

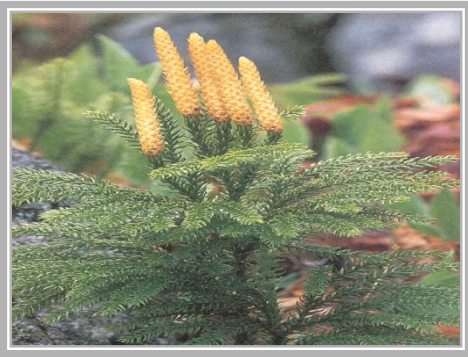
S

+



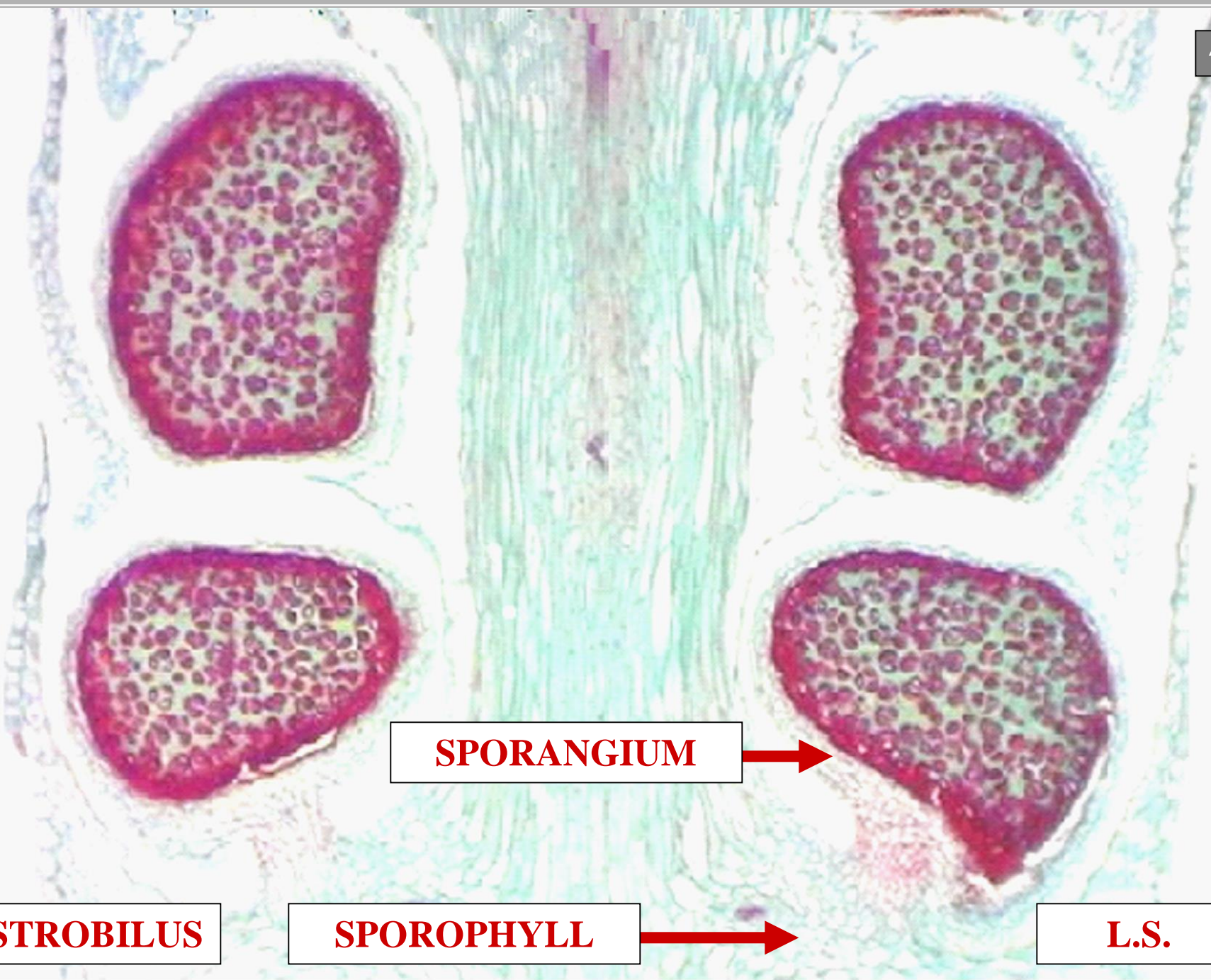
**SPORANGIUM**

**LEAF**



**SPORANGIUM**

**SPOROPHYLL**



**SPORANGIUM** →

**STROBILUS**

**SPOROPHYLL** →

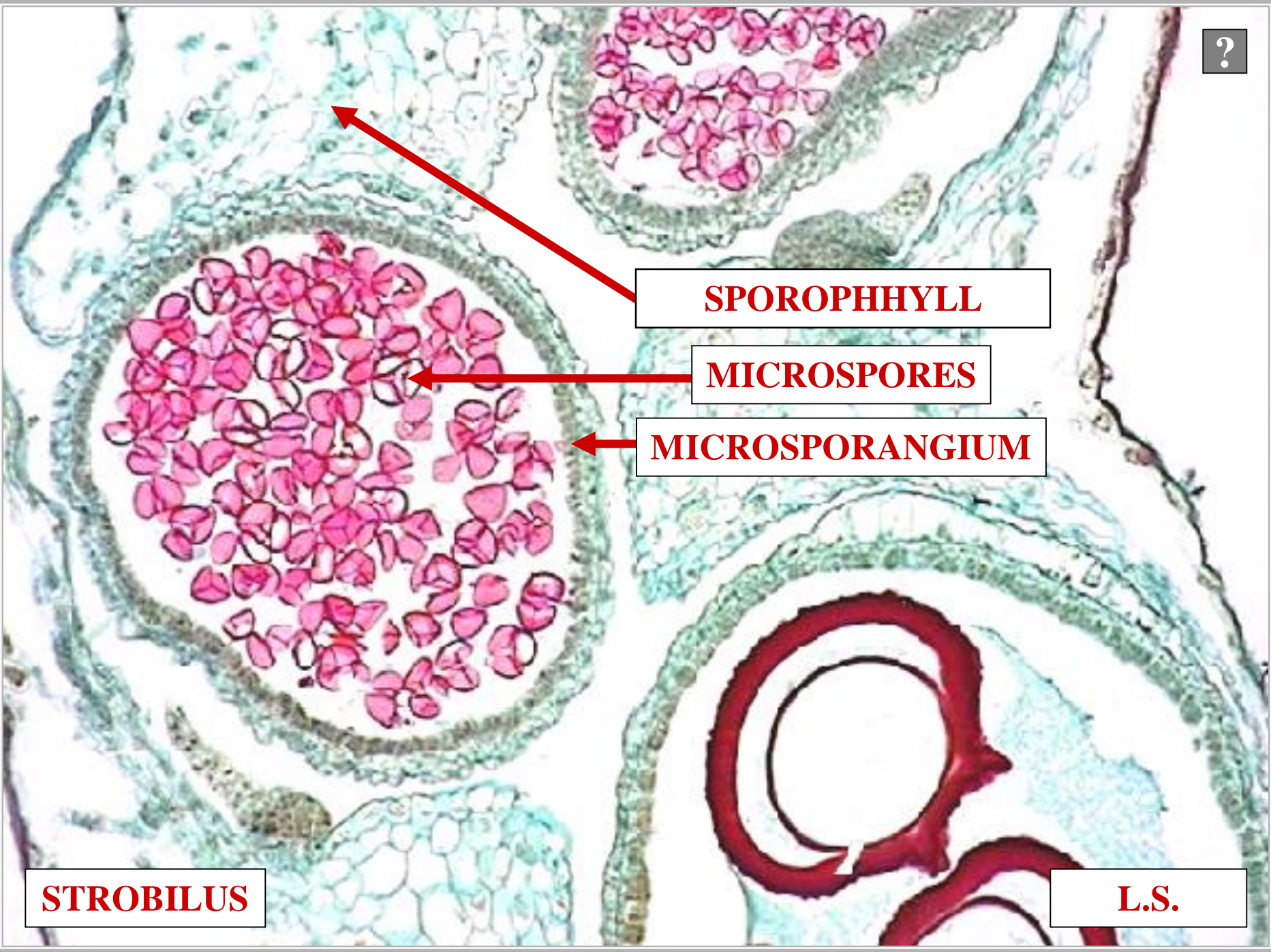
**L.S.**



# HETEROSPOROUS PLANTS SPOROPHYLL TERMS



?



**SPOROPHYLL**

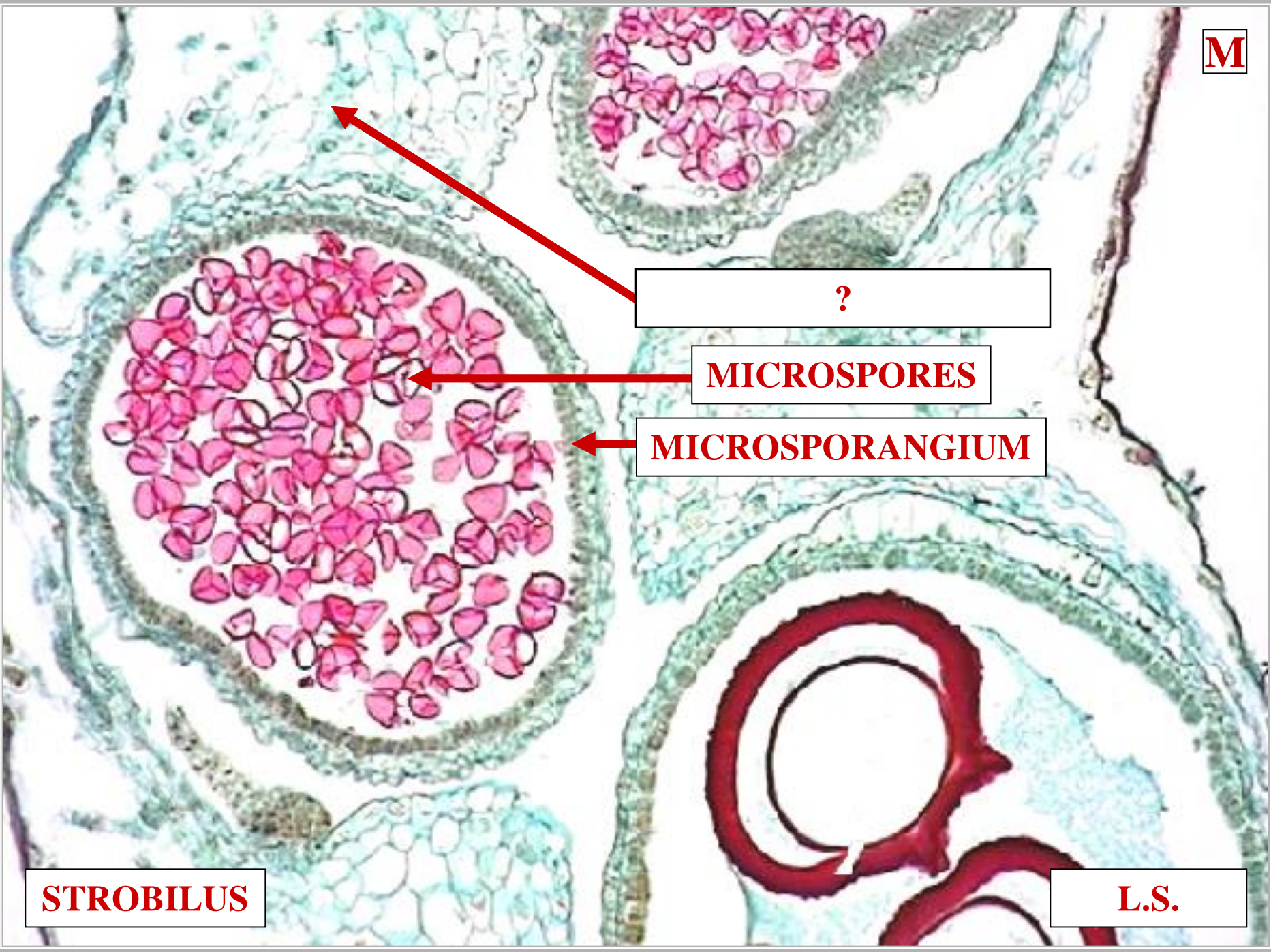
**MICROSPORES**

**MICROSPORANGIUM**

**STROBILUS**

**L.S.**





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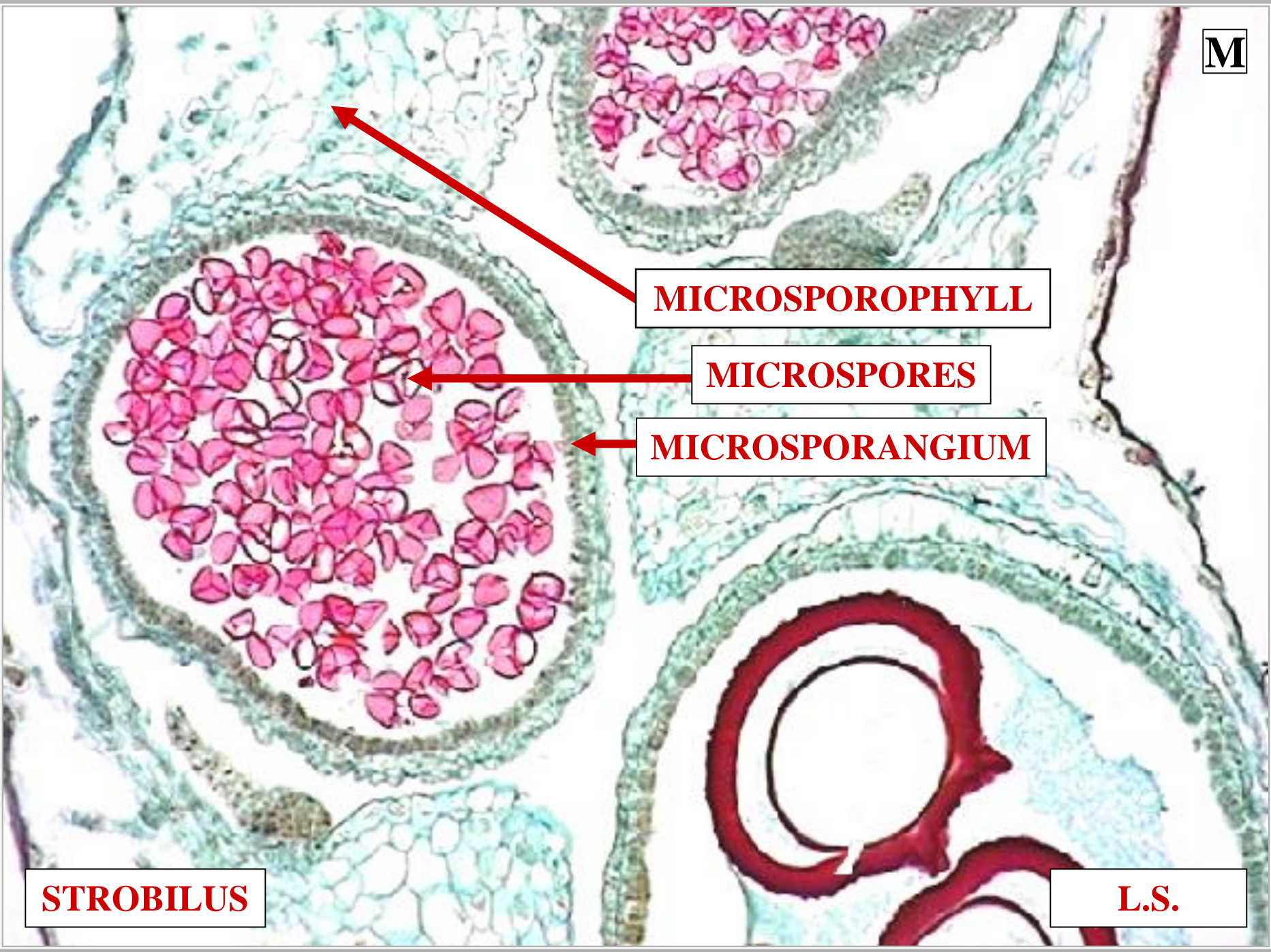
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**MICROSPORANGIUM**

**STROBILUS**

**L.S.**





**MICROSPOROPHYLL**

**MICROSPORES**

**MICROSPORANGIUM**

**STROBILUS**

**L.S.**

**MICROSPOROPHYLL**



**MICROSPOROPHYLL**



**LEAF  
BEARING  
MICROSPORANGIUM**

**MICROSPOROPHYLL**

?

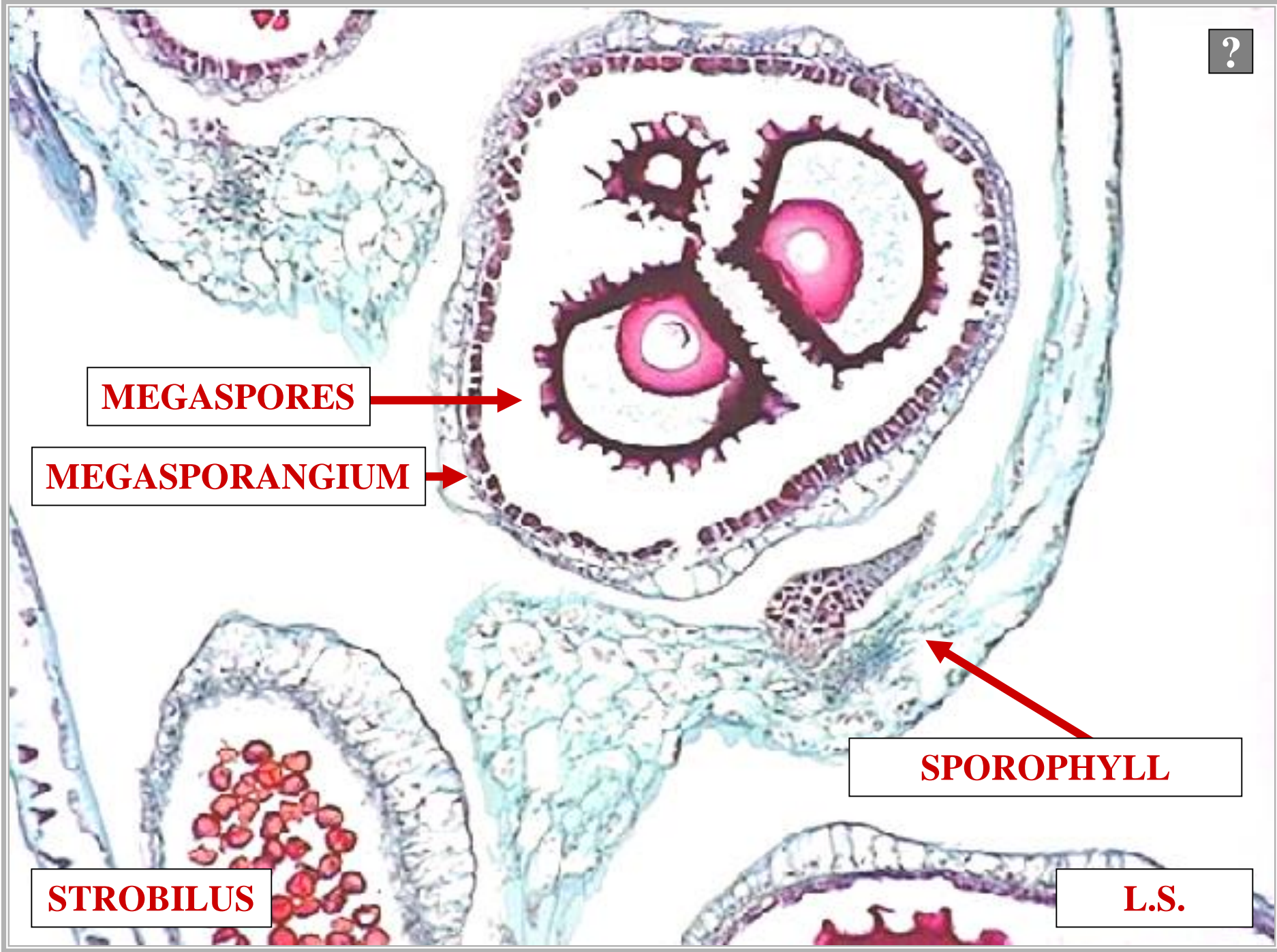
**MEGASPORES**

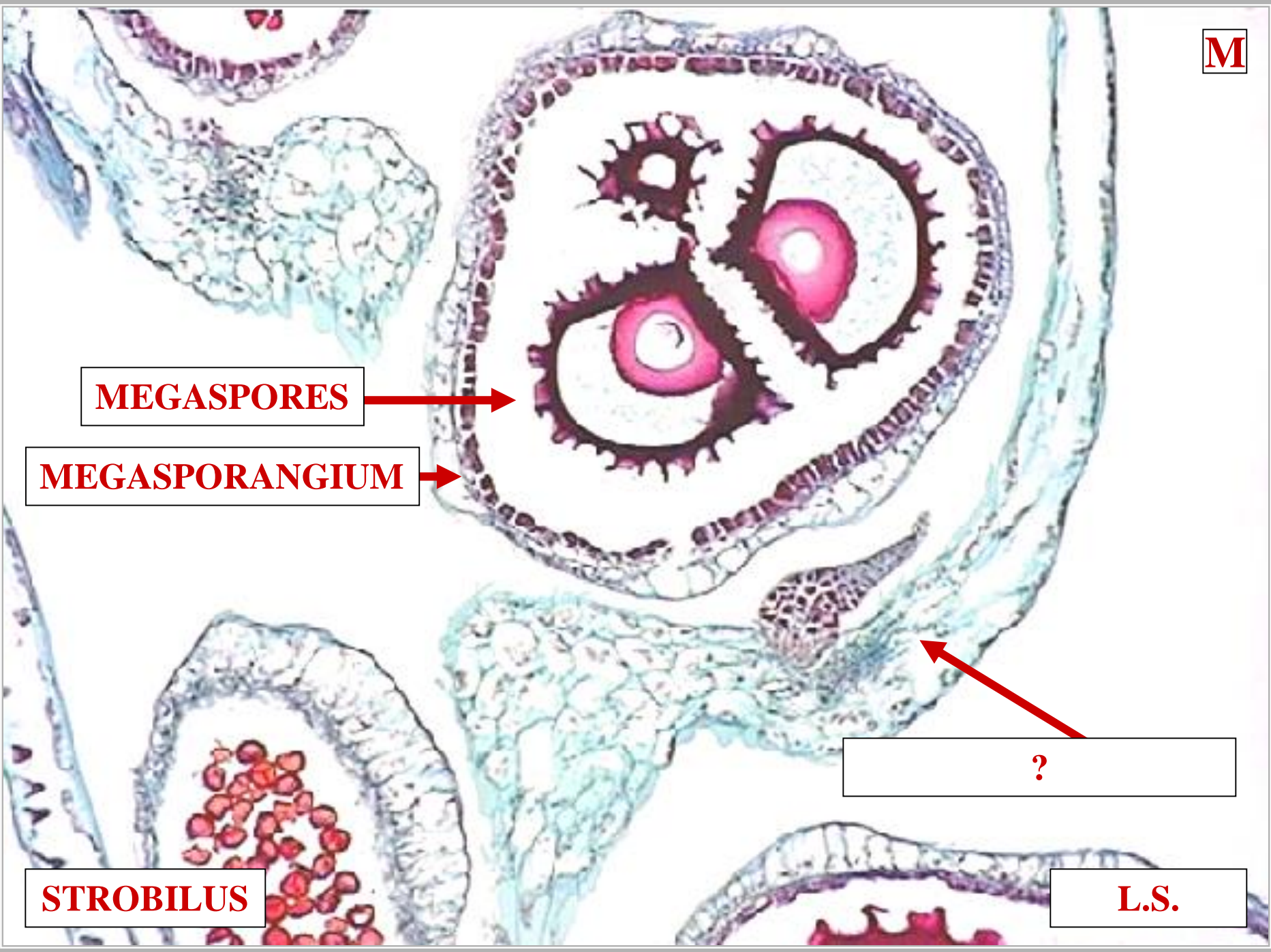
**MEGASPORANGIUM**

**SPOROPHYLL**

**STROBILUS**

**L.S.**





**MEGASPORES** →

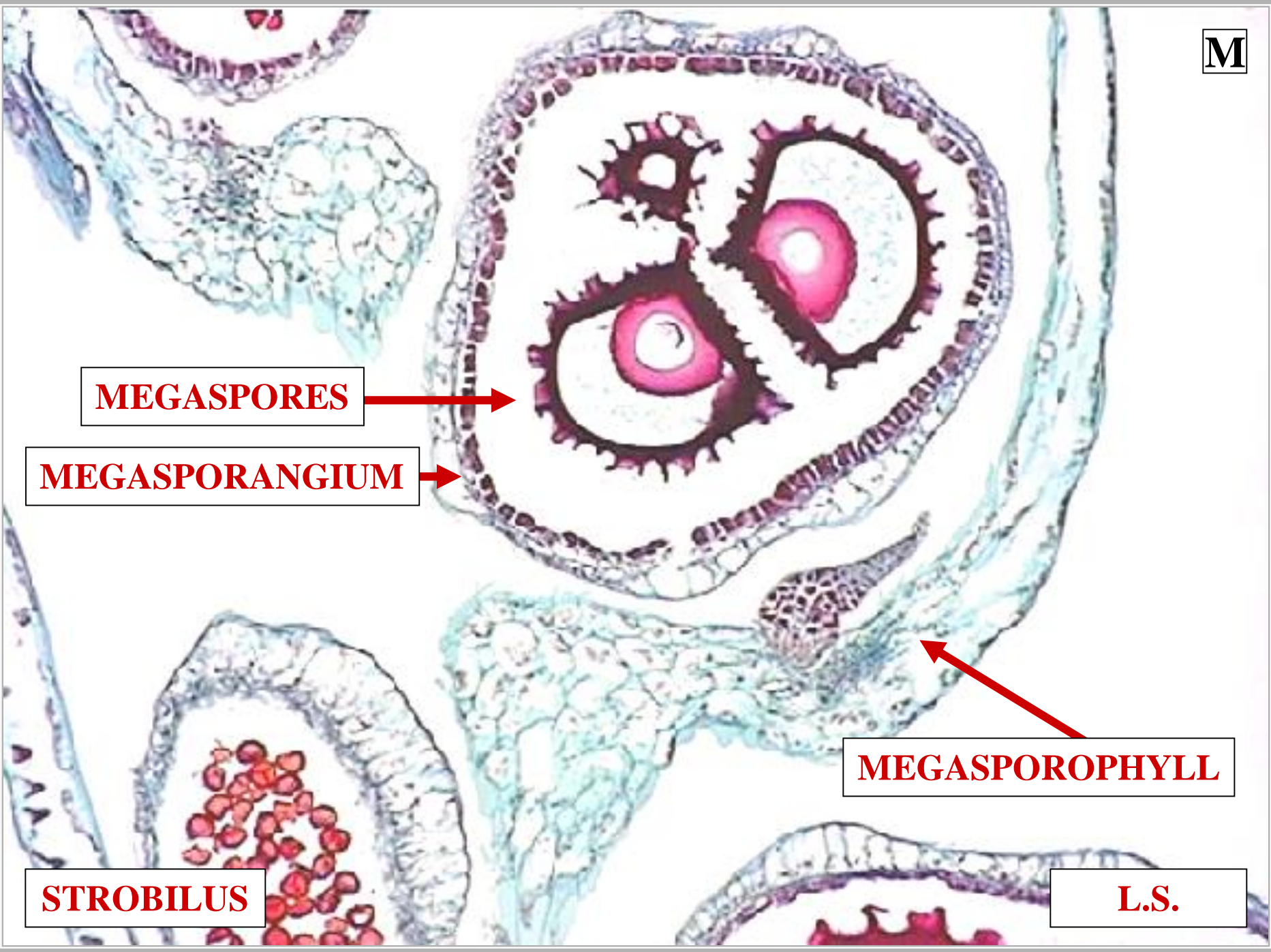
**MEGASPORANGIUM** →

→ **?**

**STROBILUS**

**L.S.**





**MEGASPORES** →

**MEGASPORANGIUM** →

← **MEGASPOROPHYLL**

**STROBILUS**

**L.S.**



**MEGASPOROPHYLL**



**MEGASPOROPHYLL**

**LEAF**

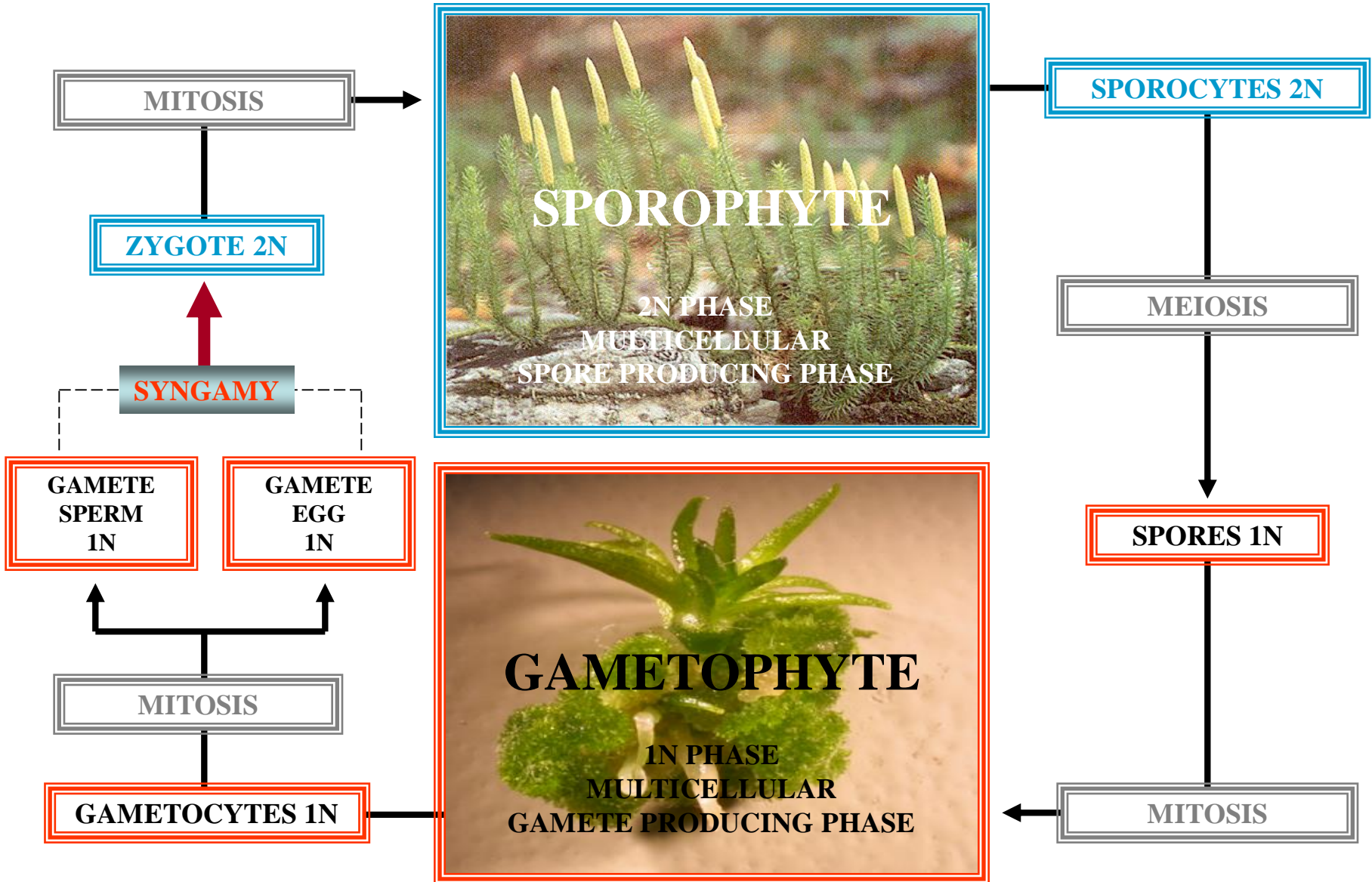
**BEARING**

**MEGASPORANGIUM**

**MEGASPOROPHYLL**

# LYCOPODIOPHYTA

## LIFE CYCLE





# GAMETOPHYTE CHARACTERS





**EXOSPORIC  
GAMETOPHYTE**

**LYCOPODIOPHYTA**





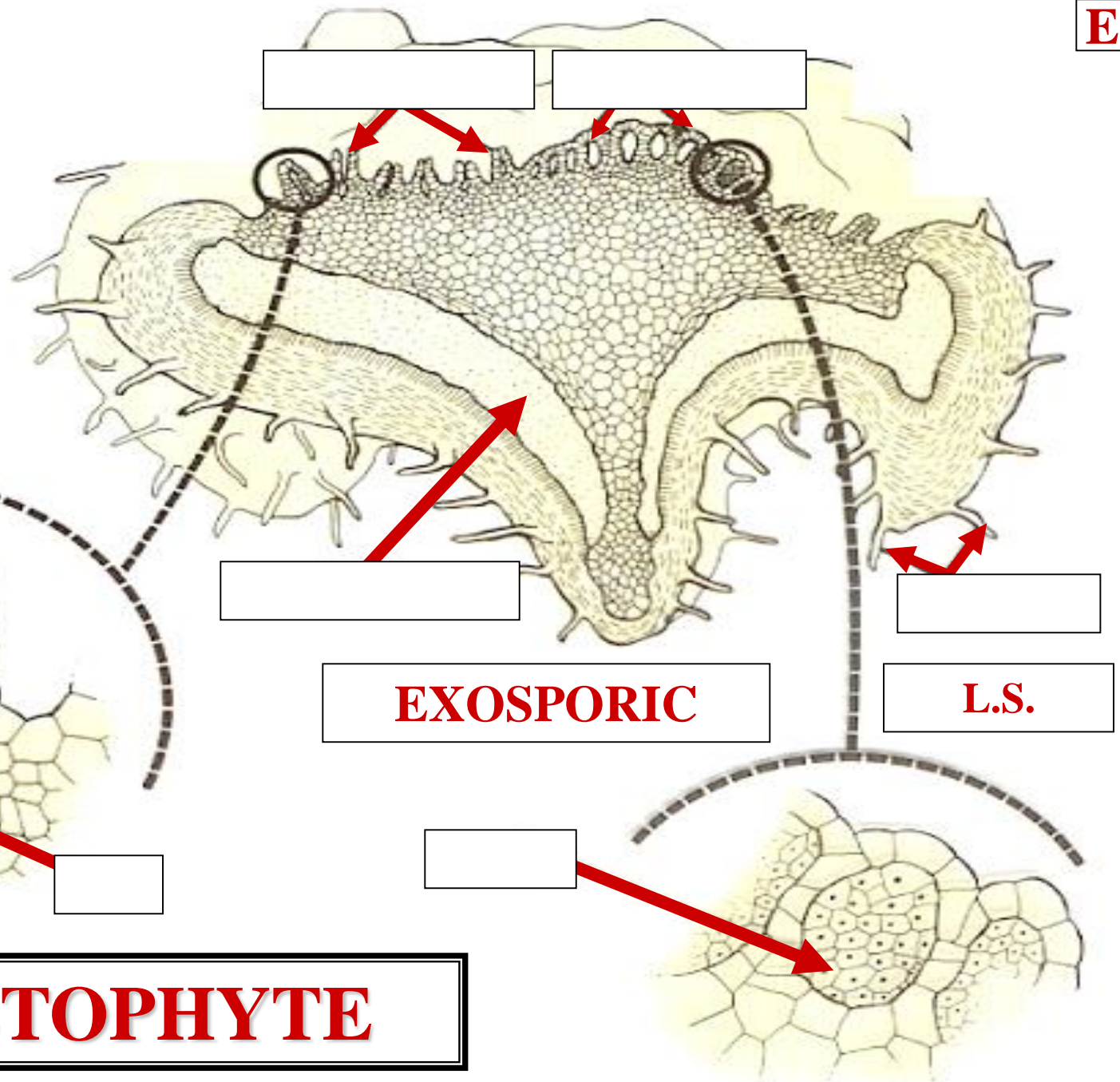
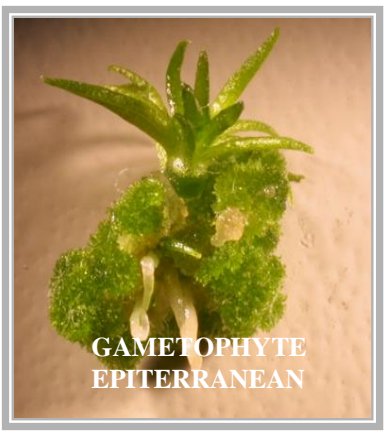
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**LYCOPODIOPHYTA**



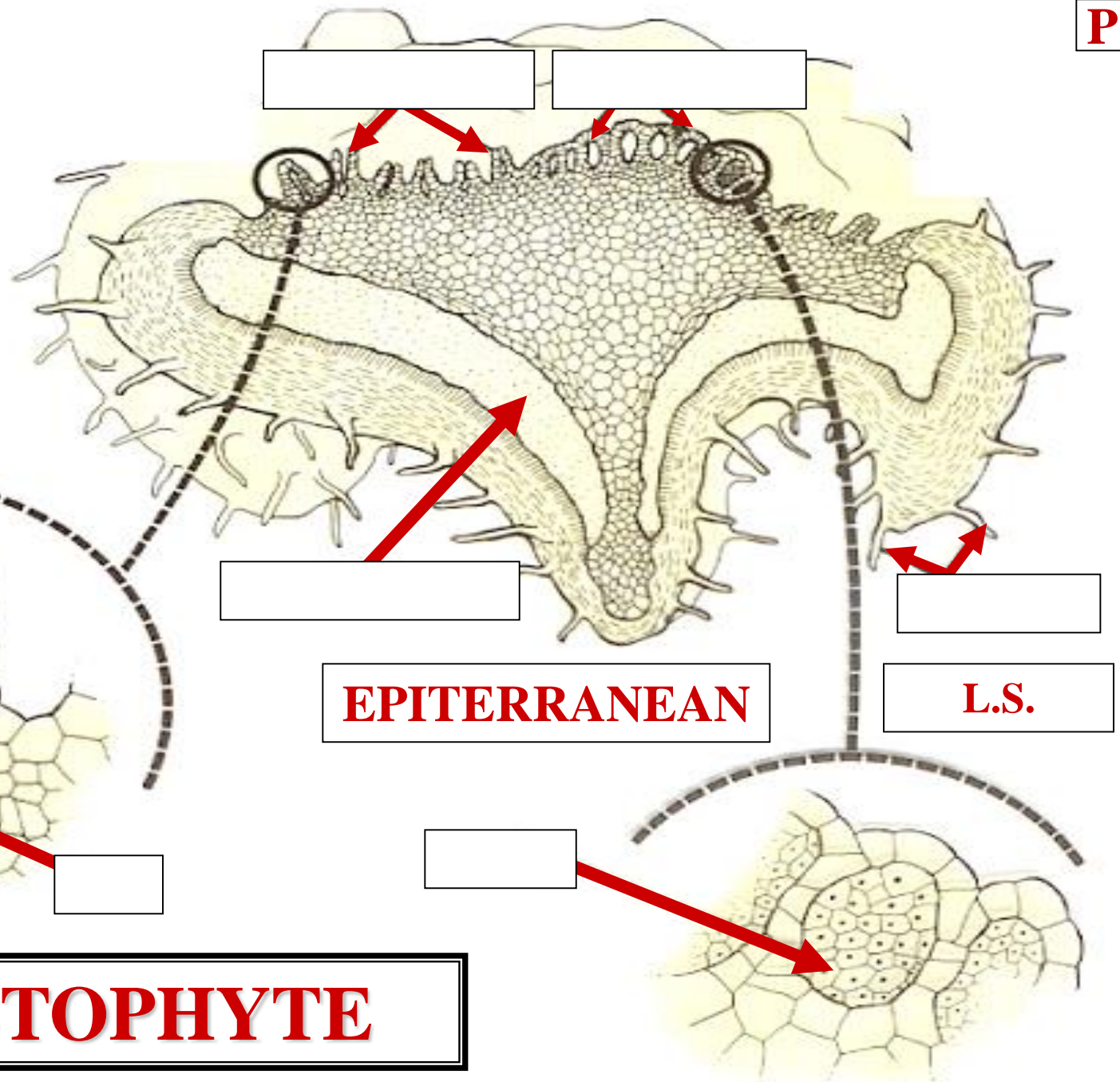
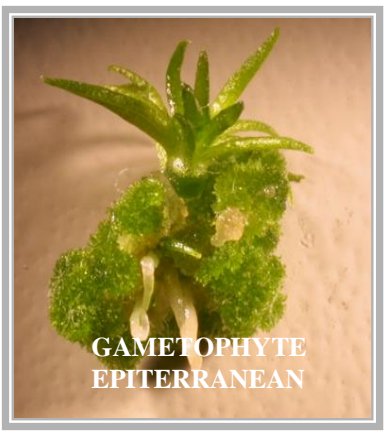
# EXOSPORIC GAMETOPHYTE



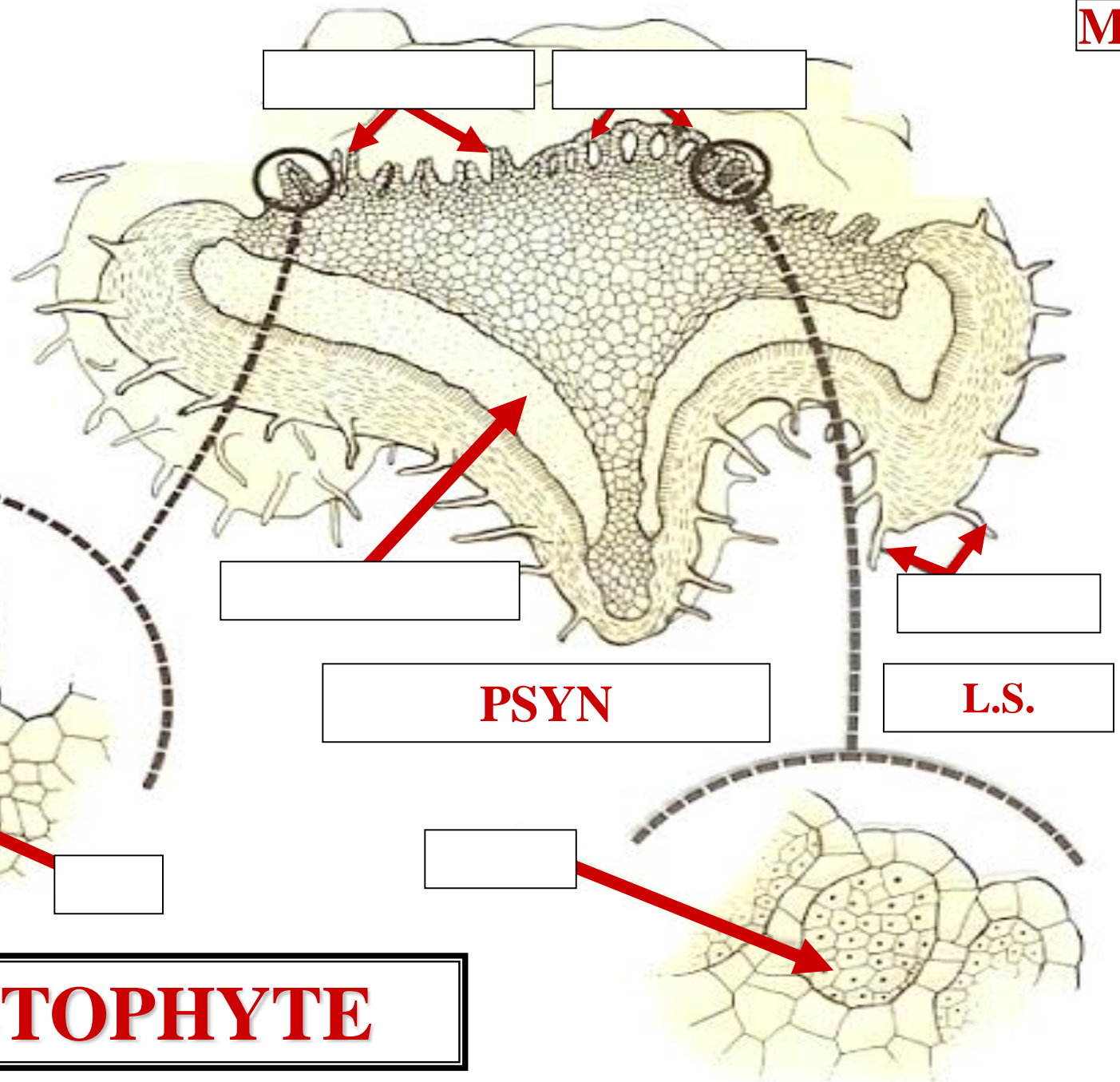


**GAMETOPHYTE**





**GAMETOPHYTE**

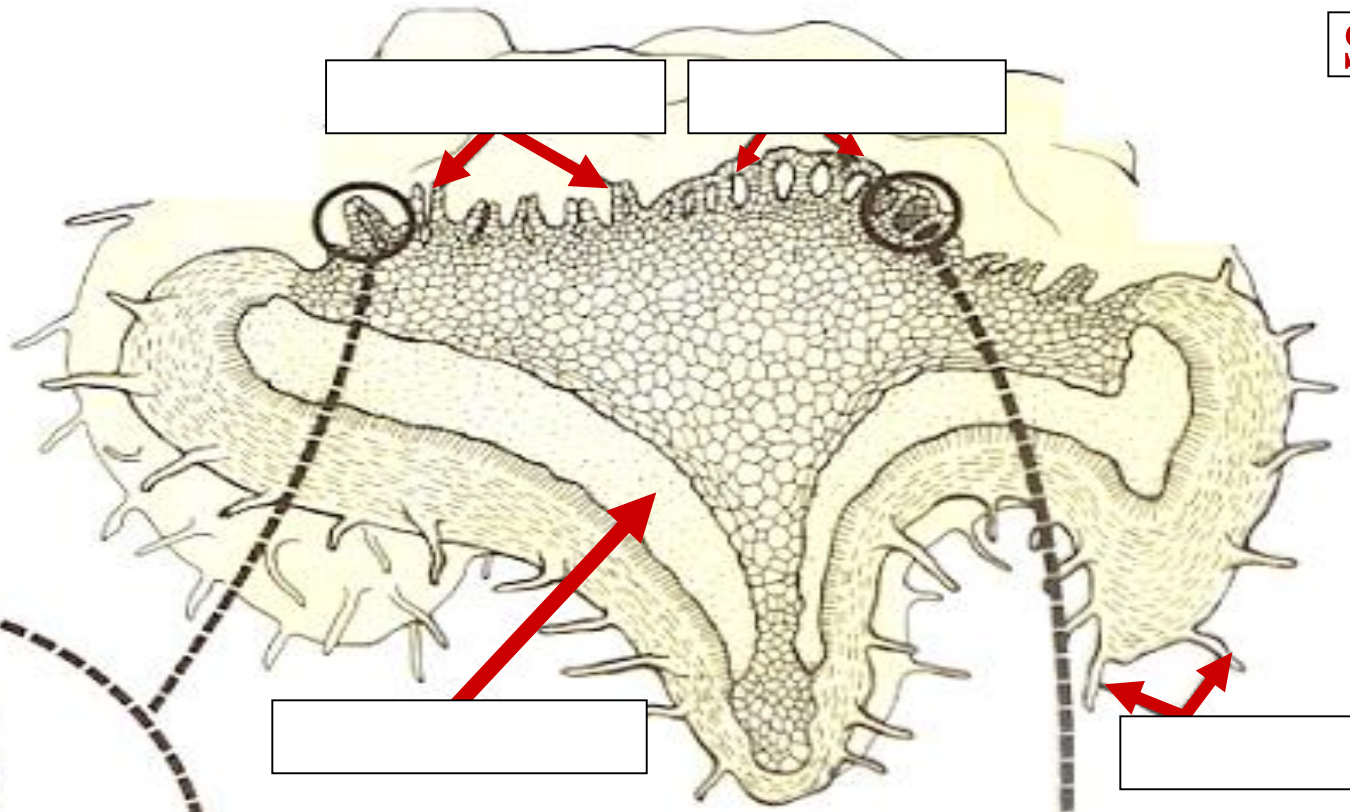


**GAMETOPHYTE**



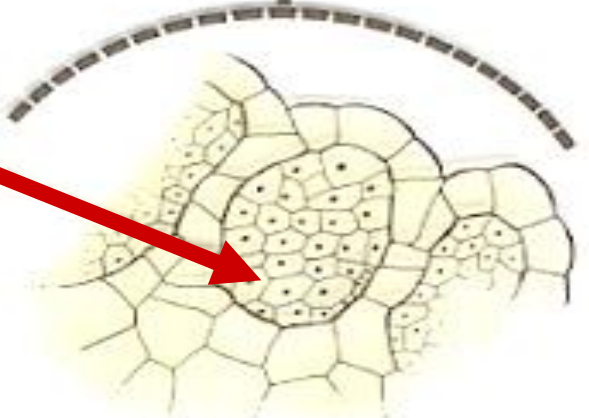
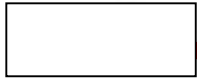


**S**



**EXOSPORIC**

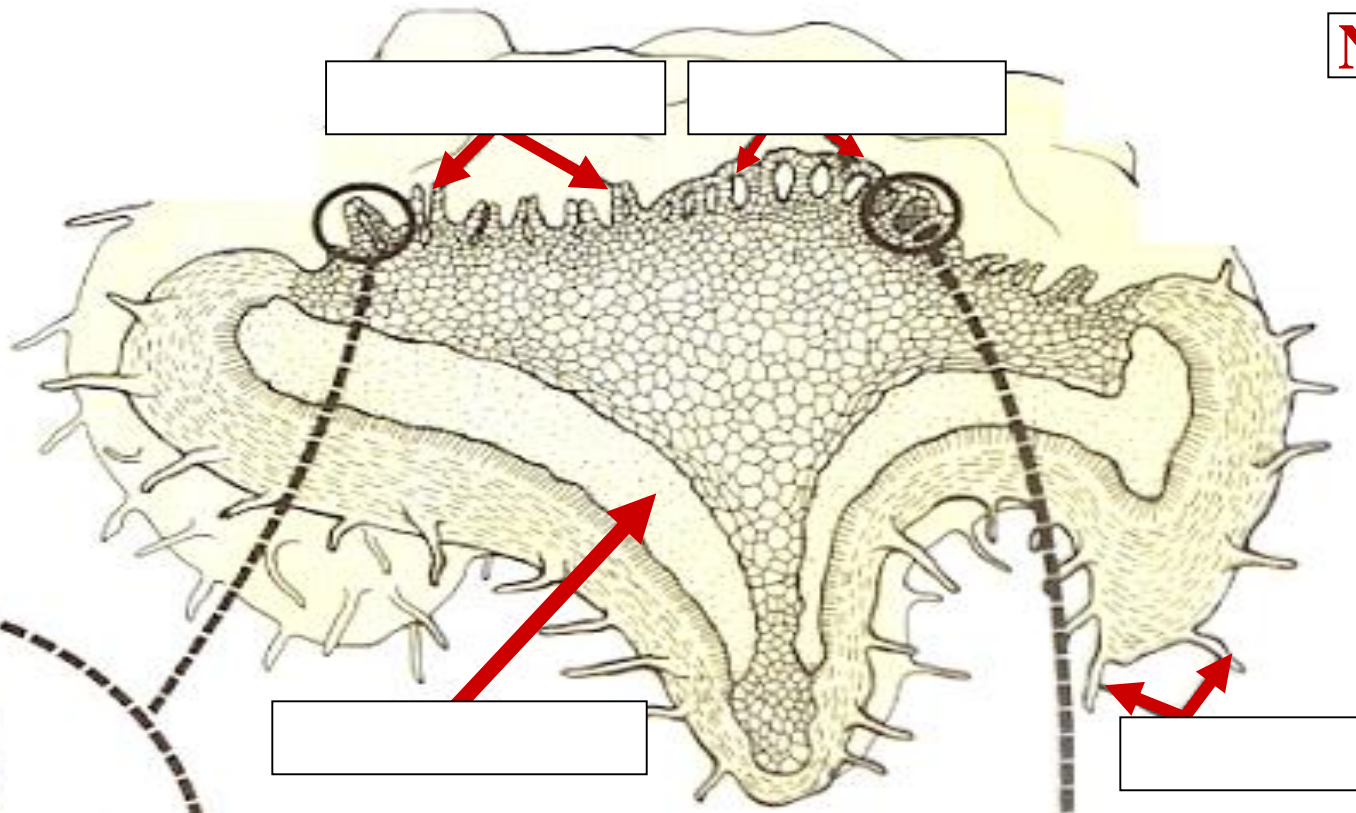
**L.S.**



**GAMETOPHYTE**



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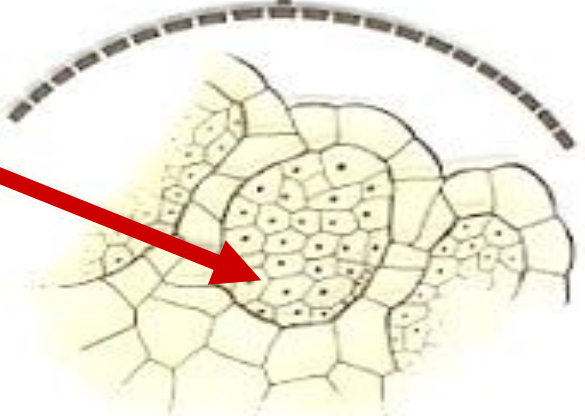
**SUBTERRANEAN**

**L.S.**

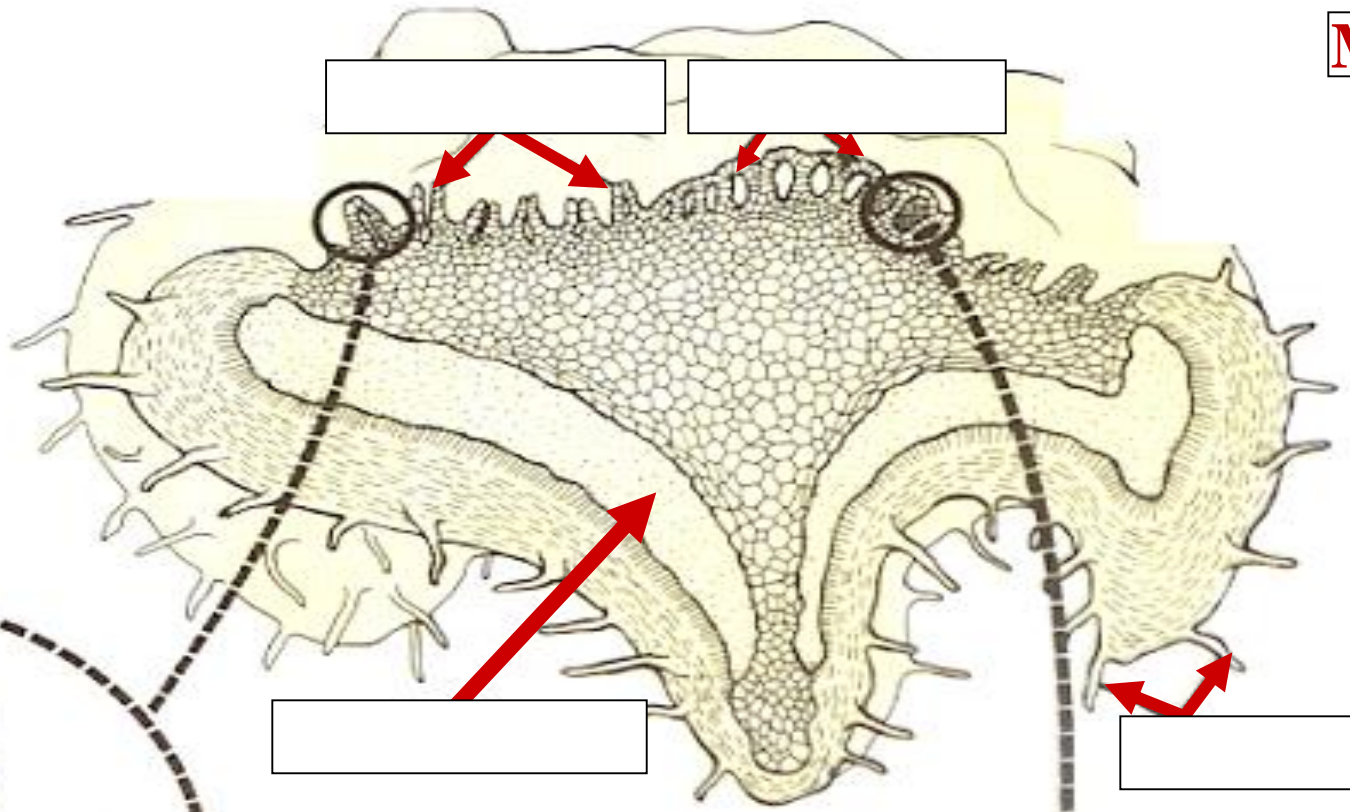


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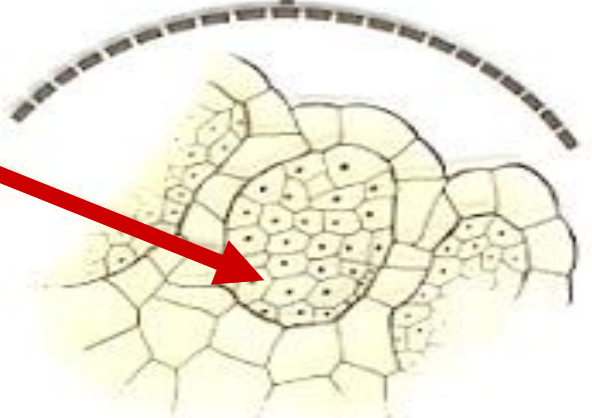
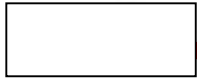


**GAMETOPHYTE**



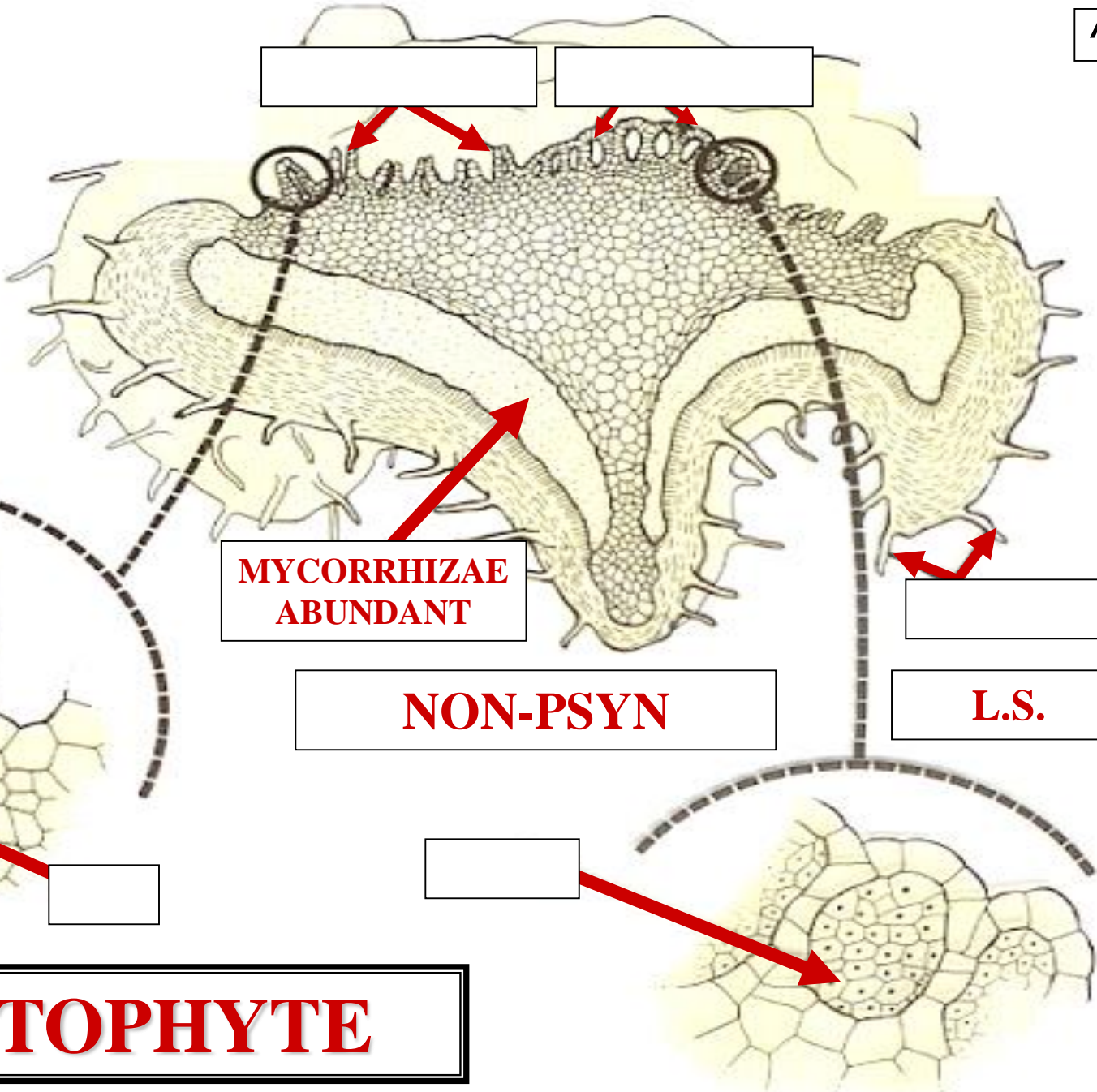
**NON-PSYN**

**L.S.**



**GAMETOPHYTE**

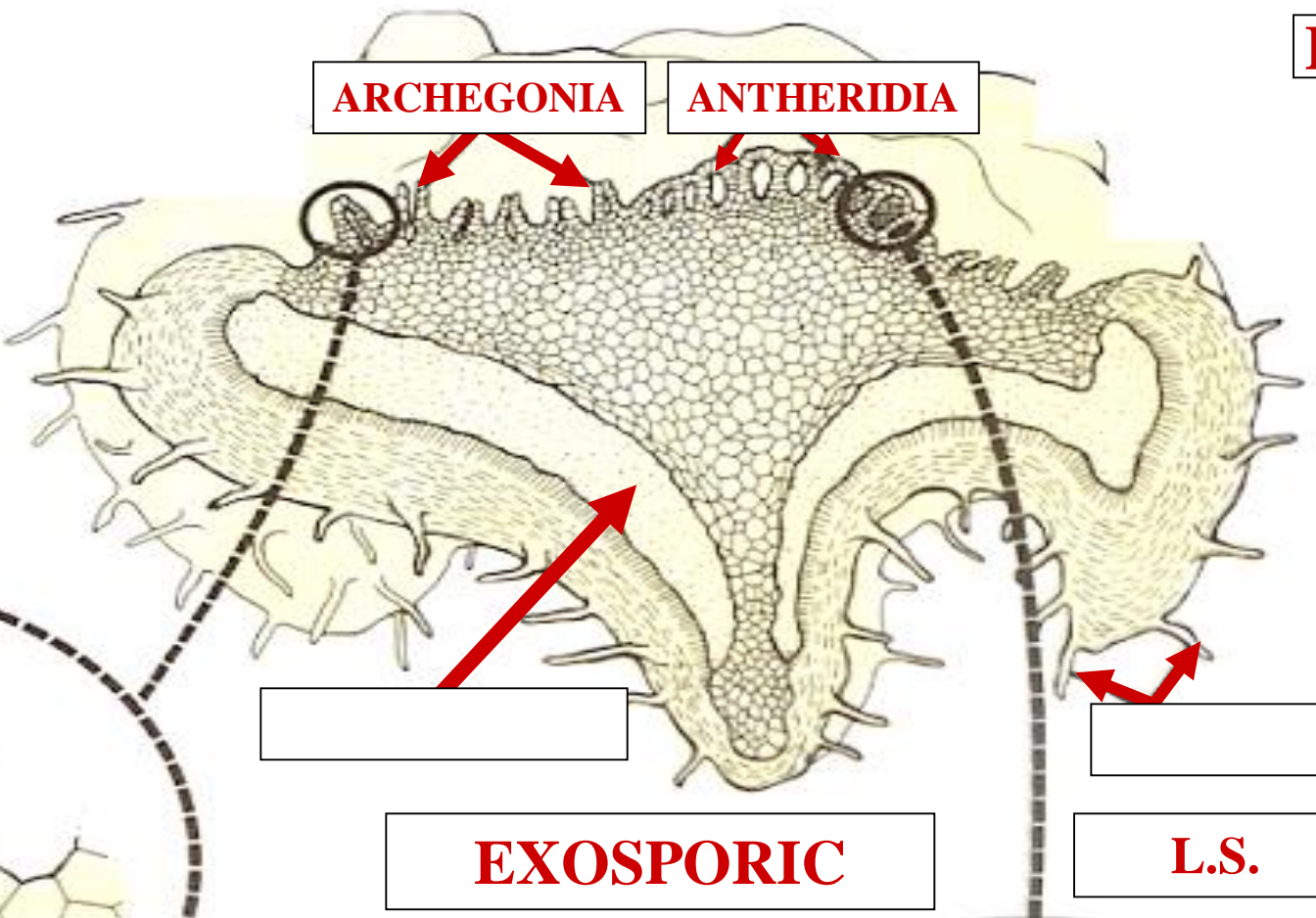




**GAMETOPHYTE**

**B**

**ARCHEGONIA**      **ANTHERIDIA**

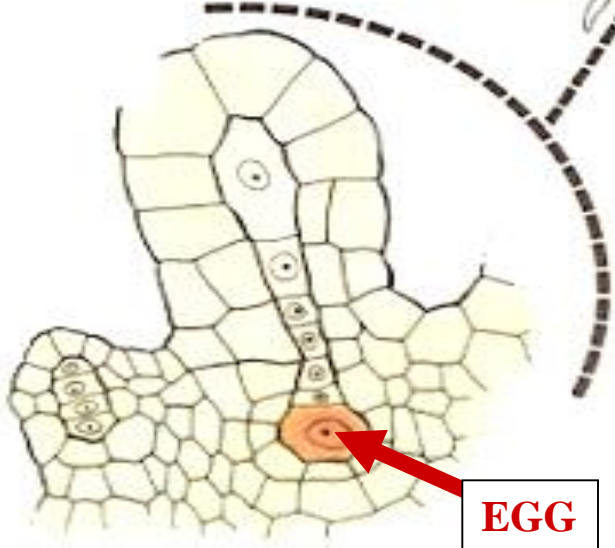


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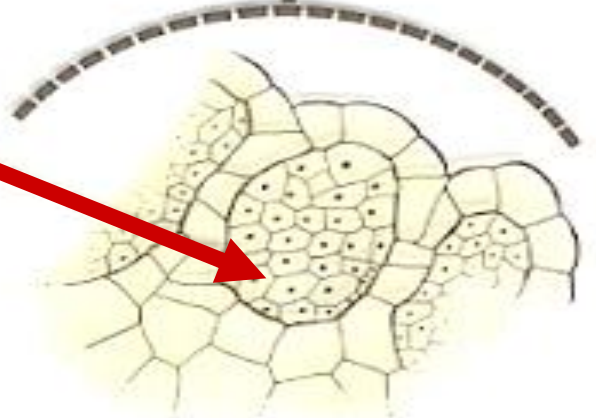
**EXOSPORIC**

**L.S.**



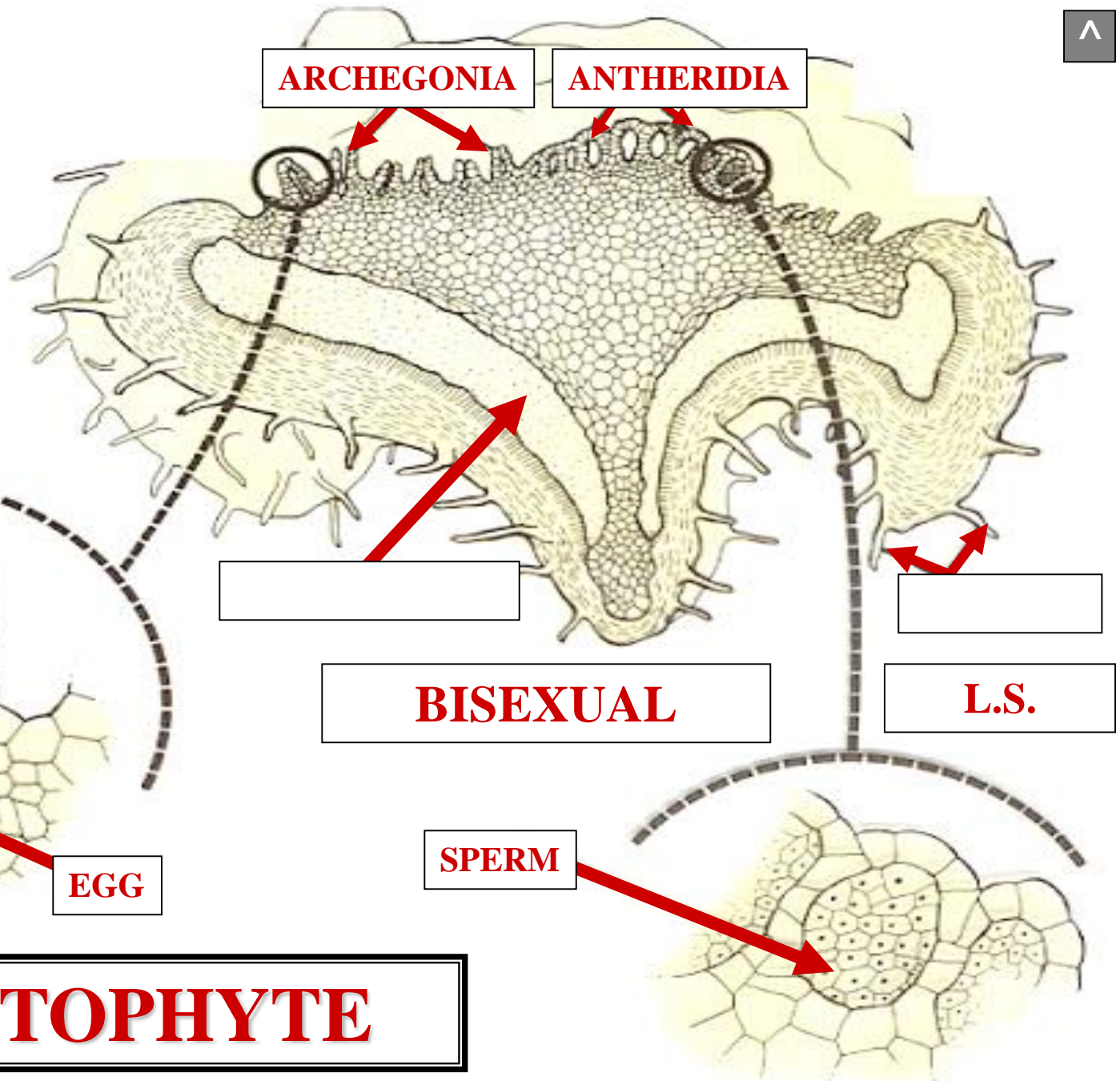
**EGG**

**SPERM**



**GAMETOPHYTE**







# GAMETOPHYTE MYCORRHIZAE

**MYCORRHIZAE**

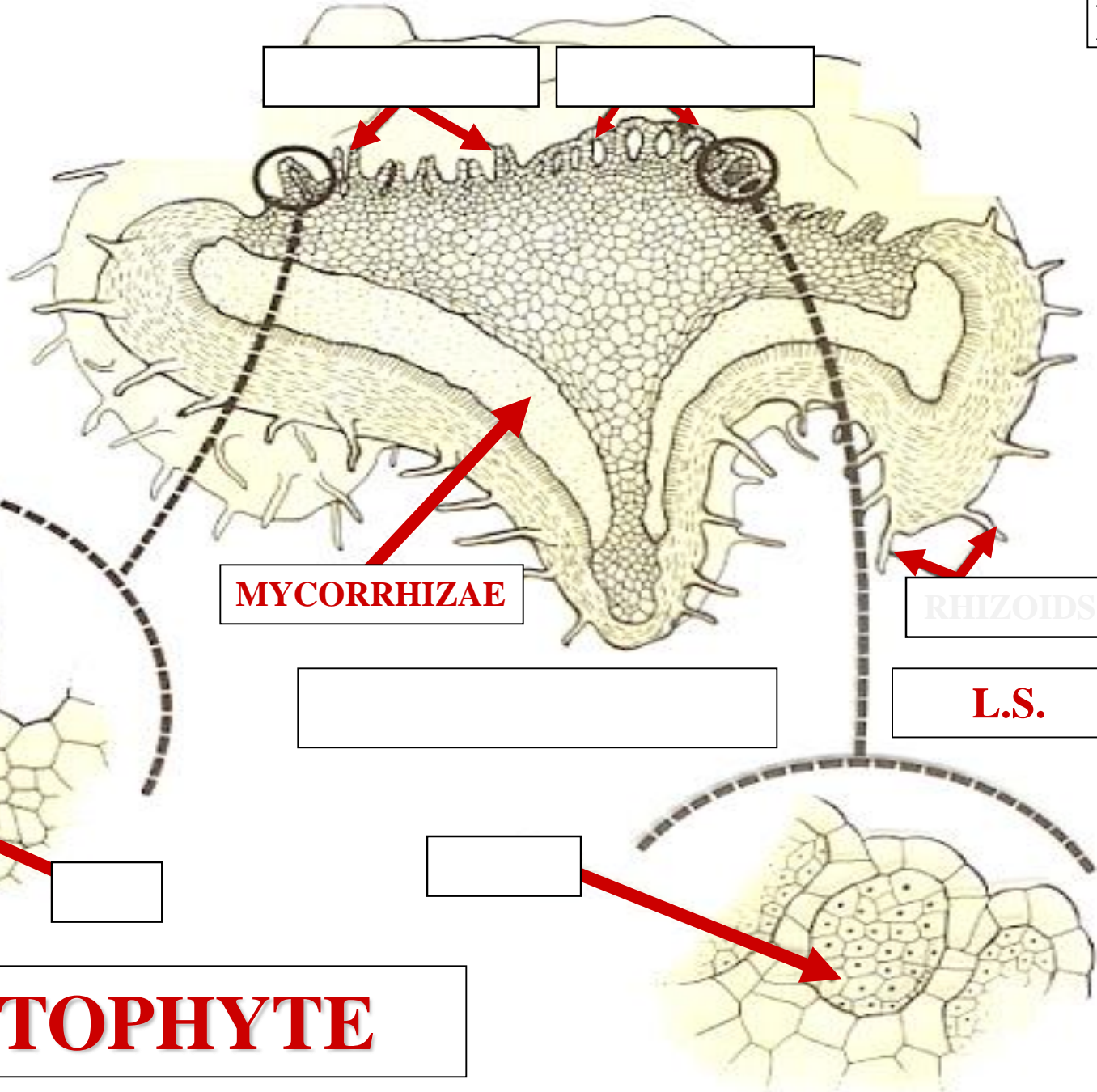


**MYCORRHIZAE**

**FUNGUS SYMBIONT**

**MYCORRHIZAE**





**GAMETOPHYTE**

**RHIZOID**

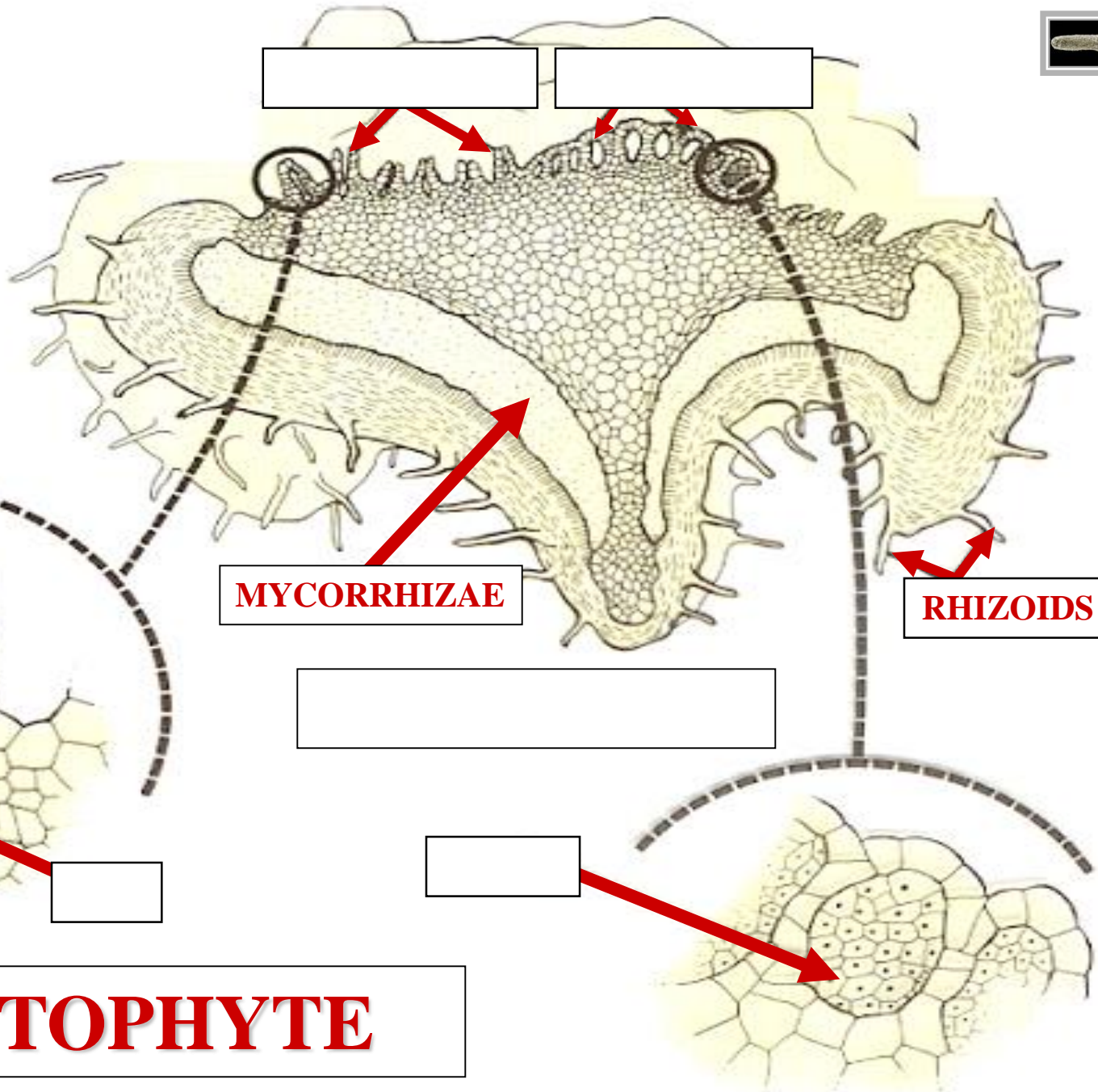


**RHIZOID**

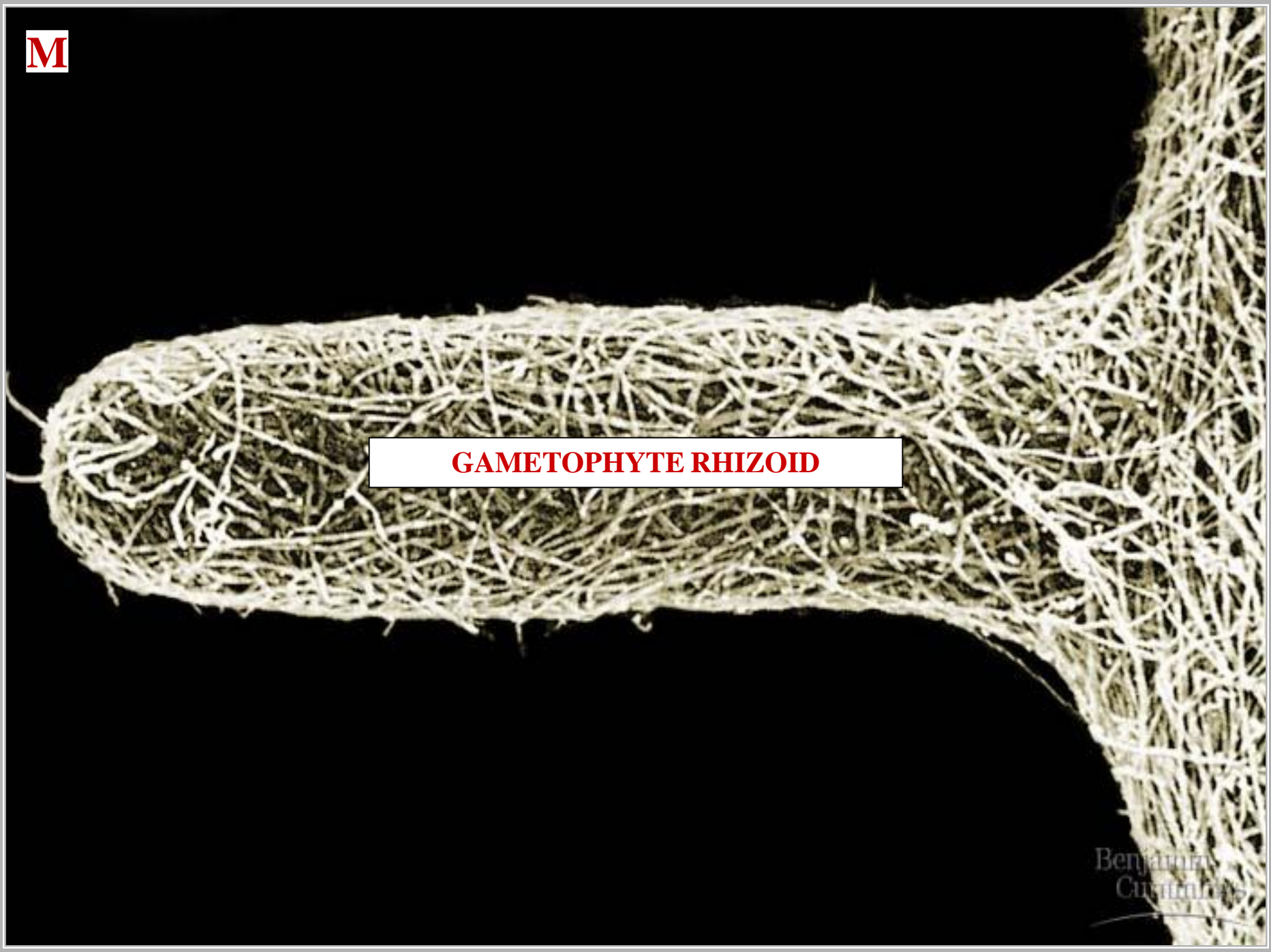
**ROOT-LIKE  
GAMETOPHYTE  
OUTGROWTH**

**RHIZOID**



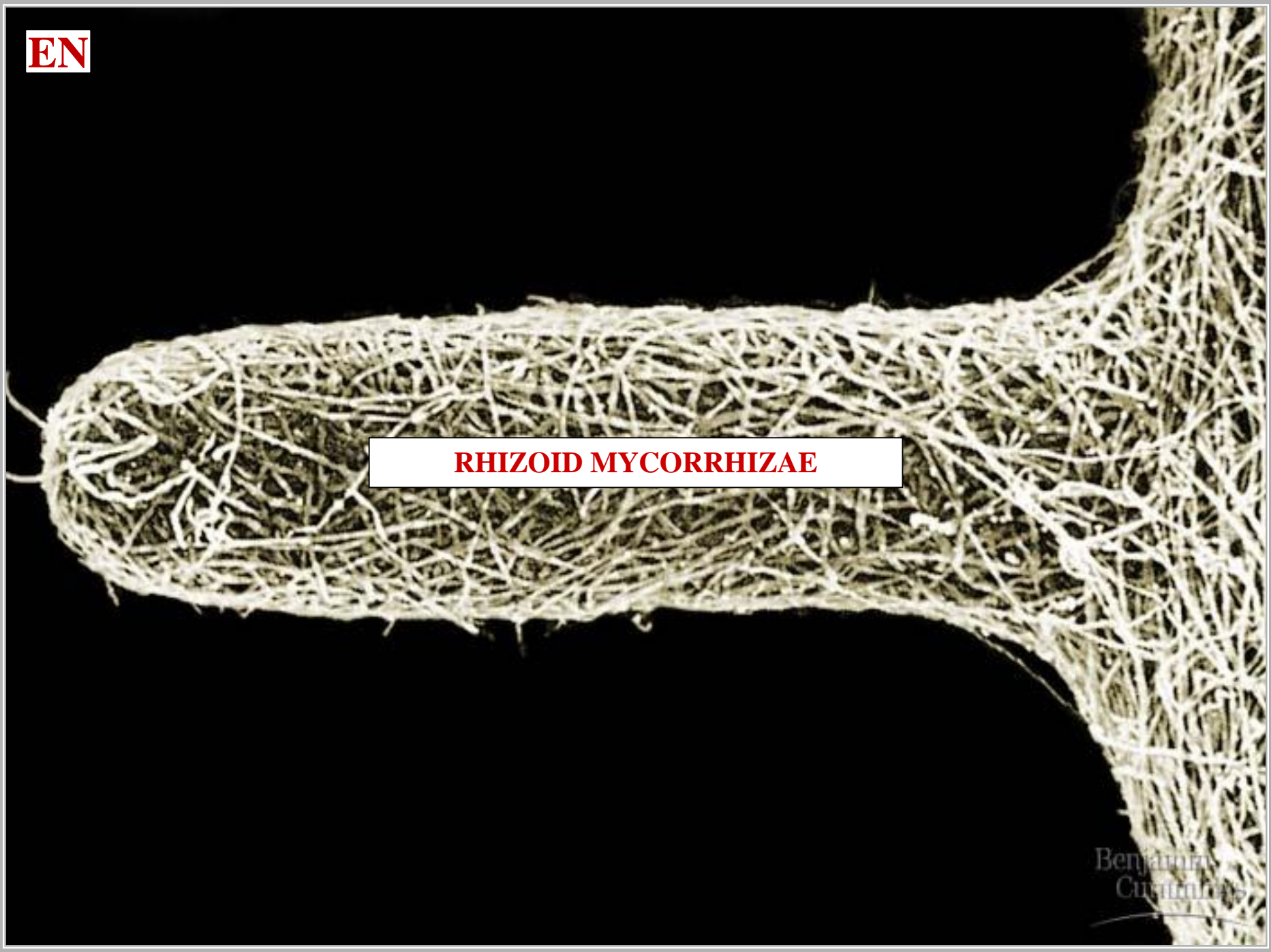


**GAMETOPHYTE**



**GAMETOPHYTE RHIZOID**





**RHIZOID MYCORRHIZAE**

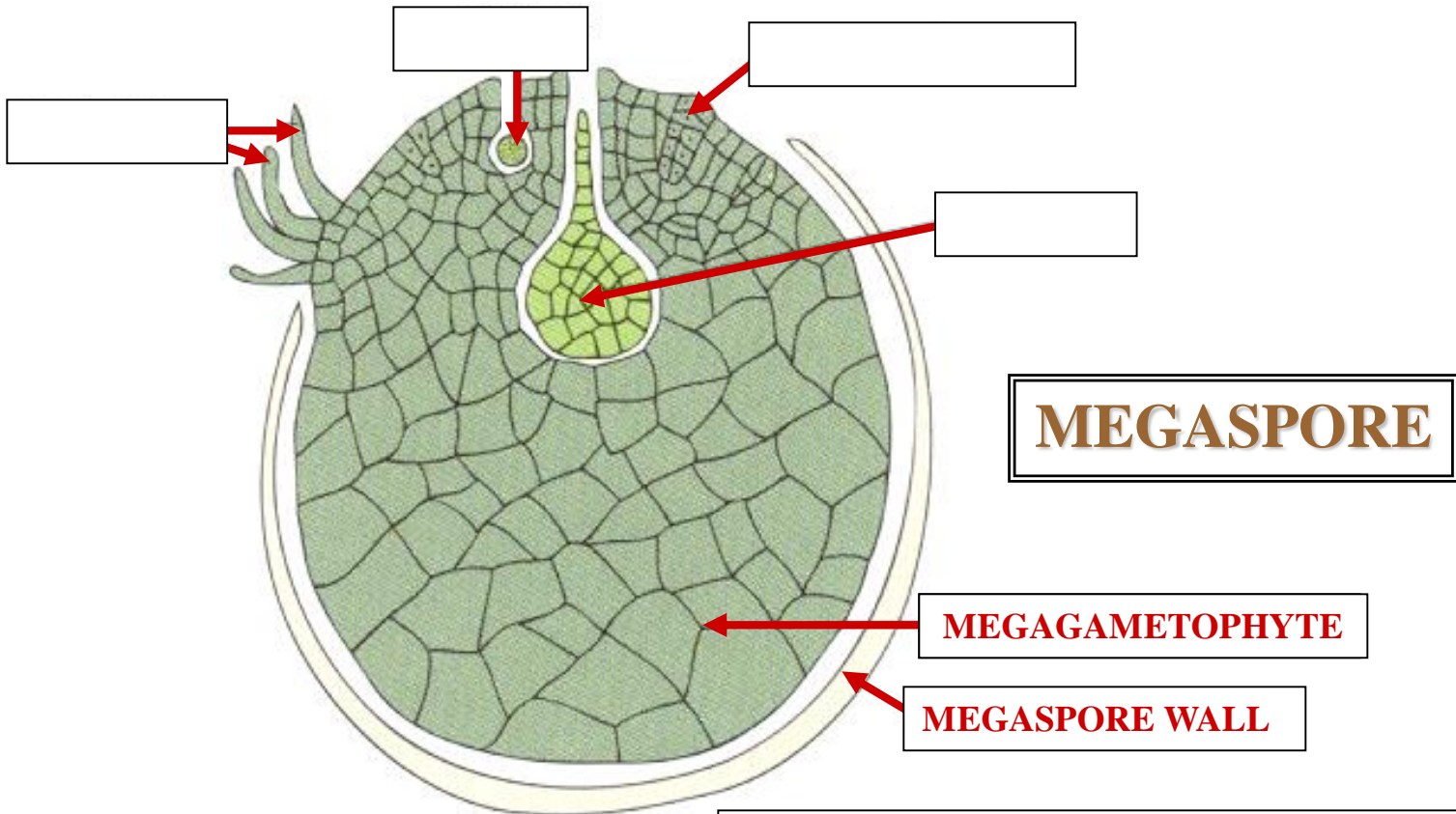




**ENHANCE NUTRIENT ABSORPTION**



# ENDOSPORIC GAMETOPHYTE



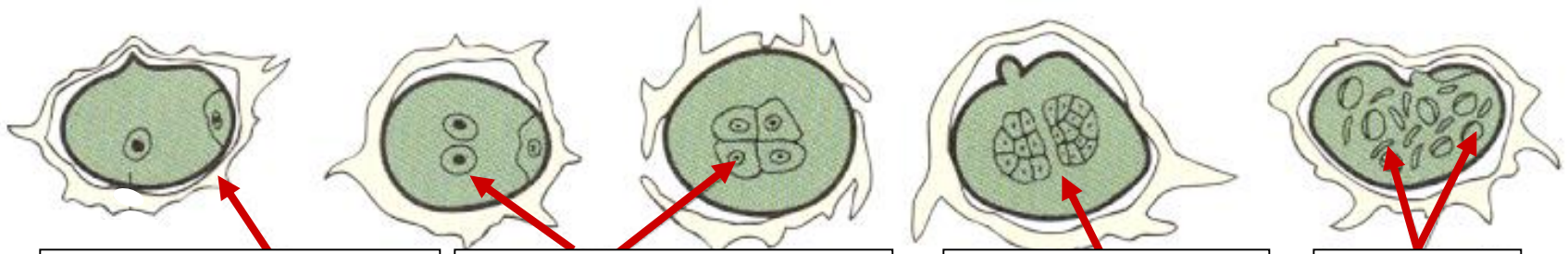
**MEGASPORE**

**MEGAGAMETOPHYTE**

**MEGASPORE WALL**

**MICROSPORE**

**GAMETOPHYTE**



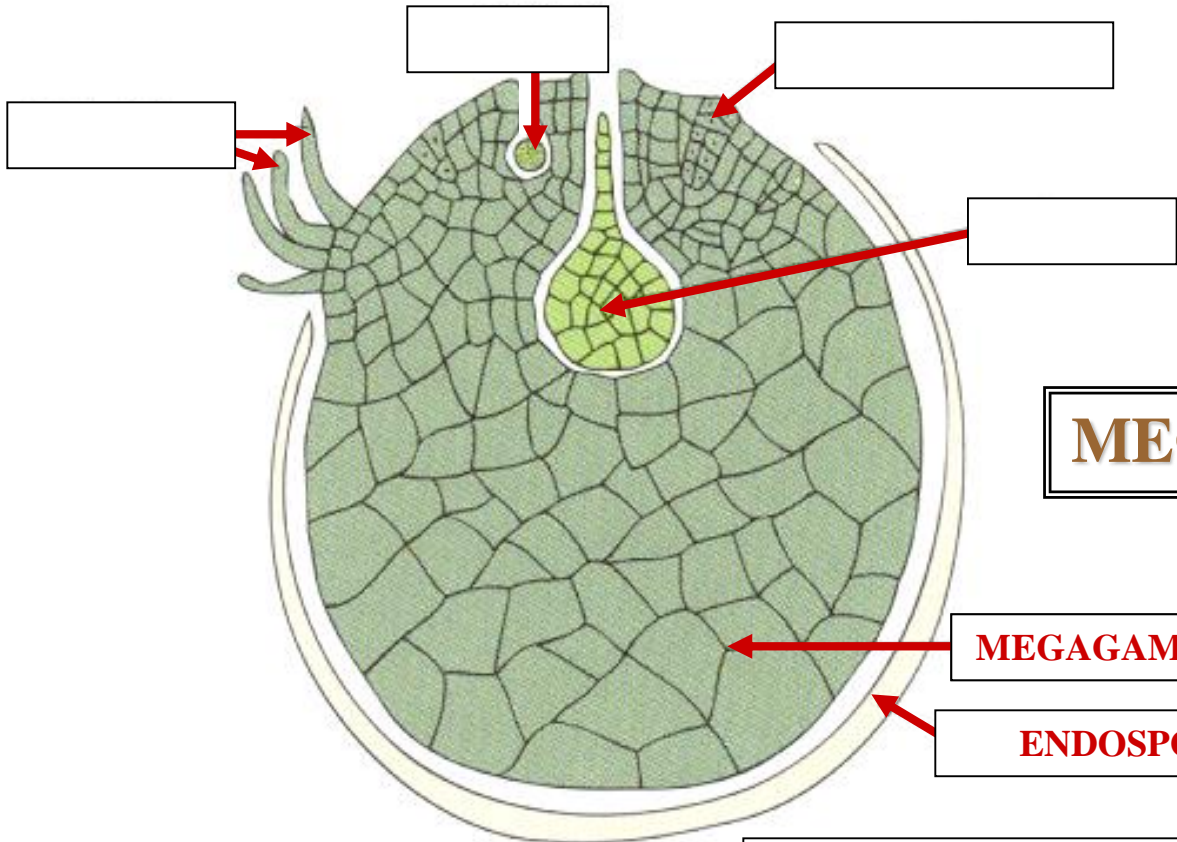
**MICROSPORE WALL**

**MICROGAMETOPHYTE**

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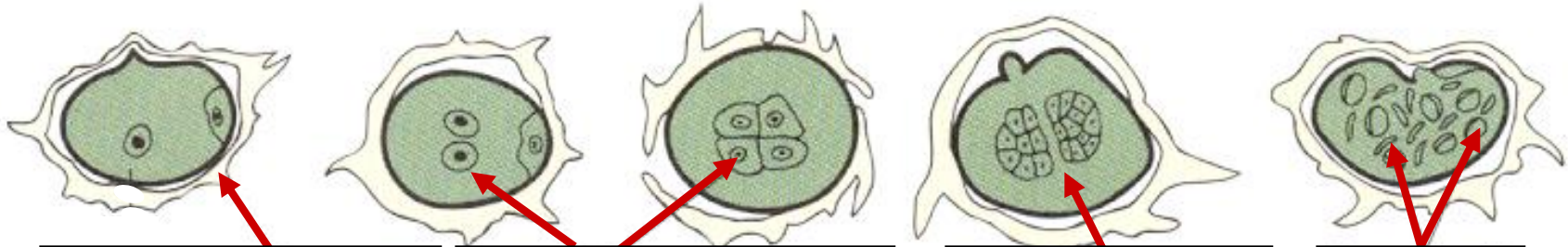
**MEGASPORE**

**MEGAGAMETOPHYTE**

**ENDOSPORIC**

**MICROSPORE**

**GAMETOPHYTE**

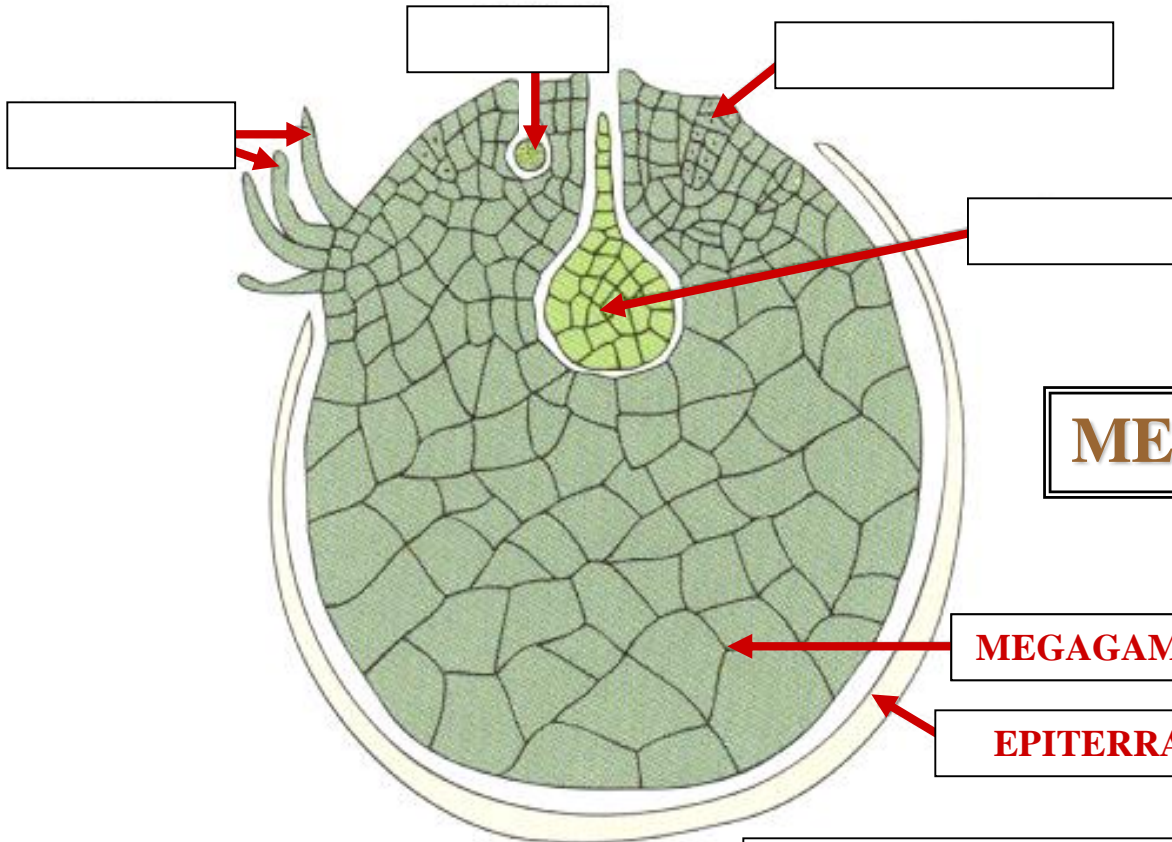


**ENDOSPORIC**

**MICROGAMETOPHYTE**

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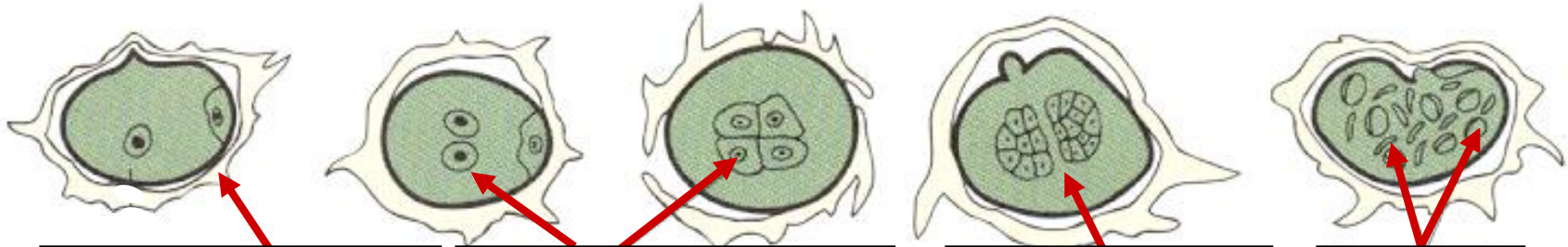
**MEGASPORE**

**MEGAGAMETOPHYTE**

**EPITERRANEAN**

**MICROSPORE**

**GAMETOPHYTE**

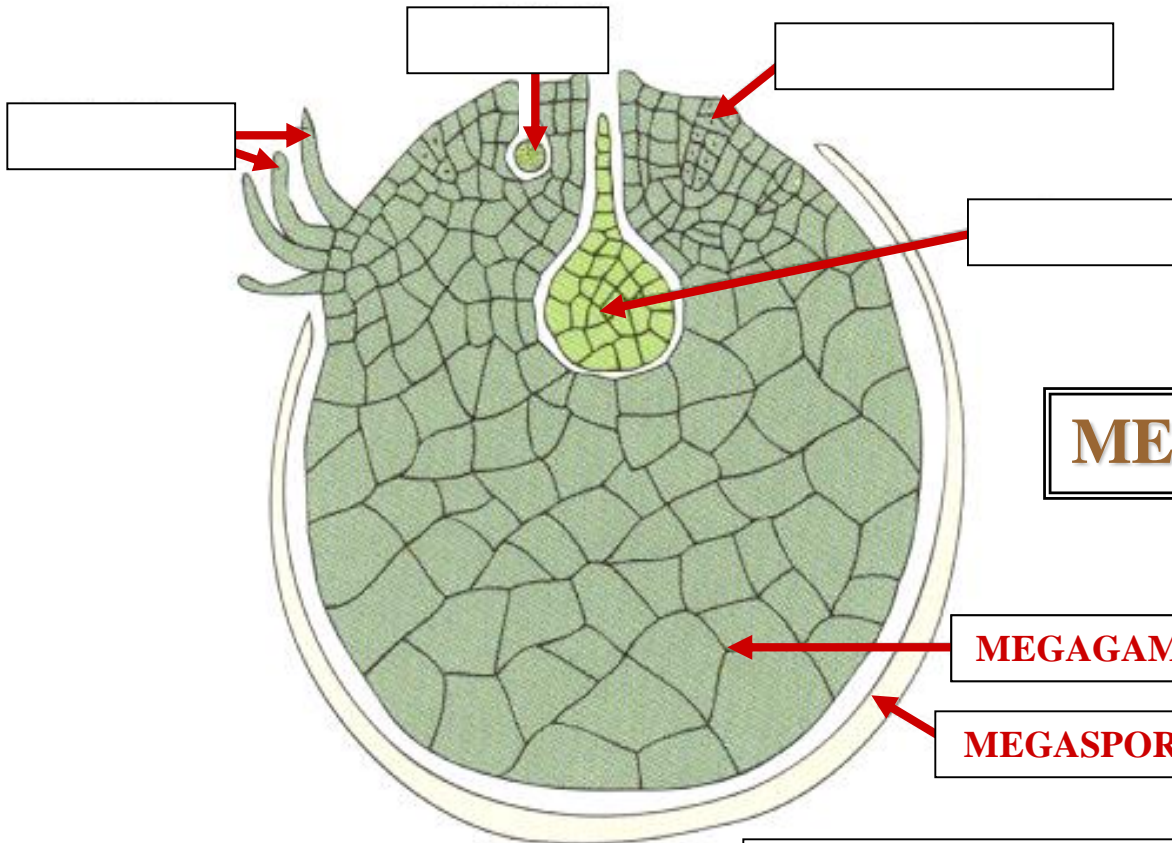


**EPITERRANEAN**

**MICROGAMETOPHYTE**

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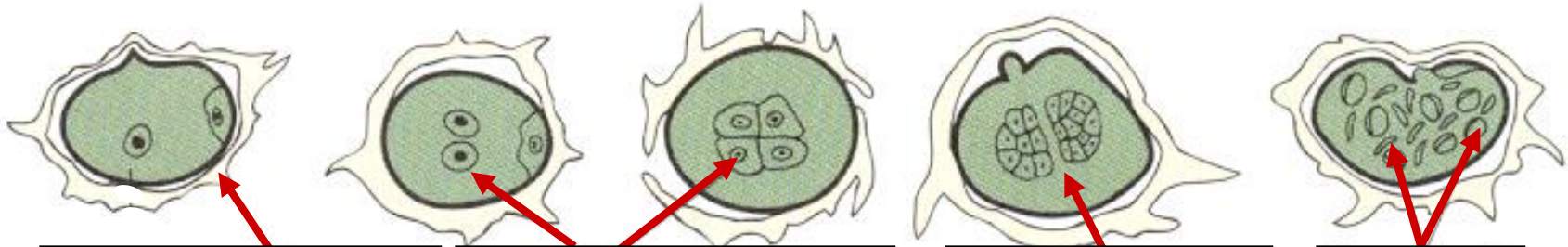
**MEGASPORE**

**MEGAGAMETOPHYTE**

**MEGASPORE WALL**

**MICROSPORE**

**GAMETOPHYTE**



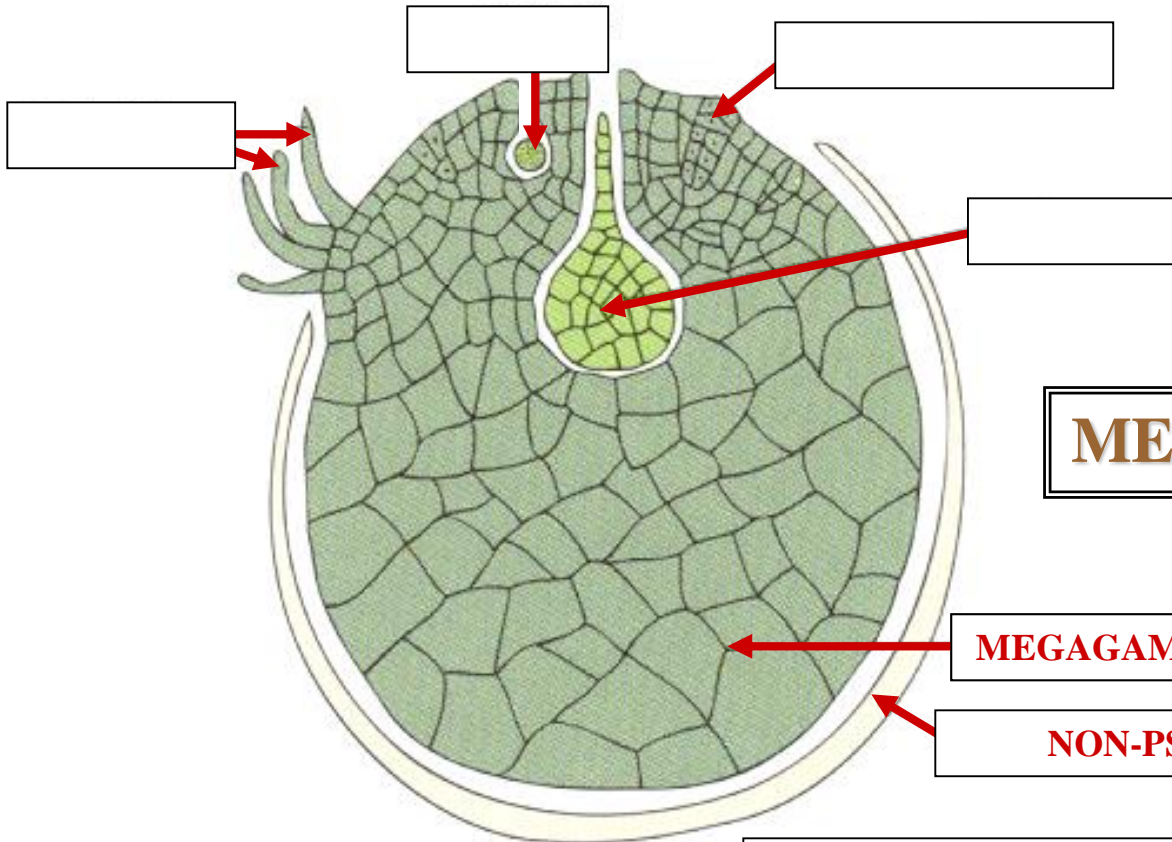
**MICROSPORE WALL**

**MICROGAMETOPHYTE**

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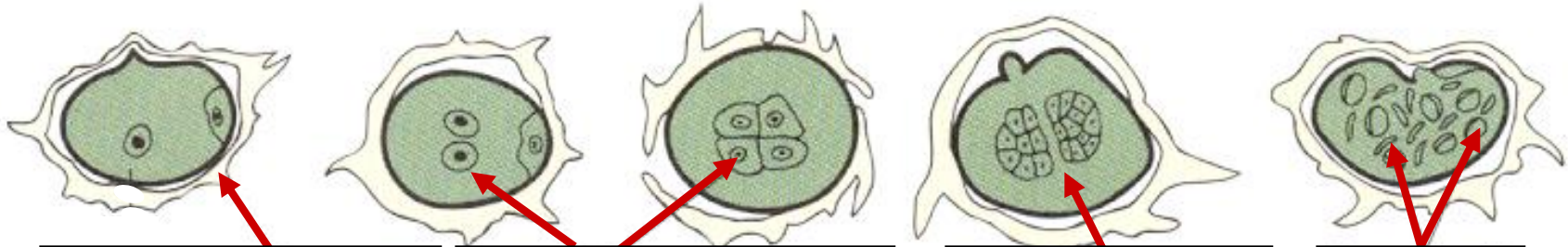
**MEGASPORE**

**MEGAGAMETOPHYTE**

**NON-PSYN**

**MICROSPORE**

**GAMETOPHYTE**

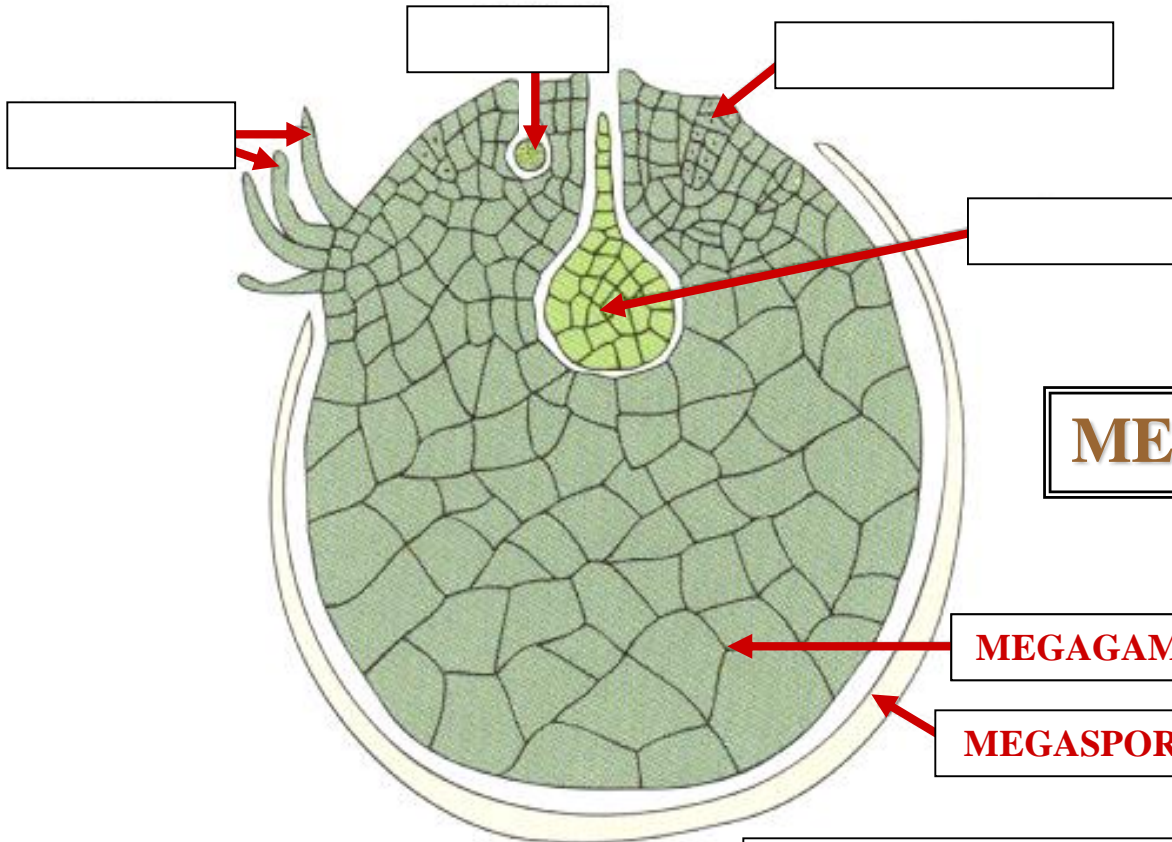


**NON-PSYN**

**MICROGAMETOPHYTE**

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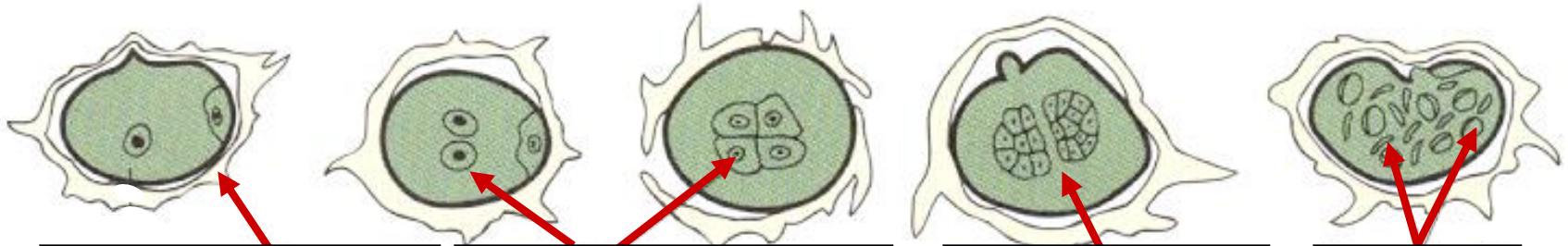
**MEGASPORE**

**MEGAGAMETOPHYTE**

**MEGASPORE WALL**

**MICROSPORE**

**GAMETOPHYTE**

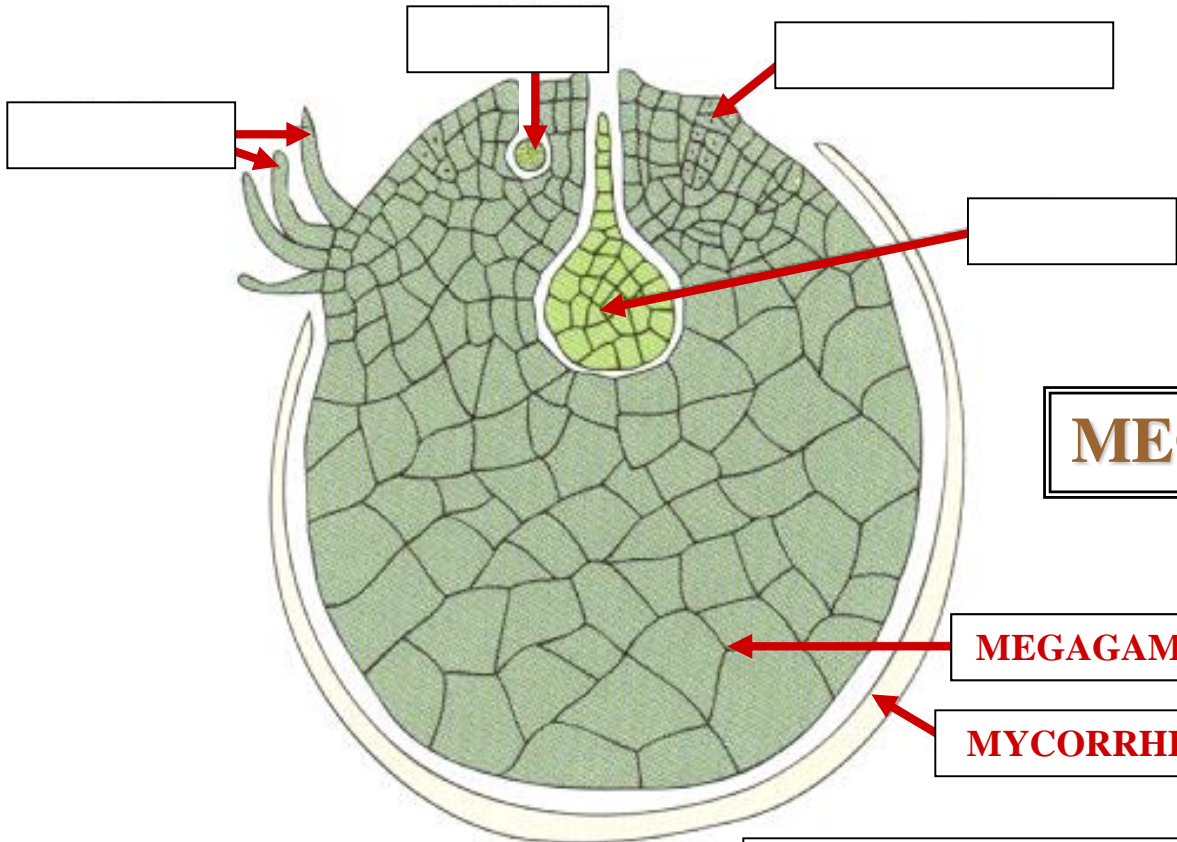


**MICROSPORE WALL**

**MICROGAMETOPHYTE**

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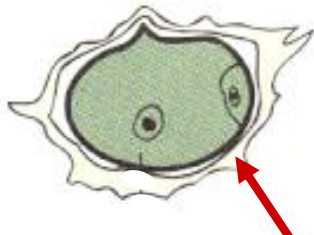
**MEGASPORE**

**MEGAGAMETOPHYTE**

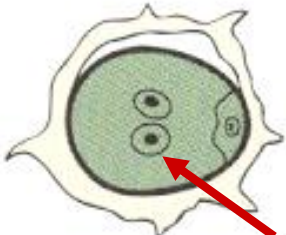
**MYCORRHIZAE ABSENT**

**MICROSPORE**

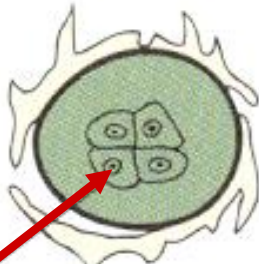
**GAMETOPHYTE**



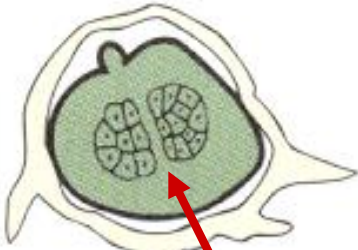
**MYCORRHIZAE ABSENT**



**MICROGAMETOPHYTE**



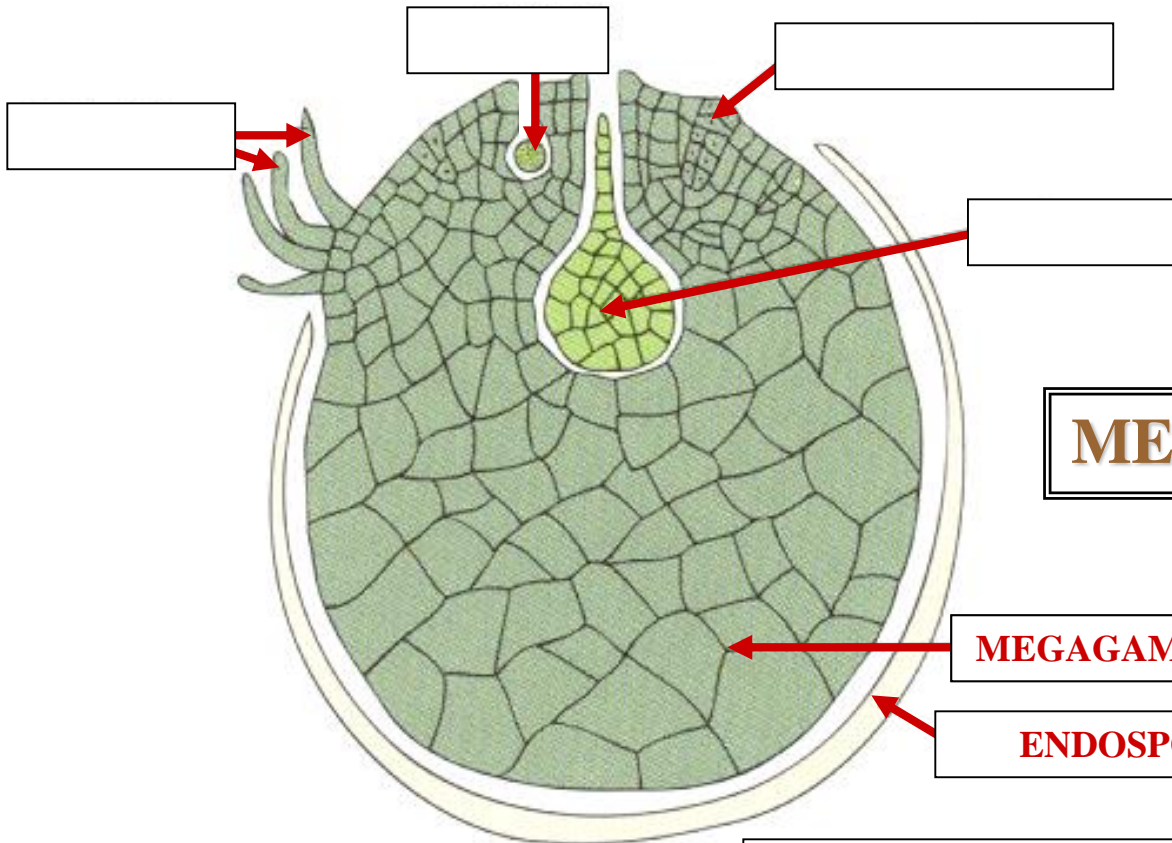
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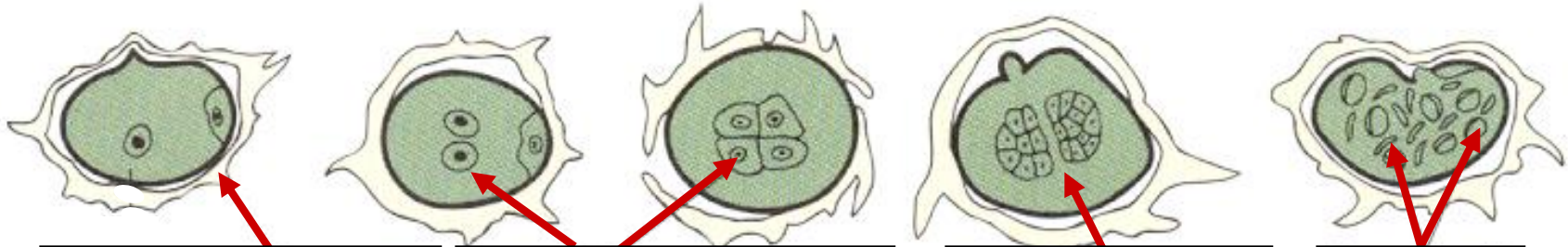
**MEGASPORE**

**MEGAGAMETOPHYTE**

**ENDOSPORIC**

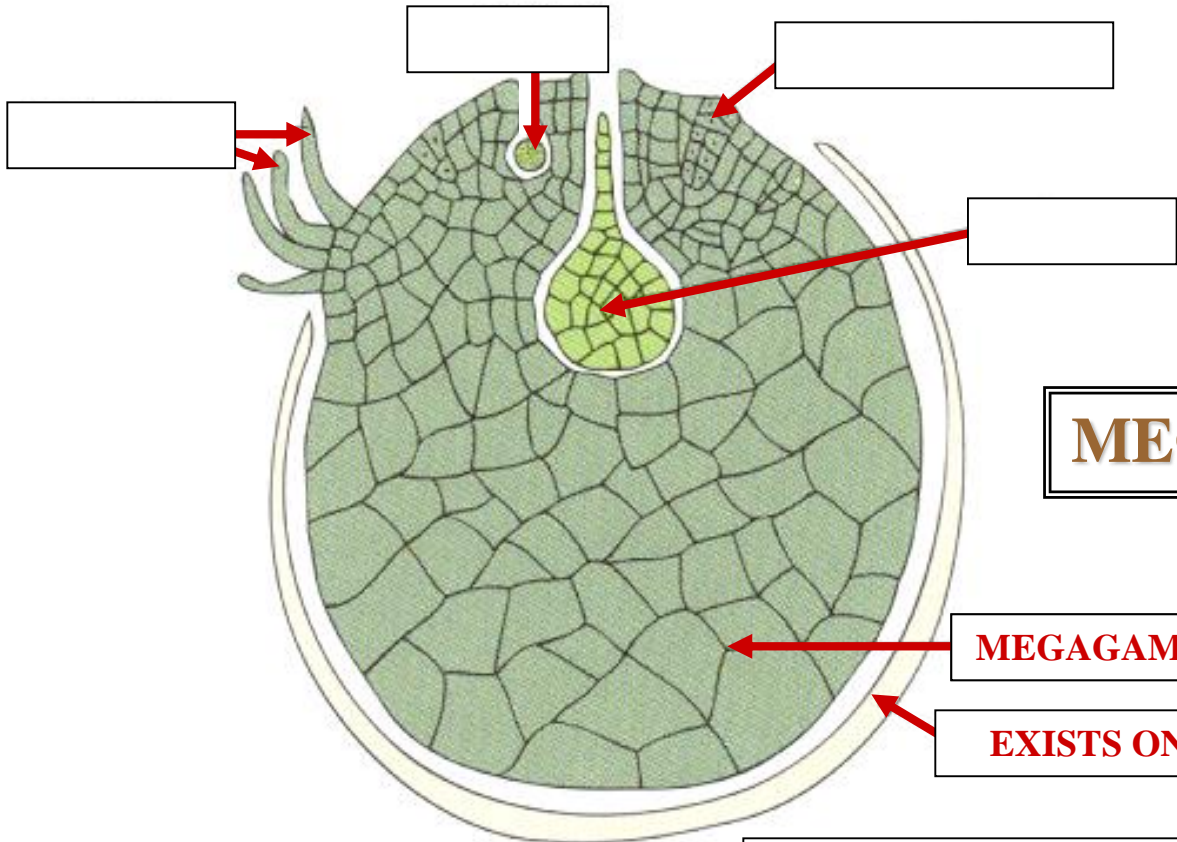
**MICROSPORE**

**GAMETOPHYTE**



**ENDOSPORIC**

**MICROGAMETOPHYTE**



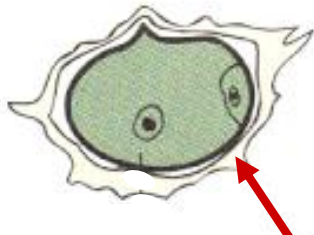
**MEGASPORE**

**MEGAGAMETOPHYTE**

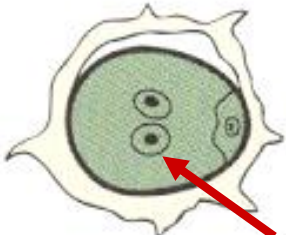
**EXISTS ON RESERVES**

**MICROSPORE**

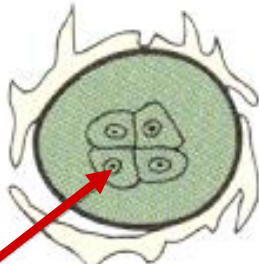
**GAMETOPHYTE**



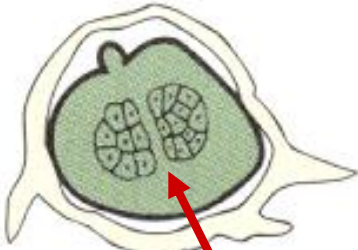
**EXISTS ON RESERVES**



**MICROGAMETOPHYTE**

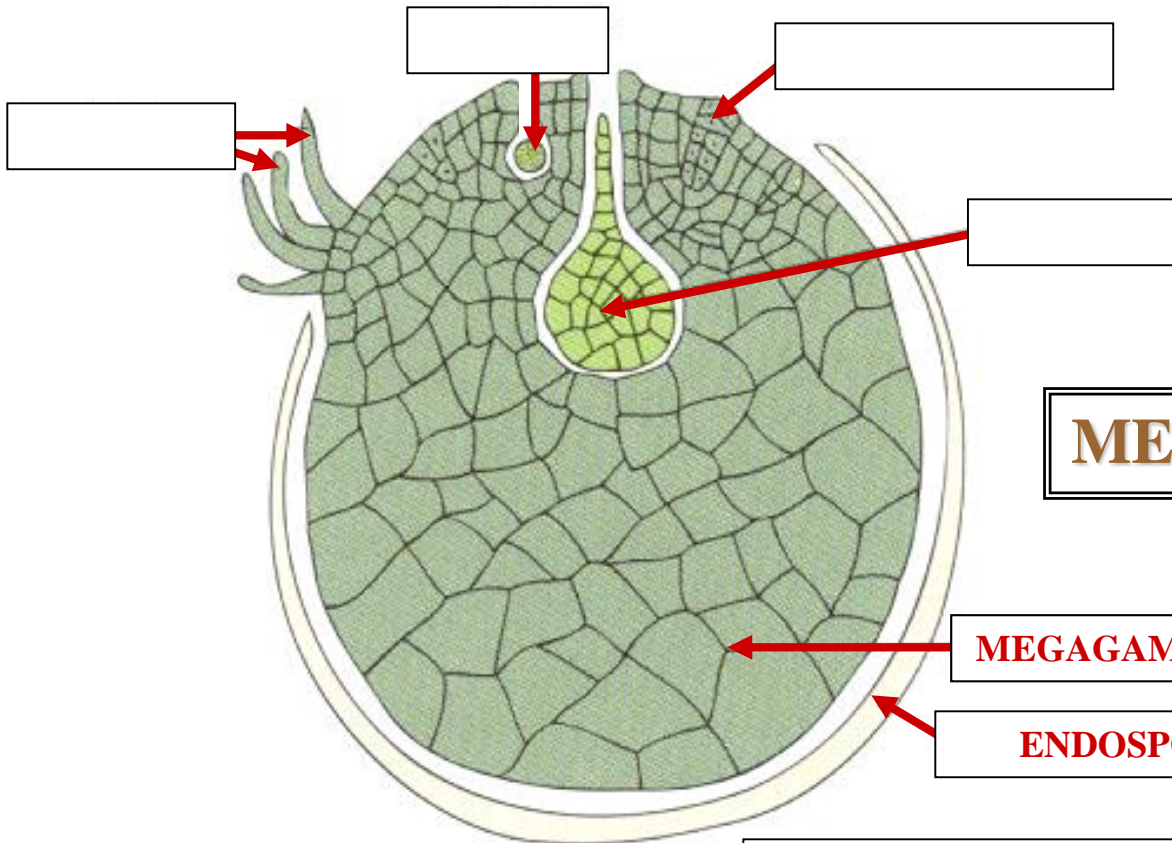


**EXISTS ON RESERVES**



**EXISTS ON RESERVES**





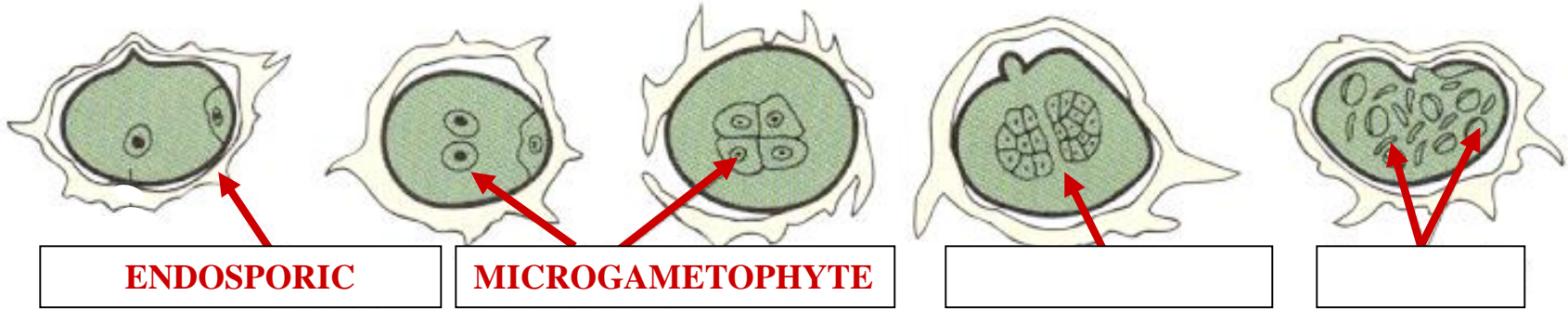
**MEGASPORE**

**MEGAGAMETOPHYTE**

**ENDOSPORIC**

**MICROSPORE**

**GAMETOPHYTE**



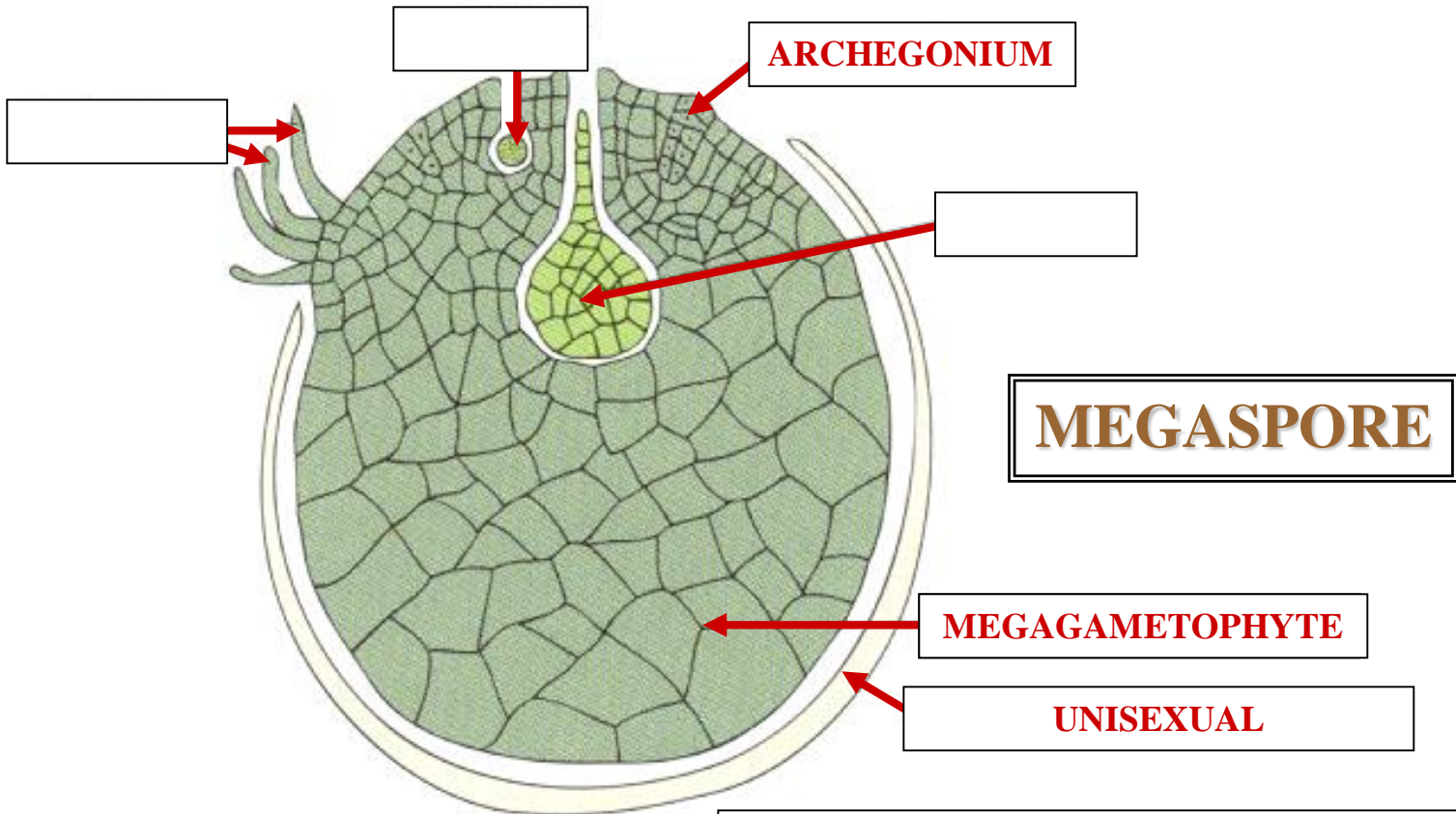
**ENDOSPORIC**

**MICROGAMETOPHYTE**

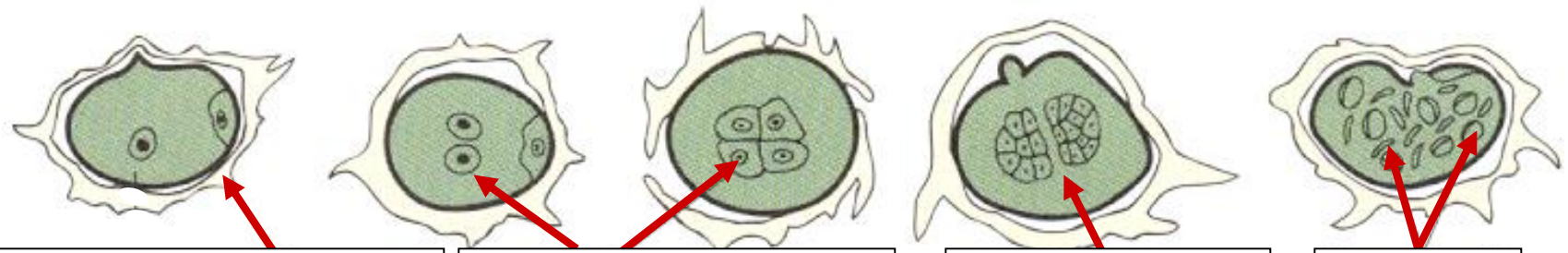
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**MICROSPORE** **GAMETOPHYTE**



**UNISEXUAL** **MICROGAMETOPHYTE** **ANTHERIDIUM** **[Empty Box]**



# SPERM

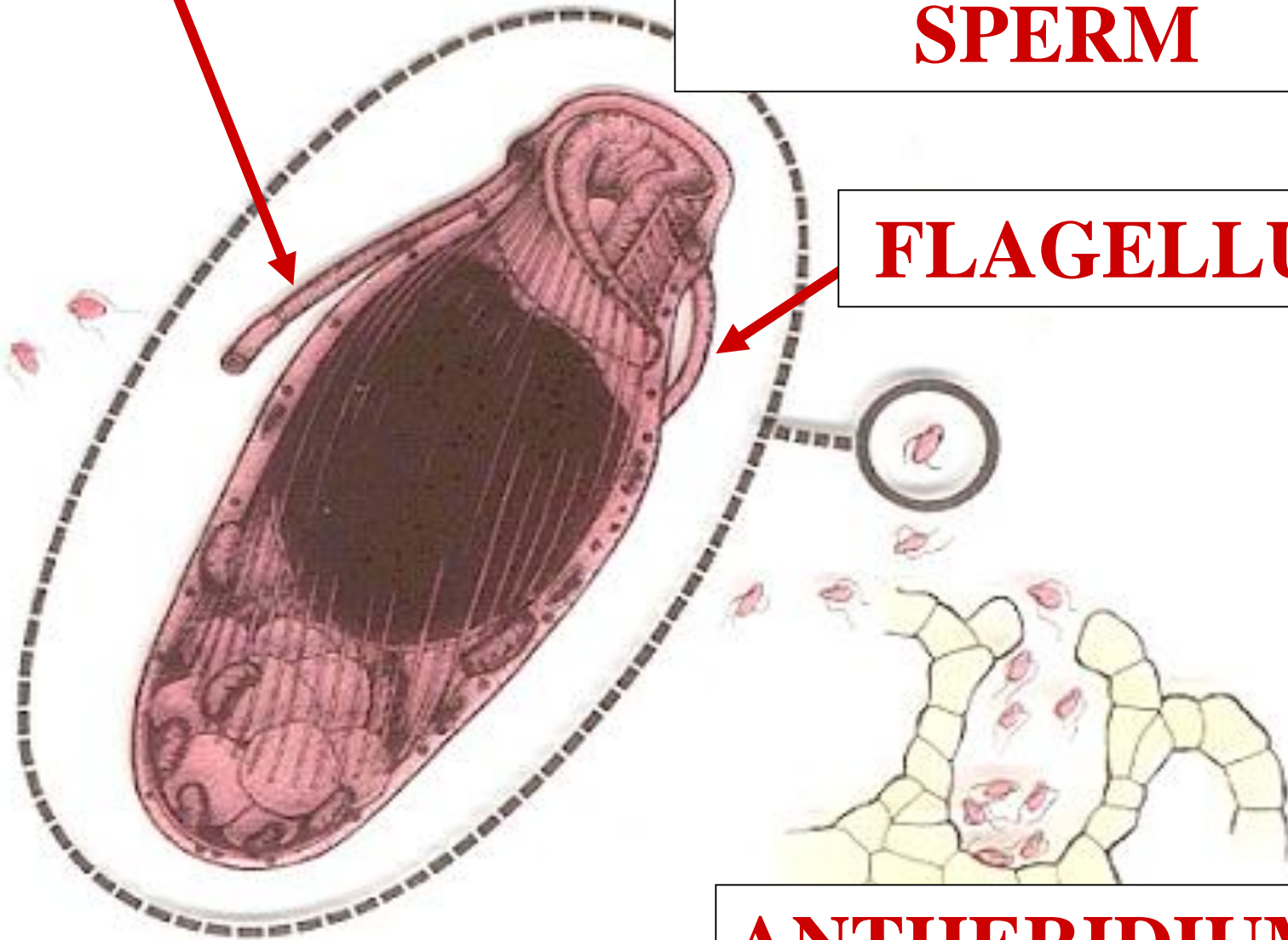
**FLAGELLUM**

**BIFLAGELLATED  
SPERM**

**FLAGELLUM**

?

**ANTHERIDIUM**

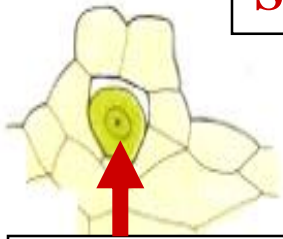




# SYNGAMY REQUIRES

?

**SYNGAMY**



**ZYGOTE**



**EGG**

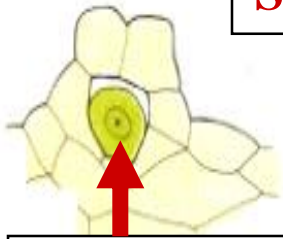
**FLAGELLATE SPERM**

# LYCOPHYTES



**SYNGAMY**  
**REQUIRES**  
**WATER**

**SYNGAMY**

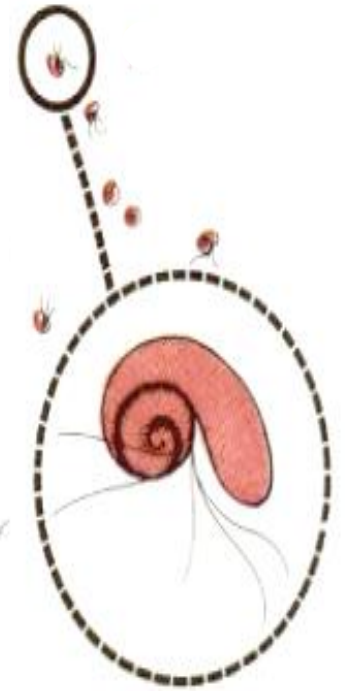


**ZYGOTE**



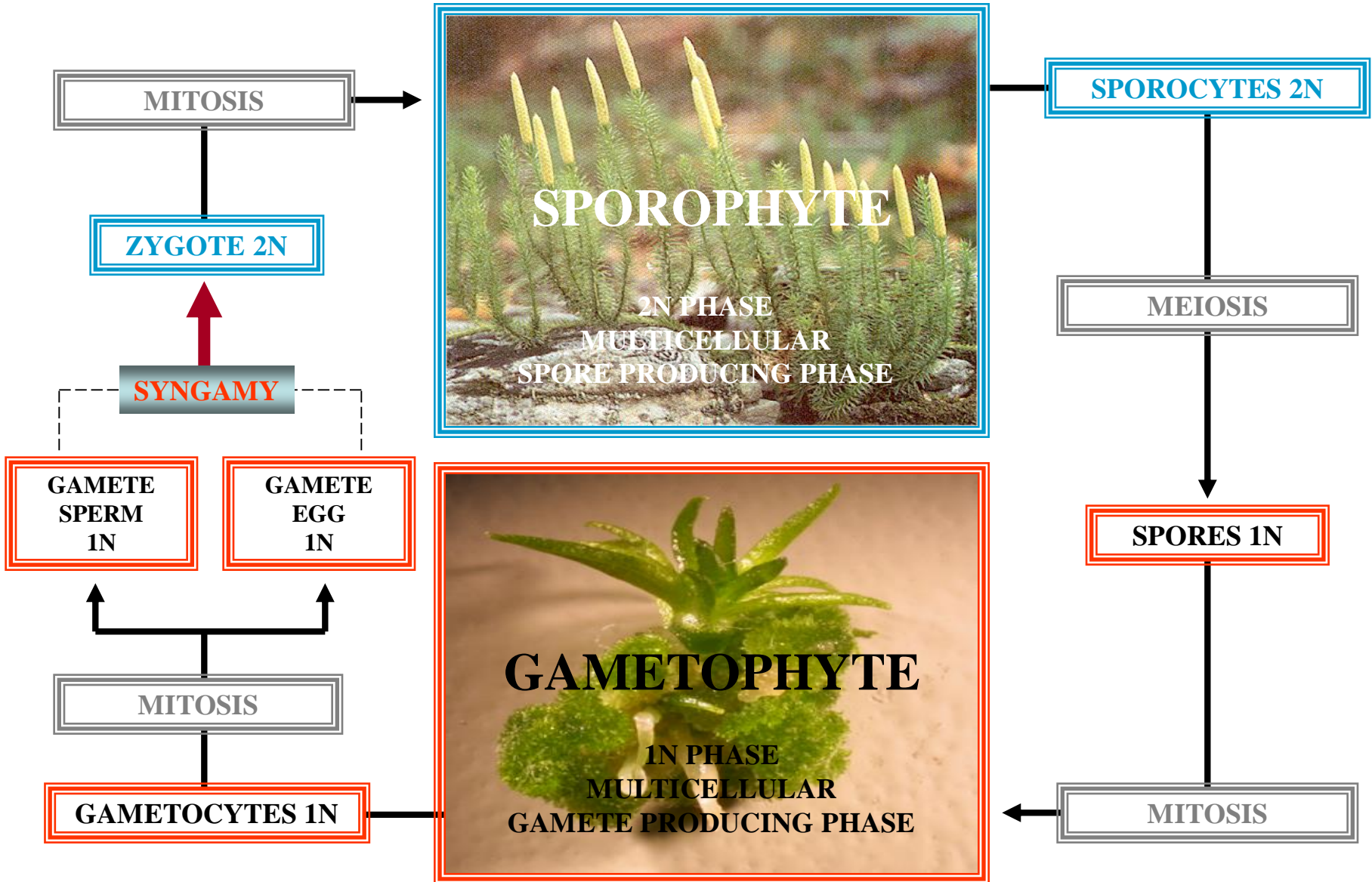
**EGG**

**FLAGELLATE SPERM**



# LYCOPODIOPHYTA

## LIFE CYCLE







# LYCOPHYTE FOSSIL RECORD



**~410**

**MILLION YEARS**



# SILURIAN







# LYCOPHYTES EVOLVE







**AUSTRALIA  
SILURIAN**

O

***BARAGWANATHIA***



**AUSTRALIA  
SILURIAN**

?

**OLDEST  
FOSSIL  
LYCOPHYTE**

***BARAGWANATHIA***





L

**QUESTION**

**HOW DO BOTANISTS  
KNOW**

***BARAGWANATHIA***

**IS A LYCOPHYTE?**

**QUESTION**



# AUSTRALIA SILURIAN



LEAF

*BARAGWANATHIA*

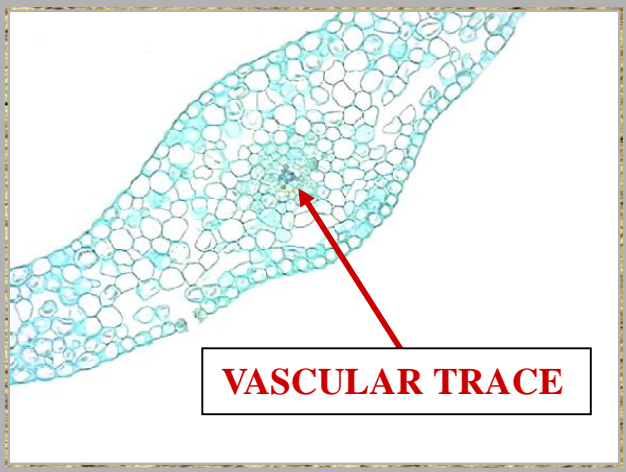




**LEAF**

***BARAGWANATHIA***





**VASCULAR TRACE**

**M**



**LEAF**

***BARAGWANATHIA***





LEAF

MICROPHYLL

*BARAGWANATHIA*



VASCULAR TRACE





O

**MICROPHYLLS**

**LYCOPODIOPHYTA**



**AUSTRALIA  
SILURIAN**



**OLDEST  
FOSSIL  
LYCOPHYTE**

***BARAGWANATHIA***





**~280**

**MILLION YEARS**





# CARBONIFEROUS



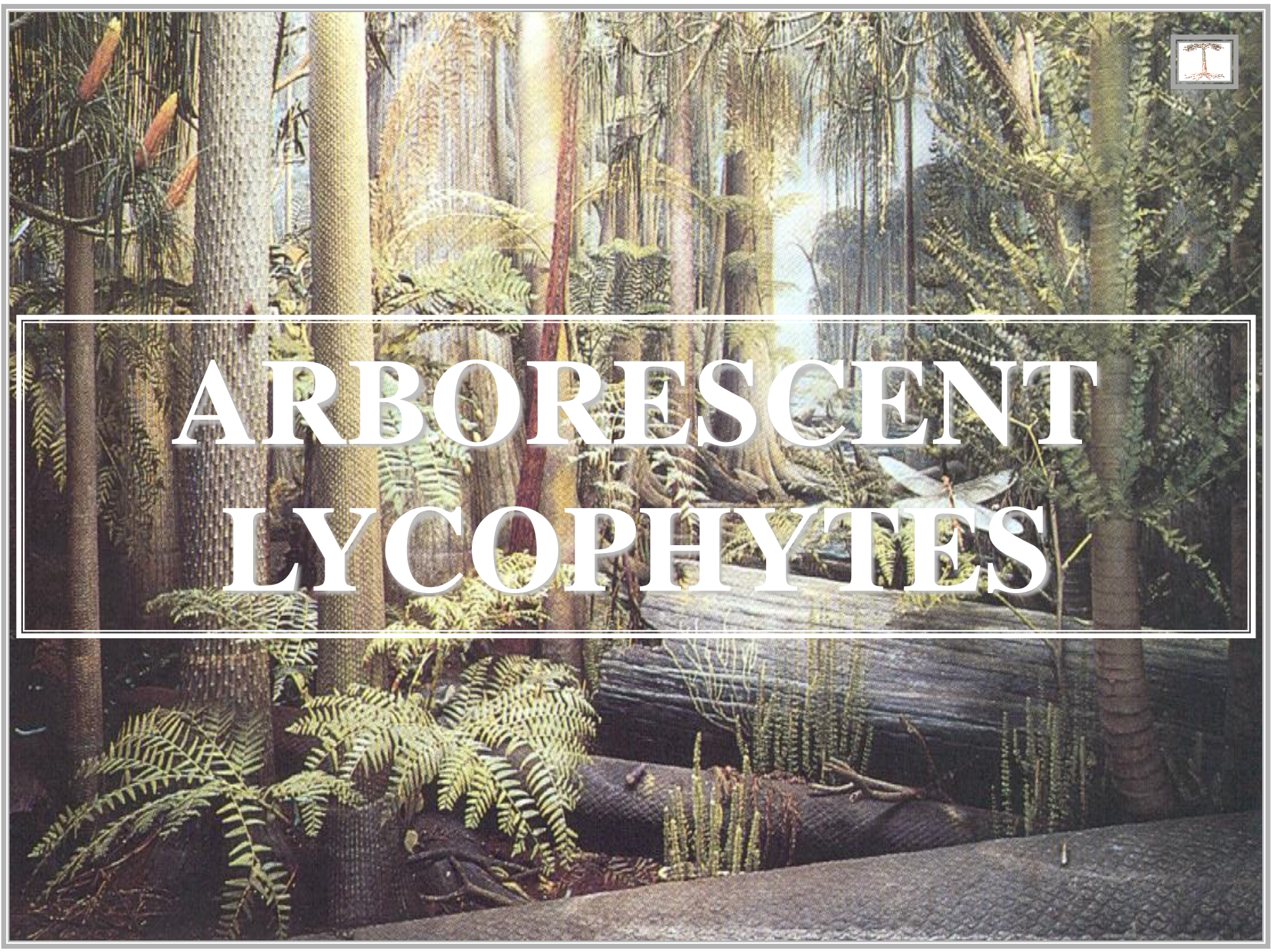
# LYCOPHYTE ZENITH



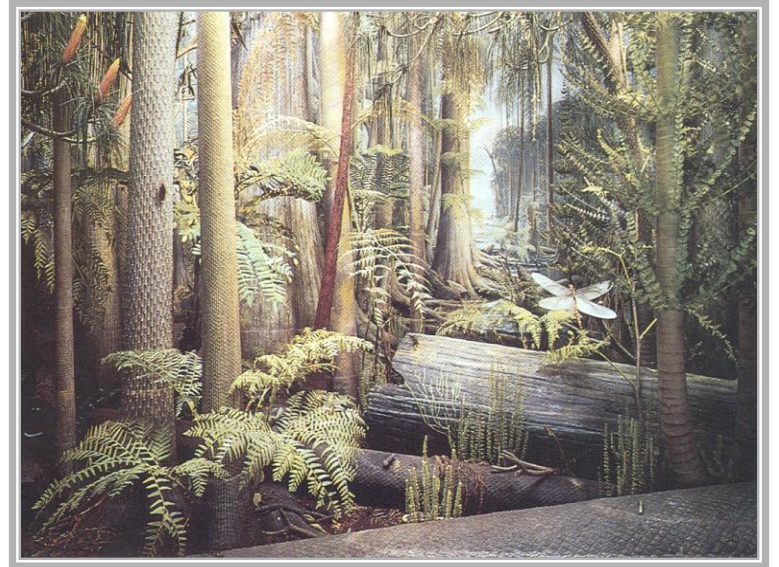
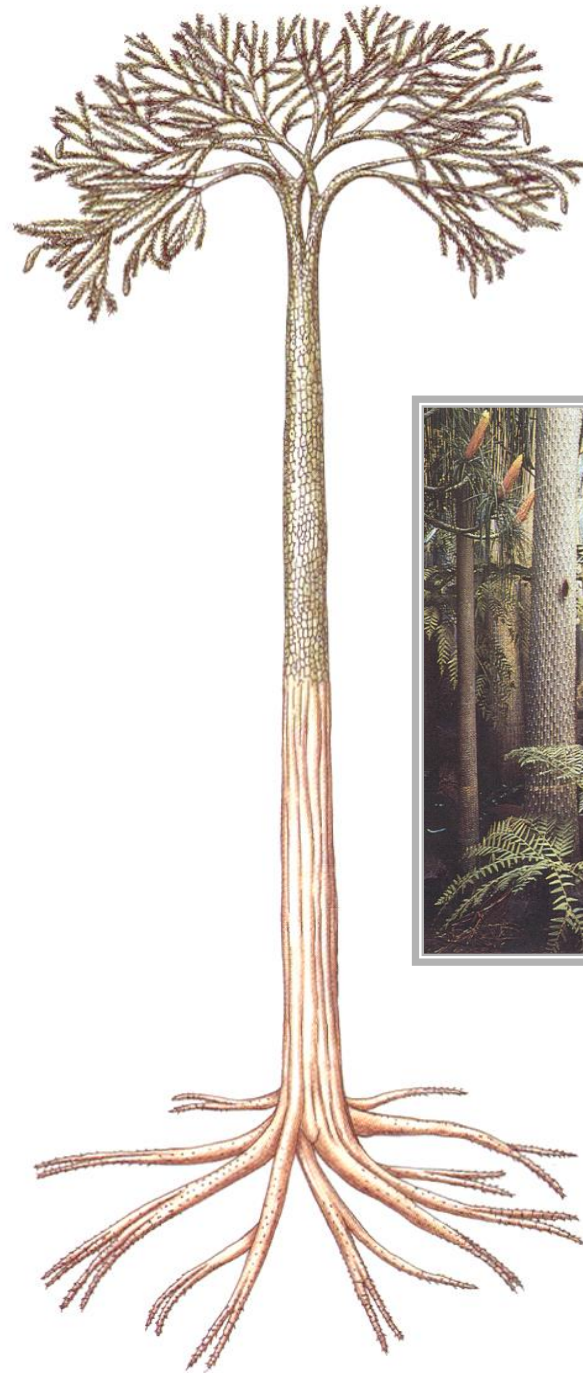


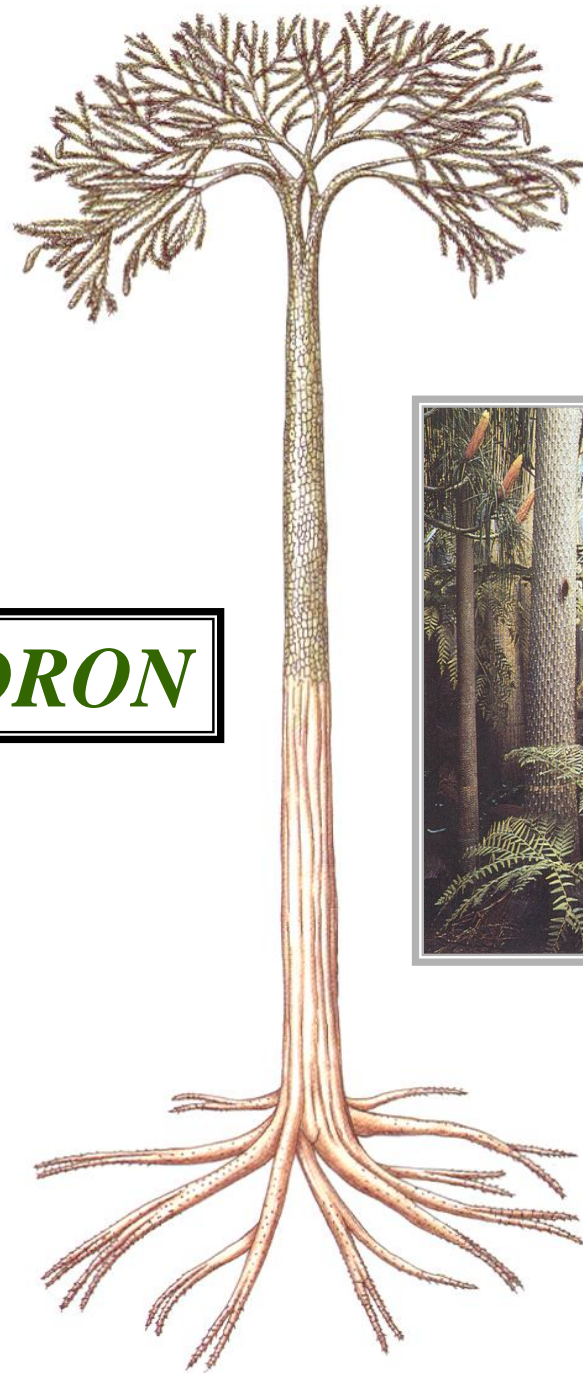


# ARBORESCENT LYCOPHYTES





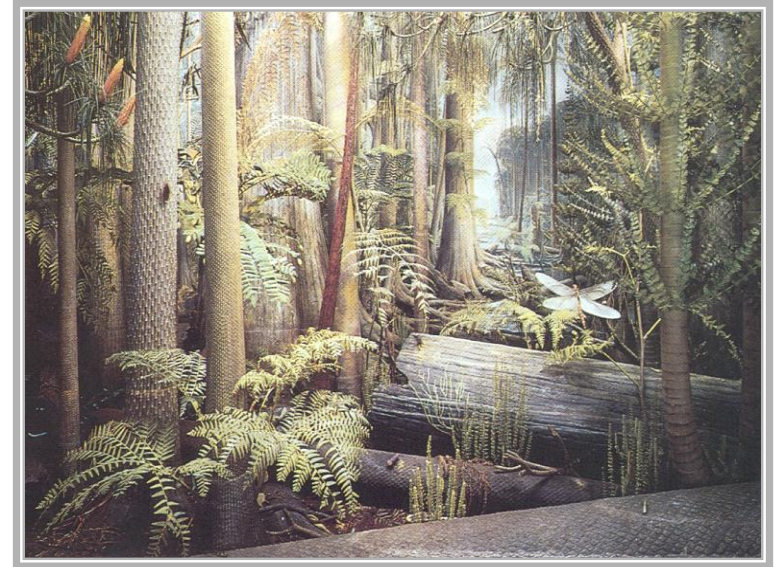




***LEPIDODENDRON***







***SIGILLARIA***





**NON-ARBORESCENT**

***LYCOPODIUM***





**NON-ARBORESCENT**

***SELAGINELLA***



# LYCOPODIOPHYTA CLASSIFICATION





**ALABAMA  
ORDER**

**LYCOPODIALES**

**ALABAMA  
ORDER**



# COMMON NAME



# CLUB-MOSSES

C

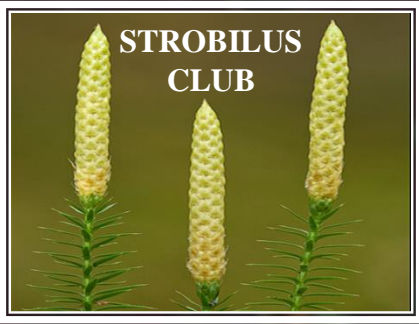




# CLUB









# MOSS





The main image shows several moss plants with upright, yellowish-green stems and capsules. The plants are growing in a natural, slightly damp environment with other vegetation in the background. The text "SUPERFICIAL MOSS-LIKE MORPHOLOGY" is overlaid in large, white, bold, uppercase letters.

**SUPERFICIAL  
MOSS-LIKE  
MORPHOLOGY**

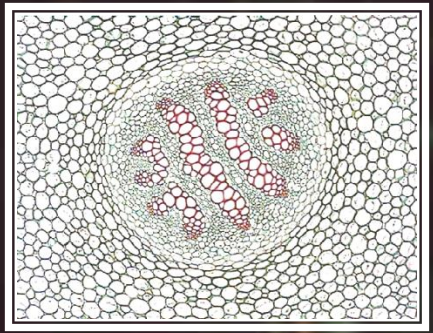


# CLUB-MOSSES

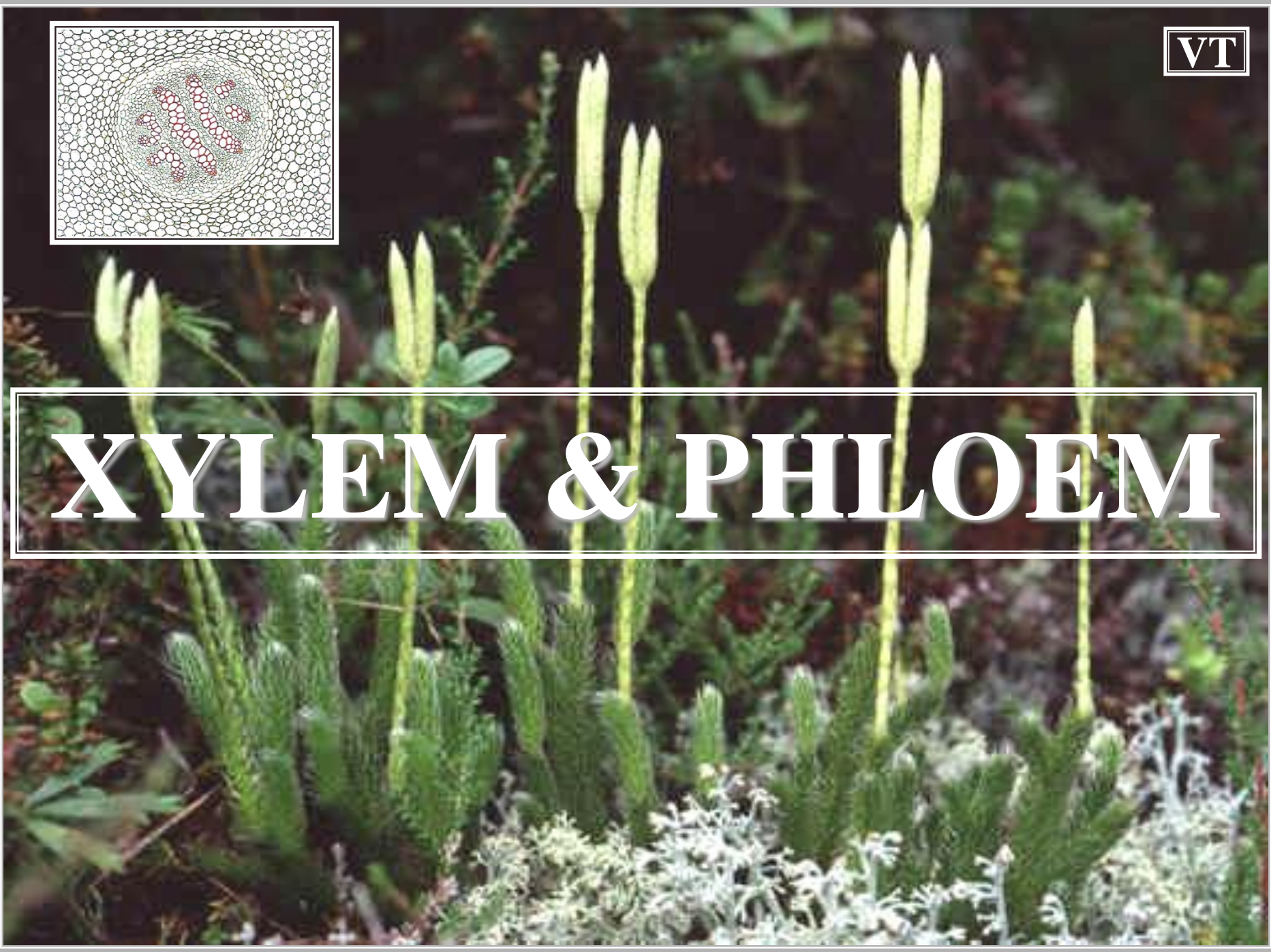
XP



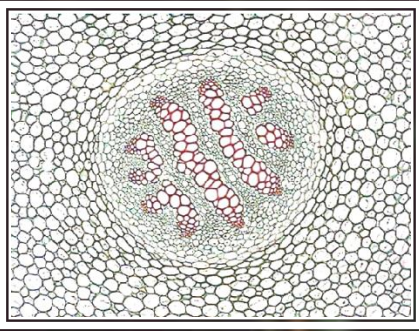




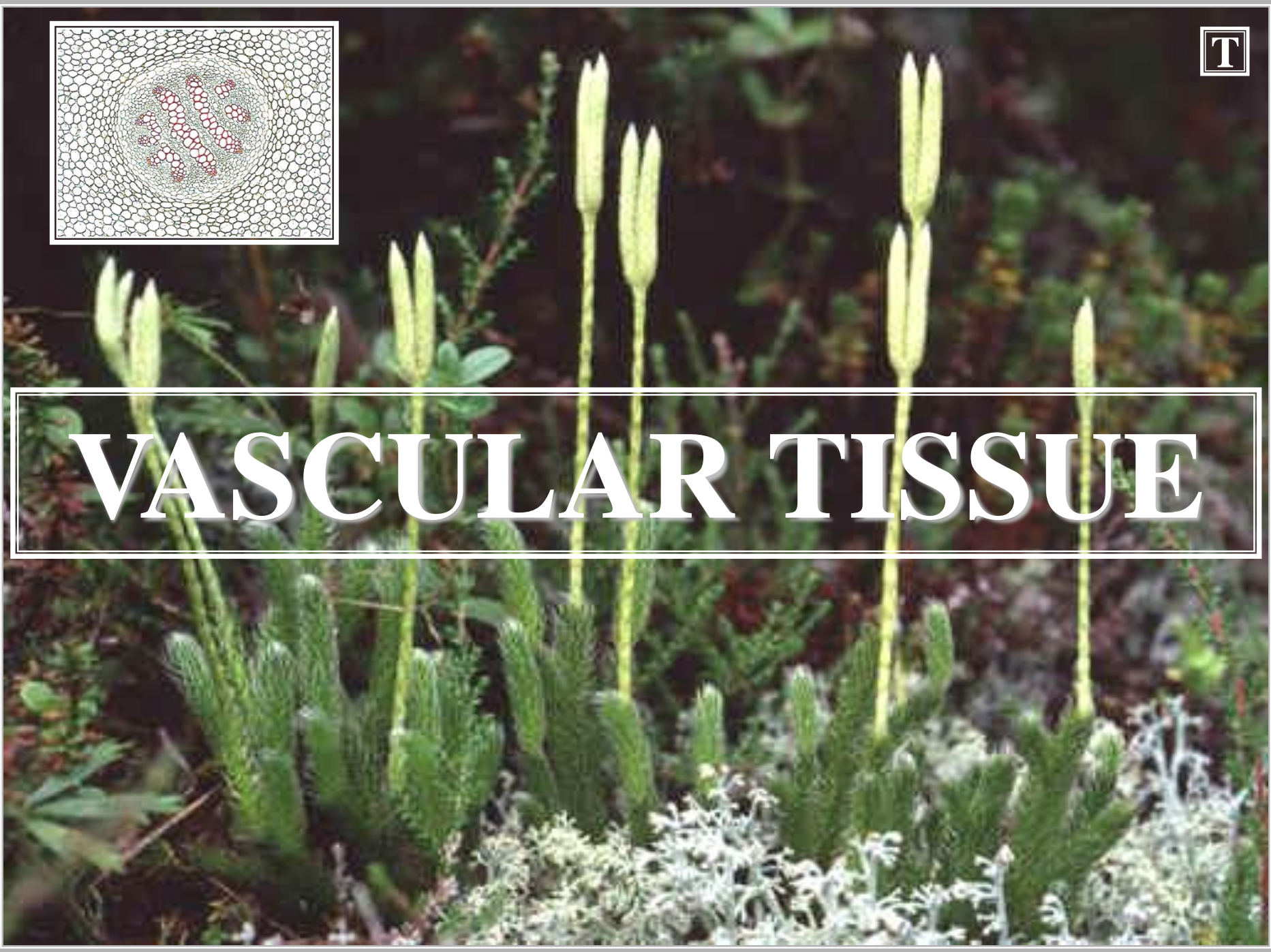
# XYLEM & PHLOEM



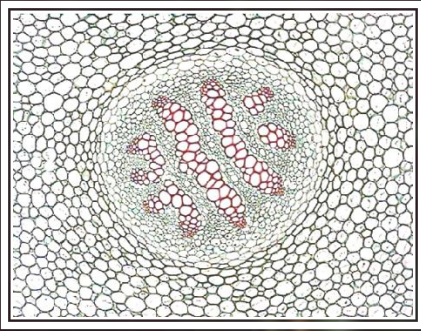




# VASCULAR TISSUE





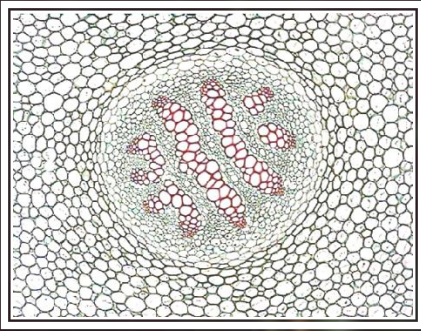


# CLUB-MOSSES

# TRACHEOPHYTES







# CLUB-MOSSES NOT A TRUE MOSS







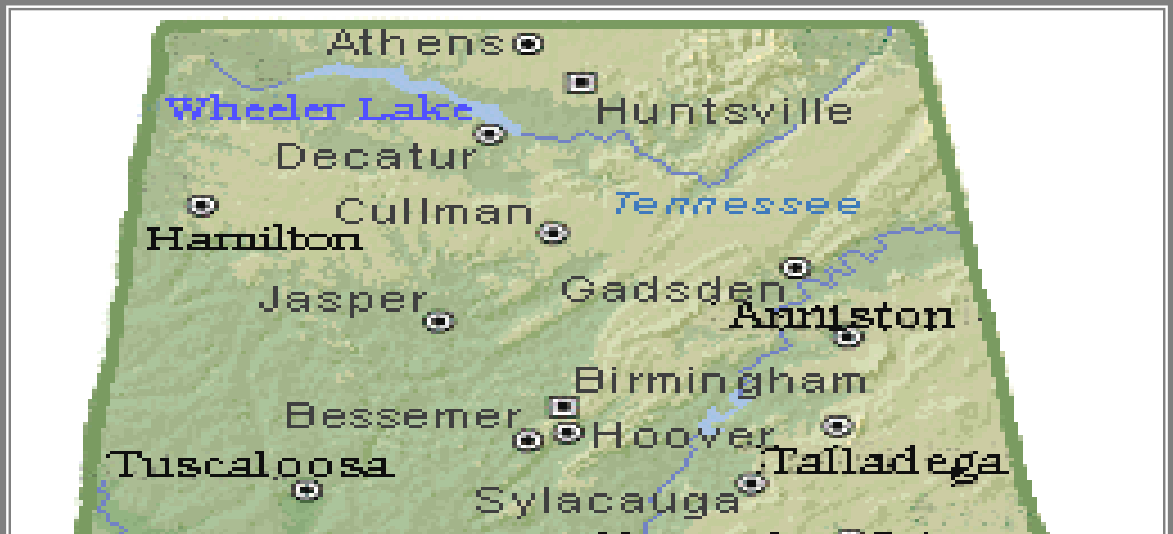
# DIVERSITY



**~400 SPECIES**

**EARTH**





**~6 SPECIES**





# REPRESENTATIVE GENUS

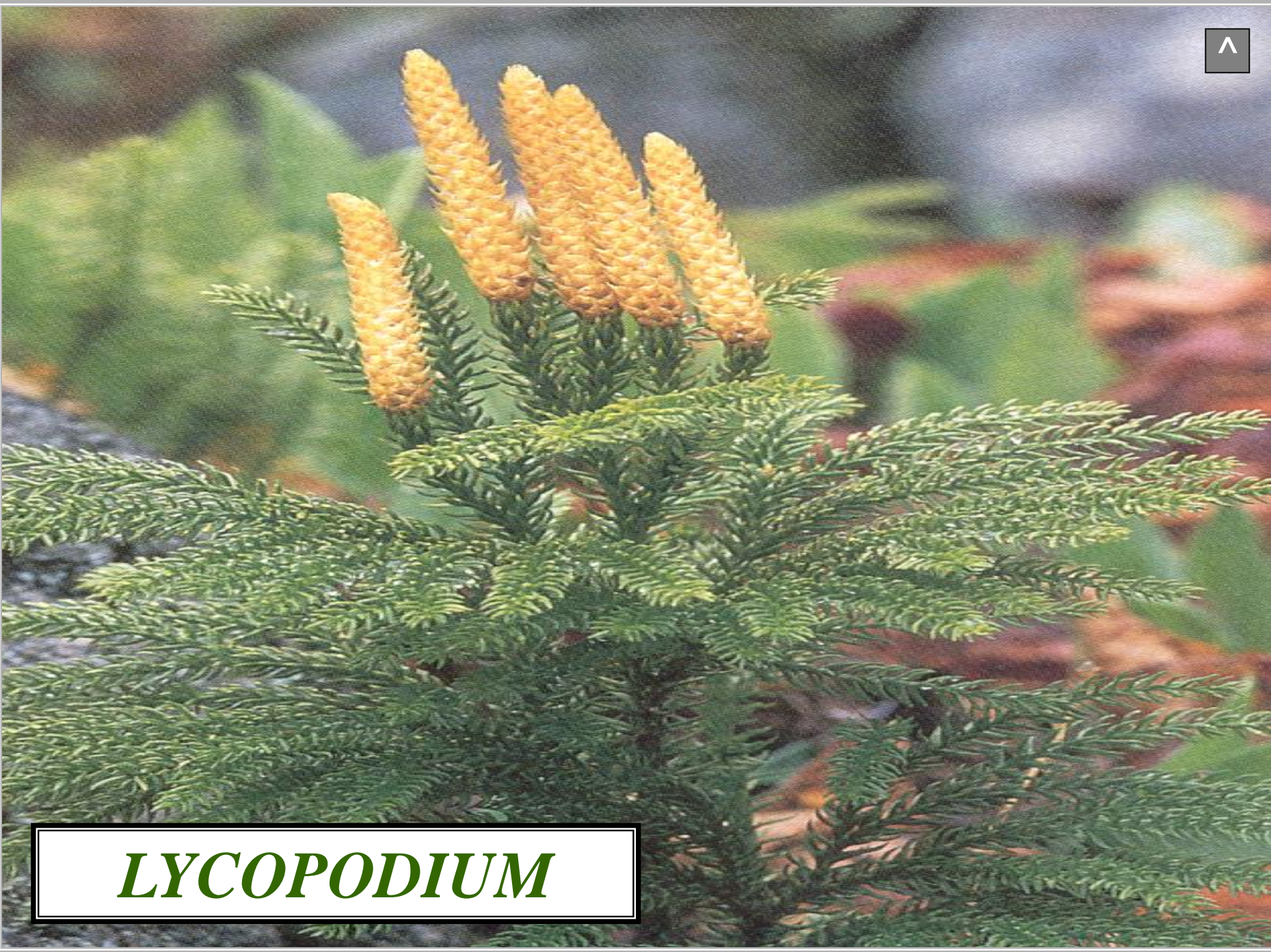


L



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***LYCOPODIUM***





# HABITAT



# ALABAMA FOREST





# GENERAL CHARACTERS