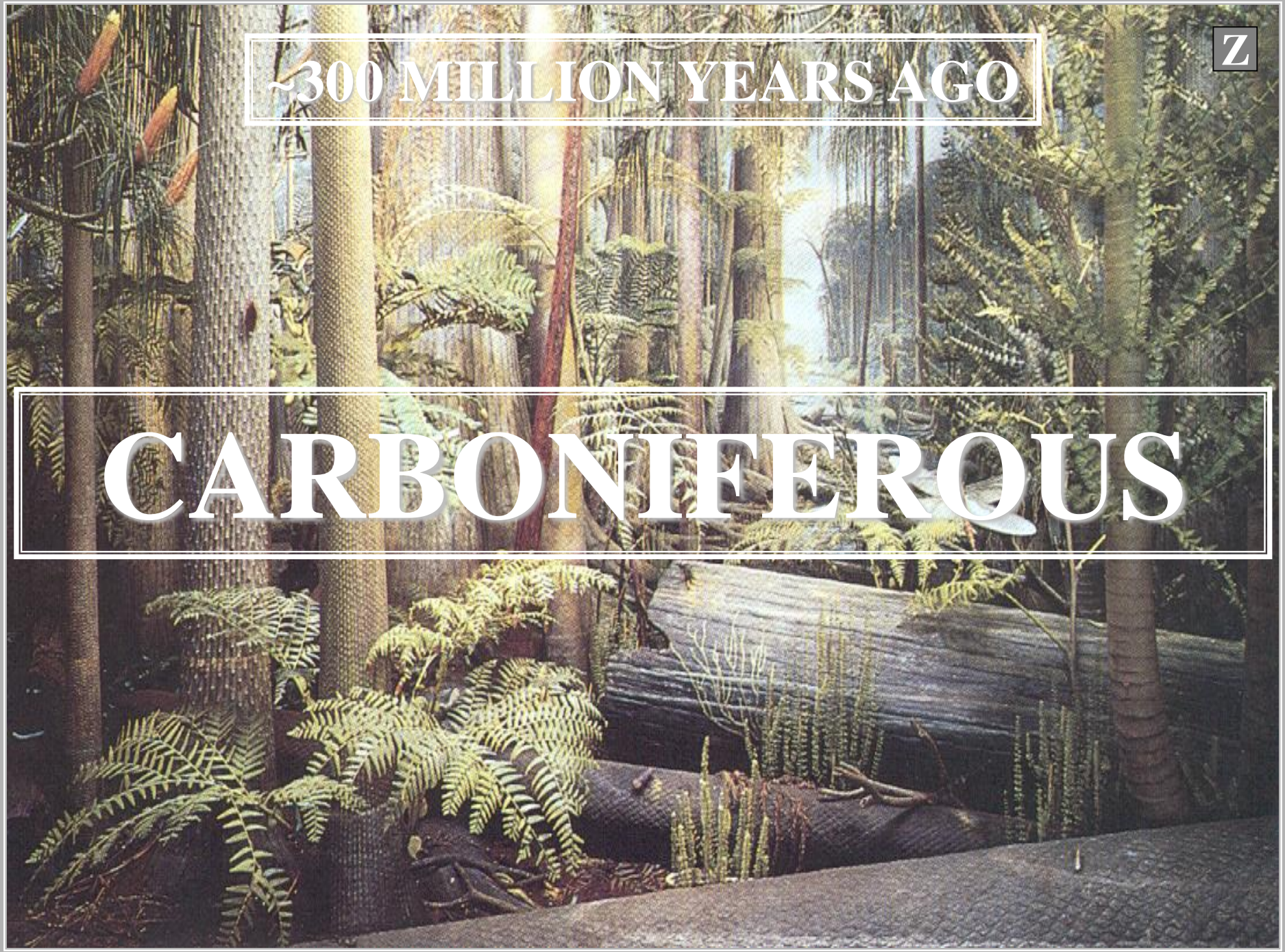
HYENIA



**~300
MILLION YEARS**

~300 MILLION YEARS AGO

CARBONIFEROUS



~300 MILLION YEARS AGO

EQUIPHYTES ZENITH



~300 MILLION YEARS AGO



S

EQUIPHYTE
SPHENOPHYLLUM





C



SPHENOPHYLLUM

~300 MILLION YEARS AGO



C

EQUIPHYTE
CALAMITES
ARBORESCENT



CALAMITES



PHYLOGENETIC RELATIONSHIP

EQUIPHYTE EVOLUTION



IBYKA

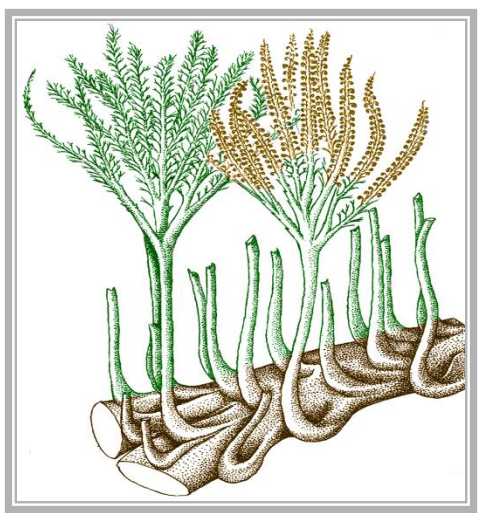
**CLADOXYLPHYTE
FERN
EXTINCT**

EQUIPHYTE EVOLUTION



IBYKA

CLADOXYLPHYTE



HYENIA

EQUIPHYTE



EQUISETUM

EQUIPHYTE



EQUISETOPSIDA ORDER

**EXTANT
ORDER**

EQUISETALES

**EXTANT
ORDER**



COMMON NAMES

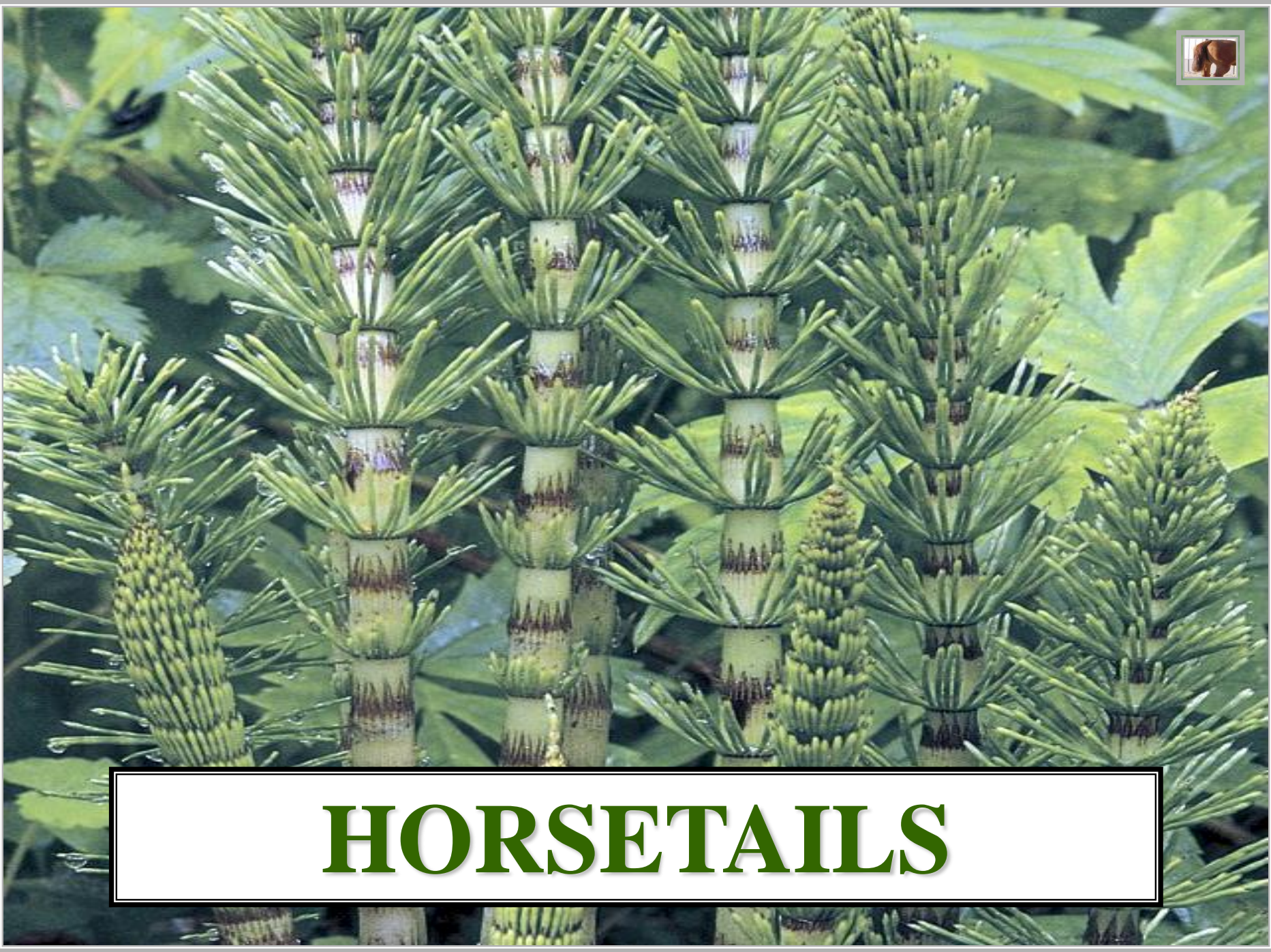


SCOURING RUSHES

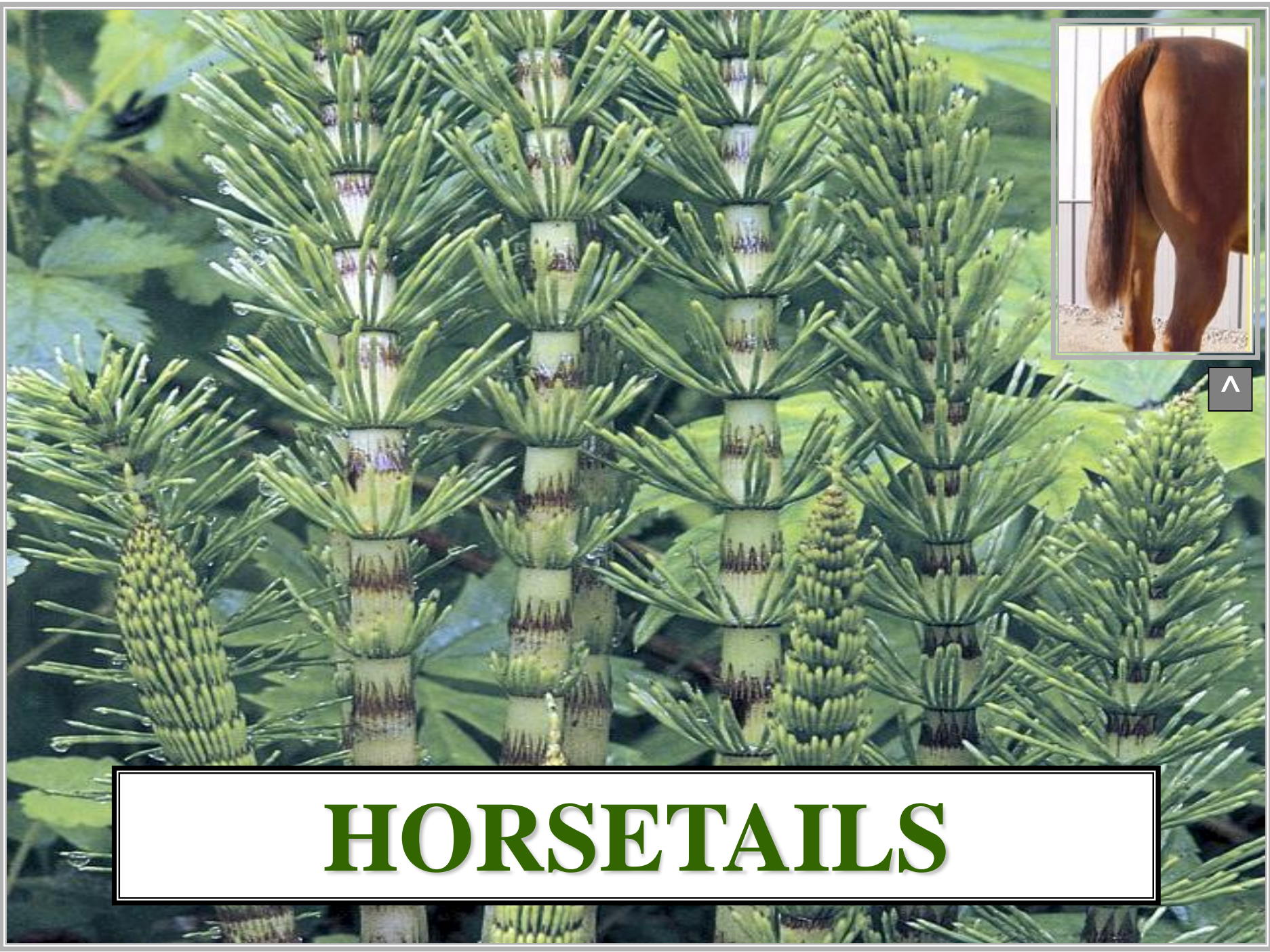


SCOURING RUSH





HORSETAILS



HORSETAILS

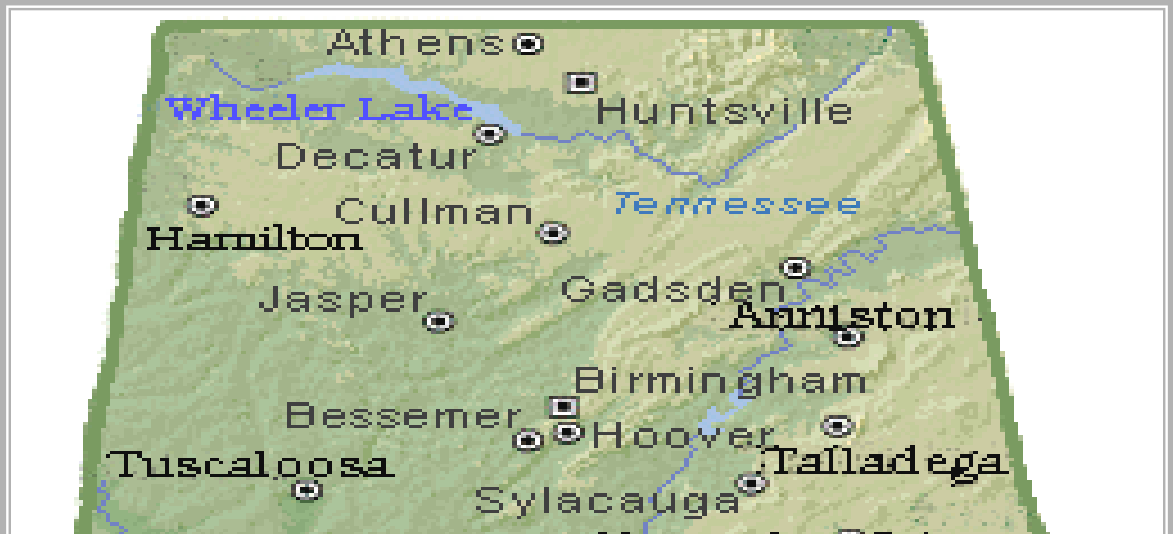


DIVERSITY

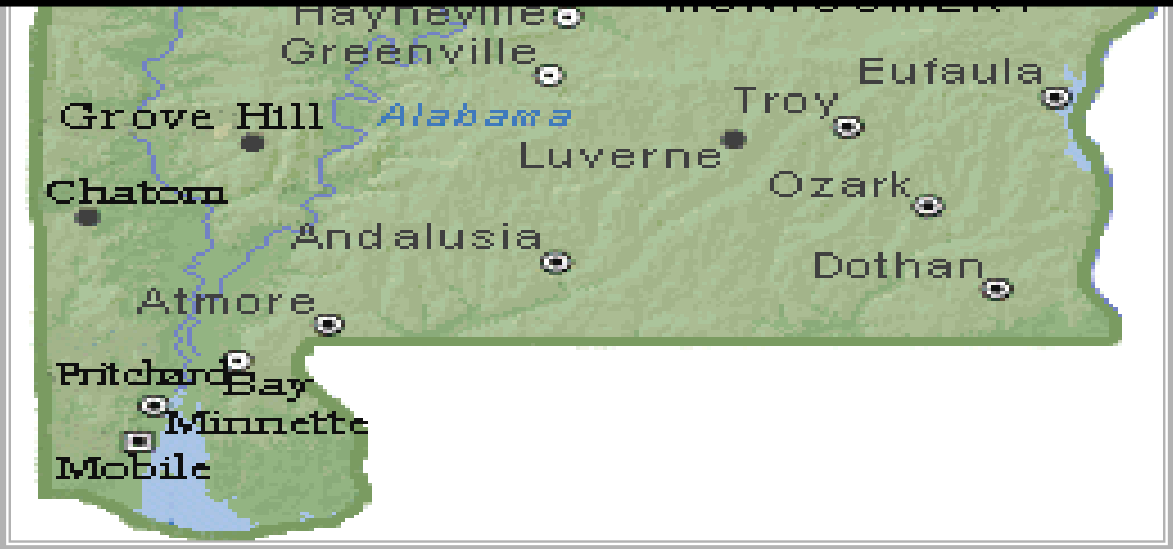


~15 SPECIES

EARTH



2 SPECIES





REPRESENTATIVE GENUS



?



EQUISETUM



TR

DISTRIBUTION

TROPICAL

EARTH



TEMPERATE

EARTH

EQUISETUM
**ABSENT
AUSTRALIAN
REGION**





HABITAT

WETLANDS



ALABAMA LAKE OR ALABAMA POND



ALABAMA LAKE OR ALABAMA POND



LITTORAL HABITAT

ALABAMA CREEK OR ALABAMA STREAM



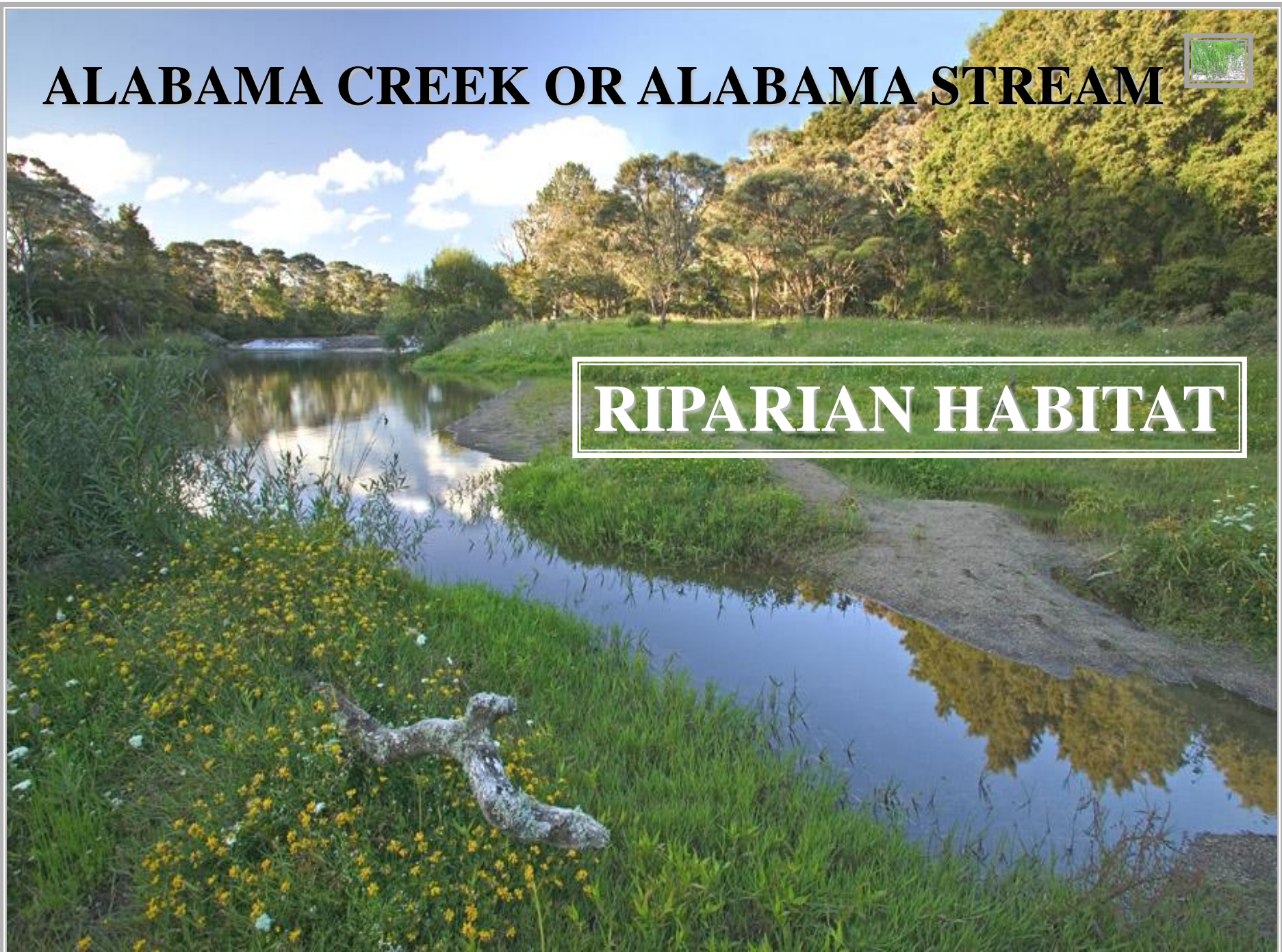
R



ALABAMA CREEK OR ALABAMA STREAM



RIPARIAN HABITAT



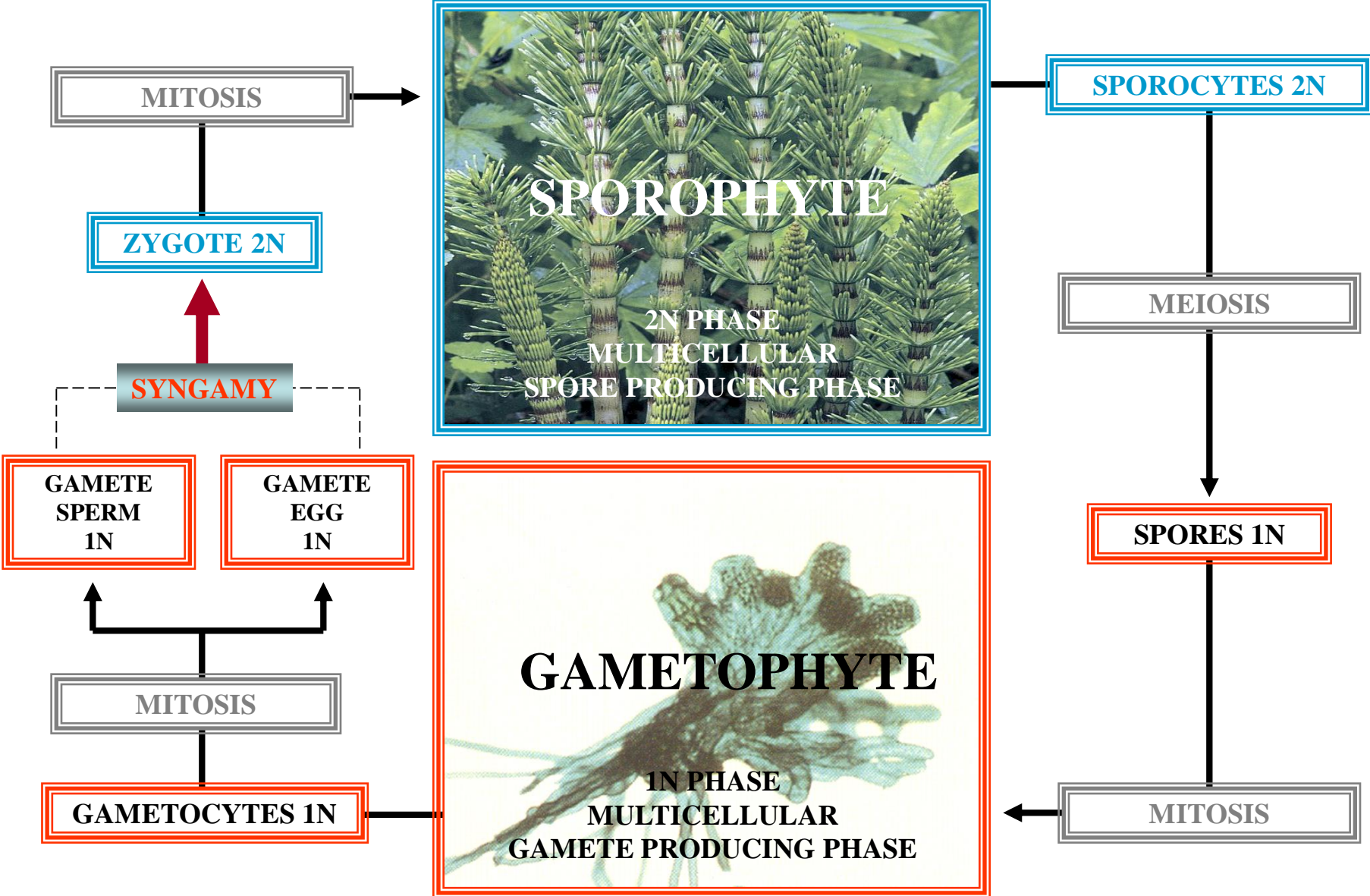


EQUISETUM



GENERAL CHARACTERS

EQUISETALES LIFE CYCLE

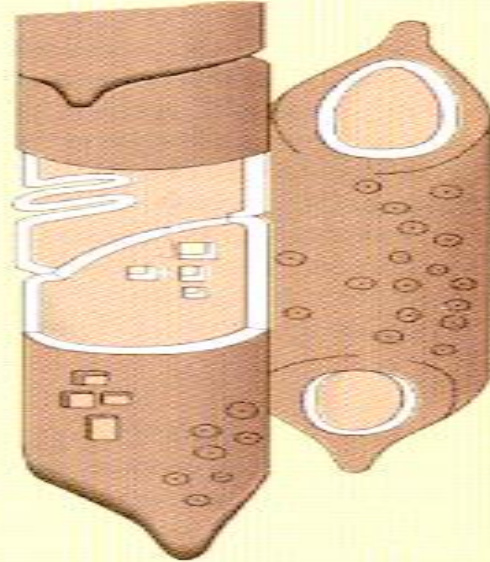
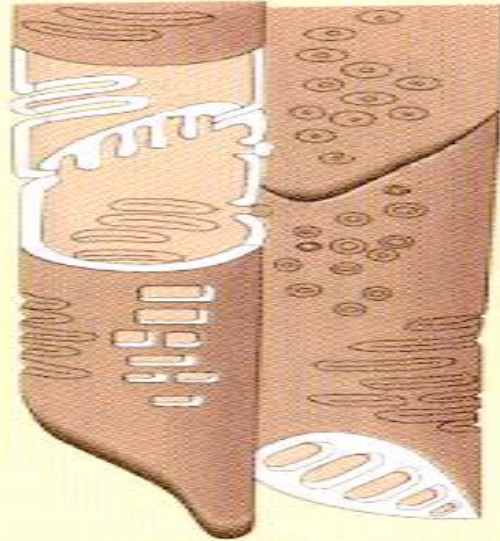
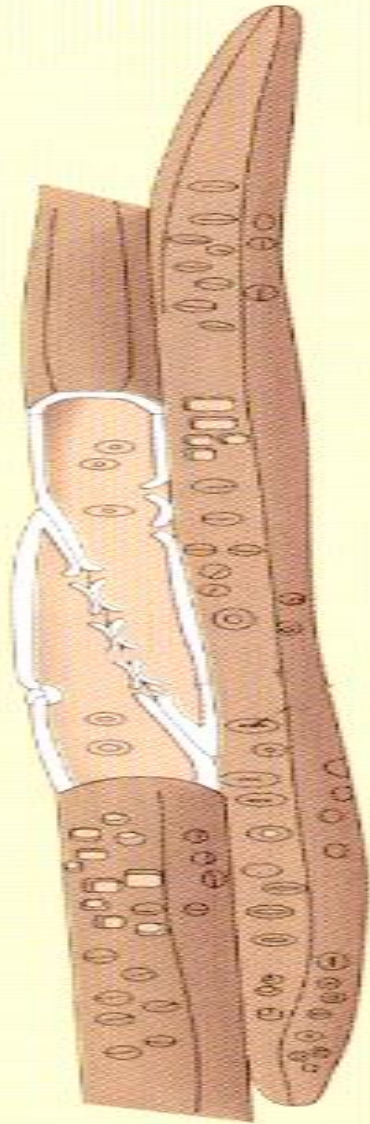




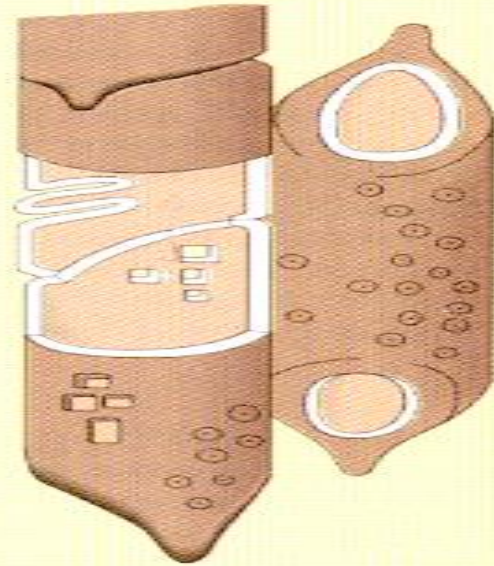
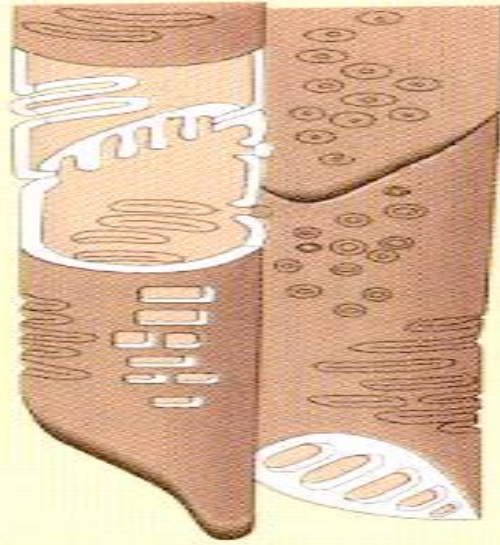
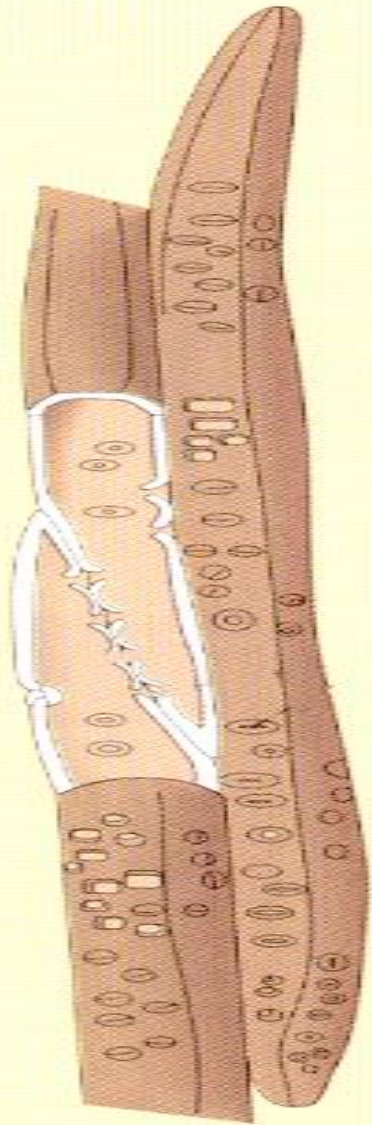
SPOROPHYTE CHARACTERS



XYLEM



XYLEM CELLS



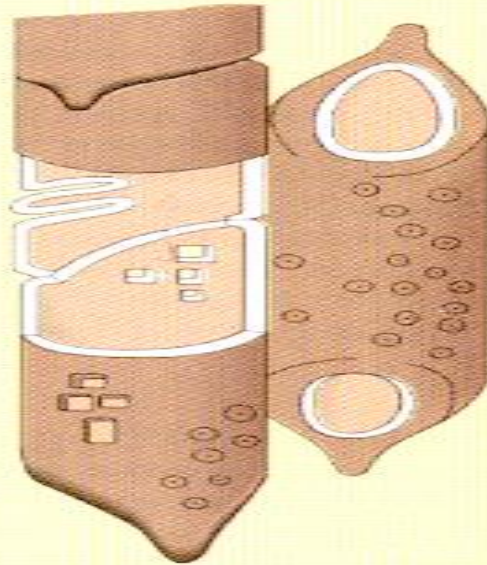
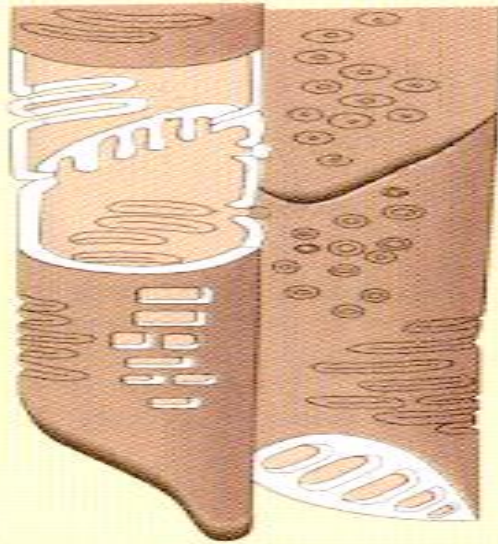
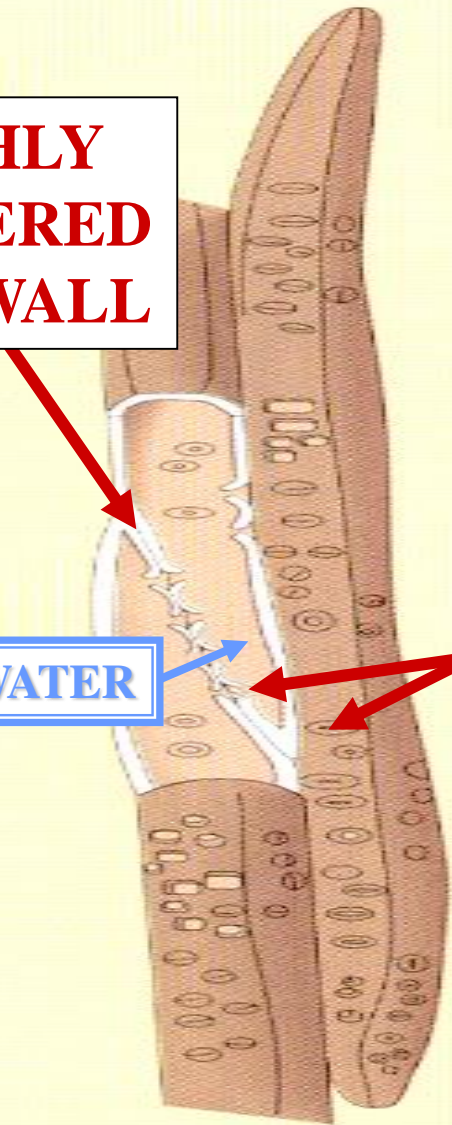
TRACHEARY ELEMENTS

**HIGHLY
TAPPED
END WALL**

WATER

PITS

?

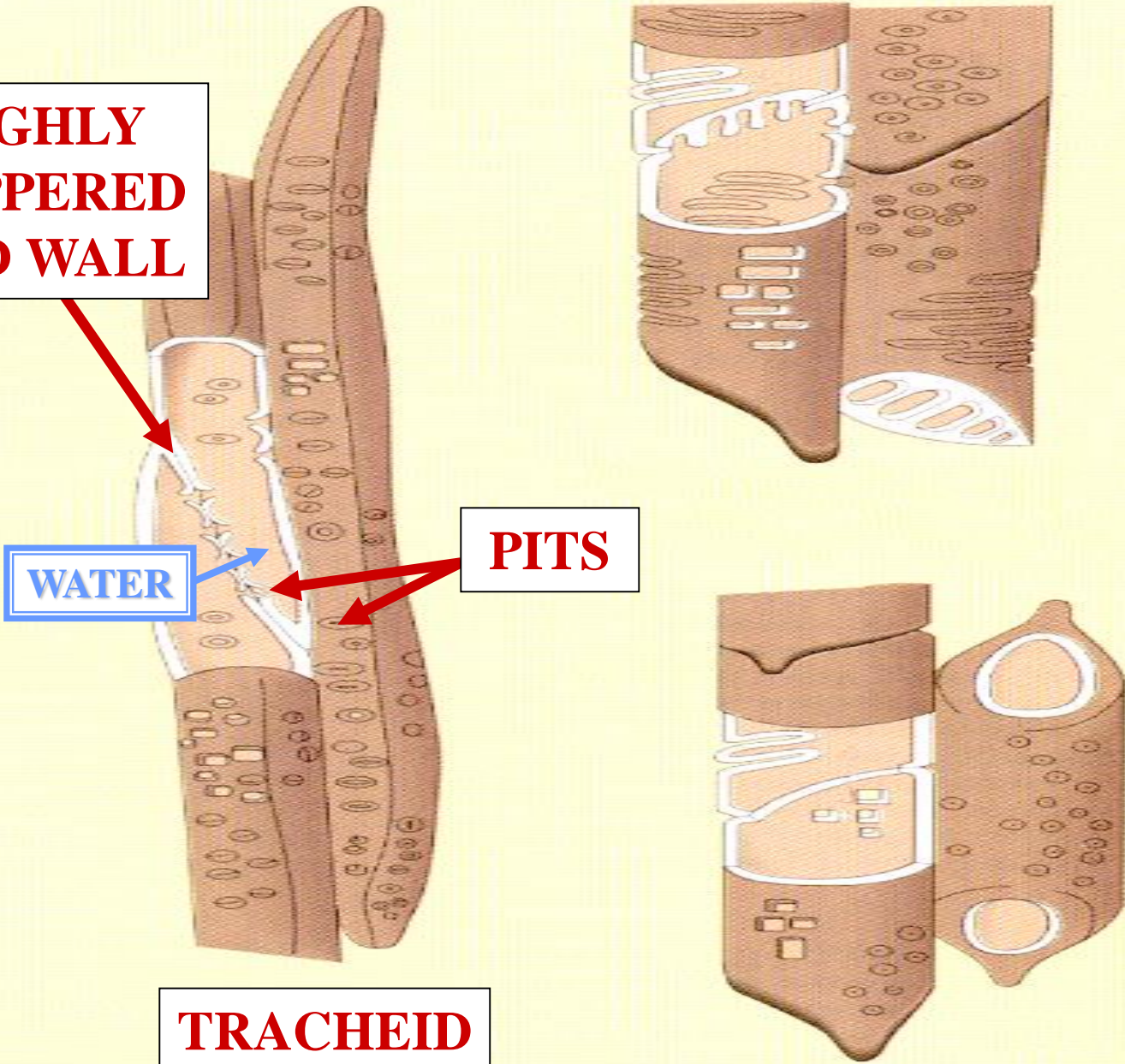


**HIGHLY
TAPPED
END WALL**

WATER

PITS

TRACHEID



**HIGHLY
TAPPED
END WALL**

**LESS
TAPPED
END WALL**

?

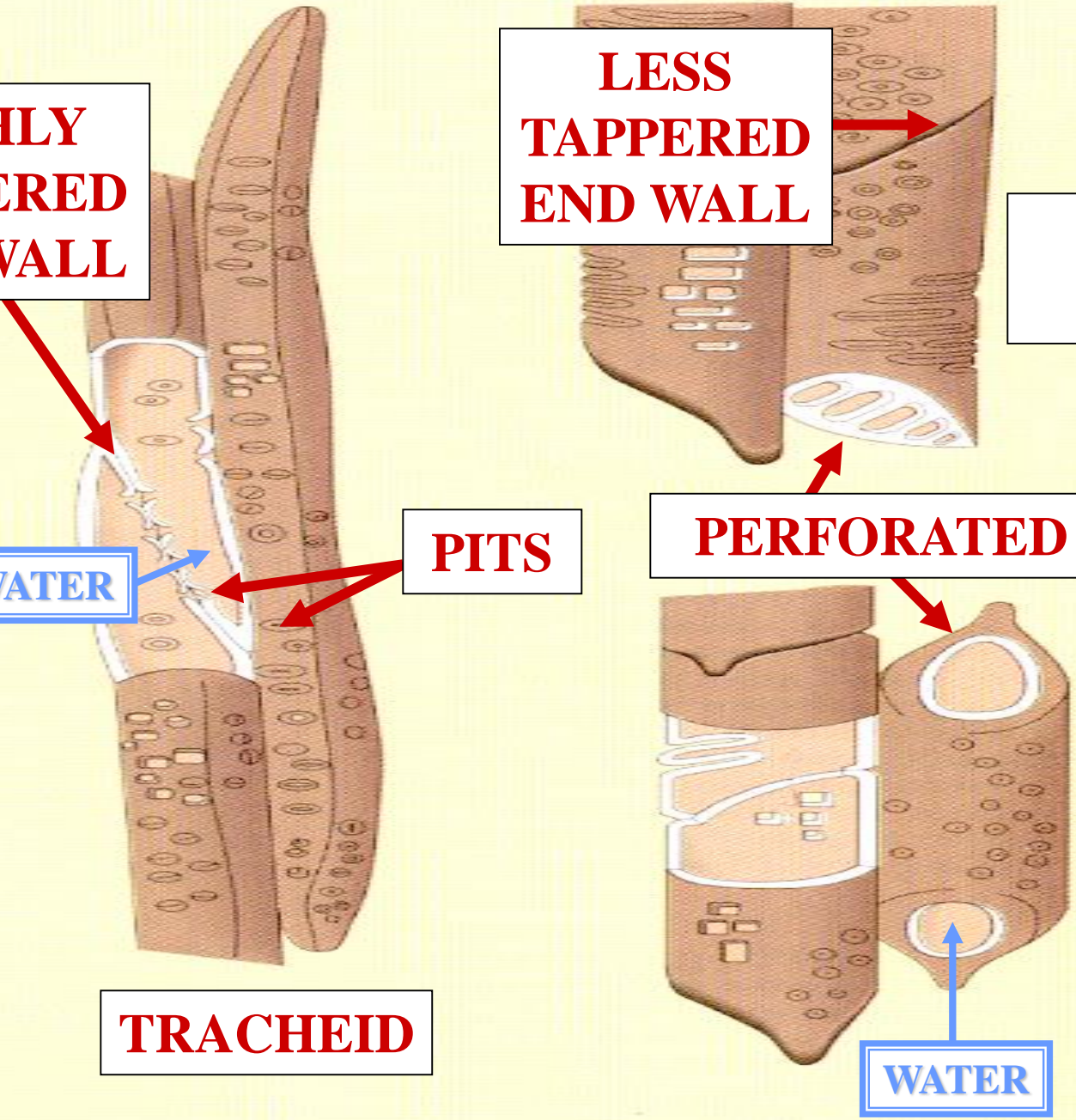
WATER

PITS

PERFORATED PLATE

TRACHEID

WATER





T

**HIGHLY
TAPPED
END WALL**

**LESS
TAPPED
END WALL**

**VESSEL
MEMBER**

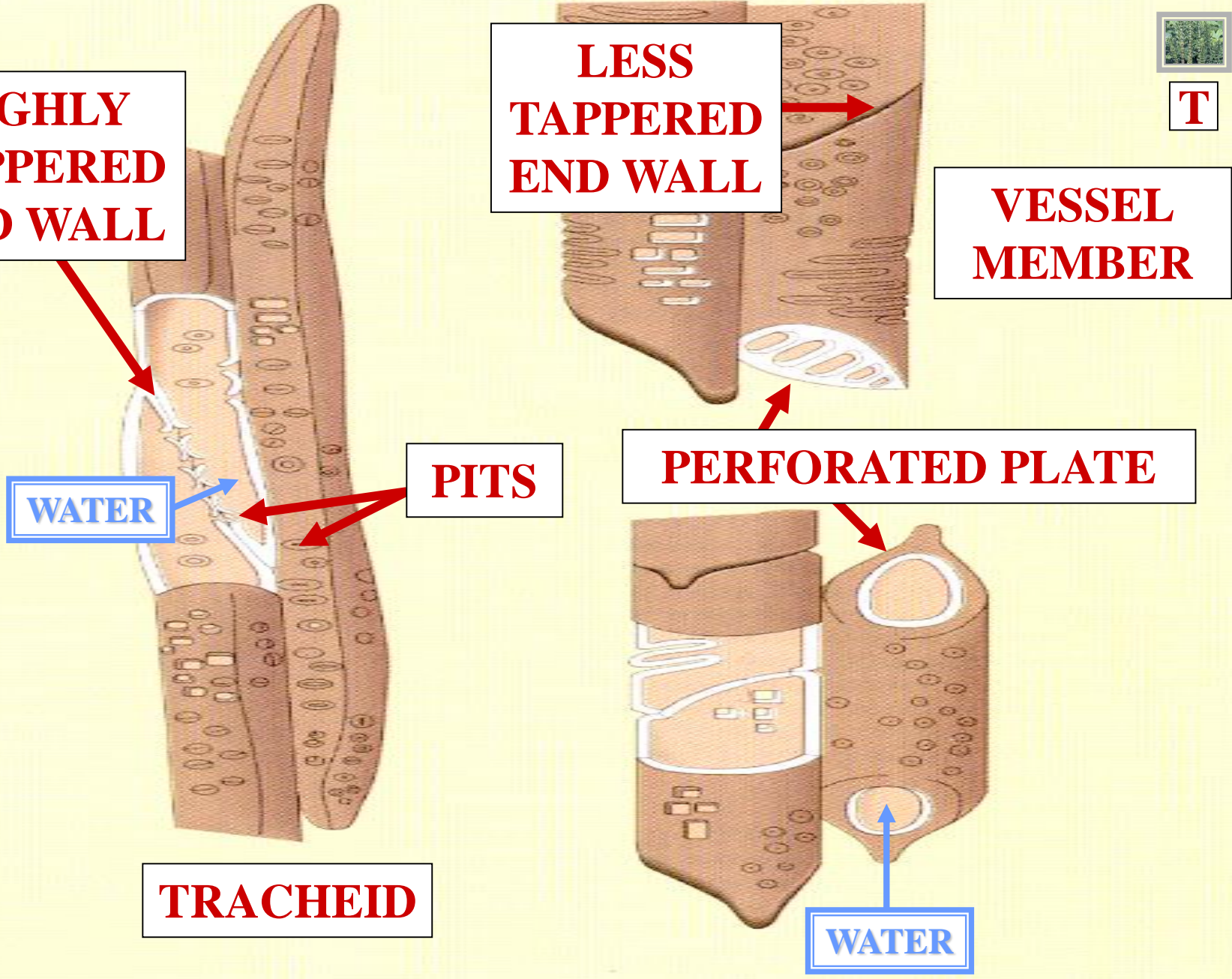
WATER

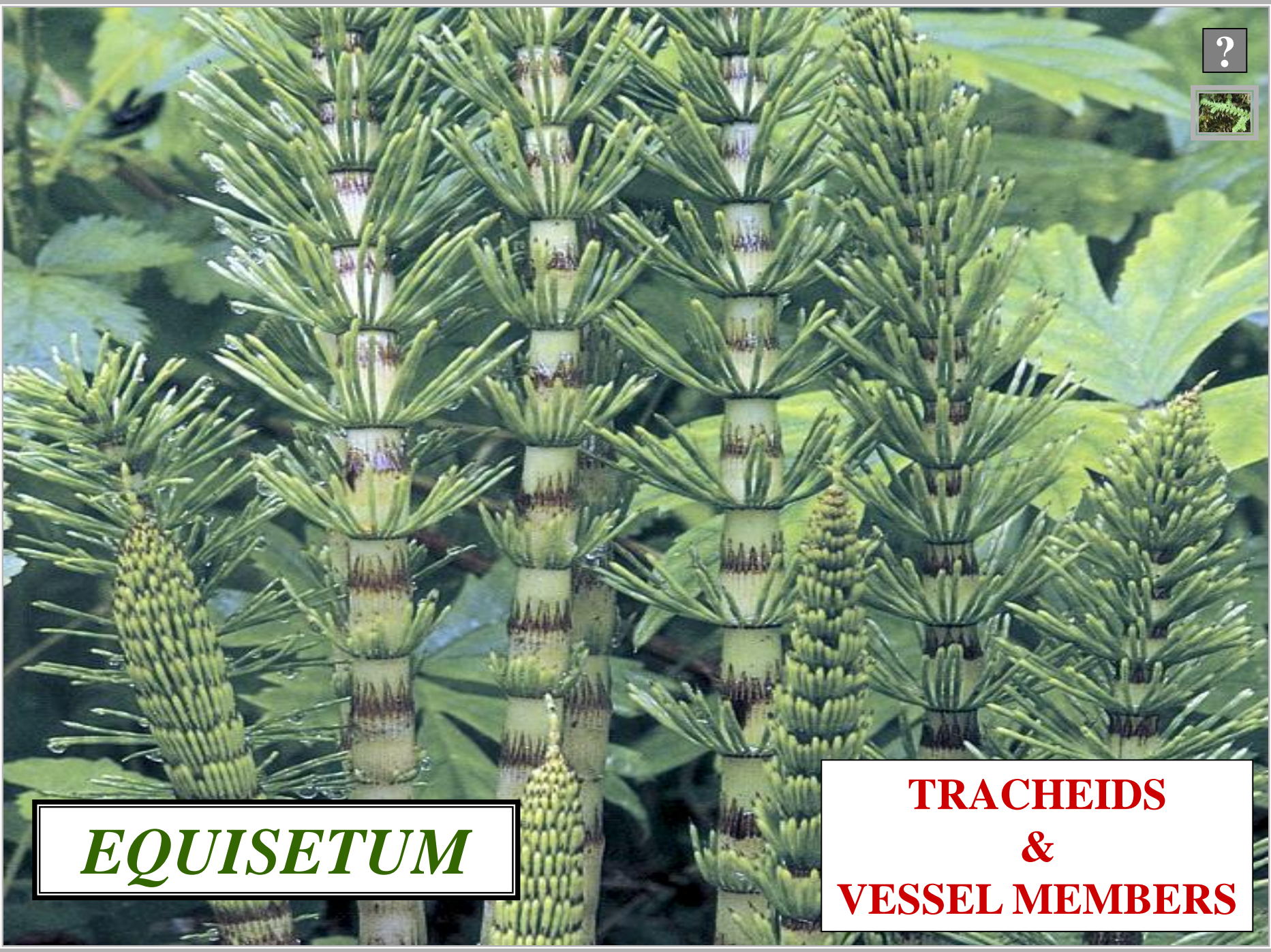
PITS

PERFORATED PLATE

TRACHEID

WATER





EQUISETUM

**TRACHEIDS
&
VESSEL MEMBERS**



S

?

**TRACHEIDS
&
VESSEL MEMBERS**



SELAGINELLA

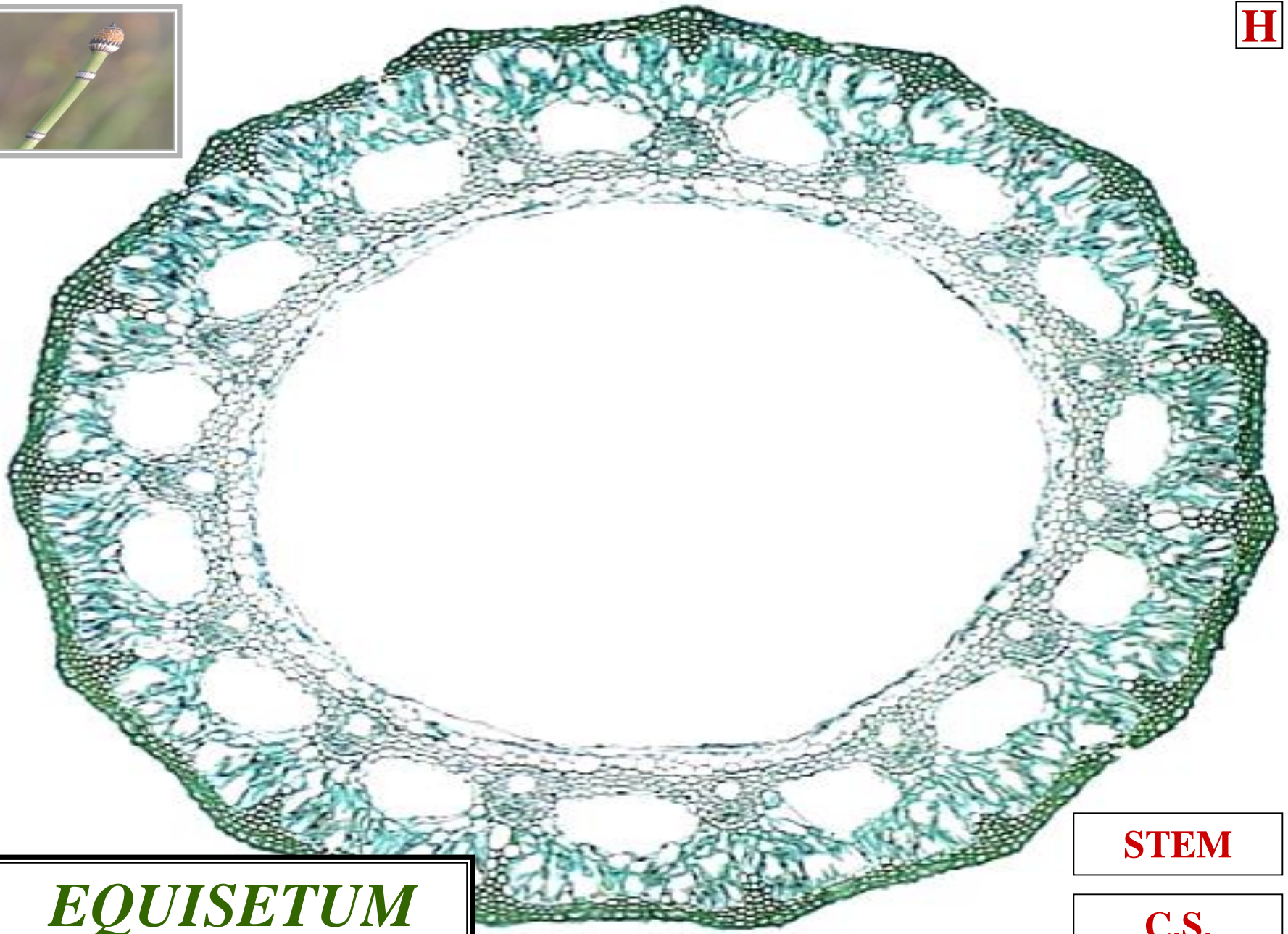
**TRACHEIDS
&
VESSEL MEMBERS**



STEM



STEM ANATOMY



EQUISETUM

STEM

C.S.