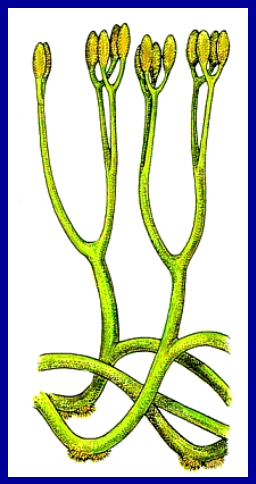
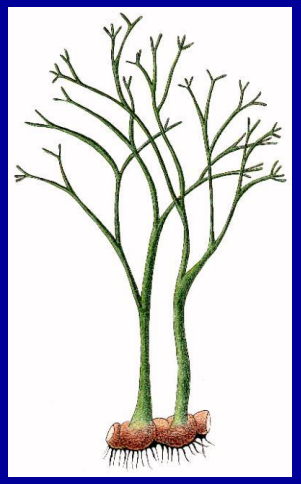
Origem e radiação das plantas vasculares
Lycophyta

Hepáticas

Musgos



Aglaophyton †



Rhynia †

Traqueófitas

Anthoceros

410 ma

Raízes

420 ma

Tecido vascular (traqueides)

425 ma

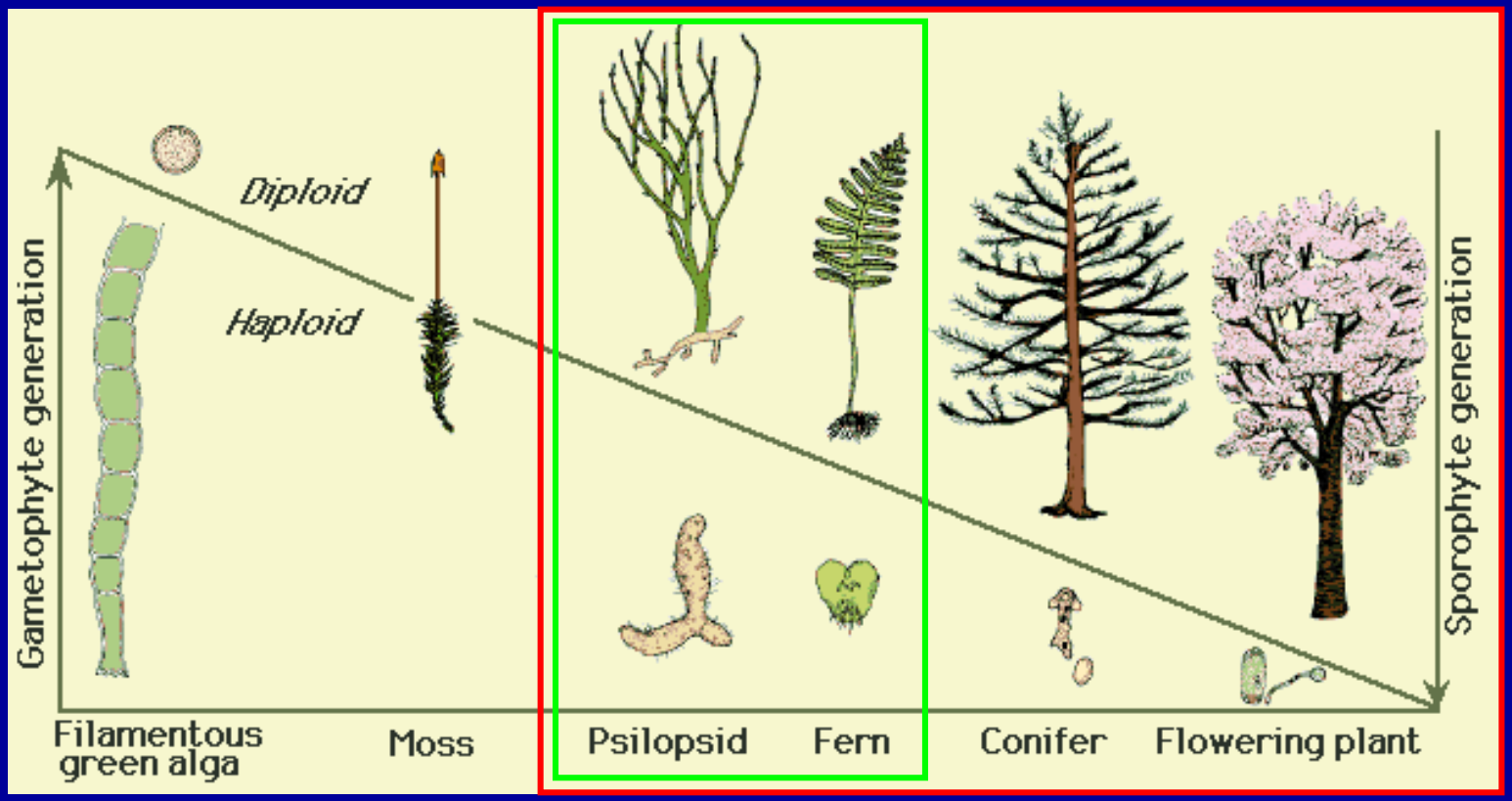
Esporófito dominante / ramificado

Gametófito dominante

Traqueófitas

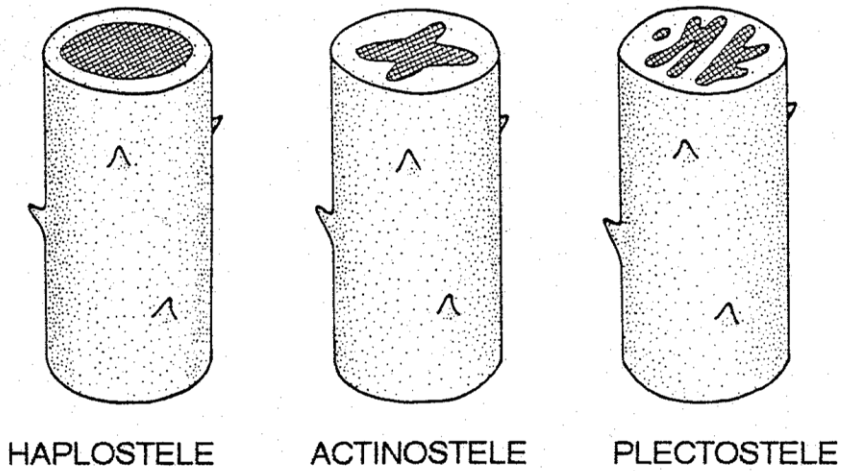
Esporófito dominante

Tendência de redução do gametófito

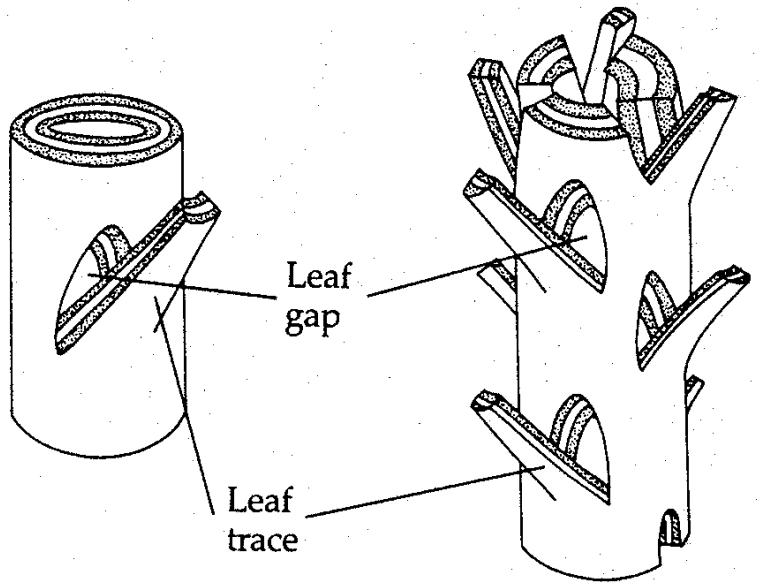


Feixes vasculares

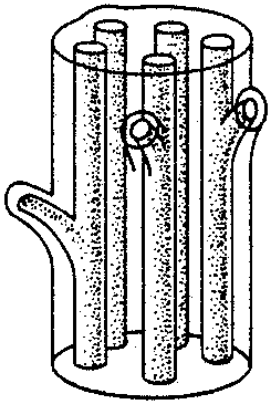
Protostelo



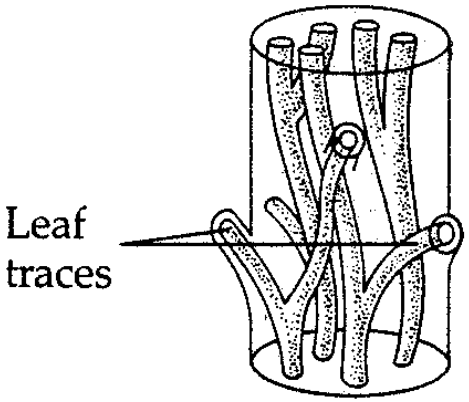
Sifonostelo



Eustelo



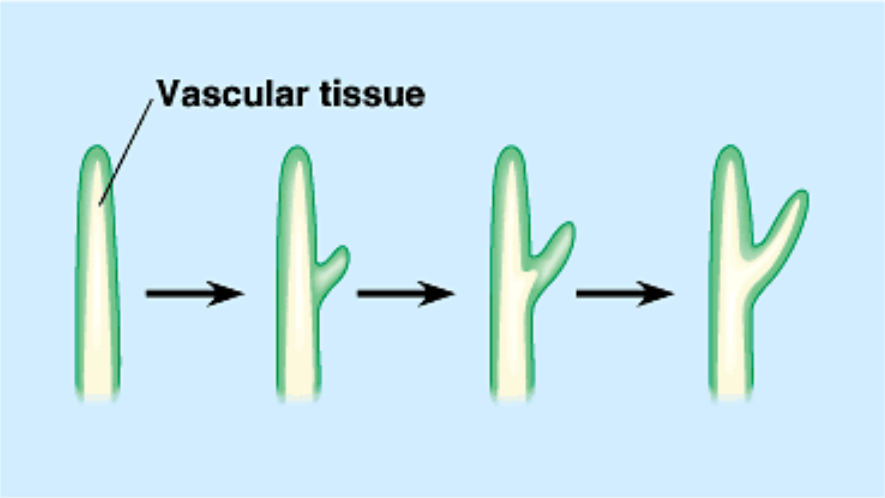
Archaeopteris



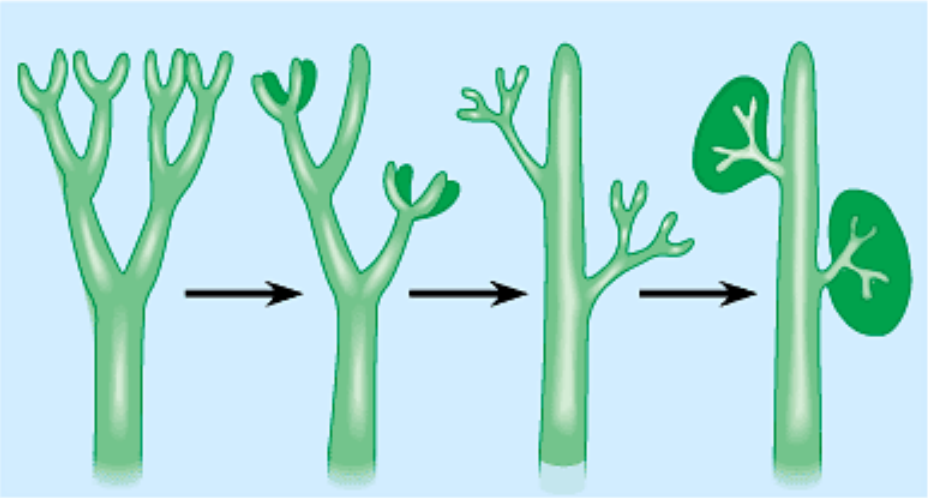
Conifers

Folhas

- **Filidios - Briofitas**
- **Microfilos – Algumas pteridofitas**
- **Megafilos – demais grupos**



(a) Microphylls



(b) Megaphylls

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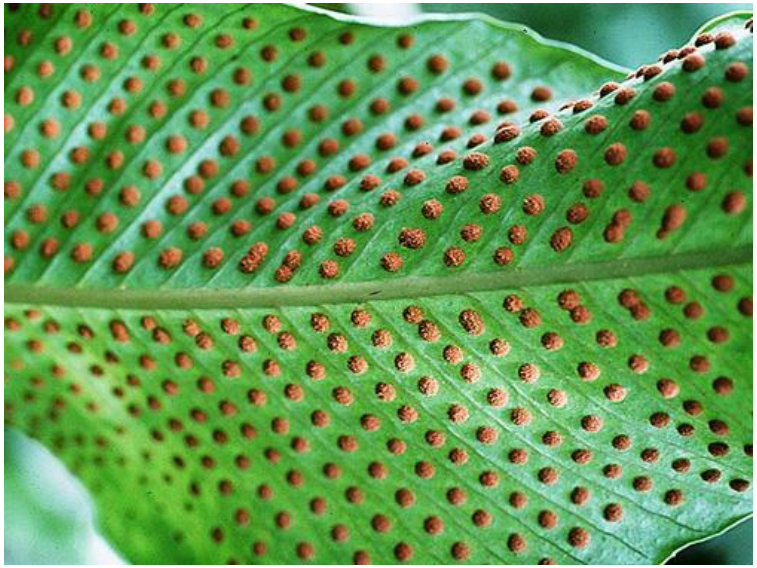
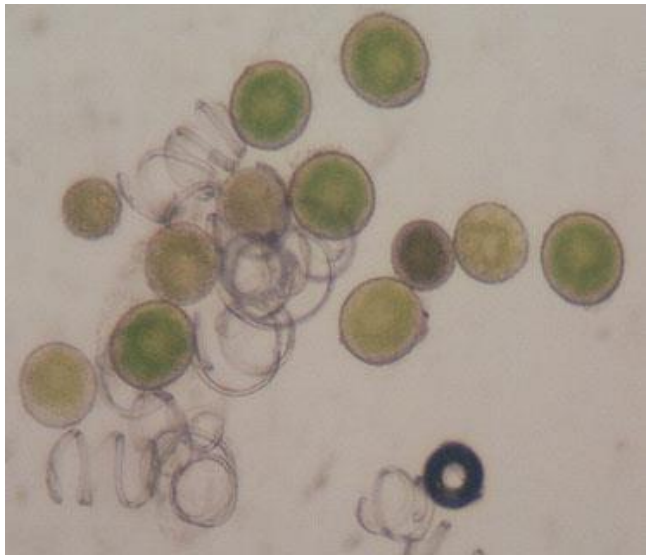
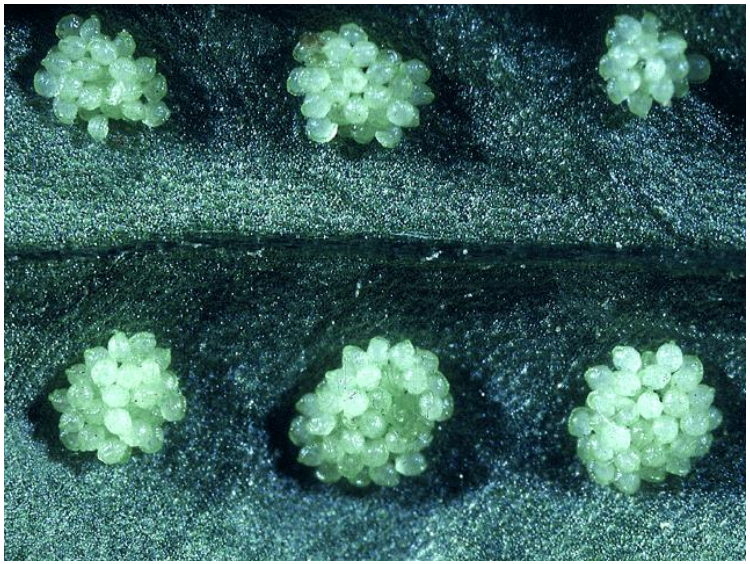
Homosporia



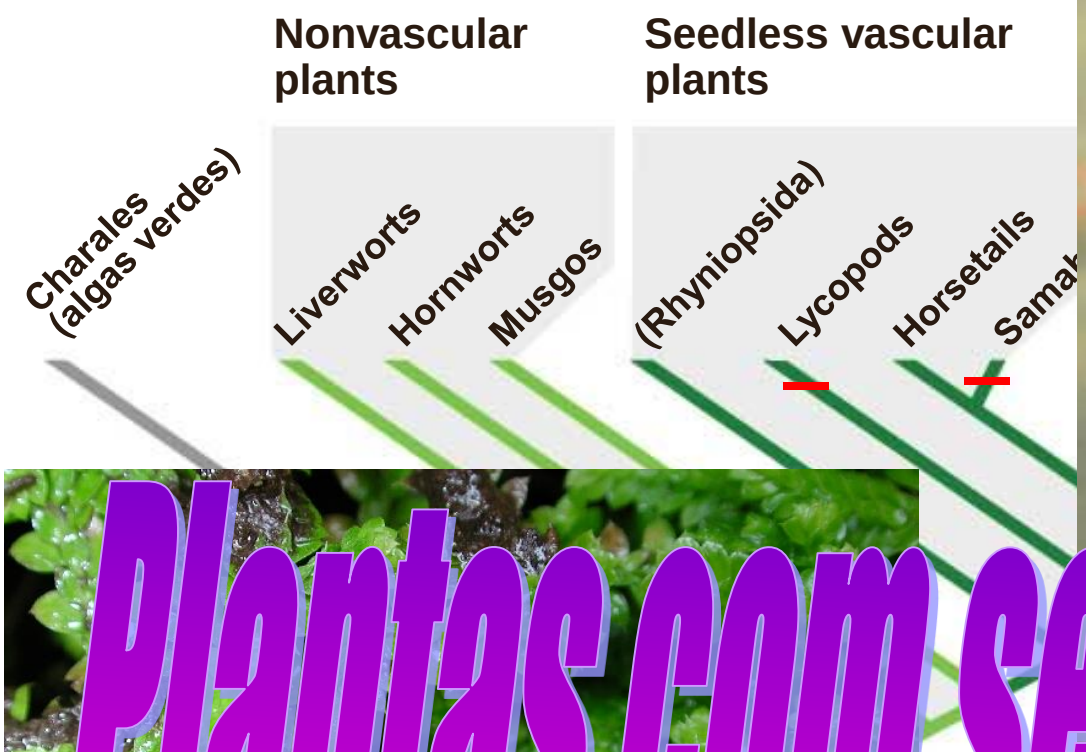


Equisetum sp.



Polypodium sp.

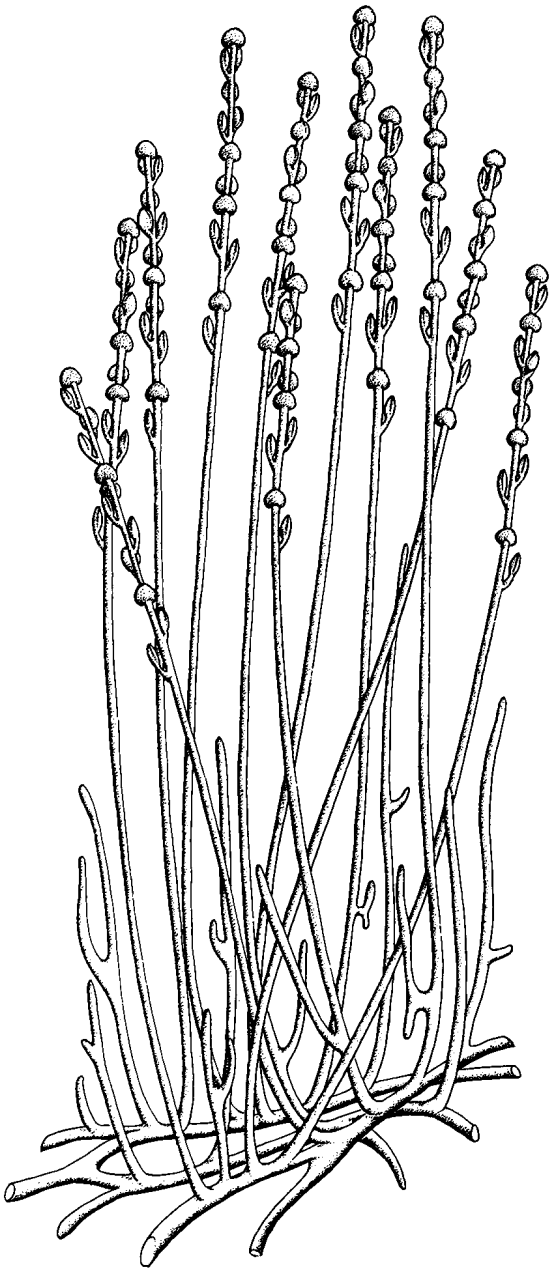
Heterosporia



Plantas com sementes!

Heterosporia

Heterosporia



Zosterophyllophyta

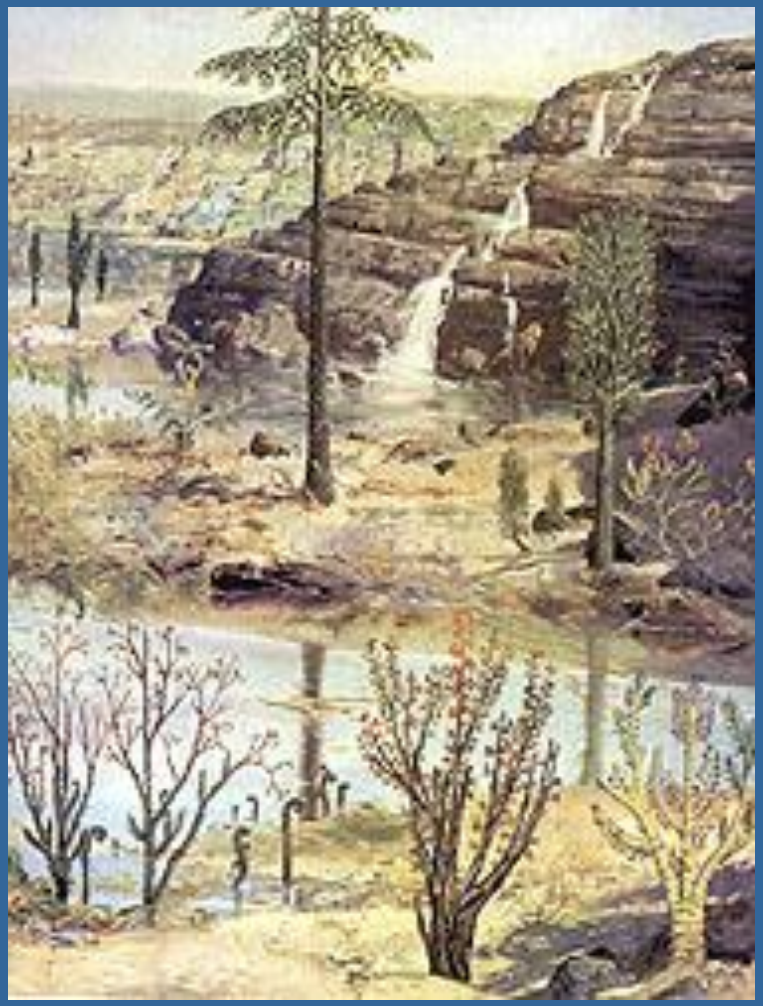
Microesporângio

Megaesporângio

Selaginella sp.

Pteridófitas

- Devoniano: prosperação
- 3 grupos extintos (360 milhões de anos):
  - *Rhyniophyta*
  - *Zosterophyllophyta*
  - *Trimerophytophyta*
- 2 principais (representantes atuais):
  - *Lycophyta*
  - *Monilophyta*



Rhyniophyta *Zosterophyllophyta* *Trimerophytophyta*

Zosterophyllum
Devoniano
(408-370 milhoes de anos)

Trimerophyton
Devoniano inferior
(395 milhoes de anos)

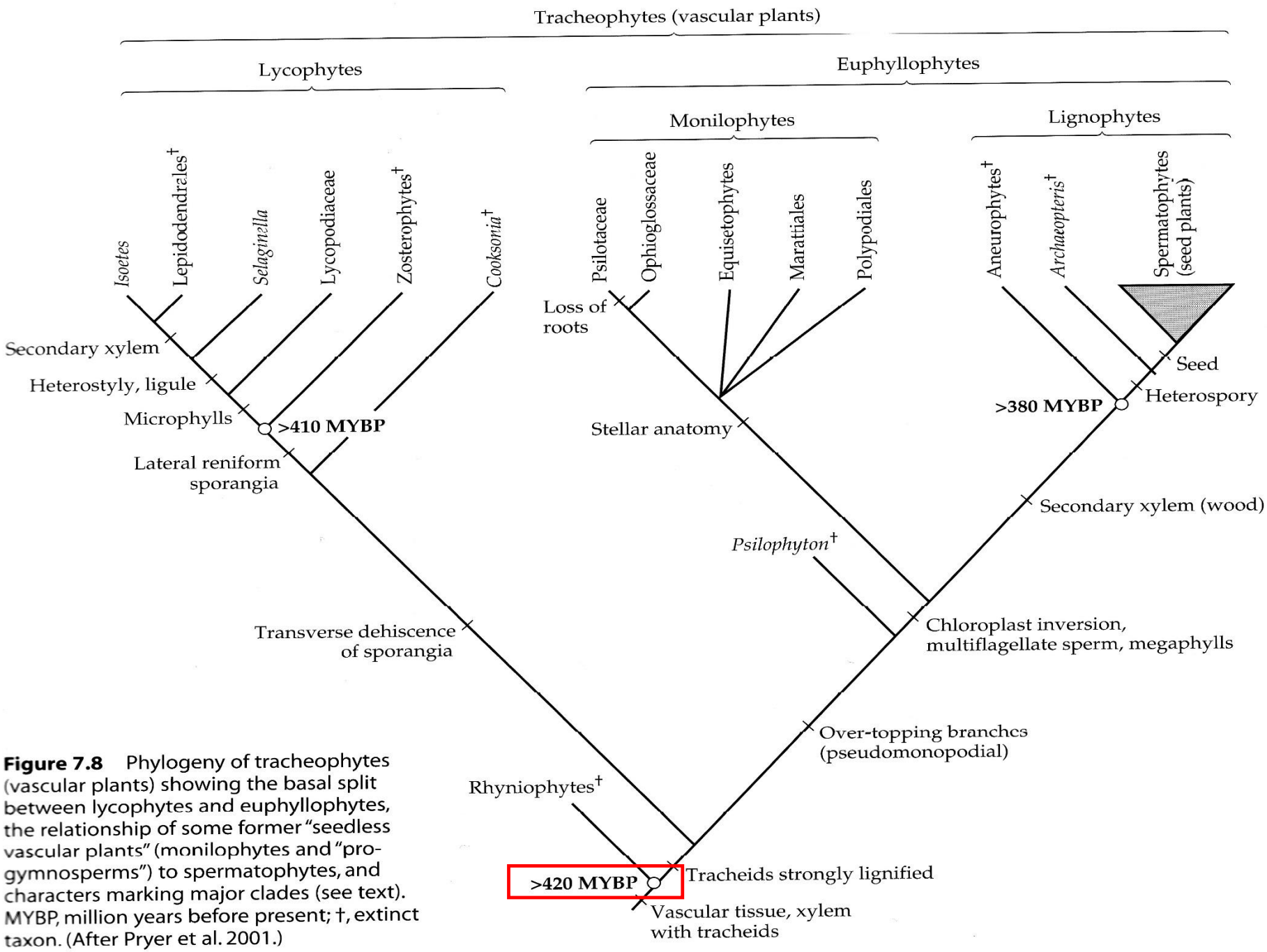


Figure 7.8 Phylogeny of tracheophytes (vascular plants) showing the basal split between lycophytes and euphyllophytes, the relationship of some former "seedless vascular plants" (monilophytes and "pro-gymnosperms") to spermatophytes, and characters marking major clades (see text). MYBP, million years before present; †, extinct taxon. (After Pryer et al. 2001.)

Lycopodiophyta ← *Equisetales, Polypodiales* →

"Progymnospermas", Spermatophyta,
(*Euphyllophyta*)

Devon. sup.

Devon. inf.

Silur sup.

360

370

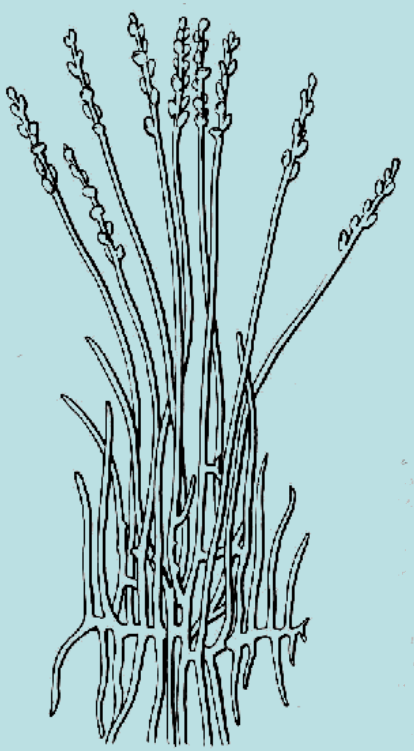
380

390

400

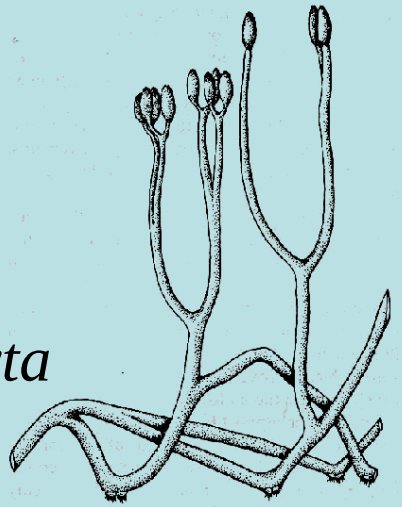
410

420

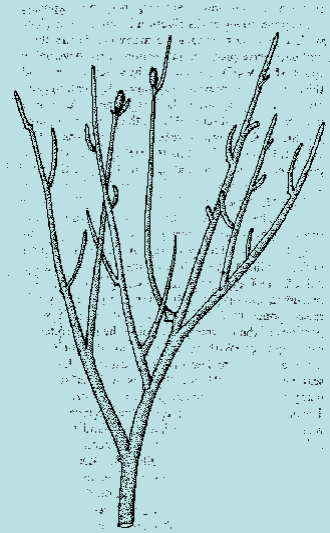


Zosterophyllophyta

Diferenciação centrípeta



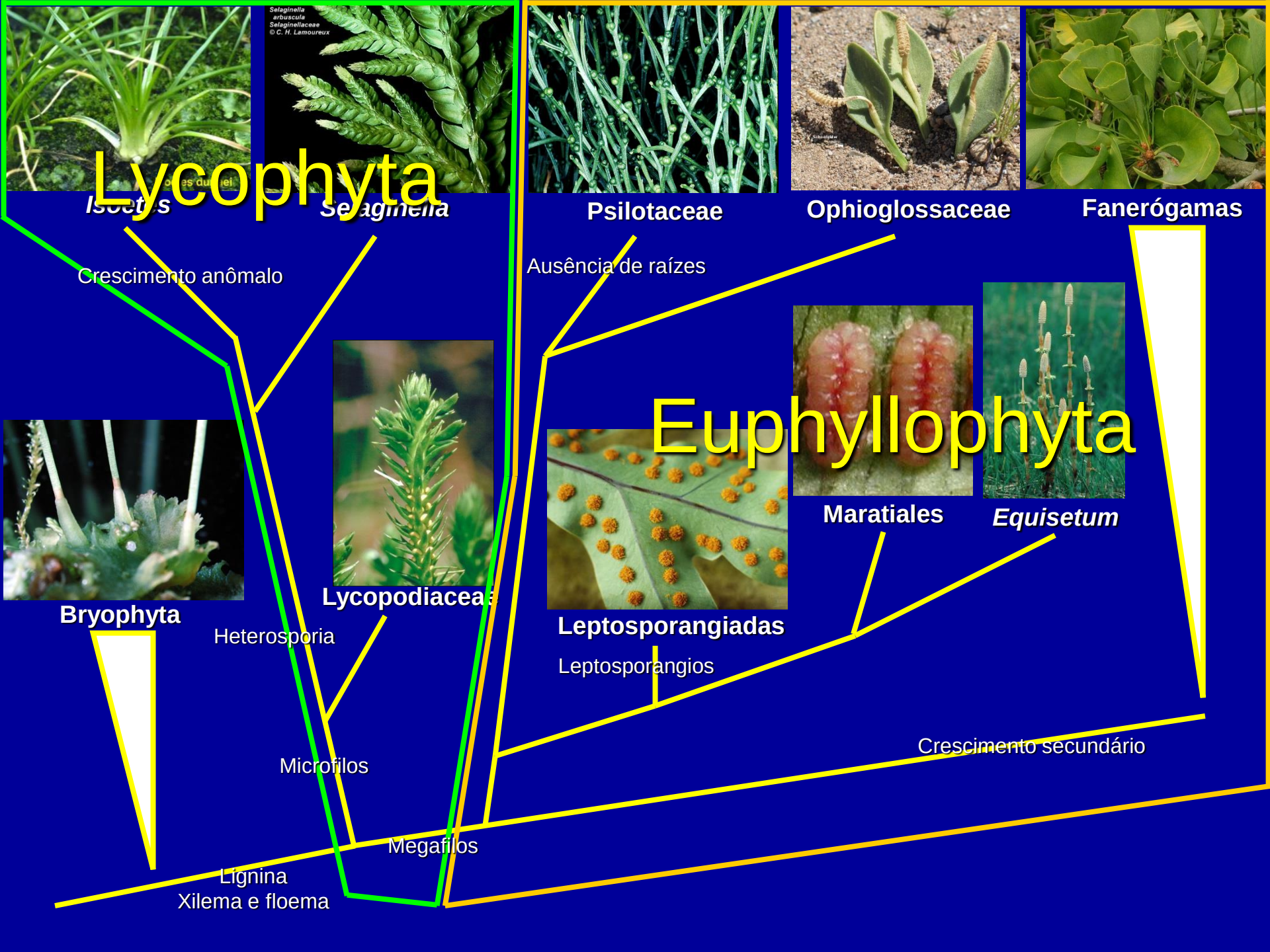
Protracheophyta

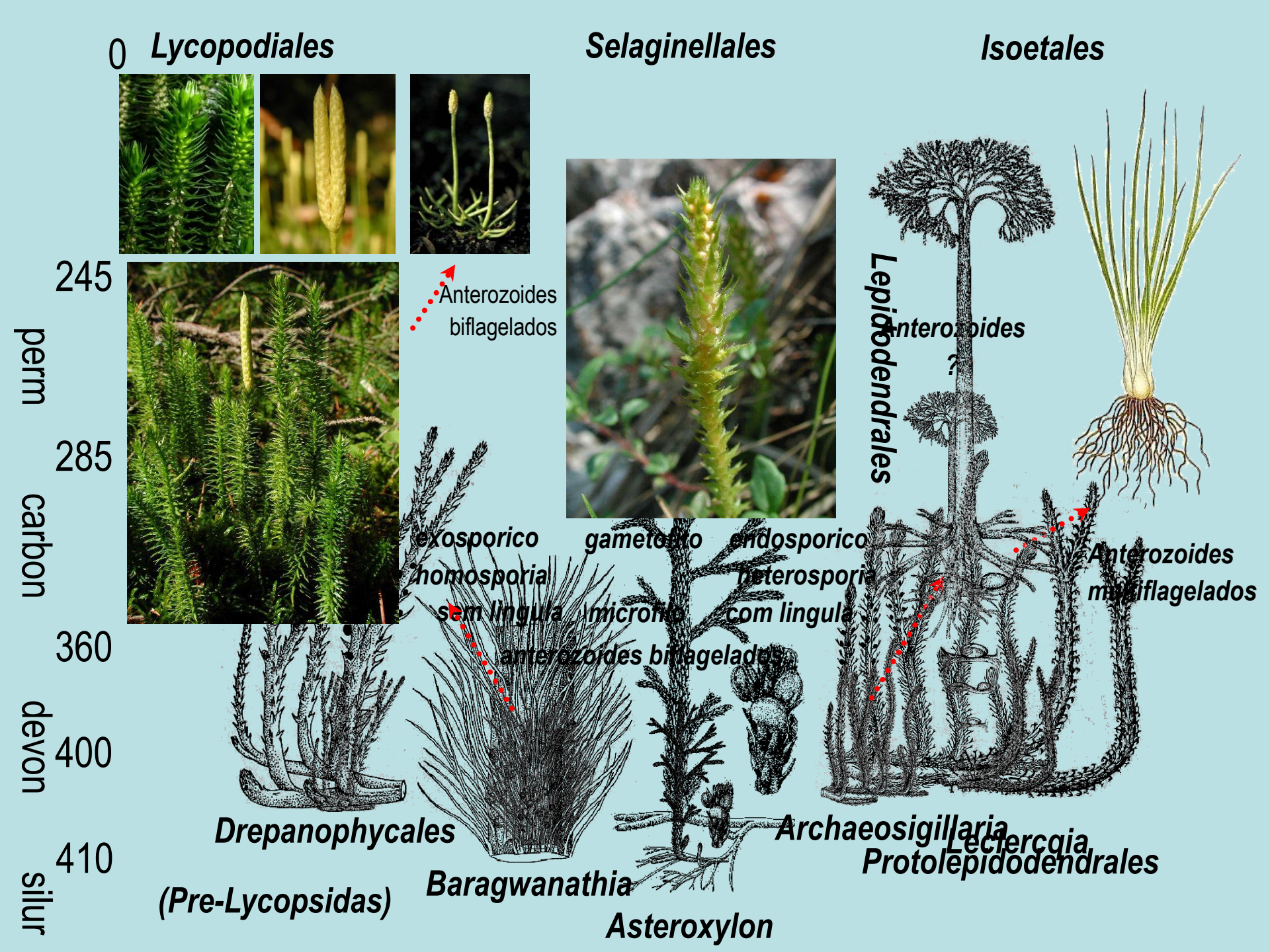


Rhyniophyta

Diferenciação centrífuga

Trimerophyton


Lycophyta
Selaginella arbuscula
Selaginellaceae
© C. H. Lamoureux
Isoetes
Selaginella
Psilotaceae
Ophioglossaceae
Fanerógamas
Crescimento anômalo
Ausência de raízes
Euphyllophyta
Bryophyta
Lycopodiaceae
Leptosporangiadas
Maratiales
Equisetum
Heterosporia
Leptosporangios
Crescimento secundário
Microfilos
Megafilos
Lignina
Xilema e floema


0
Lycopodiales
Selaginellales
Isoetales
245
285
360
400
410
perm
carbon
devon
silur
Anterozoides
biflagelados
exosporico
homosporia
sem lingula
anterozoides biflagelados
gametofito
microfito
endosporico
heterosporia
com lingula
Lepidodendrales
Anterozoides
?
Anterozoides
multiflagelados
Drepanophycales
(Pre-Lycopsidas)
Baragwanathia
Asteroxylon
Archaeosigillaria
Lecrercqia
Protolepidodendrales

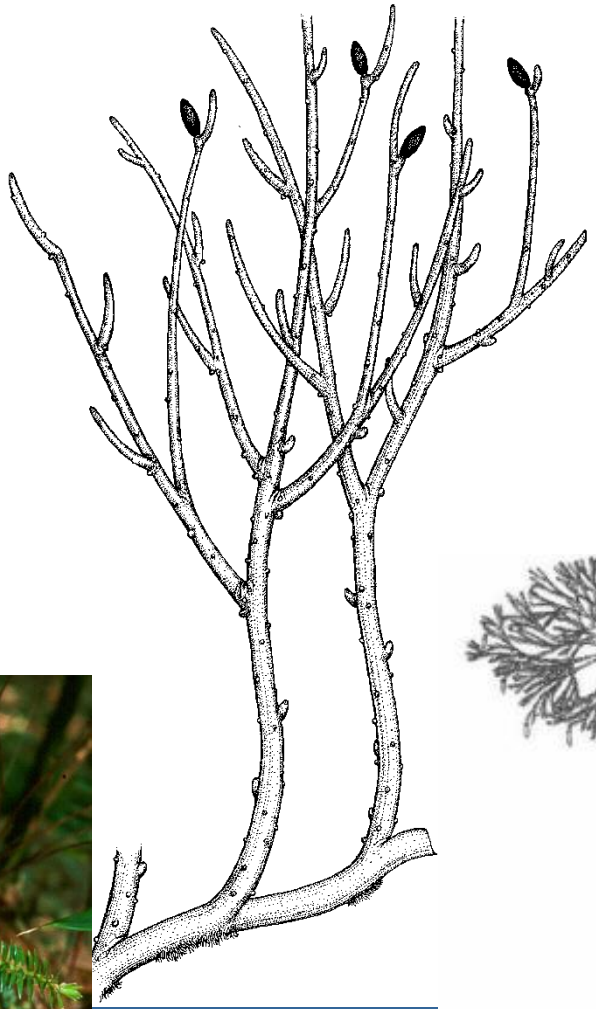
Grupos atuais

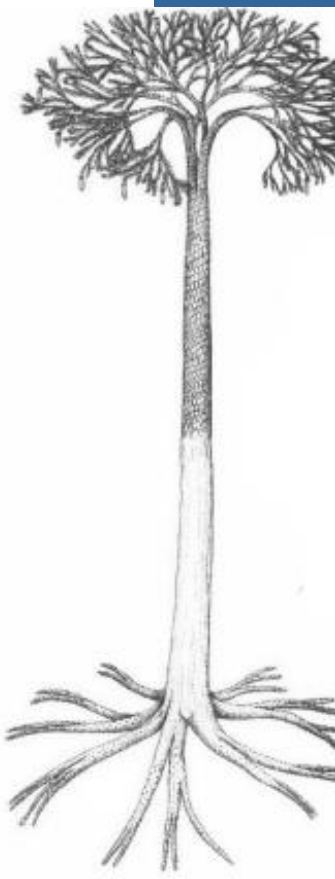
Lycophyta

Monilophyta

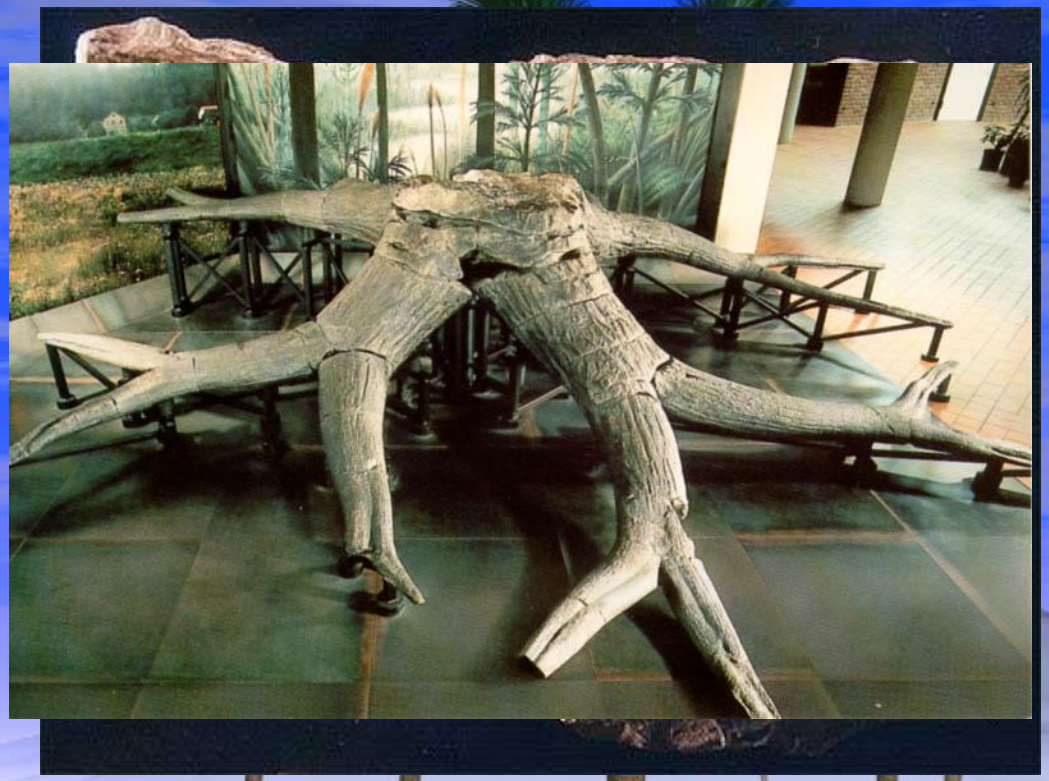
Filo *Lycophyta*

- 10-15 gêneros (1000 ssp.)
- Devoniano
- Progenitores: *Zosterophyllophyta*
- 3 ordens: Ervas
- Característica: microfilos



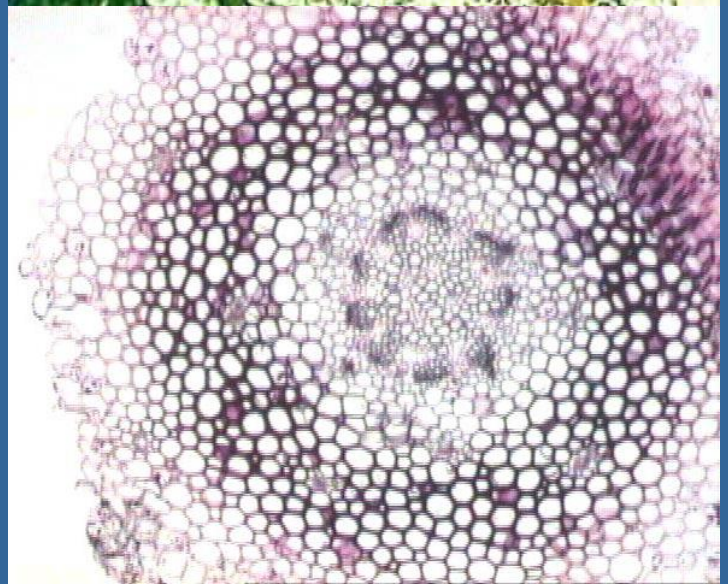


Sigillaria



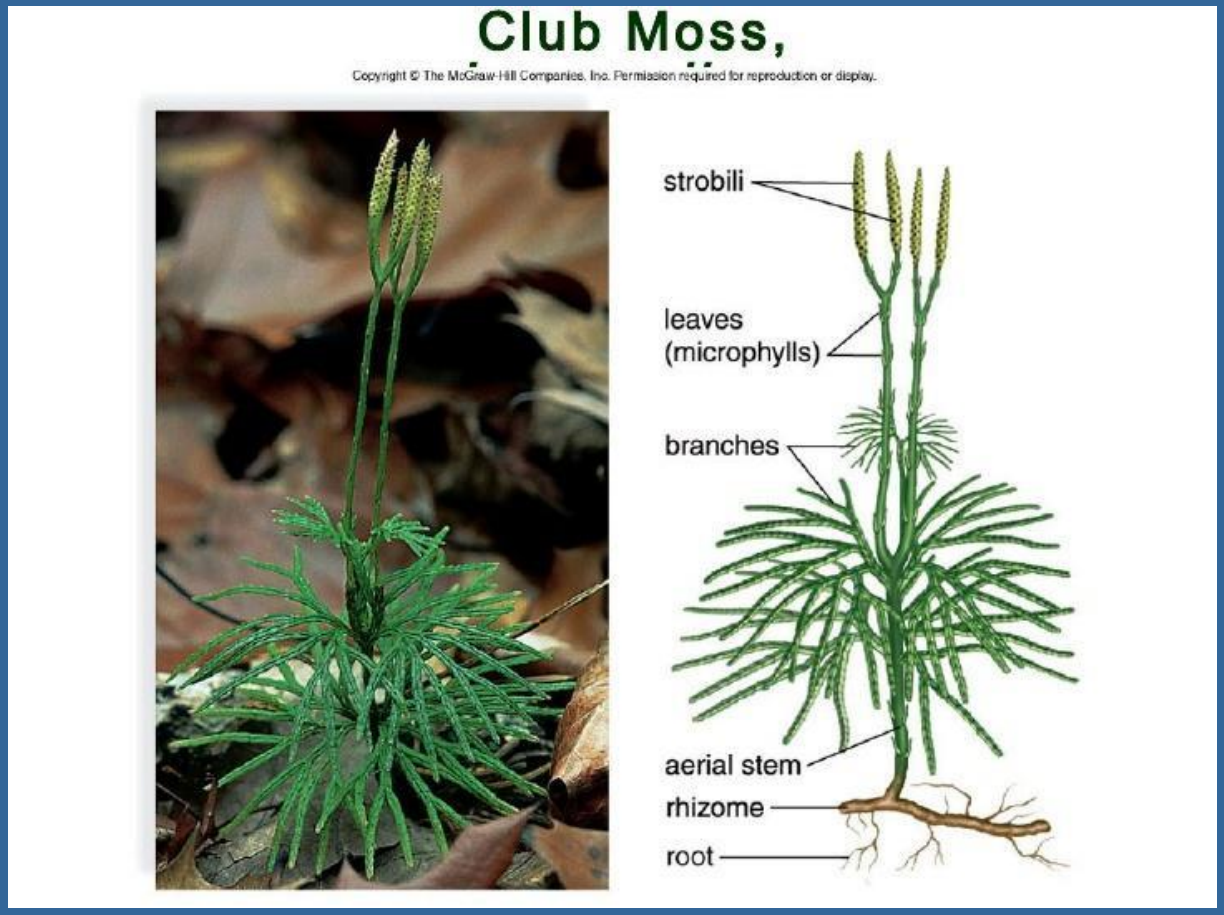
Lycopodiaceae - Licopódios

- Maioria dos gêneros atuais
- Maioria tropical
- Maioria epífita
- Esporófito: rizoma ramificado
- Caule e raiz: protostelo
- Microfilos: espirais, opostos ou verticilados
- Hosmoporadas
- Esporângios individuais (esporofilos)
- Estróbilos

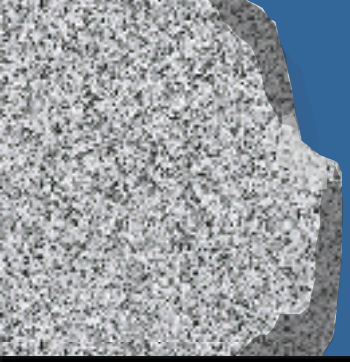


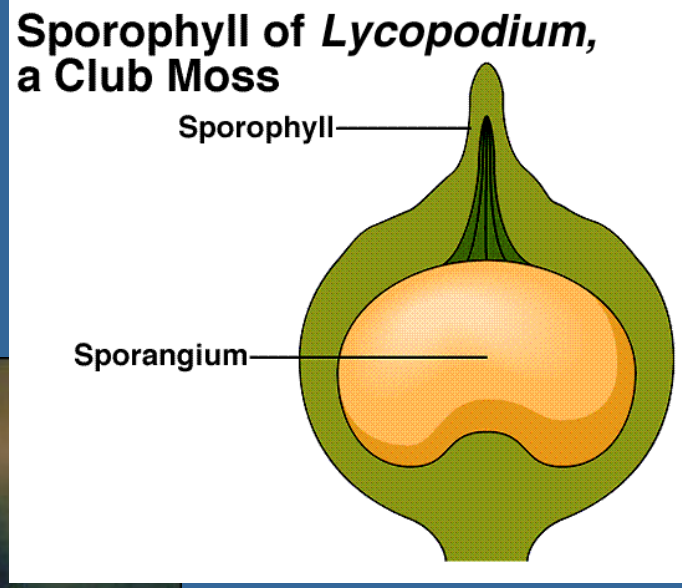
© Thomas Schoepke

Dyphasiastrum

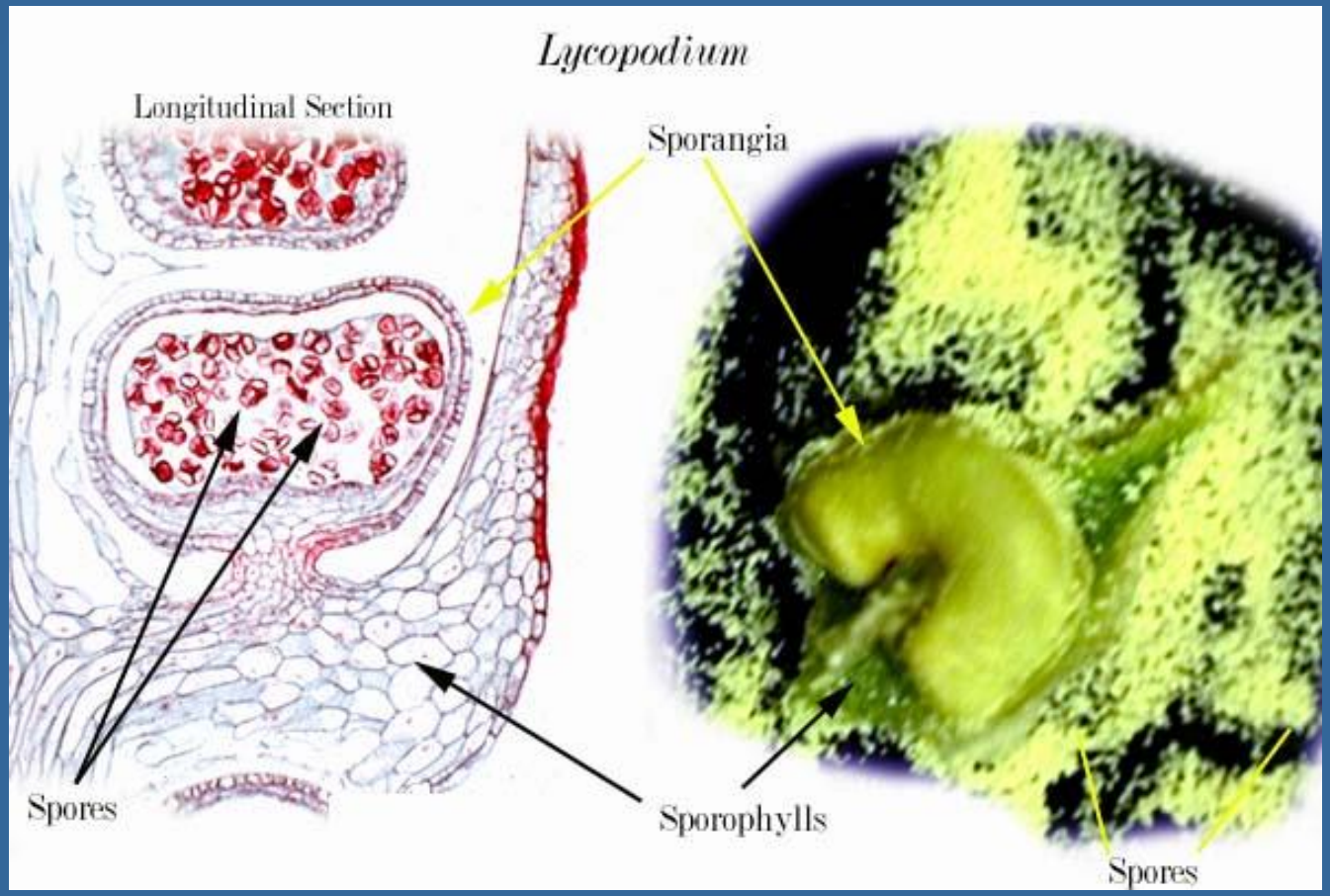


Lycopodiaceae



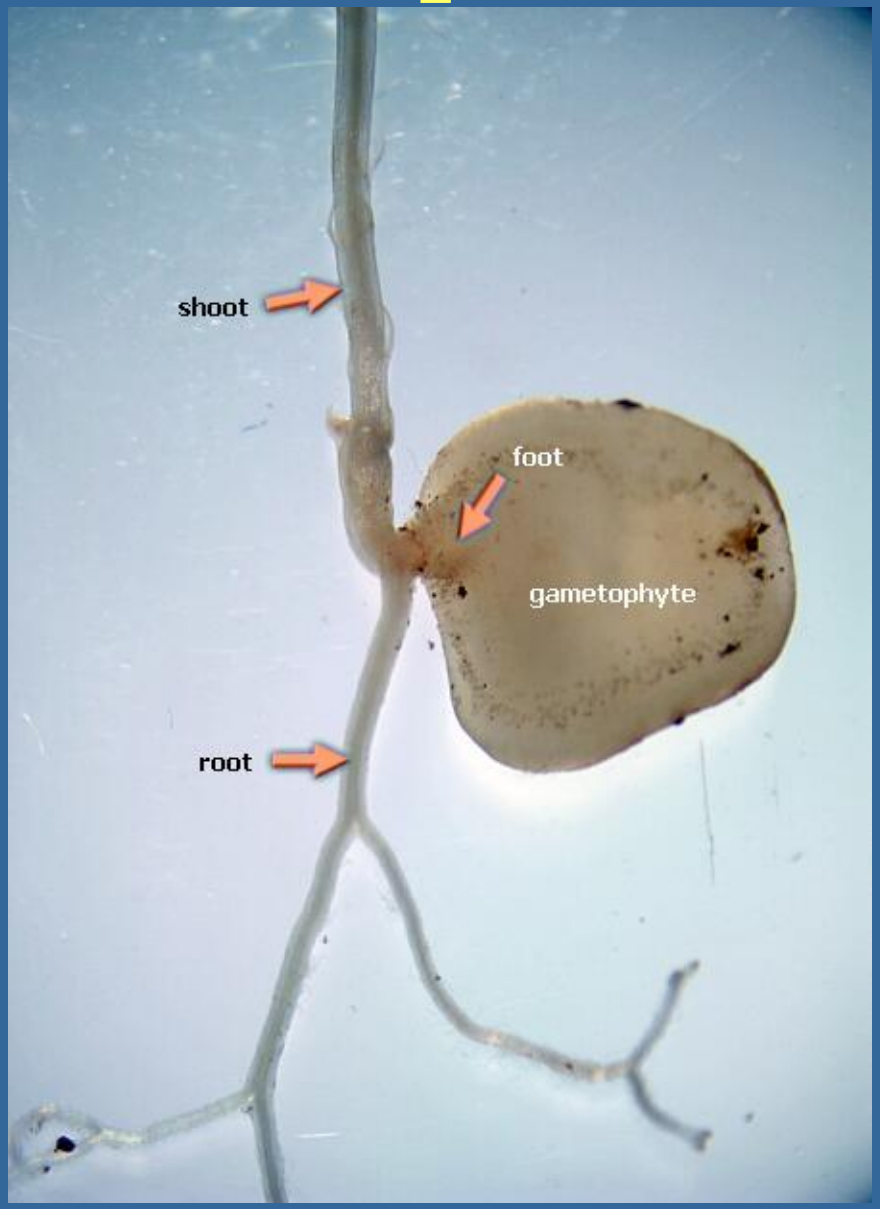


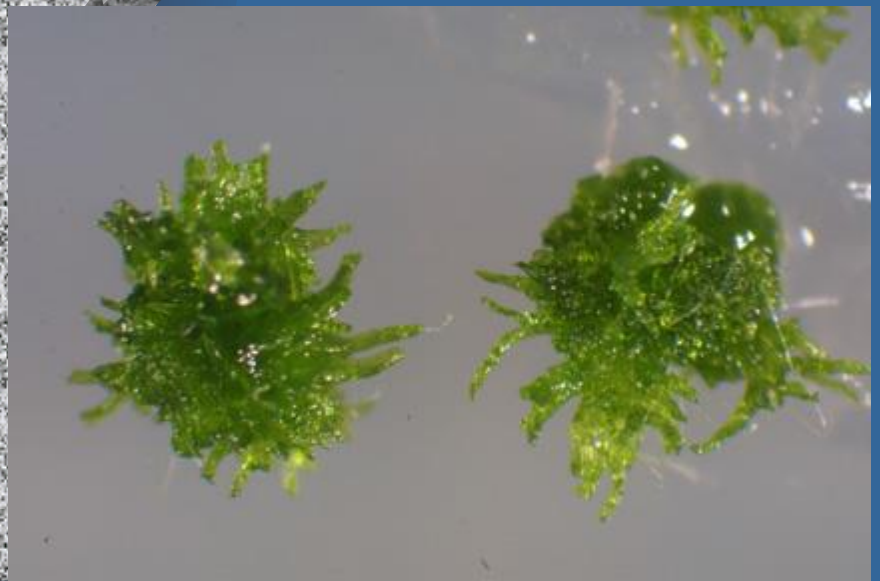
Sporangios

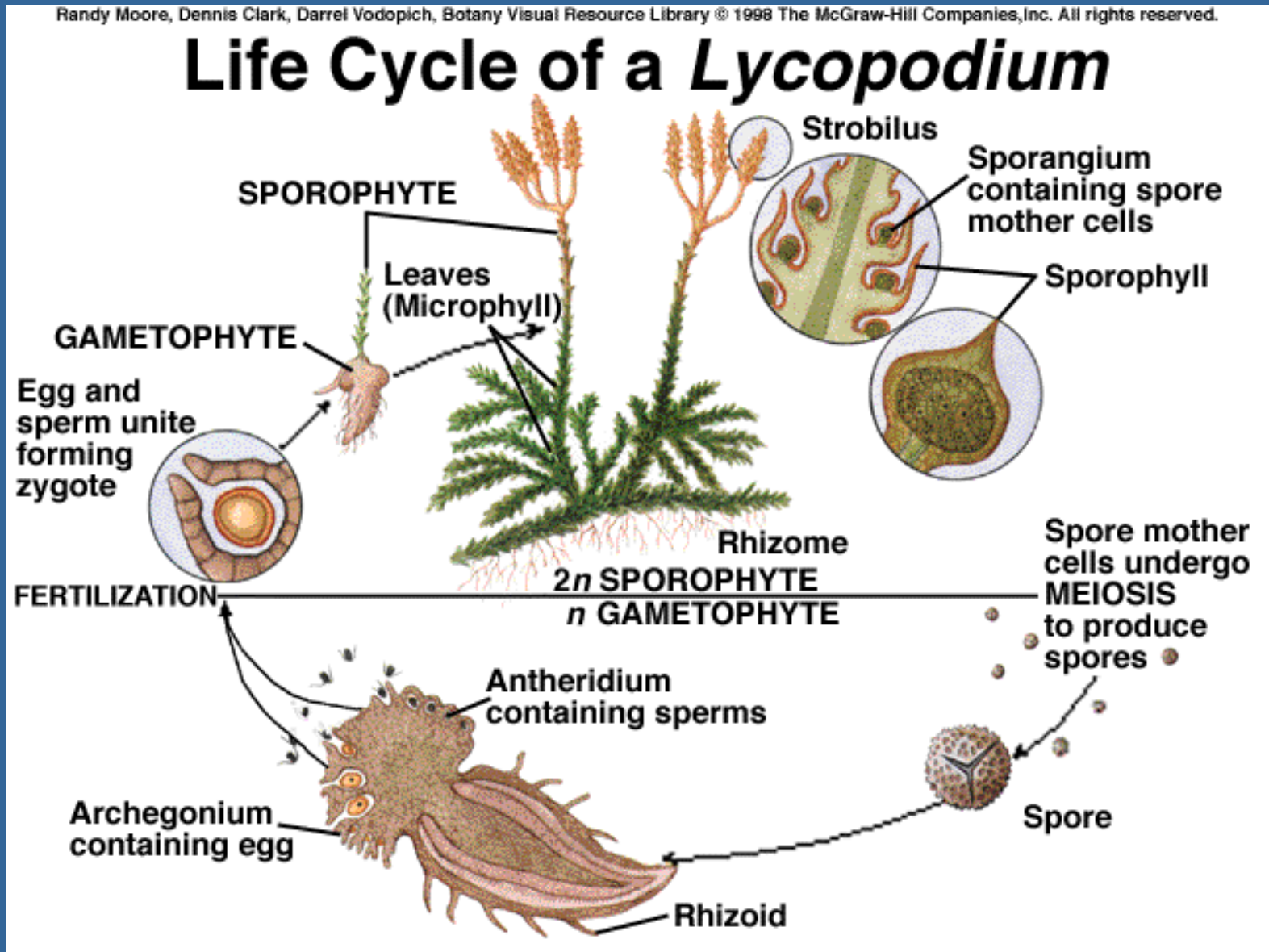

Lycopodium
Longitudinal Section
Sporangia
Spores
Sporophylls
Spores

Lycopodiaceae - Licopódios

- Germinação: gametófitos bissexuados
- Gametófitos:
  - Massas irregulares
  - Estruturas micorrízicas
- Fecundação: água
- Anterozóide: biflagelado






Randy Moore, Dennis Clark, Darrel Vodopich, Botany Visual Resource Library © 1998 The McGraw-Hill Companies,Inc. All rights reserved.
Life Cycle of a *Lycopodium*
Strobilus
Sporangium containing spore mother cells
Sporophyll
SPOROPHYTE
Leaves (Microphyll)
GAMETOPHYTE
Egg and sperm unite forming zygote
Rhizome
2*n* SPOROPHYTE
n GAMETOPHYTE
FERTILIZATION
Spore mother cells undergo MEIOSIS to produce spores
Antheridium containing sperms
Archegonium containing egg
Spore
Rhizoid

Selaginellaceae

- Único gênero: *Selaginella* (700 ssp.)
- Maioria tropical (úmido)
- "Planta da ressureição" (*Selaginella lepidophylla*)
- Esporófito herbáceo
- Esporofilos em estróbilos
- Caule e raiz: protostelo
- Lígula

Selaginellaceae

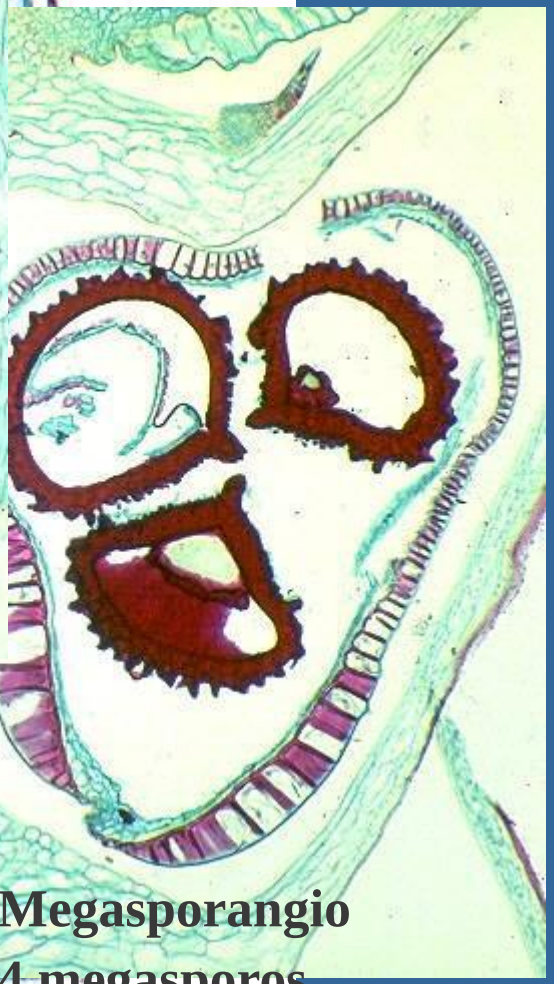
Selaginella lepidophylla

Selaginellaceae

- Heterosporada
- Gametófitos unissexuados
- Megasporofilos - megaesporângio
- Microsporofilos - microsporângios
  - Ambos no mesmo estróbilo
- Microsporo - Gametófito masculino: unica unidade protalar
- Megasporo - Gametófito feminino: ruptura do megásporo

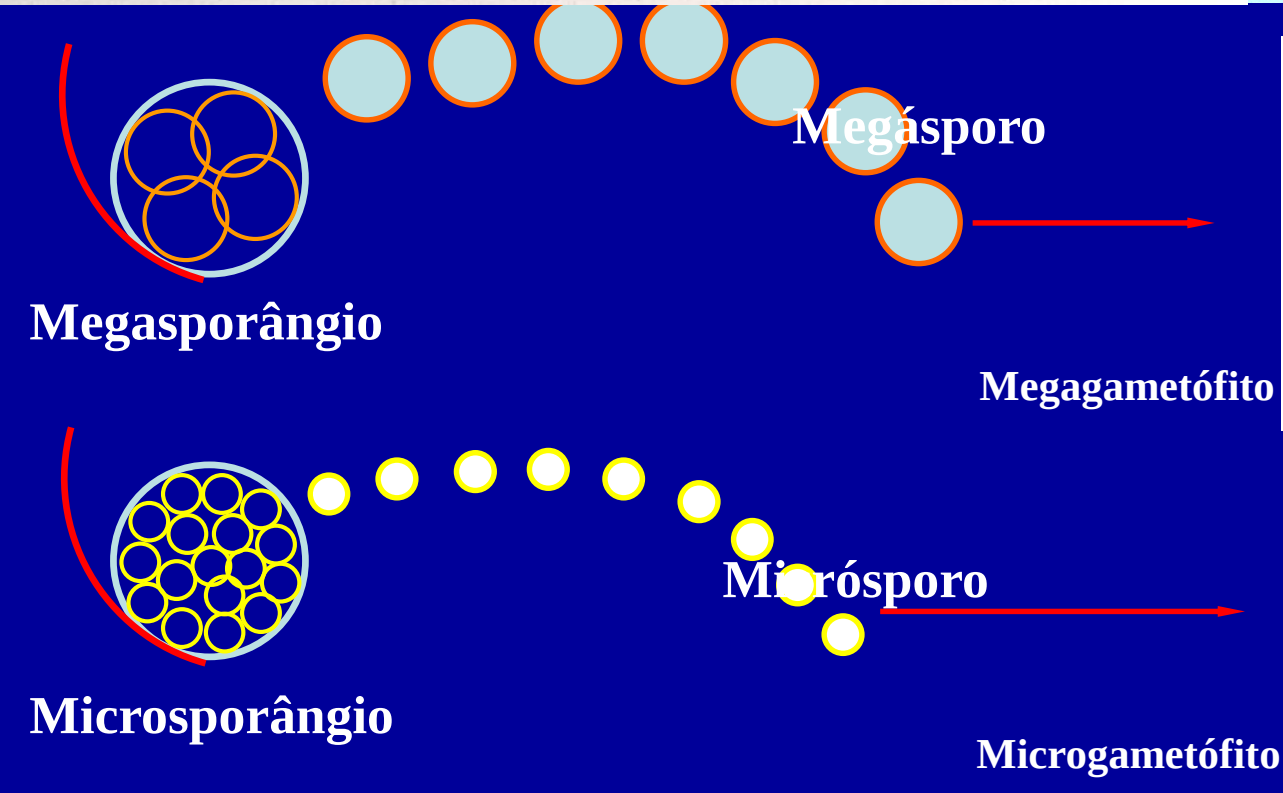
Selaginella

- Microesporangio



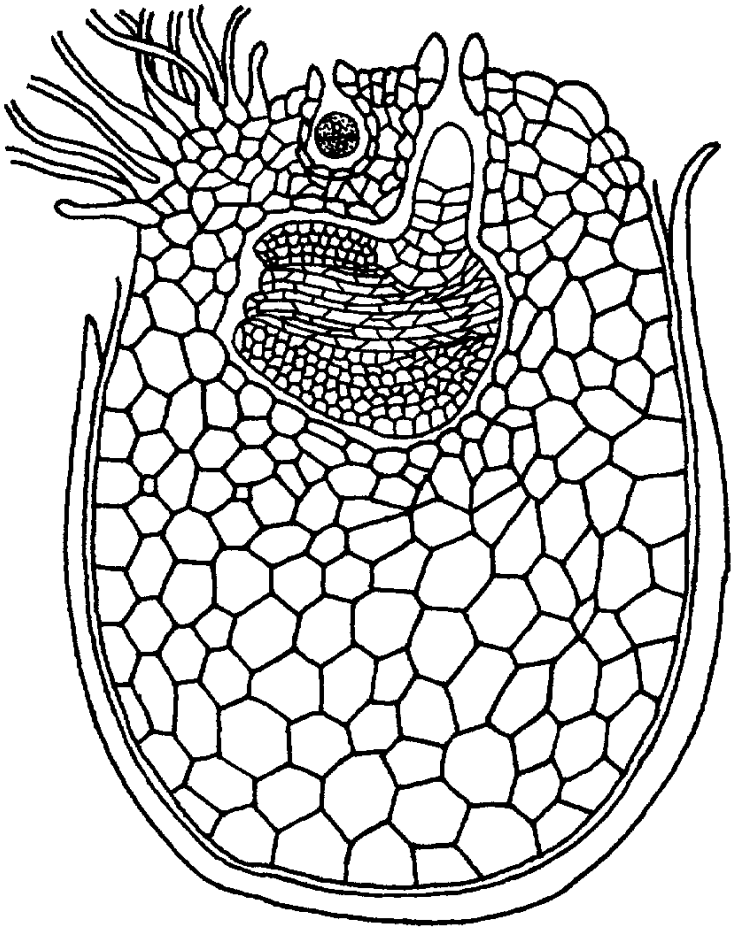
- Megasporangio
- 4 megasporos

Selaginella: Young Sporophyte
Microspores
Megagametophyte
inside megaspore wall


Megásporo
Megasporângio
Megagametófito
Micrósporo
Microsporângio
Microgametófito
ous tissue
ting
s
Biflagellate
sperm

Selaginellaceae

Megagametofito



Bec/03

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Microgametofito

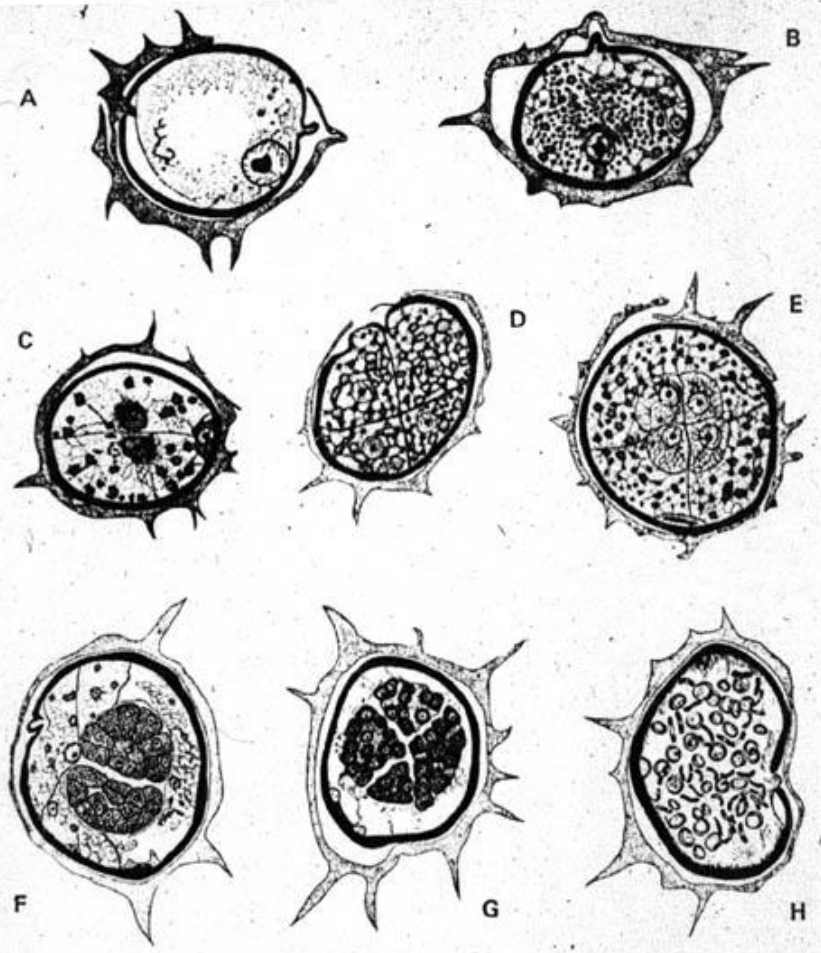
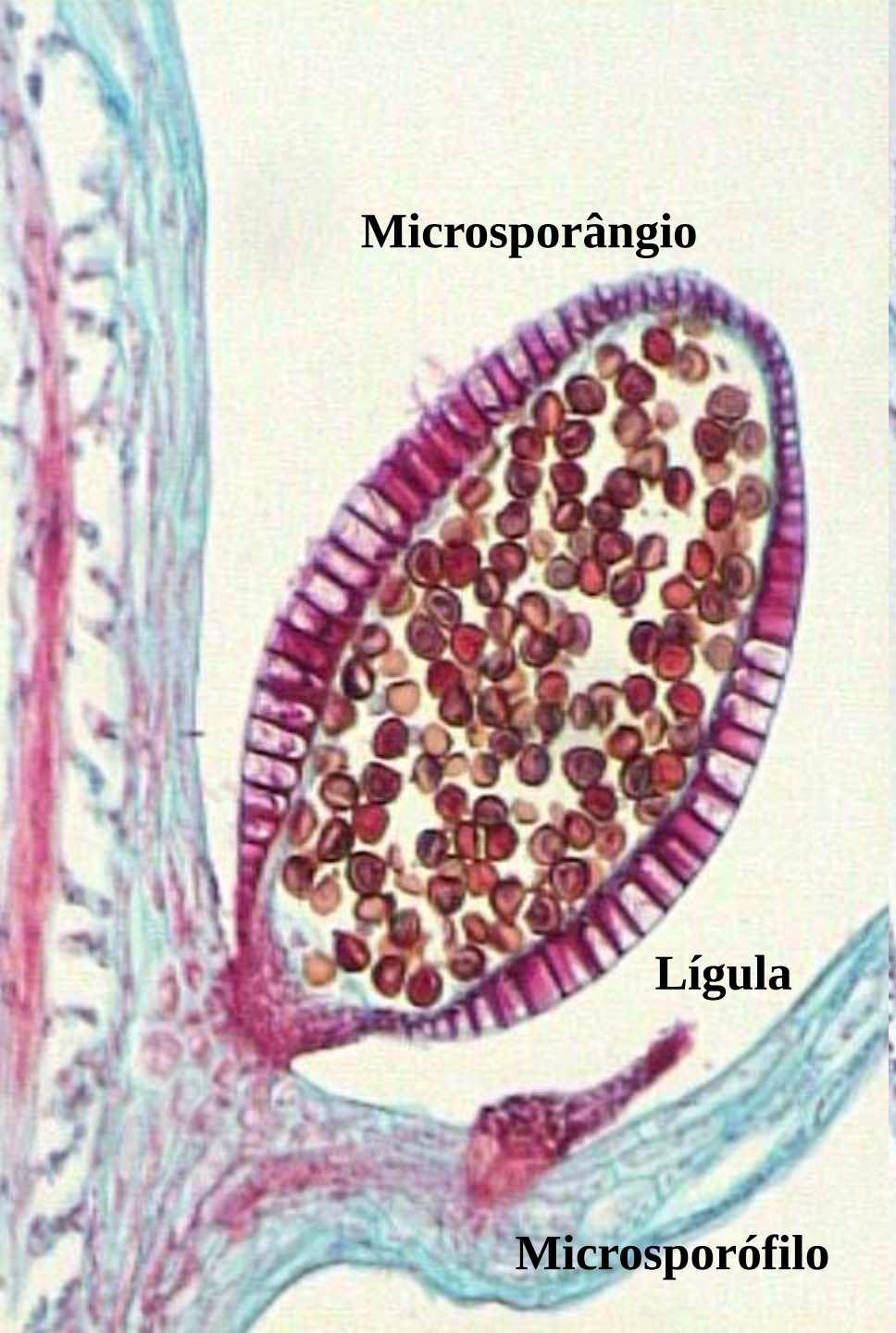
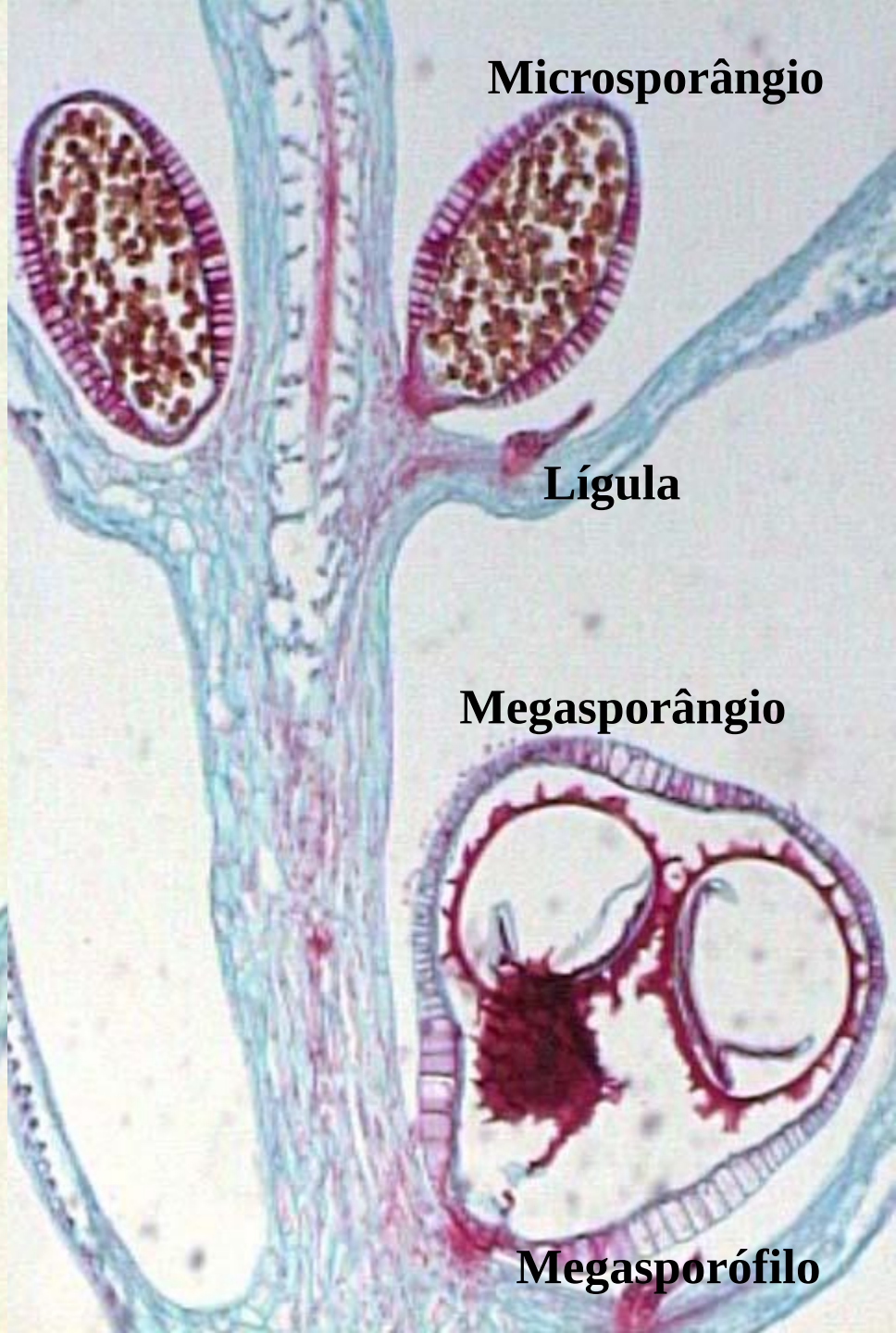
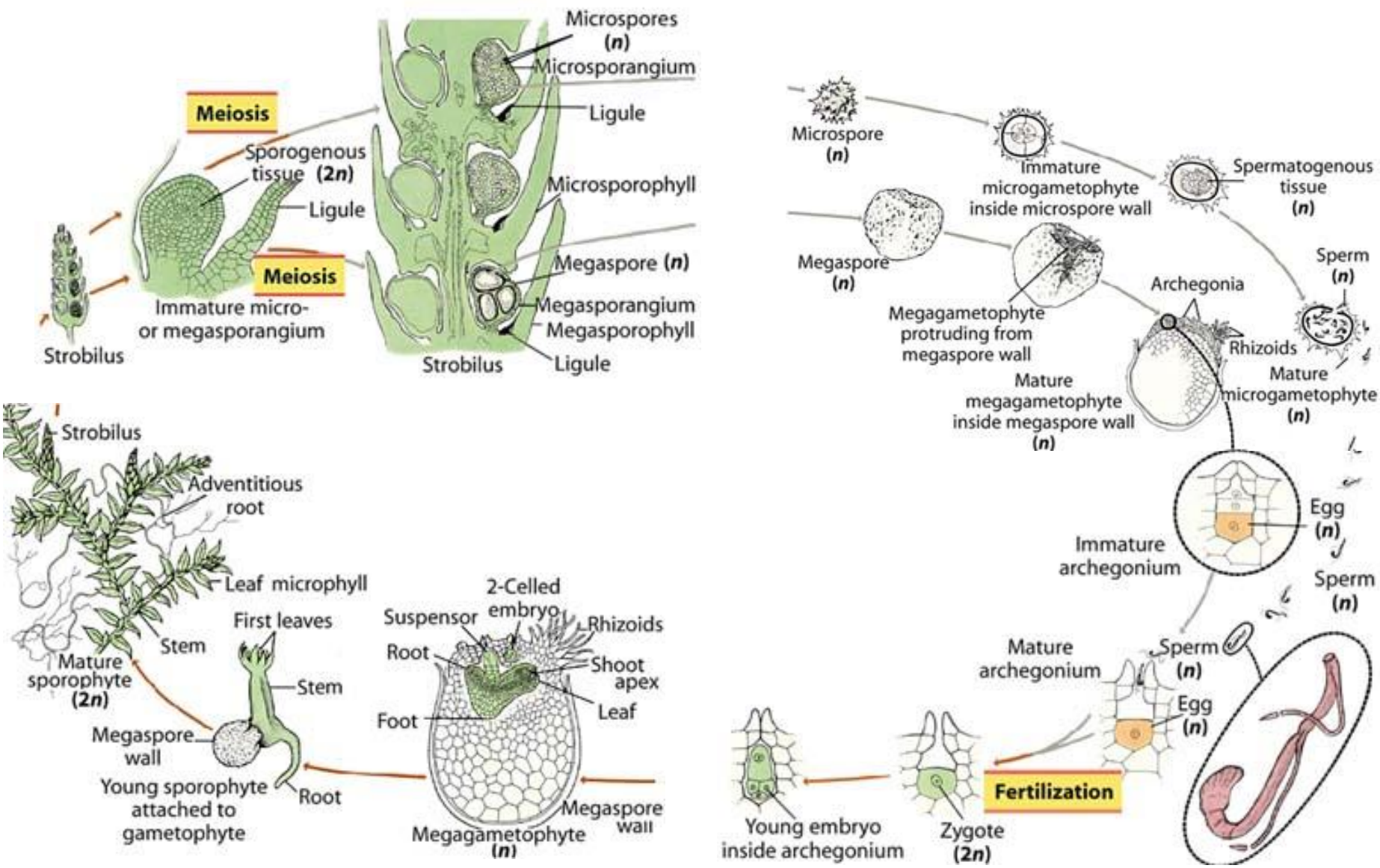


FIGURE 3–6. Development of the microgametophyte in *Selaginella kraussiana*, after Slagg (1932).


Microsporângio
Lígula
Microsporófilo


Microsporângio
Lígula
Megasporângio
Megasporófilo

Selaginella – ciclo de vida



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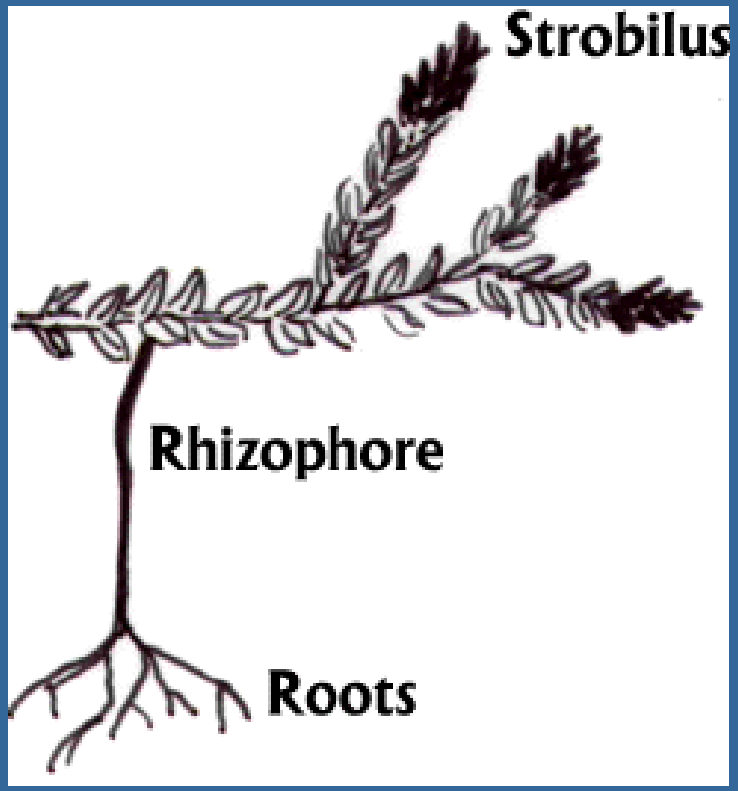
Selaginella
arbuscula
Selaginellaceae
© C. H. Lamoureux

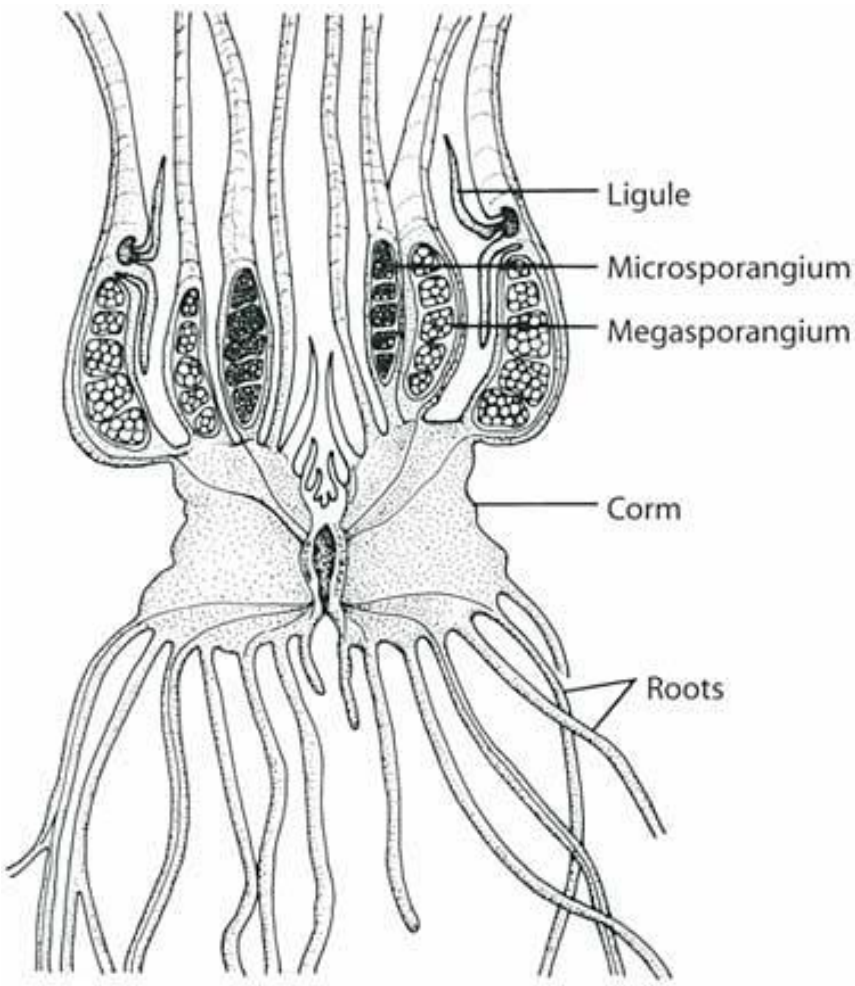
David Webb

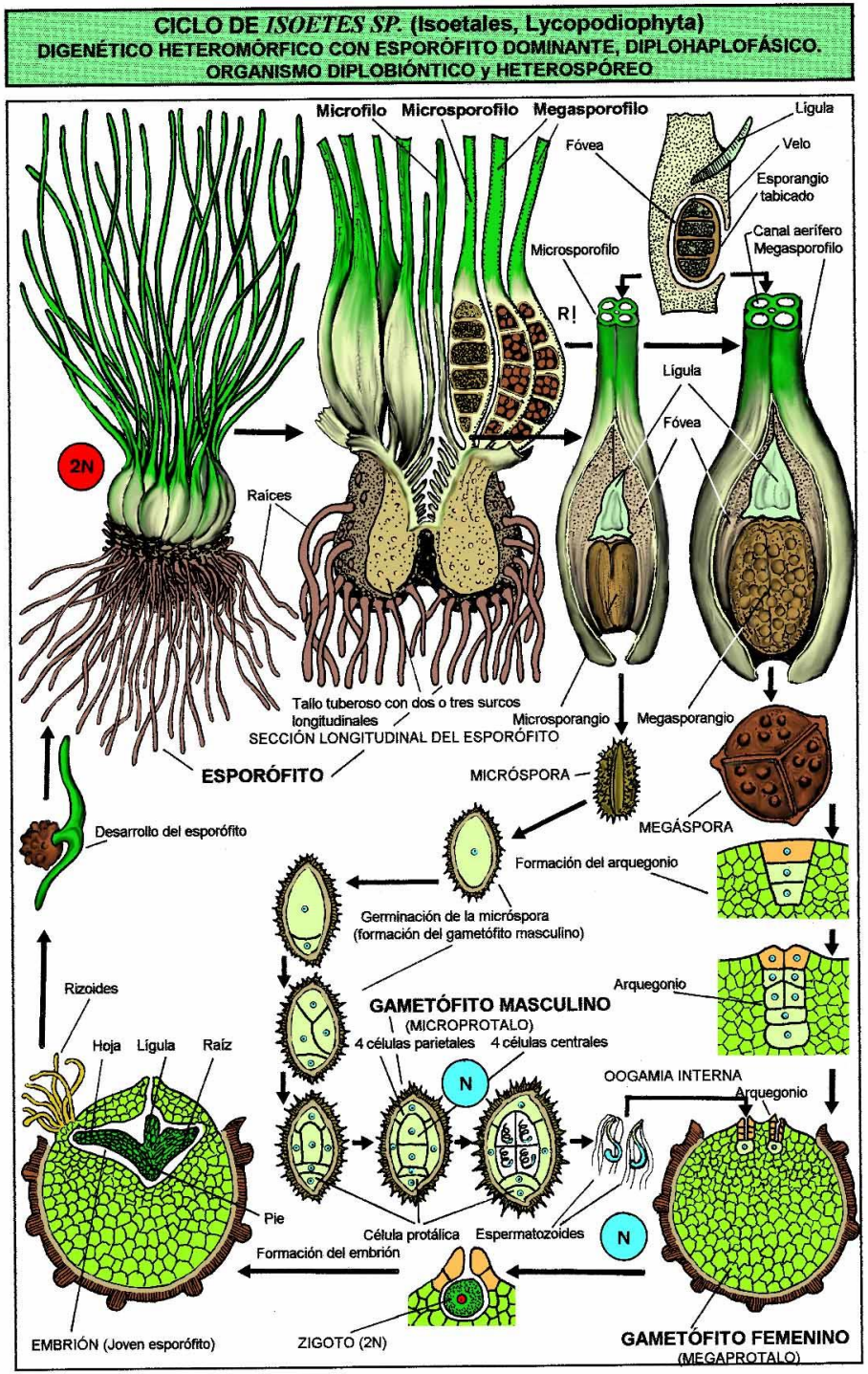

Strobilus
Rhizophore
Roots

Isoetaceae

l.s. through a megasporangium

Isoetes


Ligule
Microsporangium
Megasporangium
Corm
Roots


CICLO DE *ISOETES SP.* (Isoetales, Lycopodiophyta)
DIGENÉTICO HETEROMÓRFICO CON ESPORÓFITO DOMINANTE, DIPLOHAPLOFÁSICO.
ORGANISMO DIPLOBIÓNTICO y HETEROSPÓREO
Microfilo
Microsporofilo
Megasporofilo
Ligula
Fóvea
Velo
Esporangio tabicado
Canal aerífero
Megasporofilo
Microsporofilo
R!
Lígula
Fóvea
2N
Raíces
Talo tuberoso con dos o tres surcos longitudinales
SECCIÓN LONGITUDINAL DEL ESPORÓFITO
Microsporangio
Megasporangio
ESPORÓFITO
MICRÓSPORA
MEGÁSPORA
Desarrollo del esporófito
Formación del arquegonio
Germinación de la micróspora (formación del gametófito masculino)
Arquegonio
Rizoides
GAMETÓFITO MASCULINO
(MICROPROTALO)
4 células parietales
4 células centrales
Hoja
Lígula
Raíz
N
OOGAMIA INTERNA
Arquegonio
Pie
Célula protálica
Espermatozoides
N
Formación del embrión
EMBRIÓN (Joven esporófito)
ZIGOTO (2N)
GAMETÓFITO FEMENINO
(MEGAPROTALO)

Isoetaceae

Isoetes duriaei