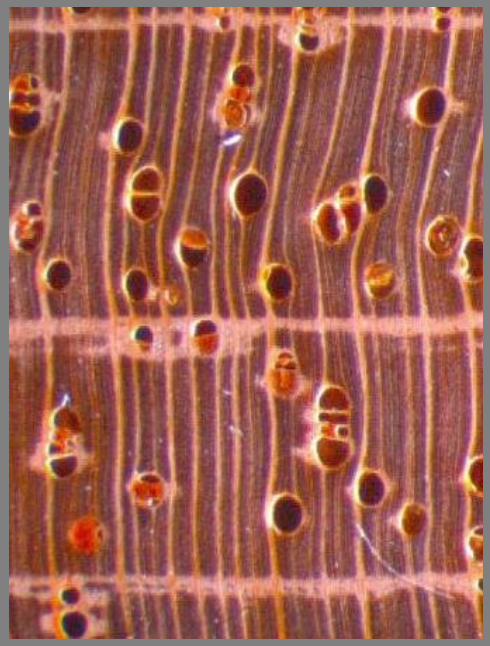
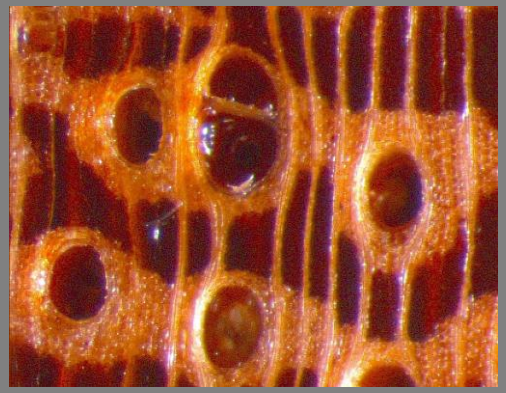
LIGNÓFITAS

Gregório CECCANTINI

BIB-124- Diversidade e Evolução dos Organismos Fotossintetizantes





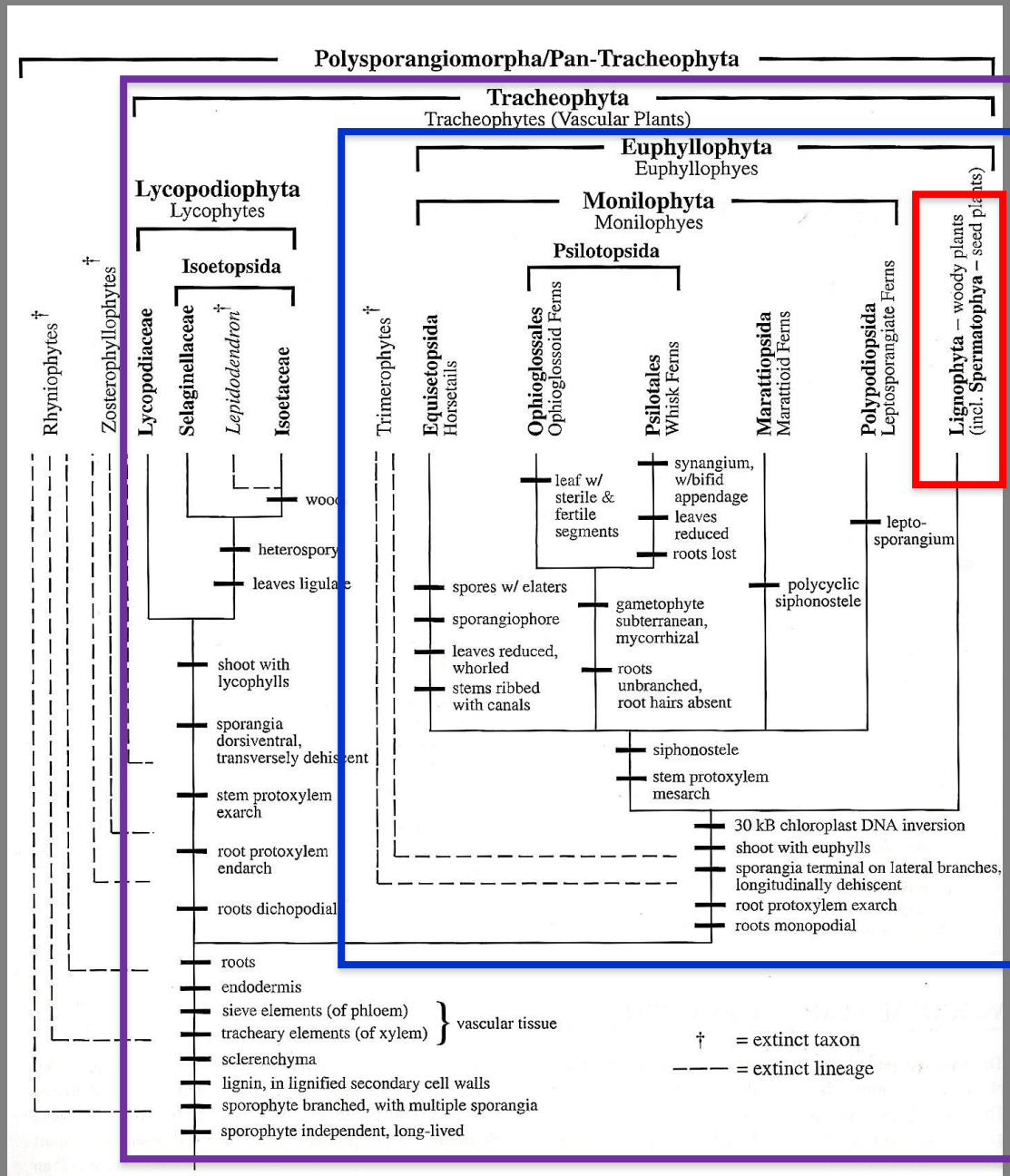


FIGURE 4.1 Phylogeny of the tracheophytes, the vascular plants, modified from Pryer et al. (2001a, 2004a,b) and Qiu et al. (2006, 2007), with selected apomorphies.

LIGNÓFITAS

Embriófitas

Traqueófitas

Eufilófitas

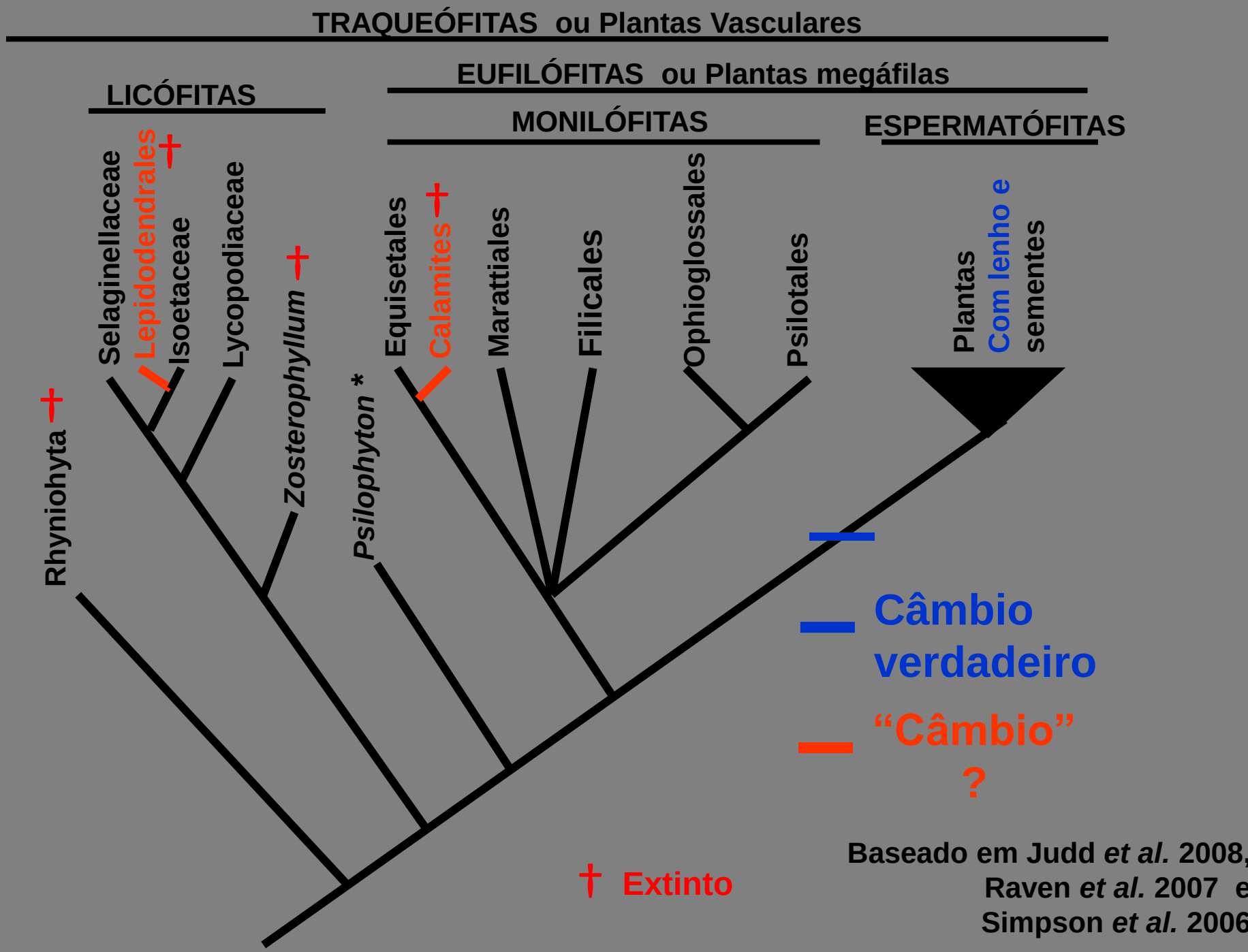
Lignófitas

Espermatófitas

Gimnospermas

Antófitas=

Angiospermas


TRAQUEÓFITAS ou Plantas Vasculares
EUFILÓFITAS ou Plantas megáfilas
LICÓFITAS
MONILÓFITAS
ESPERMATÓFITAS
Selaginellaceae
Lepidodendrales †
Isoetaceae
Lycopodiaceae
Zosterophyllum †
Rhyniohyta †
Psilophyton *
Equisetales
Calamites †
Marattiales
Filicales
Ophioglossales
Psilotales
Plantas Com lenho e sementes
Câmbio verdadeiro
"Câmbio" ?
† Extinto
Baseado em Judd et al. 2008, Raven et al. 2007 e Simpson et al. 2006

Licófitas

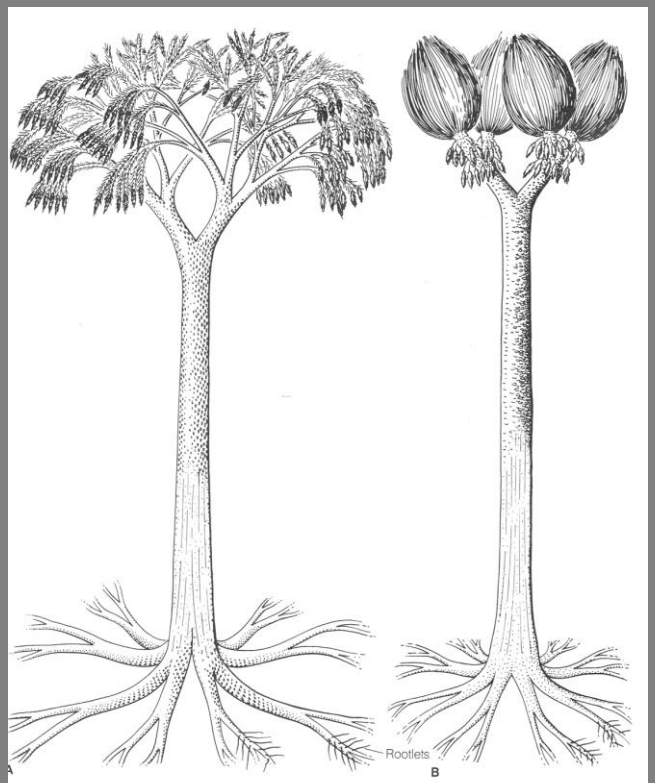


FIGURE 9-41 Suggested reconstructions. A, *Lepidodendron* sp.; B, *Sigillaria elegans*. Note strobili and the large rhizophores with attached rootlets at base of trunks. *Form* or *organ* genera exist for all basic parts of the plants. (Consult text for pertinent information.) [Modified from *Handbuch der Paläobotanik* by M. Hirmer. R. Olden-

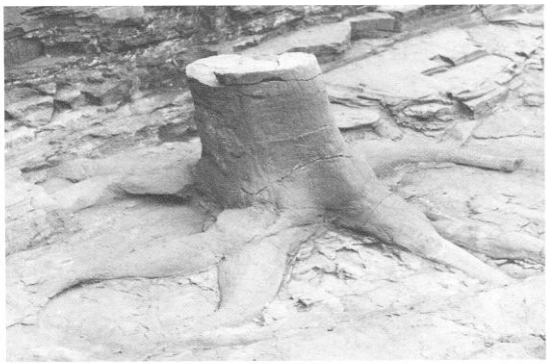


FIGURE 9-43 Tree stump of a lepidodendrid in "Fossil Grove," Victoria Park, Glasgow, Scotland. The basal dichotomously branched lobes, to which rootlets were attached, are designated *Stigmaria* (an organ genus). The fossil is a cast of the original tree. Stumps, which measure 15 to 40 inches at their widest diameter, were exposed by carefully removing the hard rock that encased them. [Photograph courtesy of Dr. E. G. Cutter.]

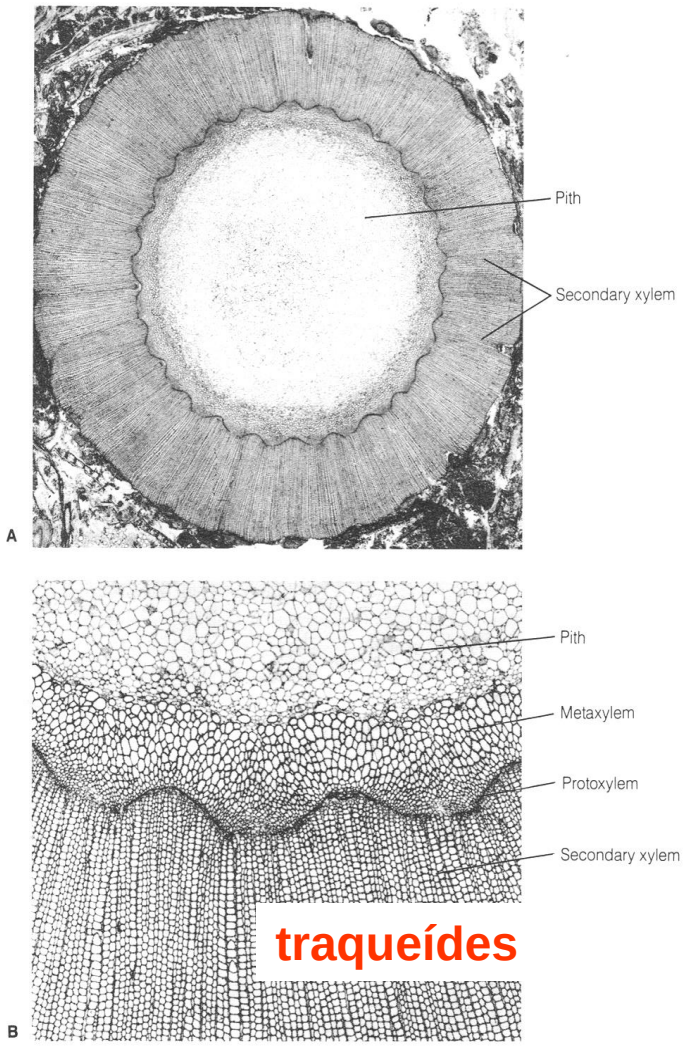
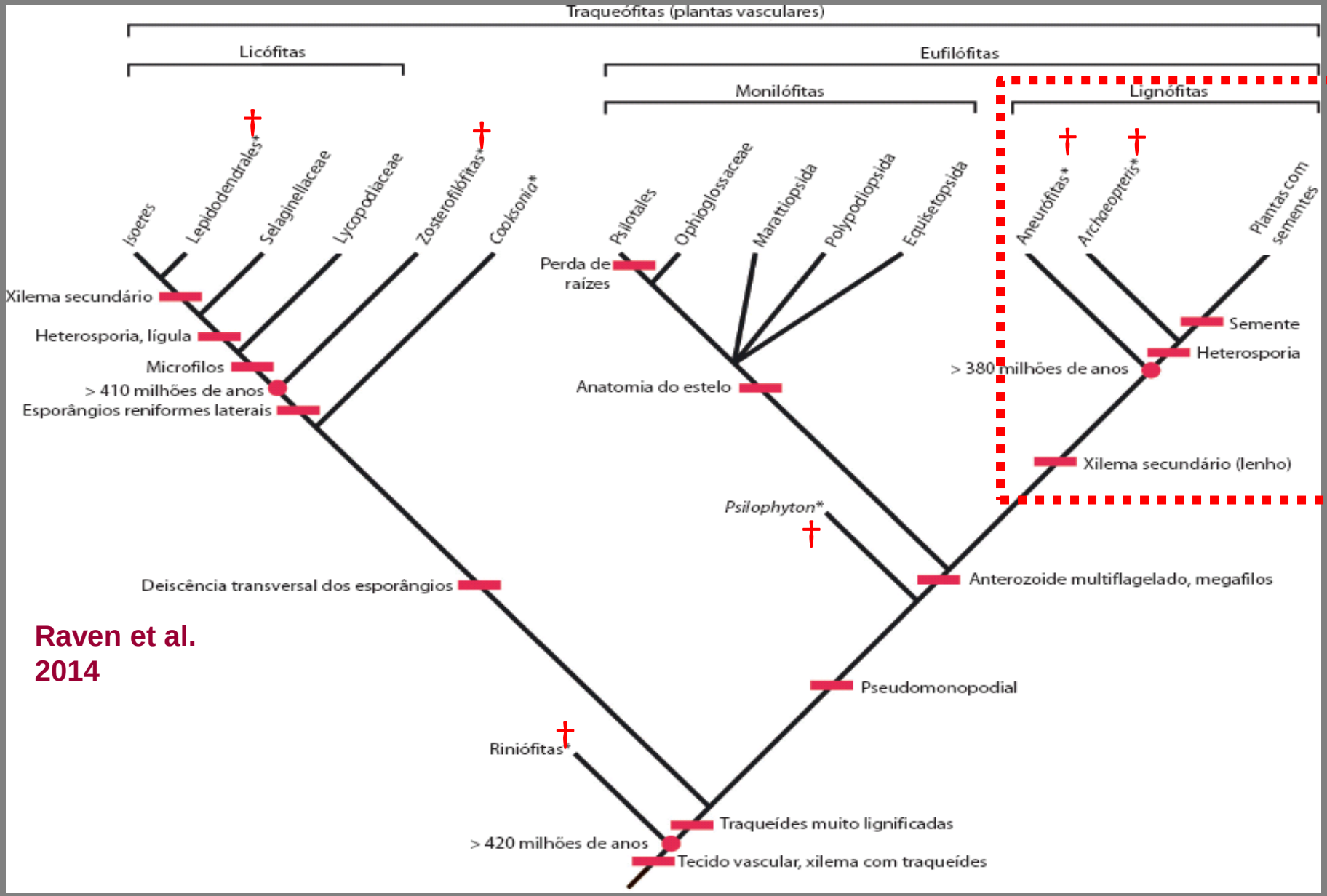


FIGURE 9-45 A, transverse section of a siphonostele of *Sigillaria approximata*. B, details of a section from A. [Courtesy of Dr. T. Delevoryas.]

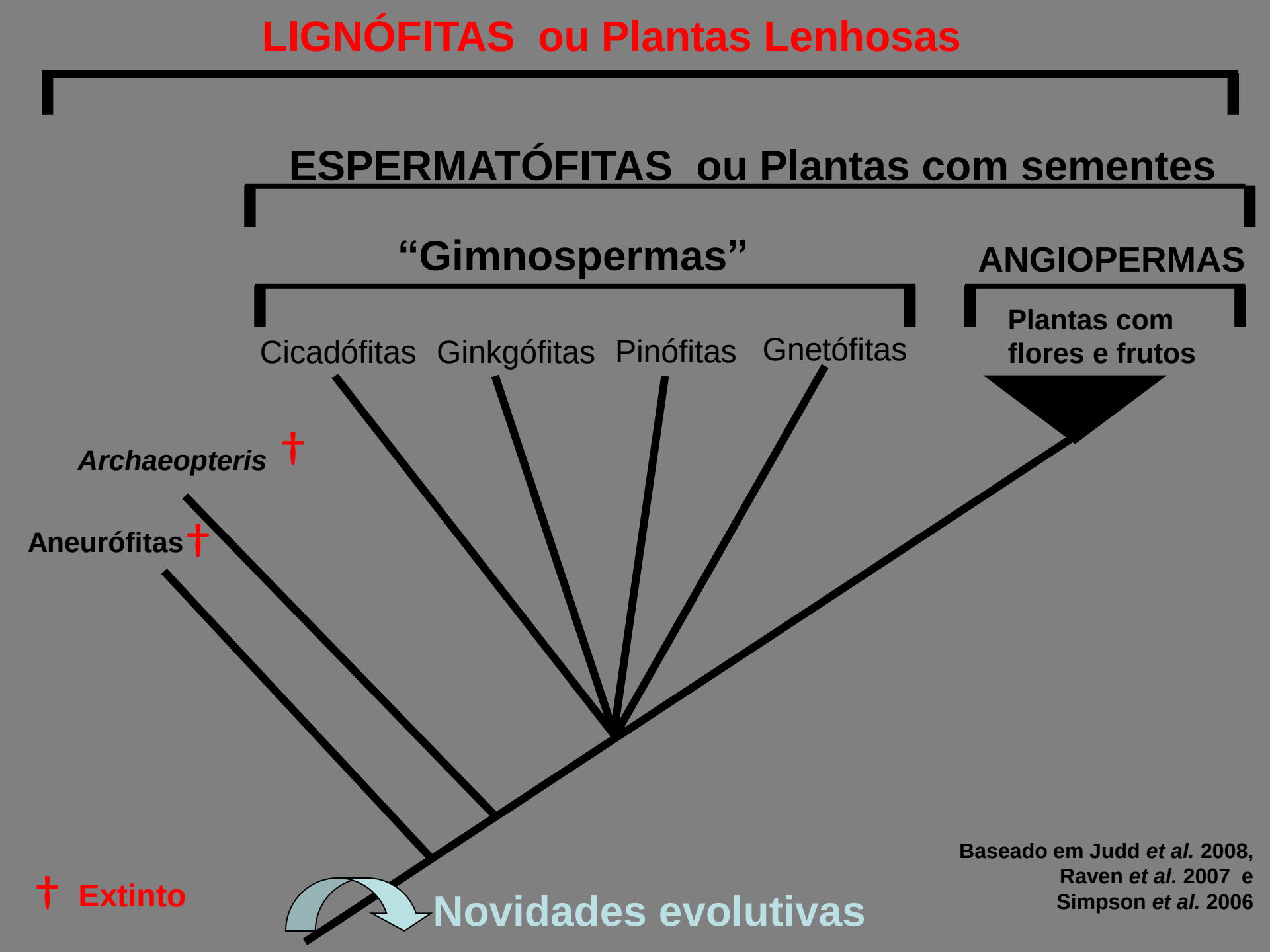
Lepidodendron

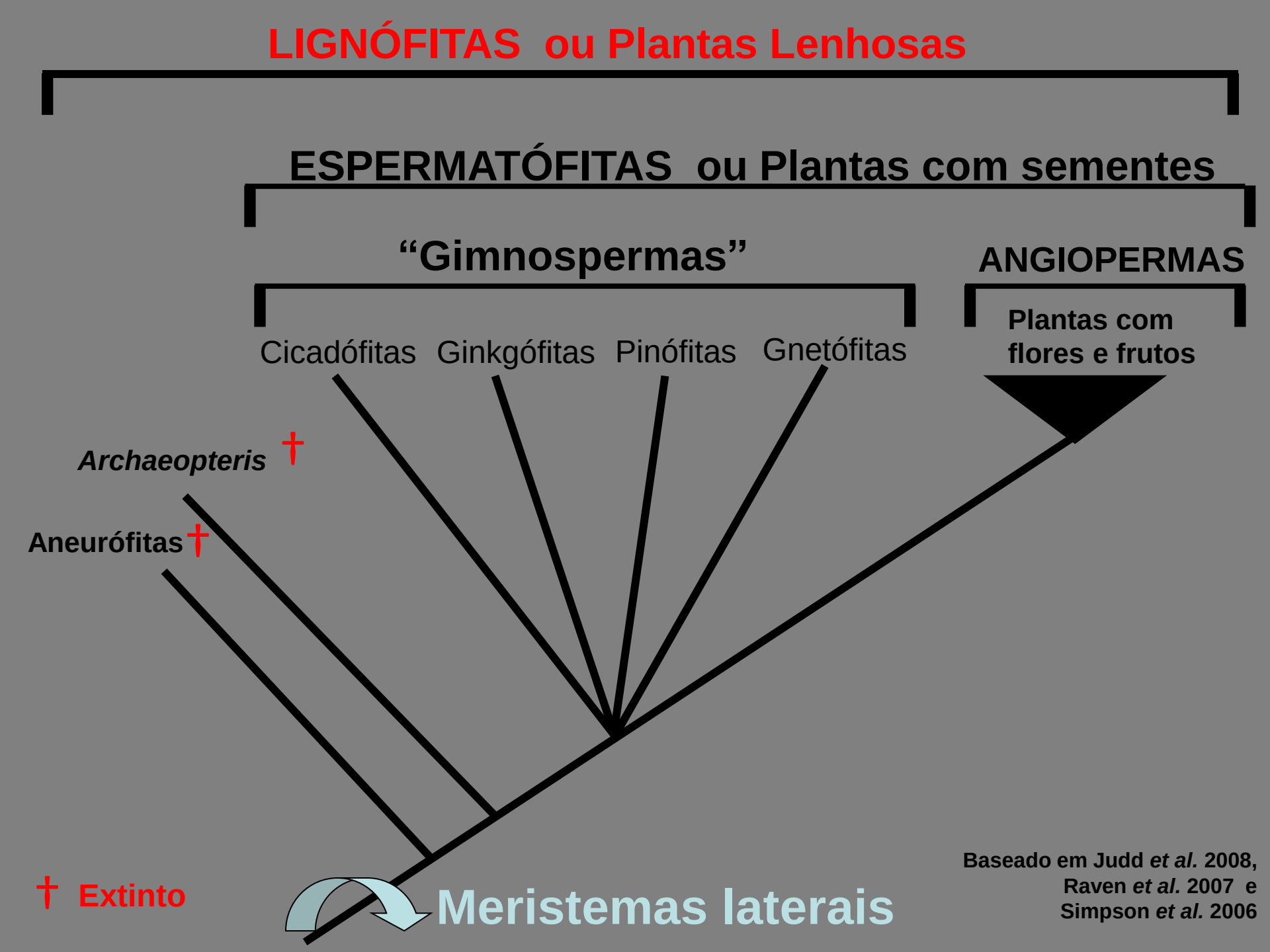
Sigillaria

LIGNÓFITAS ou Plantas Lenhosas

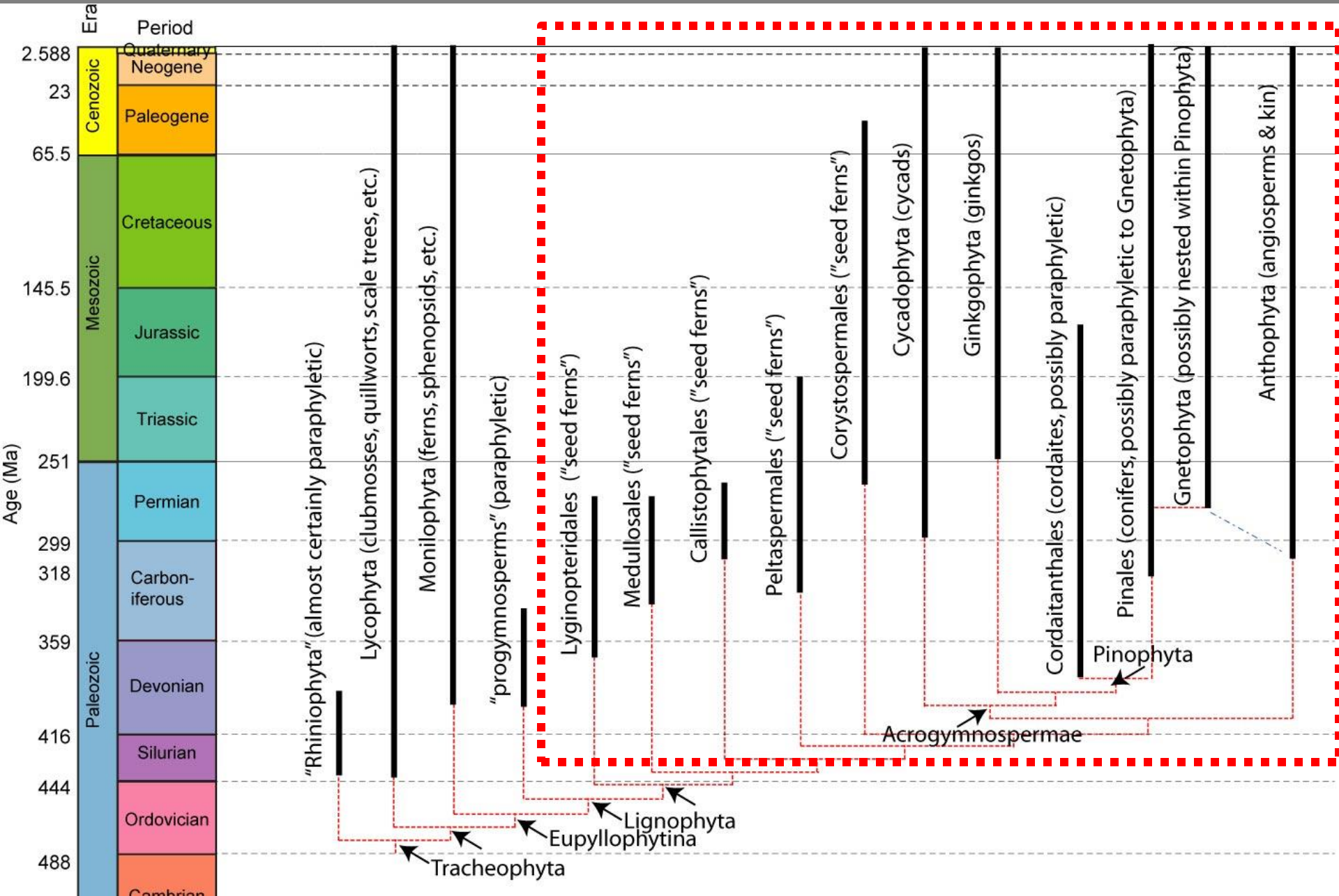


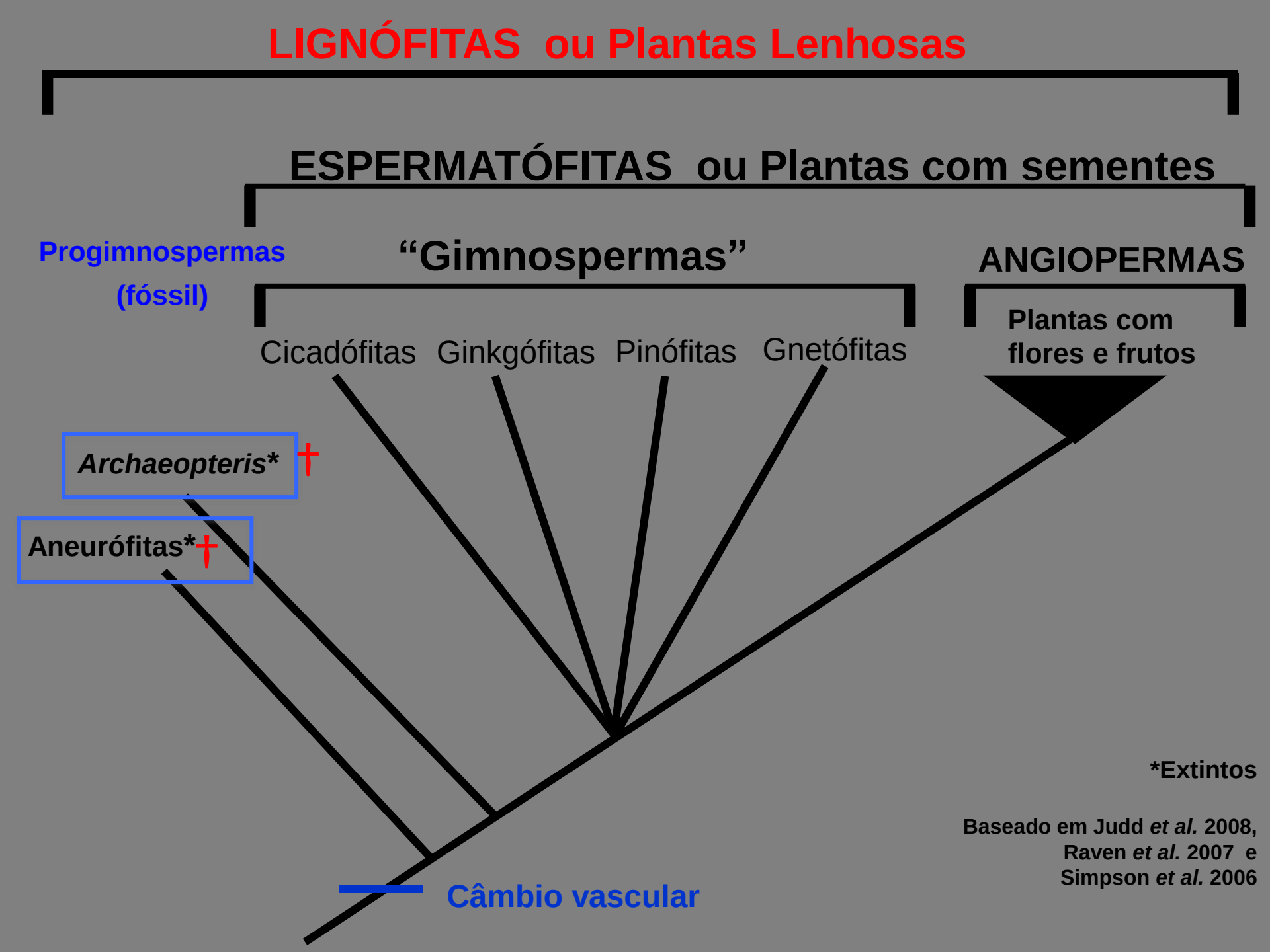
Raven et al. 2014


LIGNÓFITAS ou Plantas Lenhosas
ESPERMATÓFITAS ou Plantas com sementes
“Gimnospermas”
ANGIOPERMAS
Cicadófitas
Ginkgófitas
Pinófitas
Gnetófitas
Plantas com flores e frutos
Archaeopteris †
Aneurófitas †
† Extinto
Novidades evolutivas
Baseado em Judd et al. 2008, Raven et al. 2007 e Simpson et al. 2006


LIGNÓFITAS ou Plantas Lenhosas
ESPERMATÓFITAS ou Plantas com sementes
“Gimnospermas”
ANGIOPERMAS
Cicadófitas
Ginkgófitas
Pinófitas
Gnetófitas
Plantas com flores e frutos
Archaeopteris †
Aneurófitas †
† Extinto
Meristemas laterais
Baseado em Judd et al. 2008, Raven et al. 2007 e Simpson et al. 2006

Aparecimento das LIGNÓFITAS - O/S ~450 Ma




LIGNÓFITAS ou Plantas Lenhosas
ESPERMATÓFITAS ou Plantas com sementes
Progimnospermas
(fóssil)
“Gimnospermas”
ANGIOPERMAS
Cicadófitas
Ginkgófitas
Pinófitas
Gnetófitas
Plantas com
flores e frutos
Archaeopteris* †
Aneurófitas* †
Câmbio vascular
*Extintos
Baseado em Judd et al. 2008,
Raven et al. 2007 e
Simpson et al. 2006

Progimnospermas

Floresta do Carbonífero

Giffortd & Foster 1989

PROGIMNOSPERMAS (fóssil) † Extinto

Devoniano médio ao Carbonífero inferior

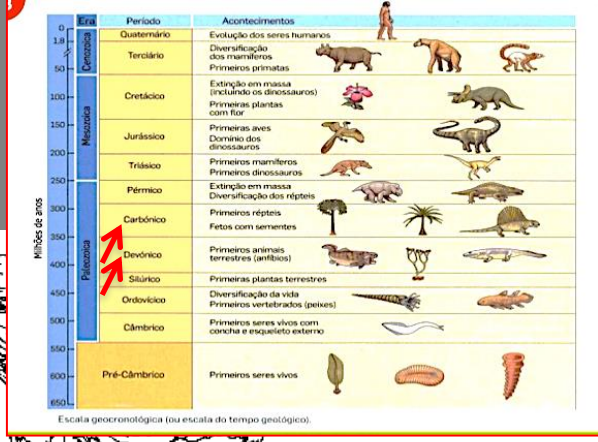
- ANEUROPHYTALES
- ARCHAEOPTERIDALES

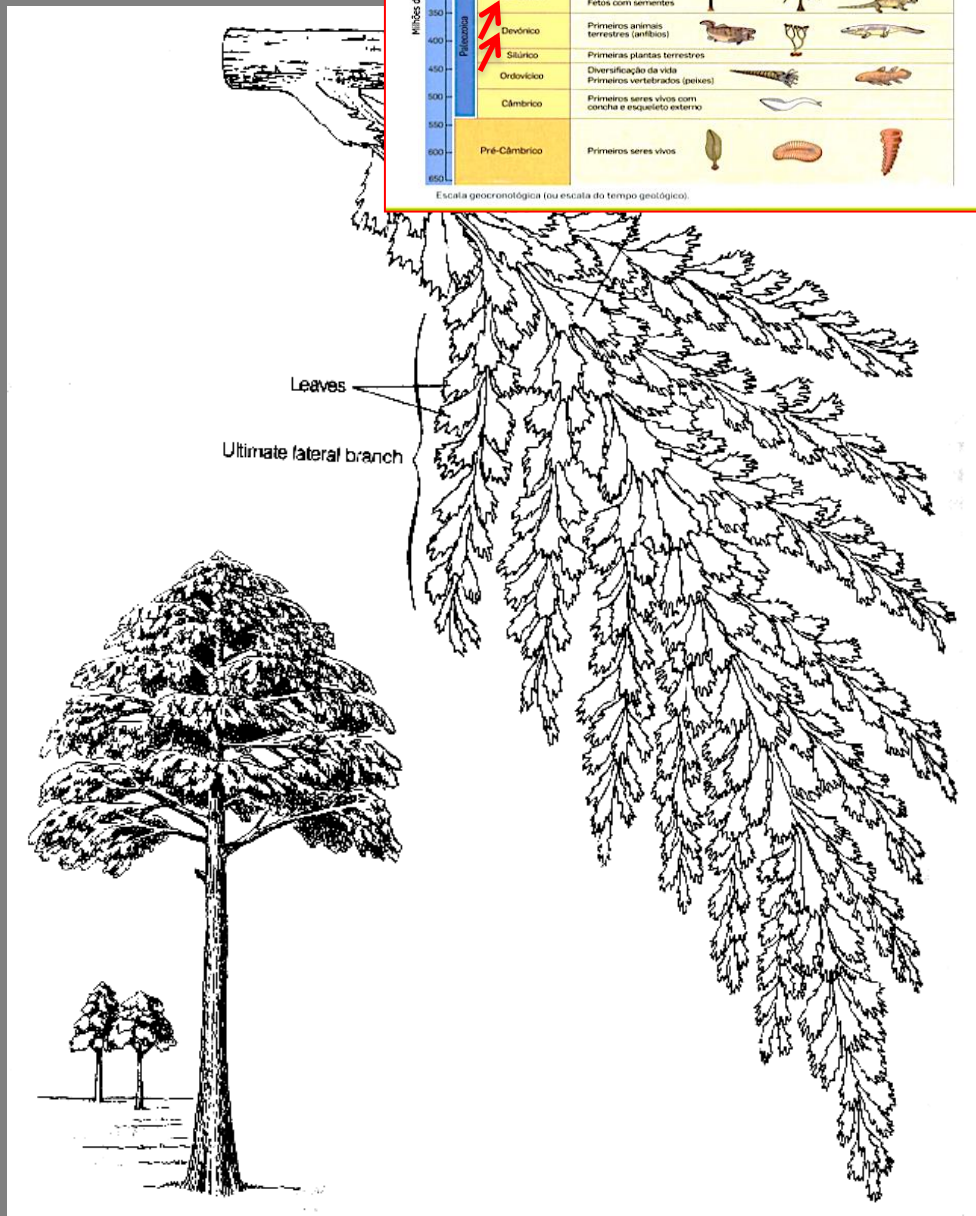
Beck 1960:

Archaeopteris

✓caule de “gimnosperma” (***Callixylon***) +

✓folhas semelhantes às de monilófitas (***Archaeopteris***)





traqueídes

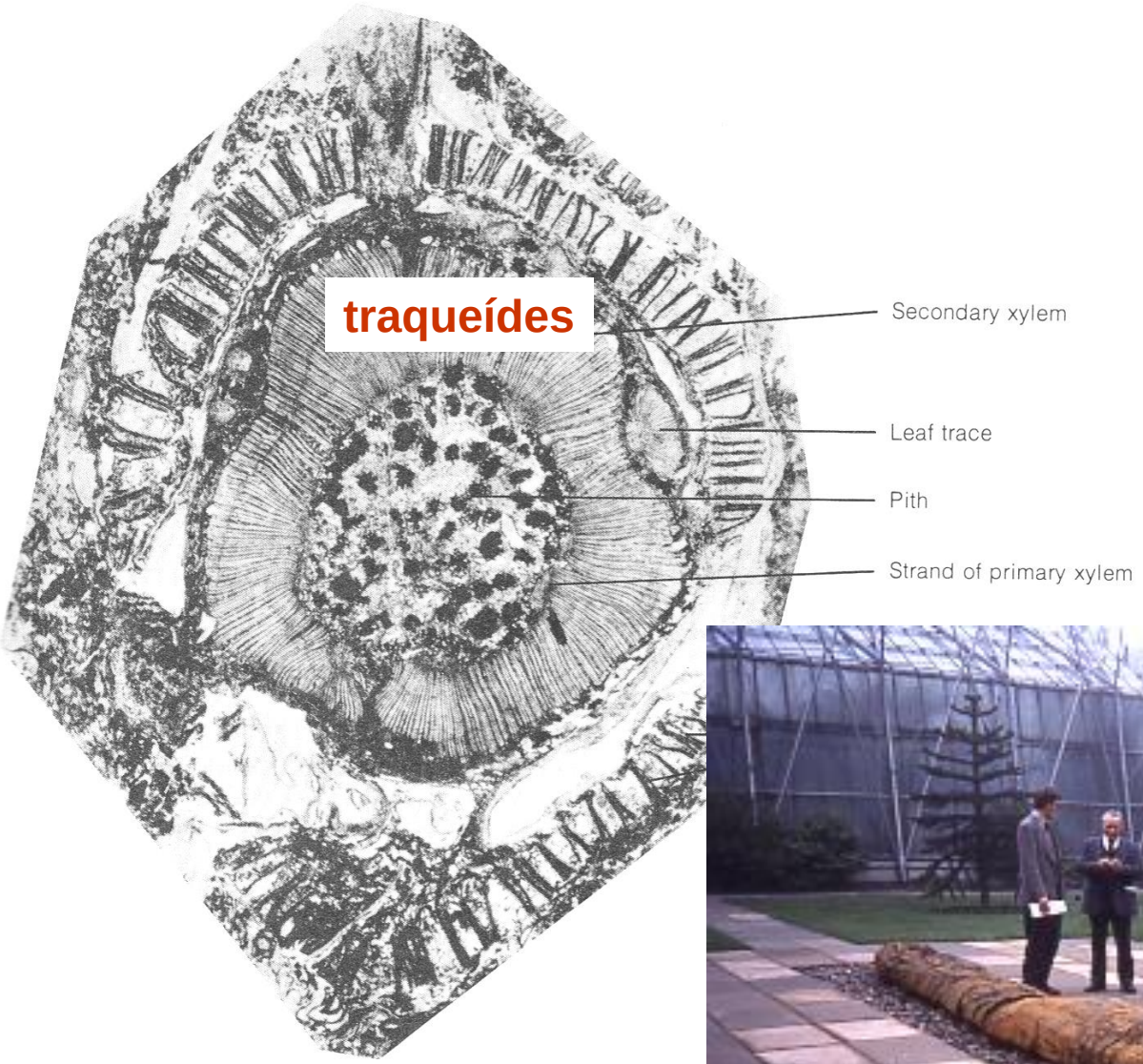
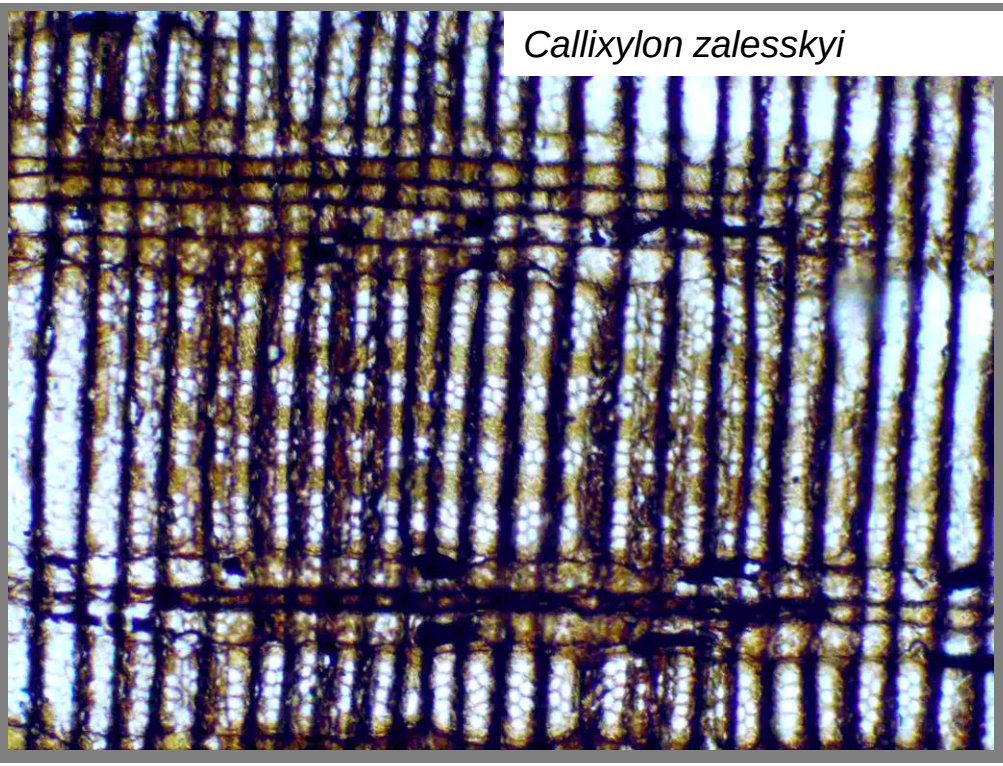


FIGURE 15-2 Transection of stem of *Lyginopteris ola*
strands, leaf traces, and the well-developed cylinder o
characteristic network of fibrous strands in the outer
the Study of Fossil Plants by J. Walton. Adam and Ch

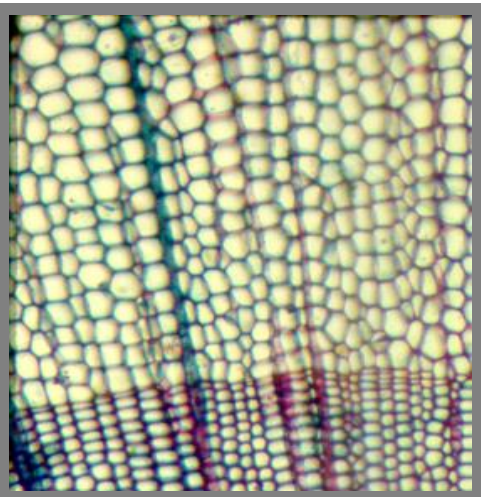
Xilema secundário **fóssil** de **progymnosperma** - Archaeopterilales

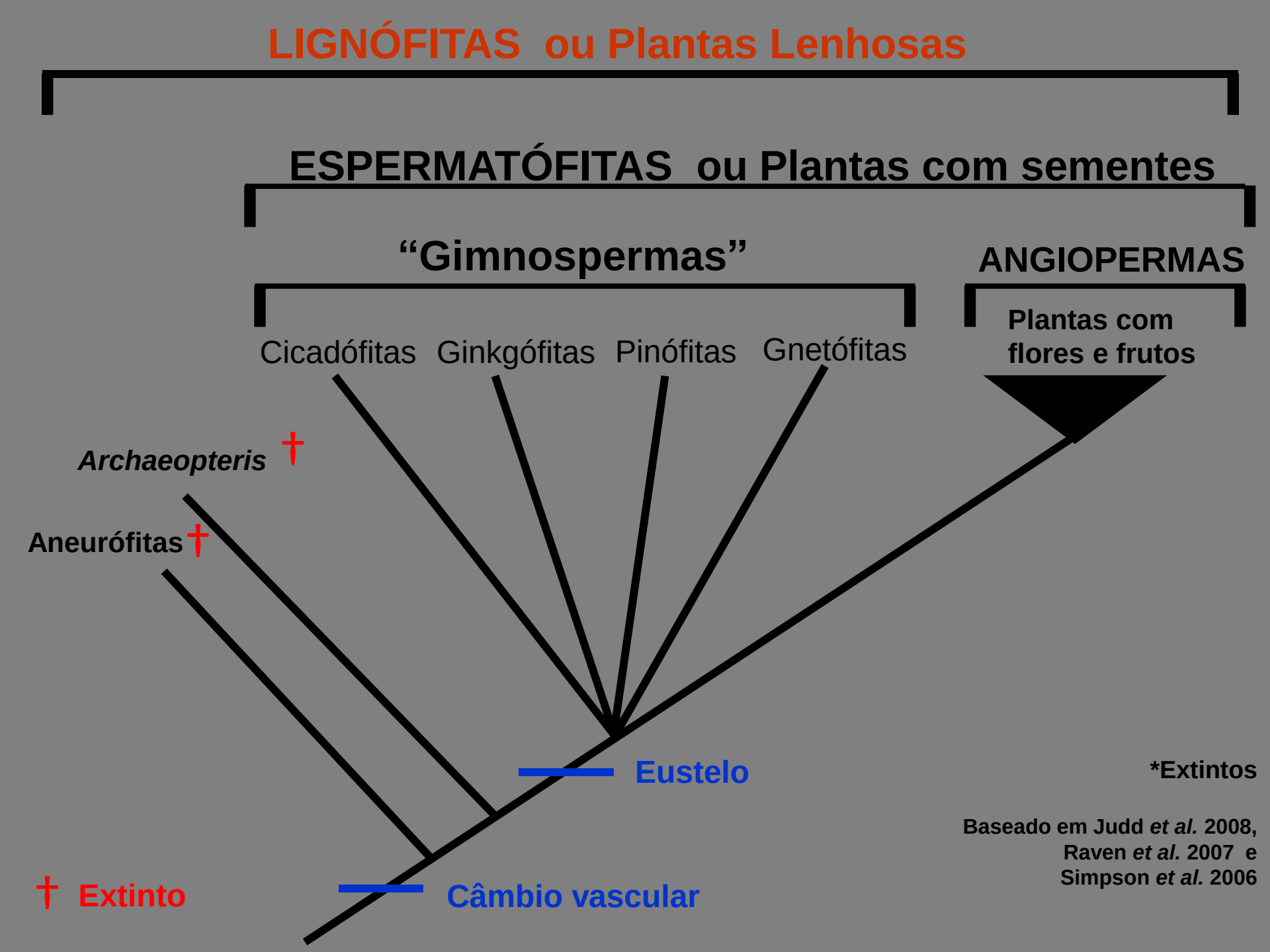


Callixylon zalesskyi

Galtier 2005

Xilema secundário **atual** de **"gimnosperma"** – Pinófita: *Pinus* sp. Pinaceae




LIGNÓFITAS ou Plantas Lenhosas
ESPERMATÓFITAS ou Plantas com sementes
“Gimnospermas”
ANGIOPERMAS
Cicadófitas
Ginkgófitas
Pinófitas
Gnetófitas
Plantas com flores e frutos
Archaeopteris †
Aneurófitas †
Eustelo
Câmbio vascular
† Extinto
*Extintos
Baseado em Judd et al. 2008, Raven et al. 2007 e Simpson et al. 2006

EMBRIÓFITAS

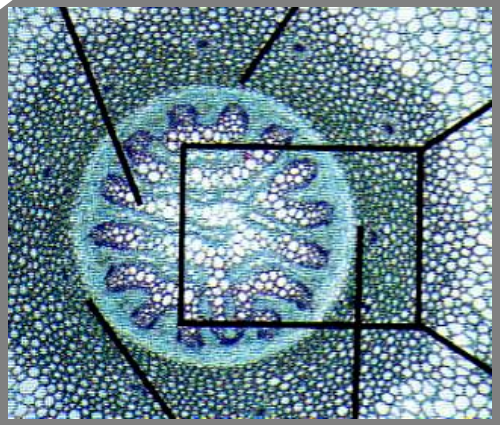
Traqueófitas

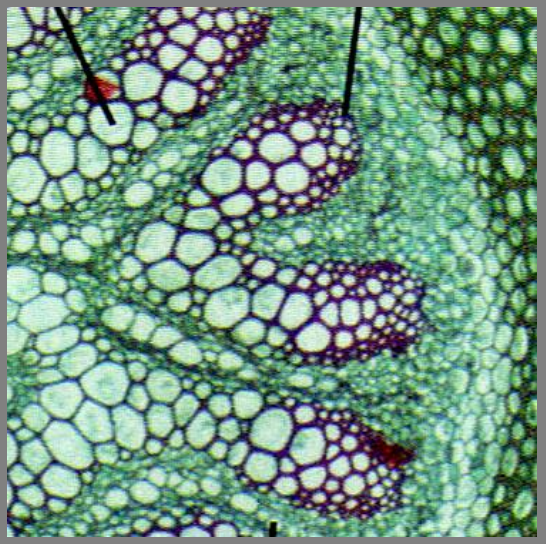
Eufilófitas

Hep. Musci Antoc. Licófitas Monilófitas Espermatófitas

ESTELO

Protostelo





Lycopodium
Licófita

EMBRIÓFITAS

Traqueófitas

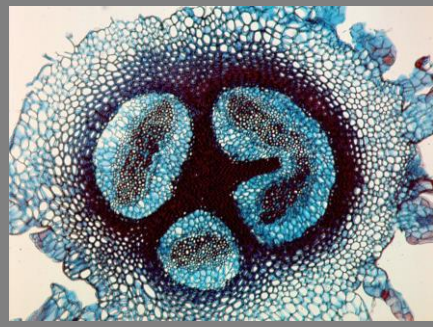
Eufilófitas

Hep. Musci Antoc. Licófitas Monilófitas Espermatófitas

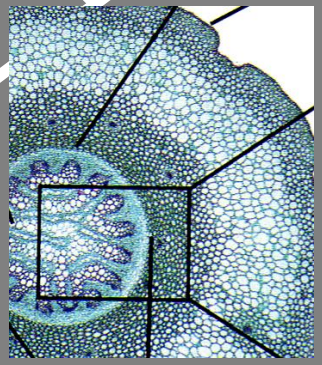
ESTELO

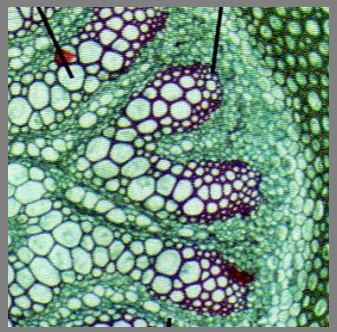
Sifonostelo

Protostelo



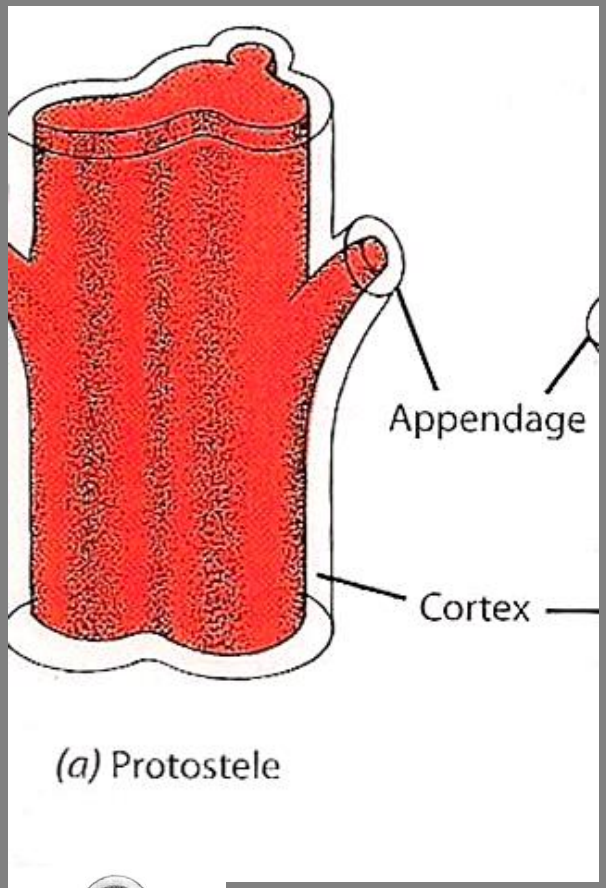
Adianthum
Monilófita

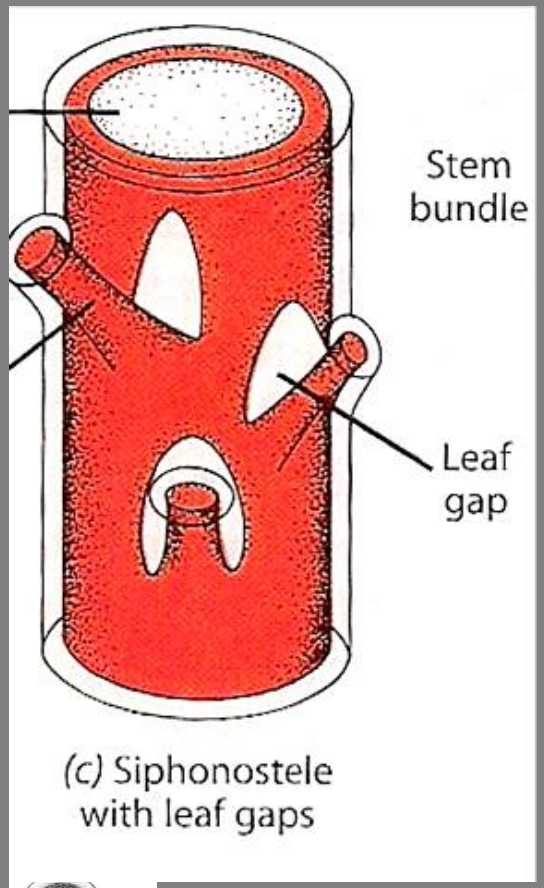


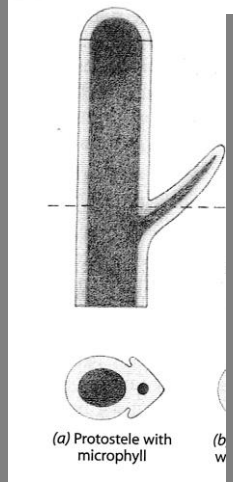


Lycopodium
Licófita

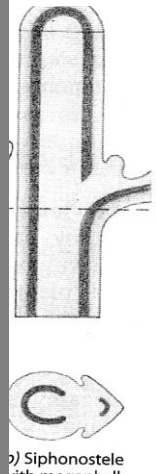
Estelo





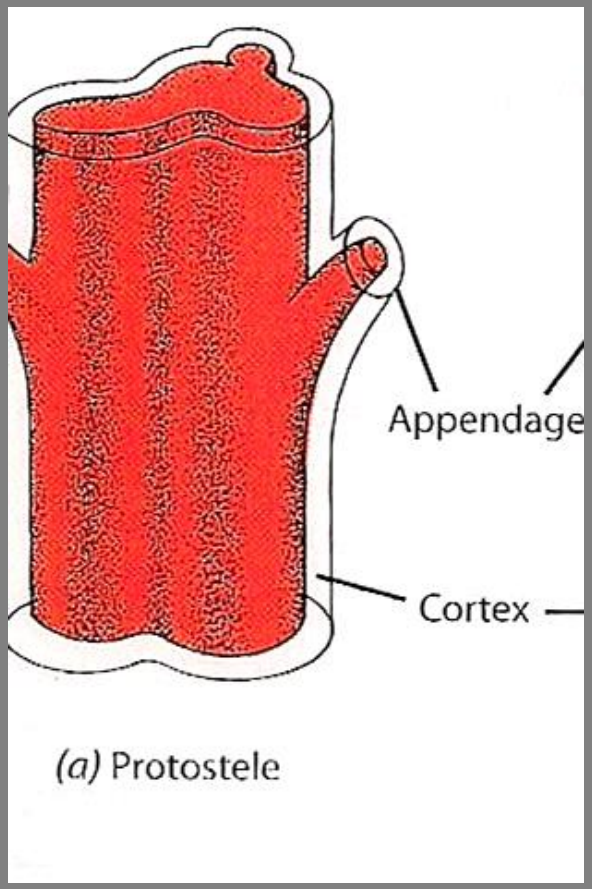


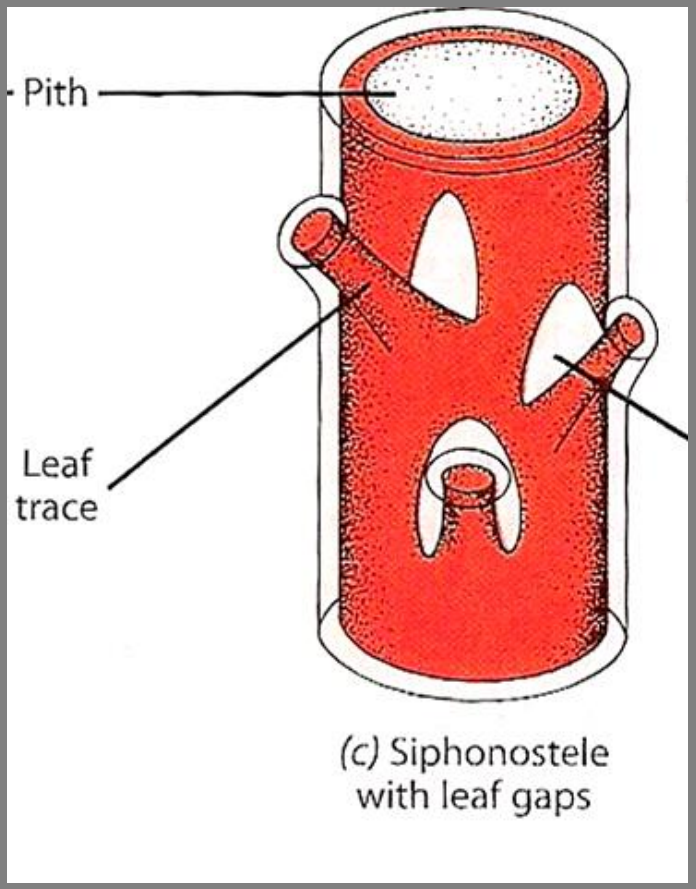
Caule de LICÓFITAS e em TODAS AS RAÍZES das plantas vasculares



Caule de Eufilófitas= Megáfilas

Sifonostelo: como surgiu uma região parenquimática central durante a evolução?

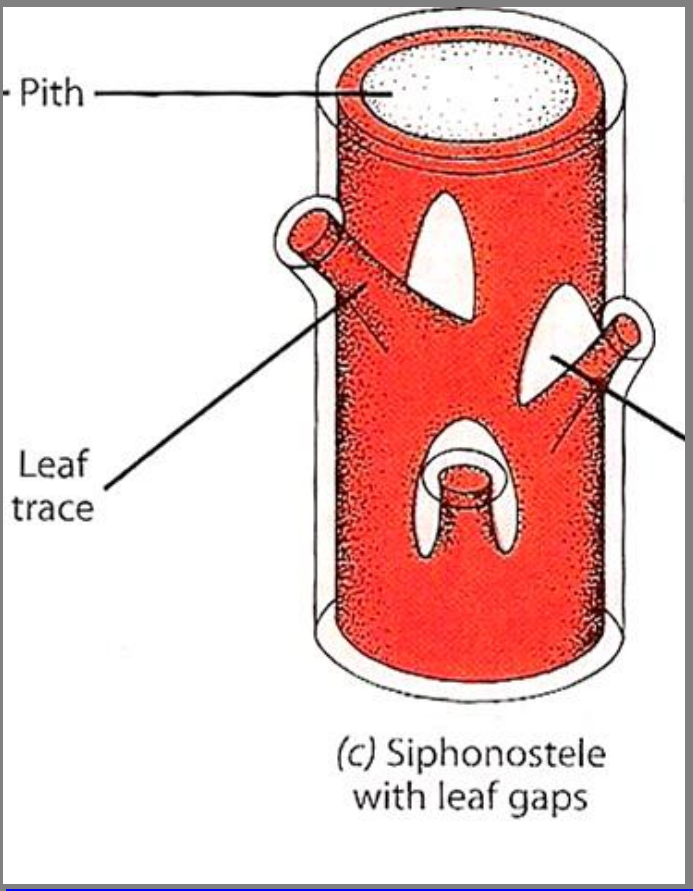




<u>Teoria da "expansão</u>": a porção central não se diferencia em tecido vascular (xilema e floema primários)
E, o parênquima central é morfologicamente vascular.

Tal teoria se aplica às raízes que têm "medula": é um tecido de origem vascular

Sifonostelo: como surgiu uma região parenquimática central durante a evolução?



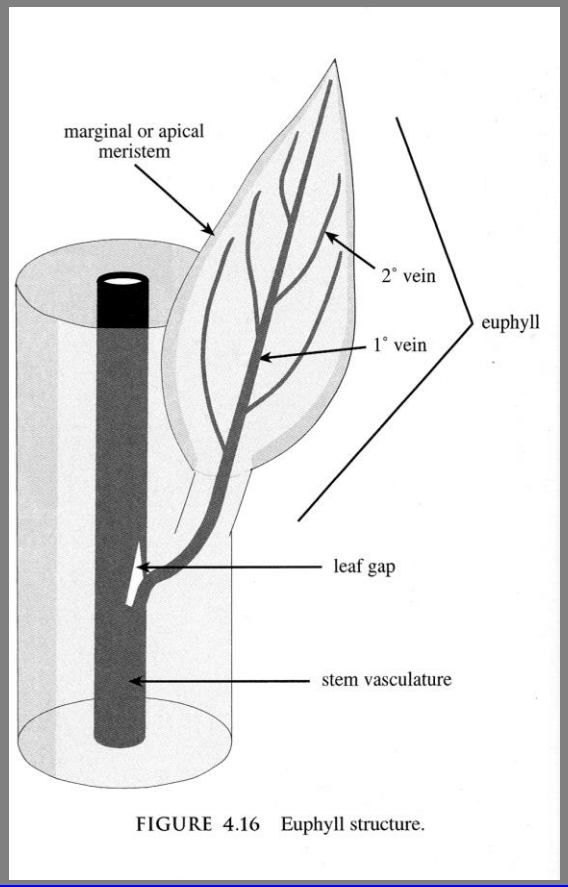
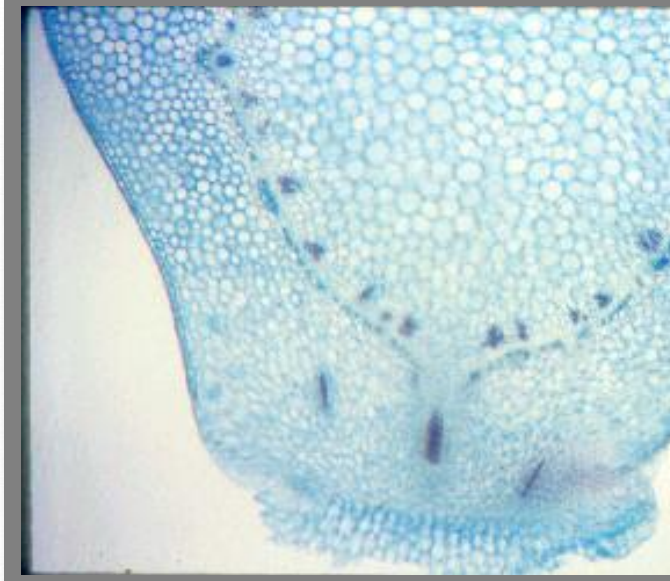
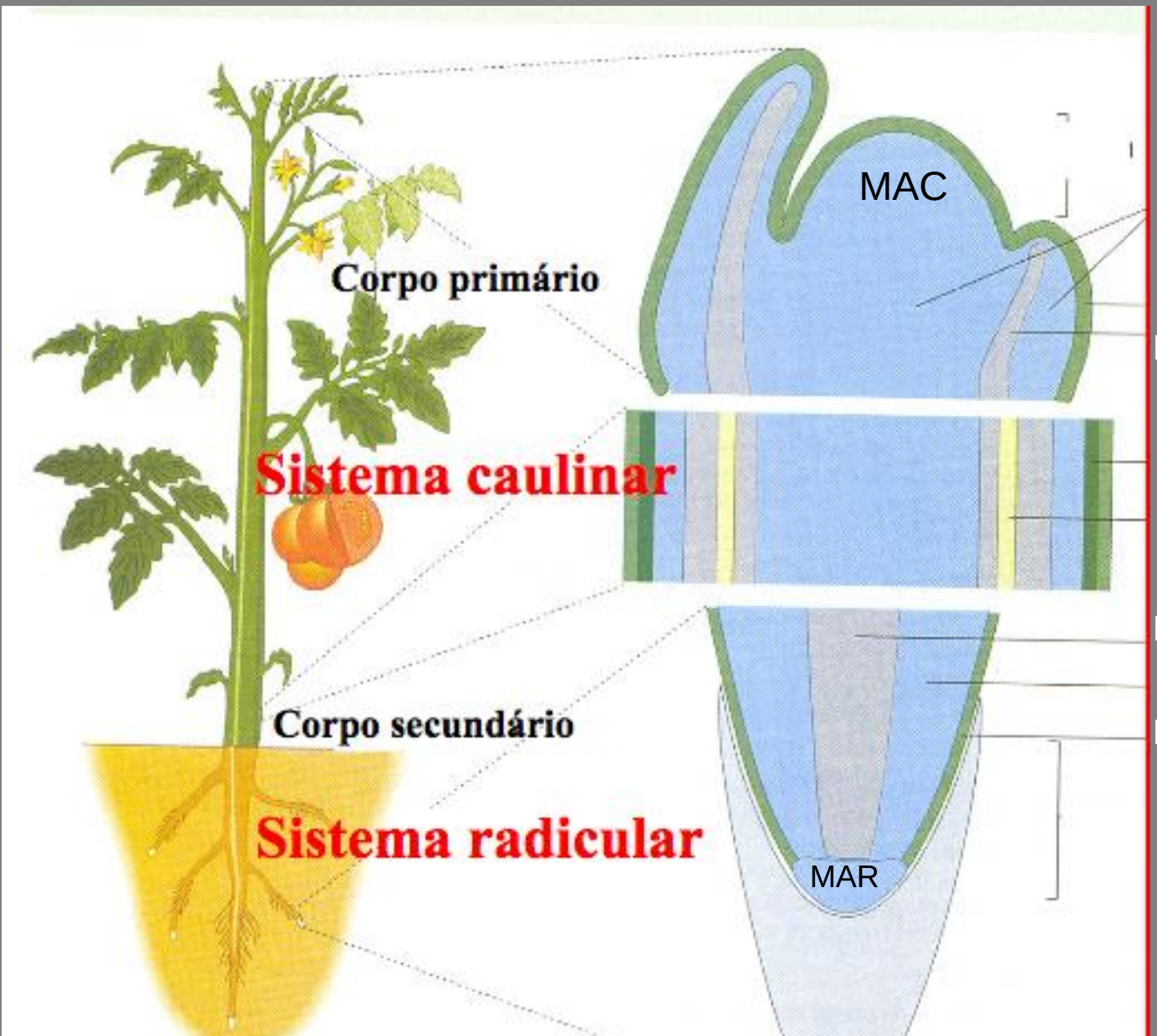


FIGURE 4.16 Euphyll structure.

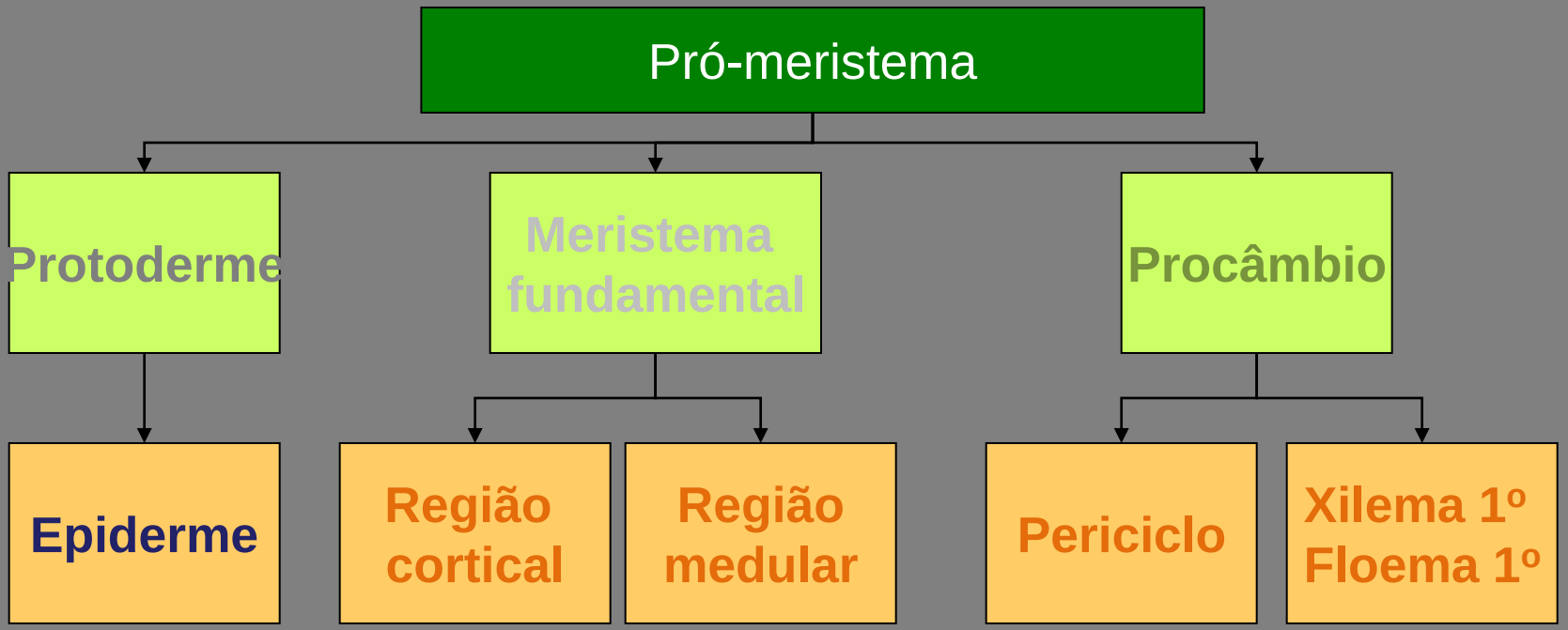


<u>Teoria da invasão</u>: córtex invade o cilindro central por meio das lacunas foliares

Se aplica aos caules


Corpo primário
Sistema caulinar
Corpo secundário
Sistema radicular
MAC
MAR
Meristema fundamental
Protoderme
Procâmbio
Procâmbio
Meristema fundamental
Protoderme

Corpo primário da planta



EMBRIÓFITAS

Traqueófitas

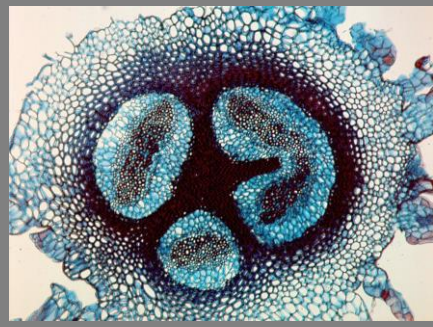
Eufilófitas

Hep. Musci Antoc. Licófitas Monilófitas Espermatófitas

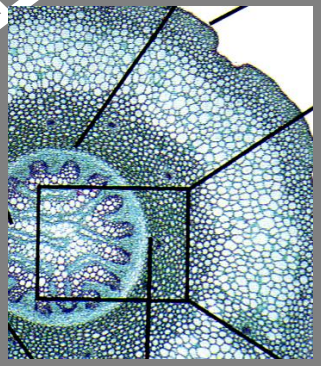
Sifonostelo

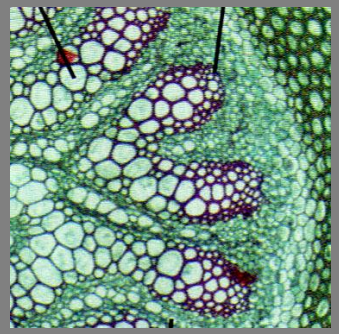
Protostelo

ESTELO

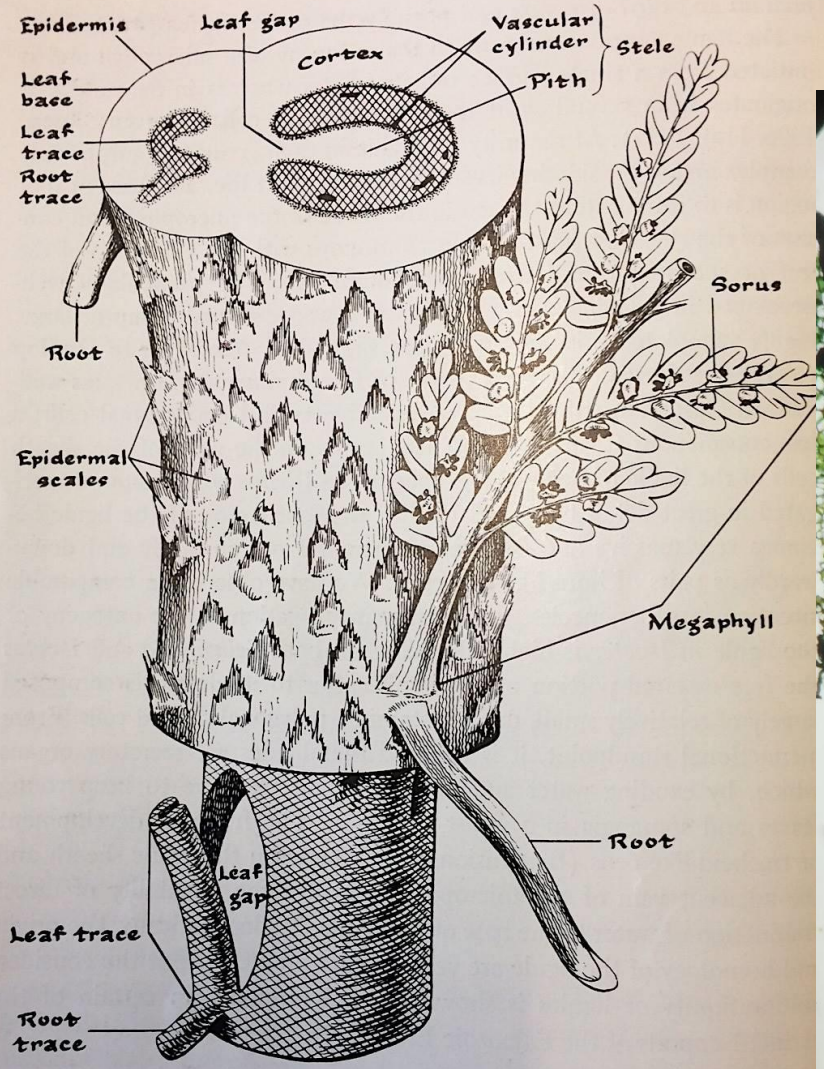


Adianthum
Monilófita





Lycopodium
Licófita



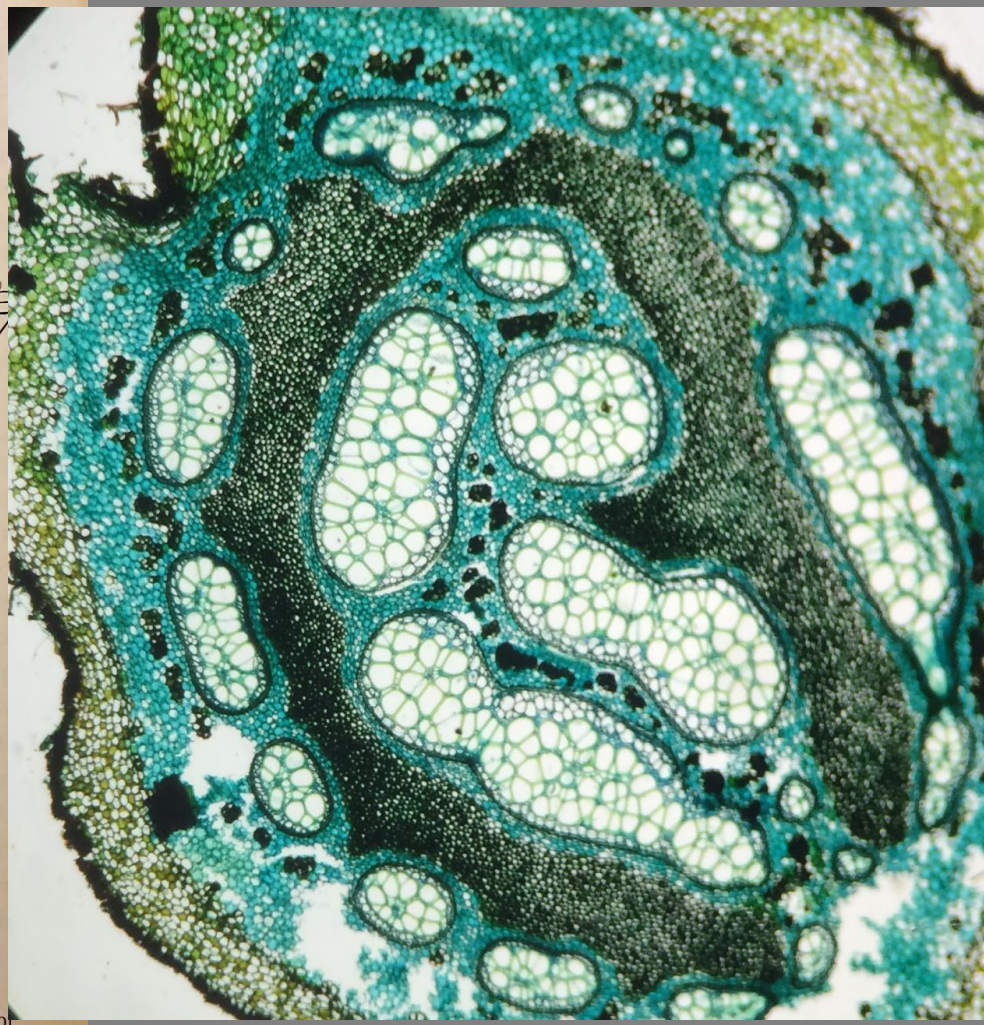


Figure 3-5 Organography and general vascular anatomy of a small portion of a fern shoot. A pinnatified megaphyll with its abaxial sori is seen in surface view at right. Note that the divergence of a leaf trace into a megaphyll (shown at the top and bottom of the figure) is associated with a leaf-gap in the stele of the stem. [From *The Anatomy of Woody Plants* by E. C. Jeffrey. Chicago: The University of Chicago Press, 1917.]

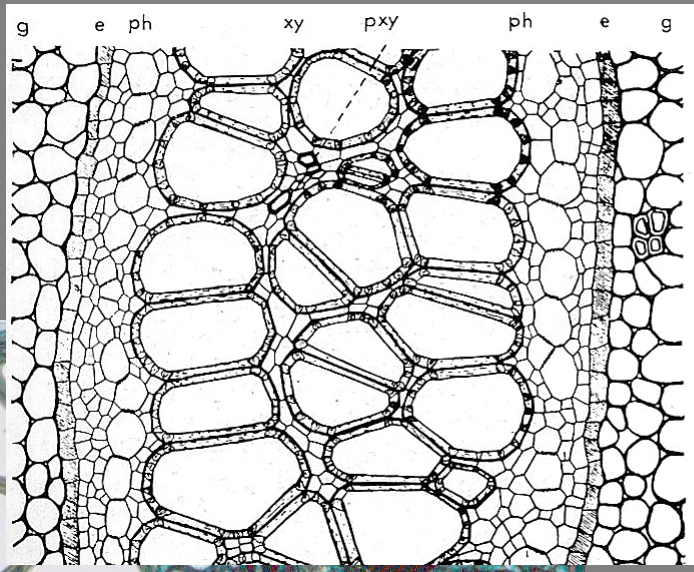
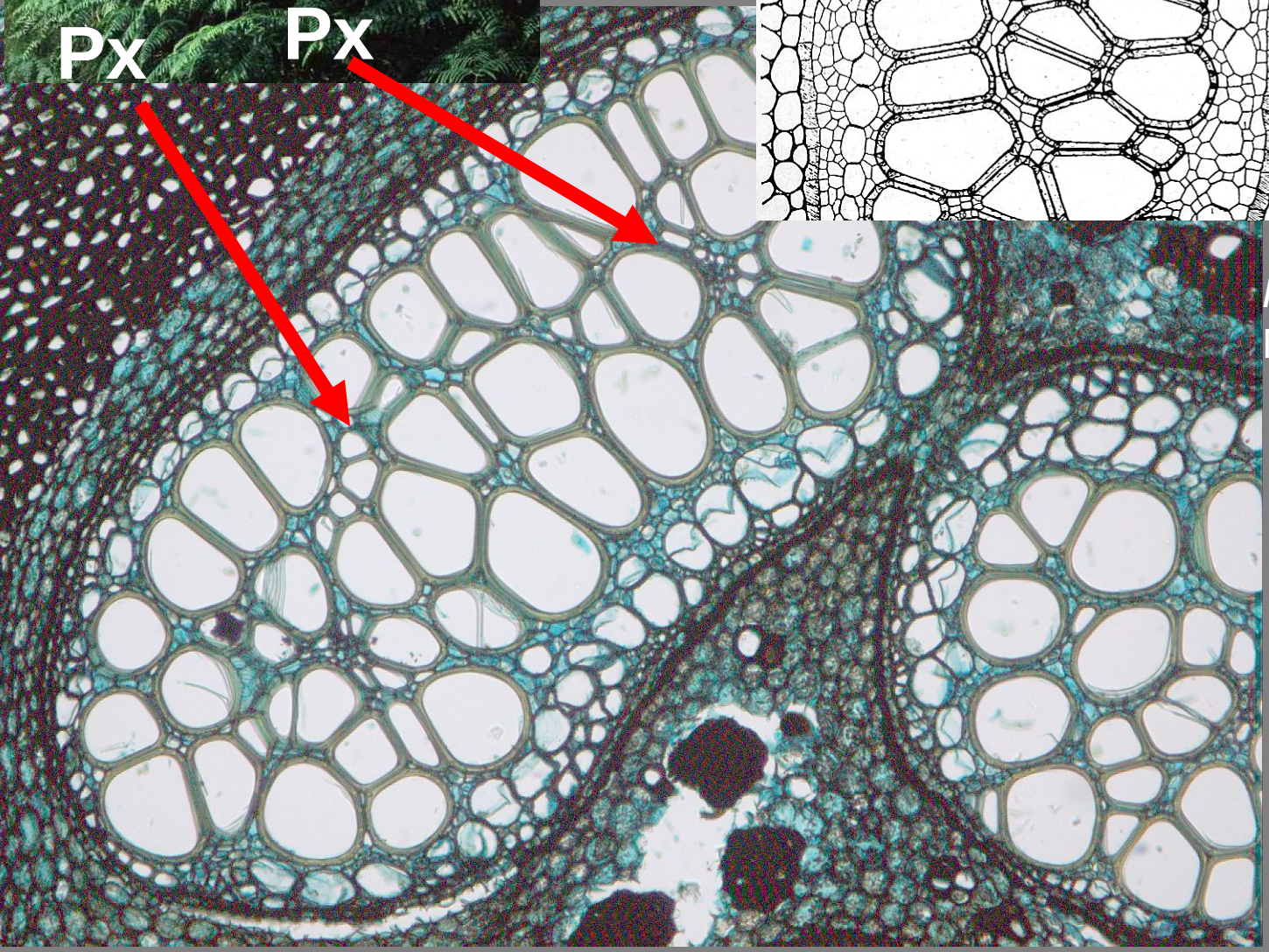
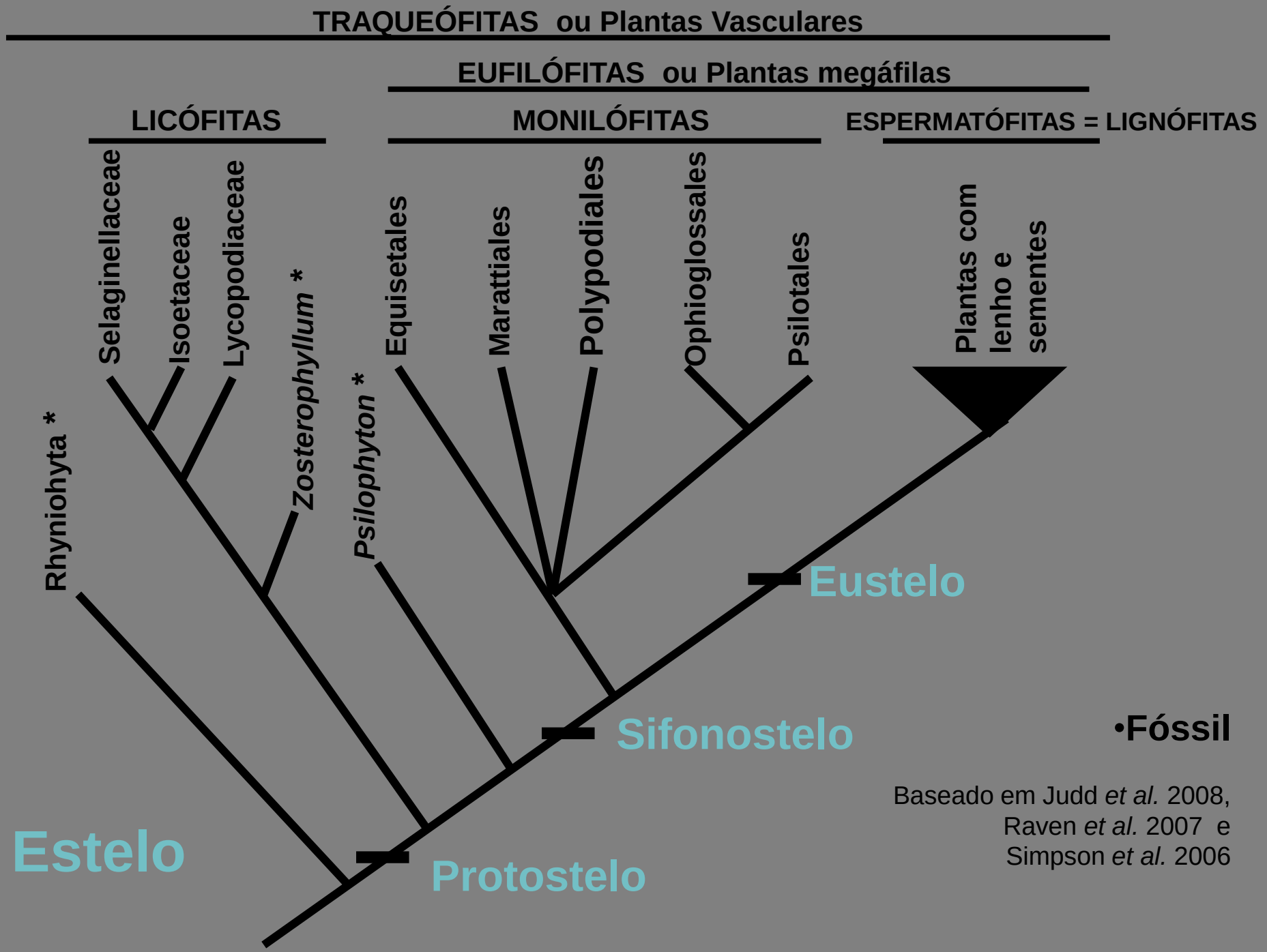


Fig. 27. *Pteridium aquilinum*. Cross-section of a part of the meristele of a rhizome. e: endodermis, g: fundamental tissue, ph: phloem, xy: xylem, p.xy: protoxylem. × 60. (After Bower)

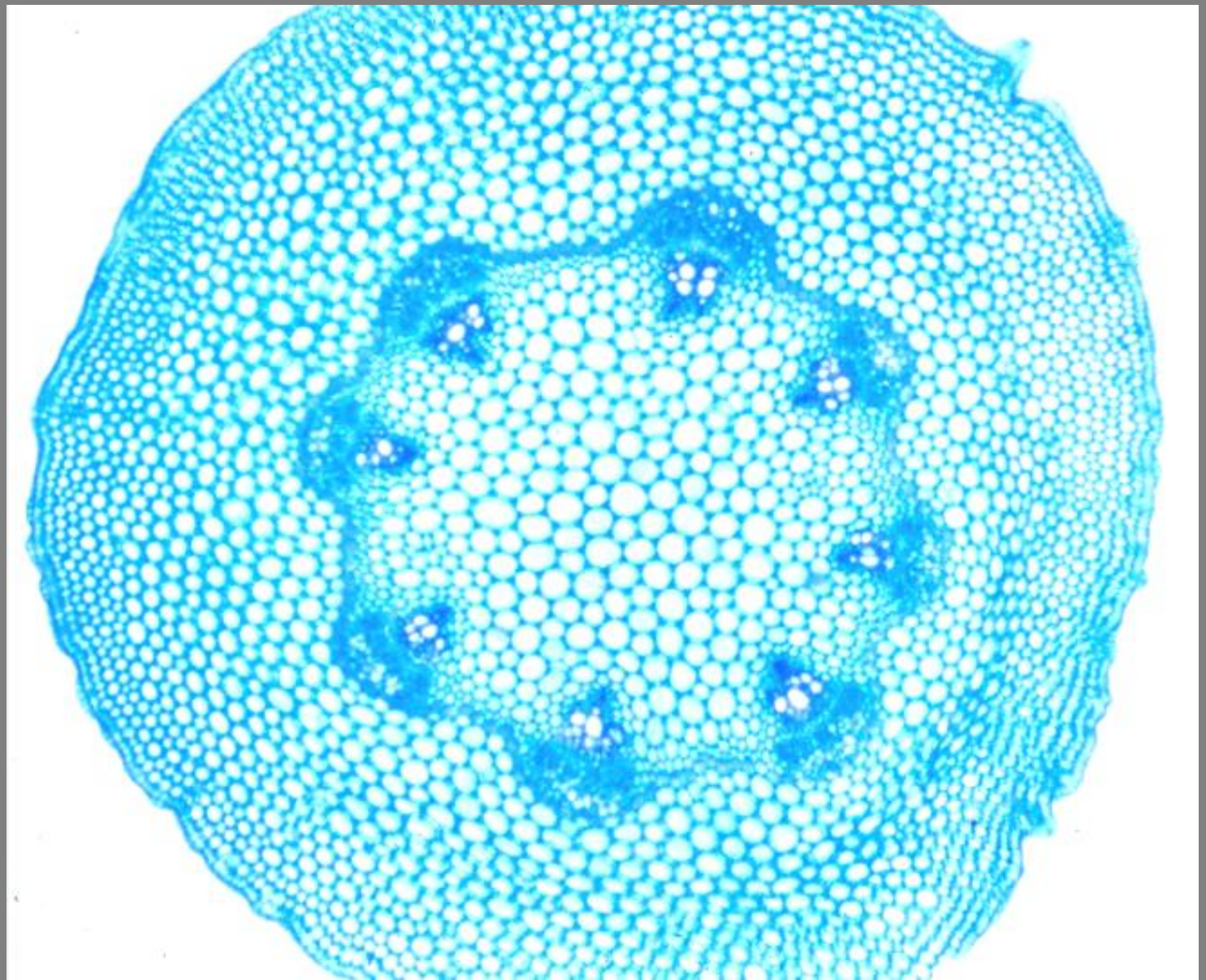


Pteridium aquinilinum
Monilófita

MONILÓFITA:
Xilema mesarco


TRAQUEÓFITAS ou Plantas Vasculares
EUFILÓFITAS ou Plantas megáfilas
LICÓFITAS
MONILÓFITAS
ESPERMATÓFITAS = LIGNÓFITAS
Selaginellaceae
Isoetaceae
Lycopodiaceae
Zosterophyllum *
Rhyniohyta *
Psilophyton *
Equisetales
Marattiales
Polypodiales
Ophioglossales
Psilotales
Plantas com lenho e sementes
Eustelo
Sifonostelo
Protostelo
Estelo
•Fóssil
Baseado em Judd et al. 2008,
Raven et al. 2007 e
Simpson et al. 2006

EUSTELO



Mamona
Ricinus communis
Euphorbiaceae,
Angiosperma

TRAQUEÓFITAS ou Plantas Vasculares

EUFILÓFITAS ou Plantas megáfilas

LICÓFITAS

MONILÓFITAS

ESPERMATÓFITAS = LIGNÓFITAS

Rhyniohyta *

Selaginellaceae

Isoetaceae

Lycopodiaceae

Zosterophyllum *

Psilophyton *

Equisetales

Marattiales

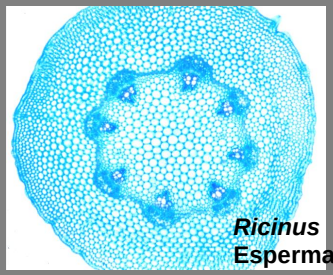
Polypodiales

Ophioglossales

Psilotales

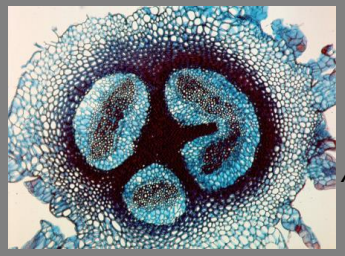
Plantas com lenho e sementes

Eustelo



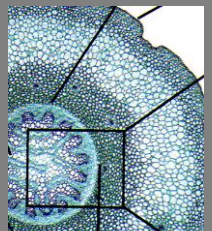
Ricinus
Espermatófita

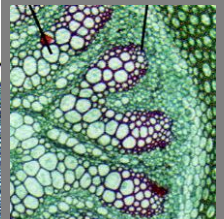
Sifonostelo



Adianthum
Monilófita

Protostelo

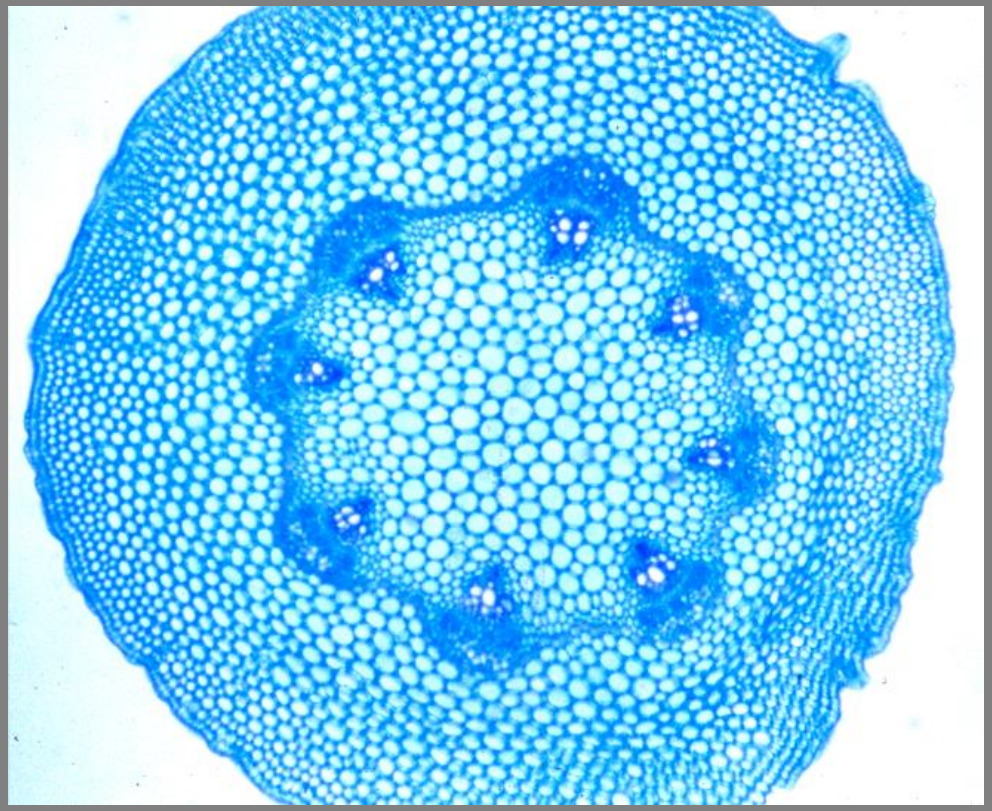


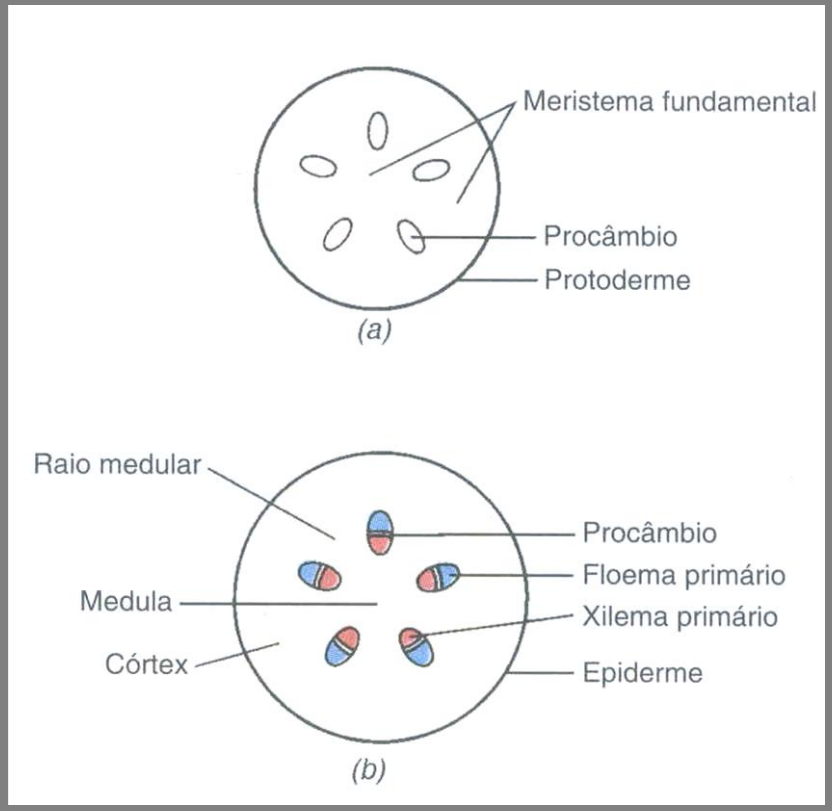


Lycopodium
Licófita

Estelo caulinar

EUSTELO

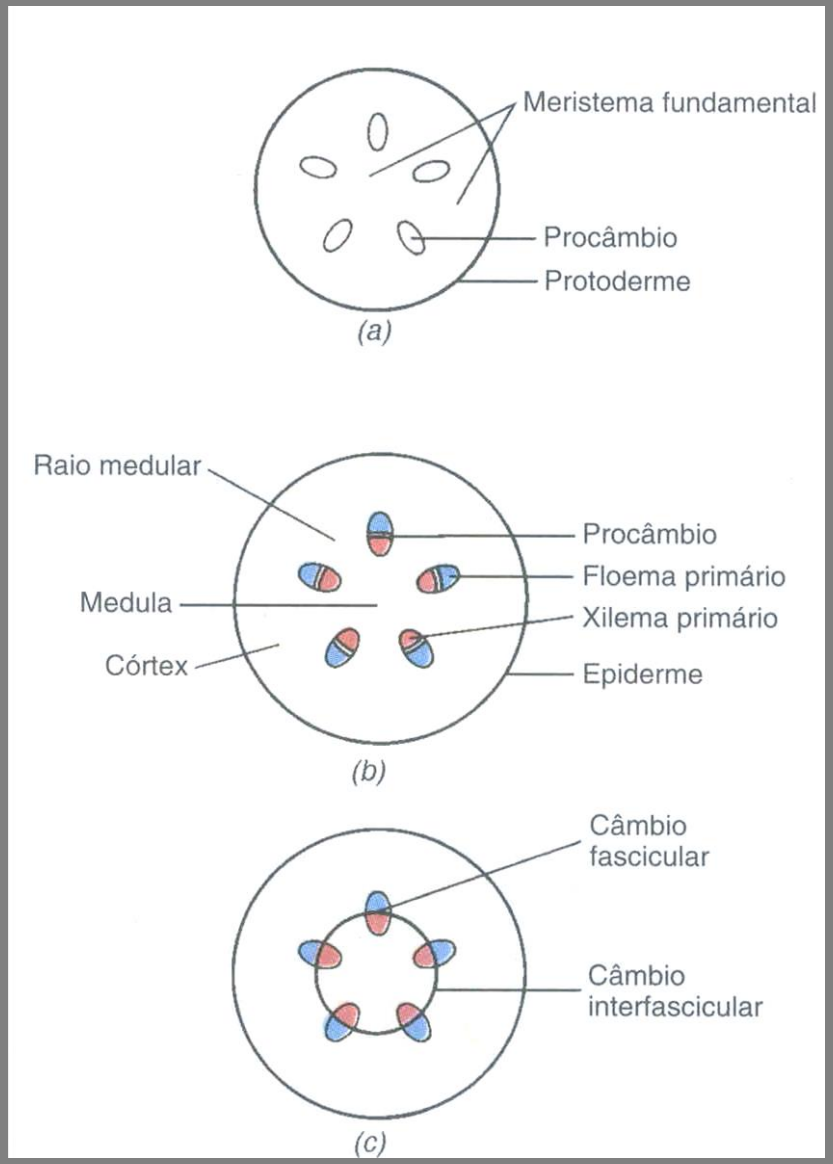


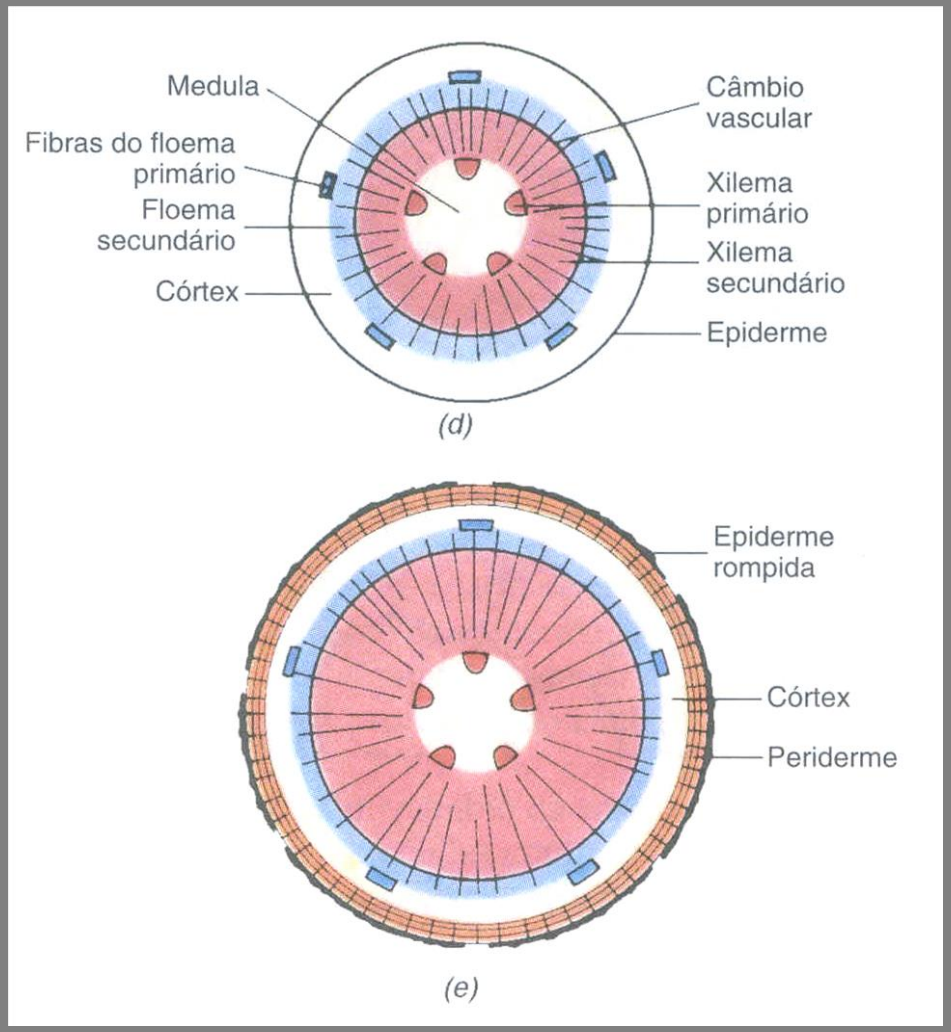


Ricinus communis
Euphorbiaceae, Angiosperma
Espermatófita

Eustelo → Instalação do câmbio vascular

Corpo primário → corpo secundário caulinar

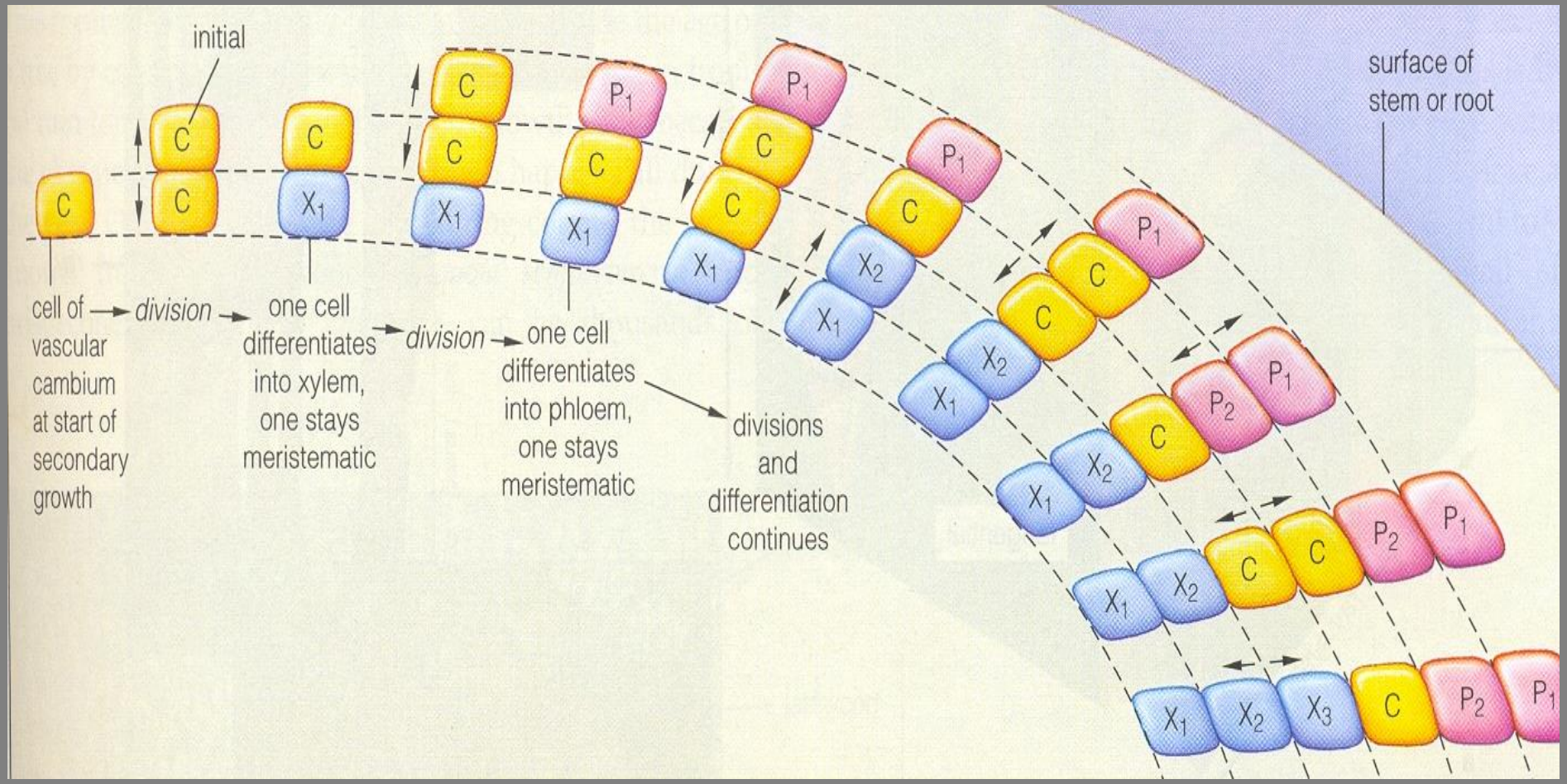


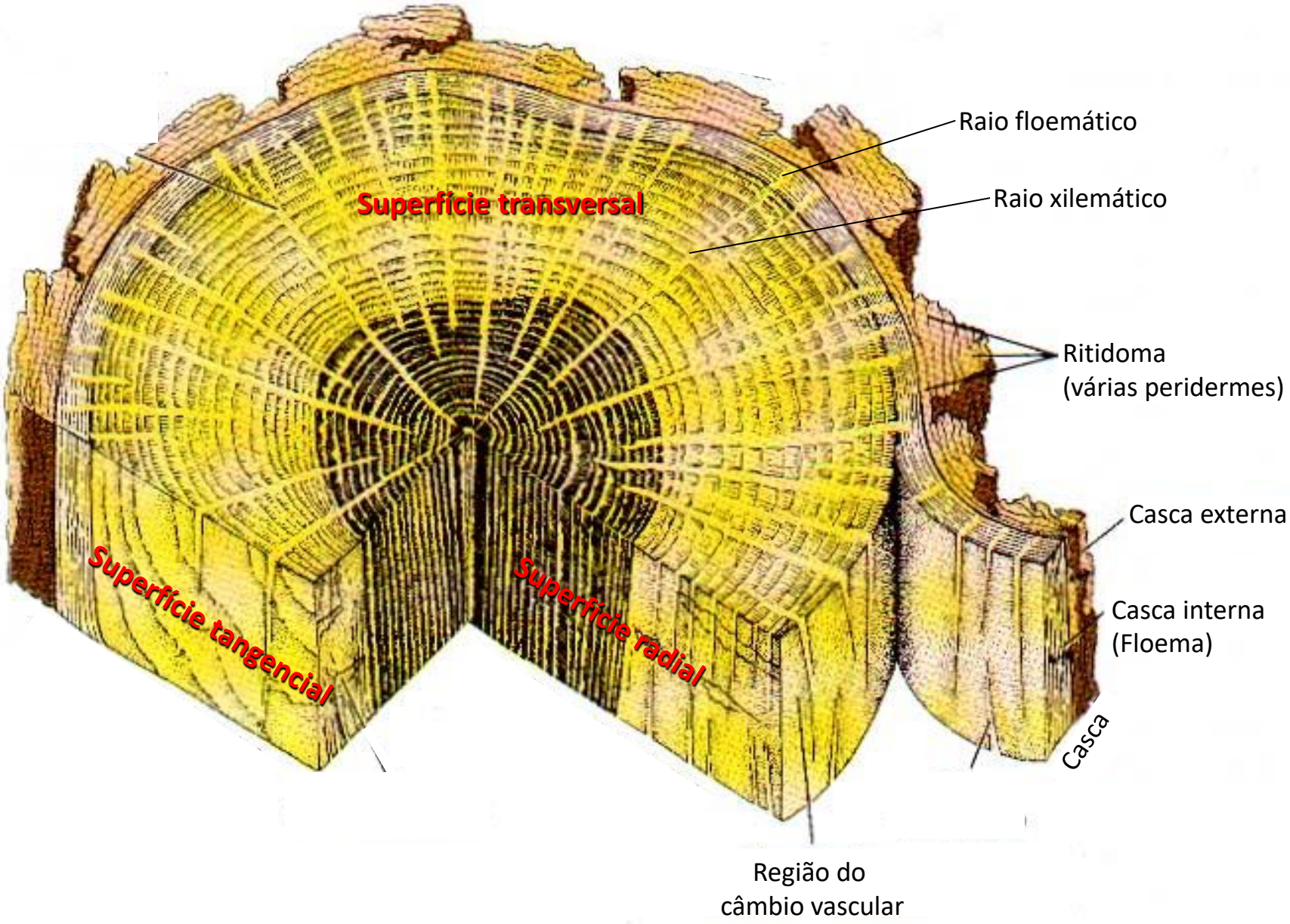


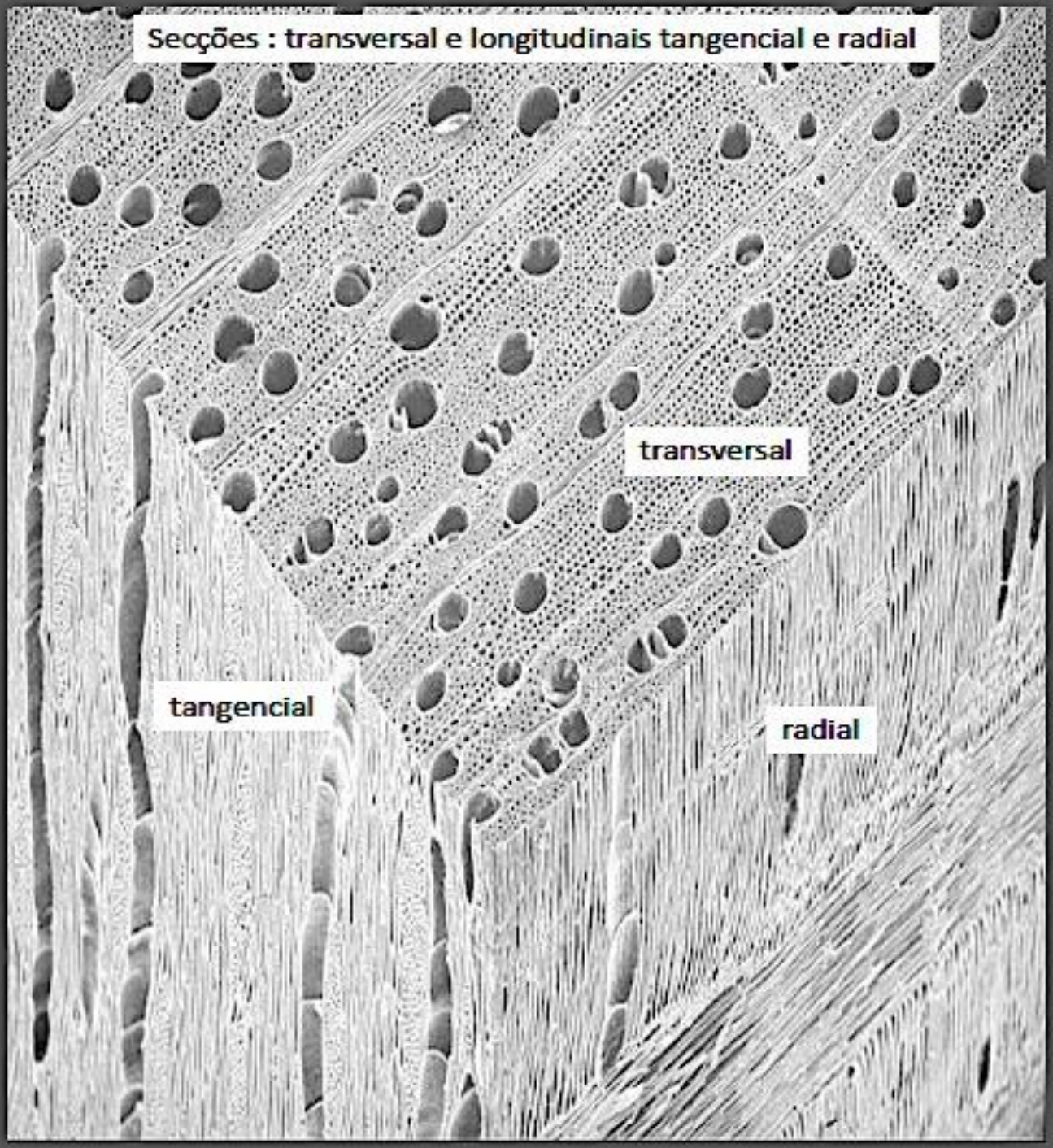
(Raven *et al*. 2001)

A atividade cambial

Divisões mitóticas das iniciais ➡ formação e diferenciação das derivadas

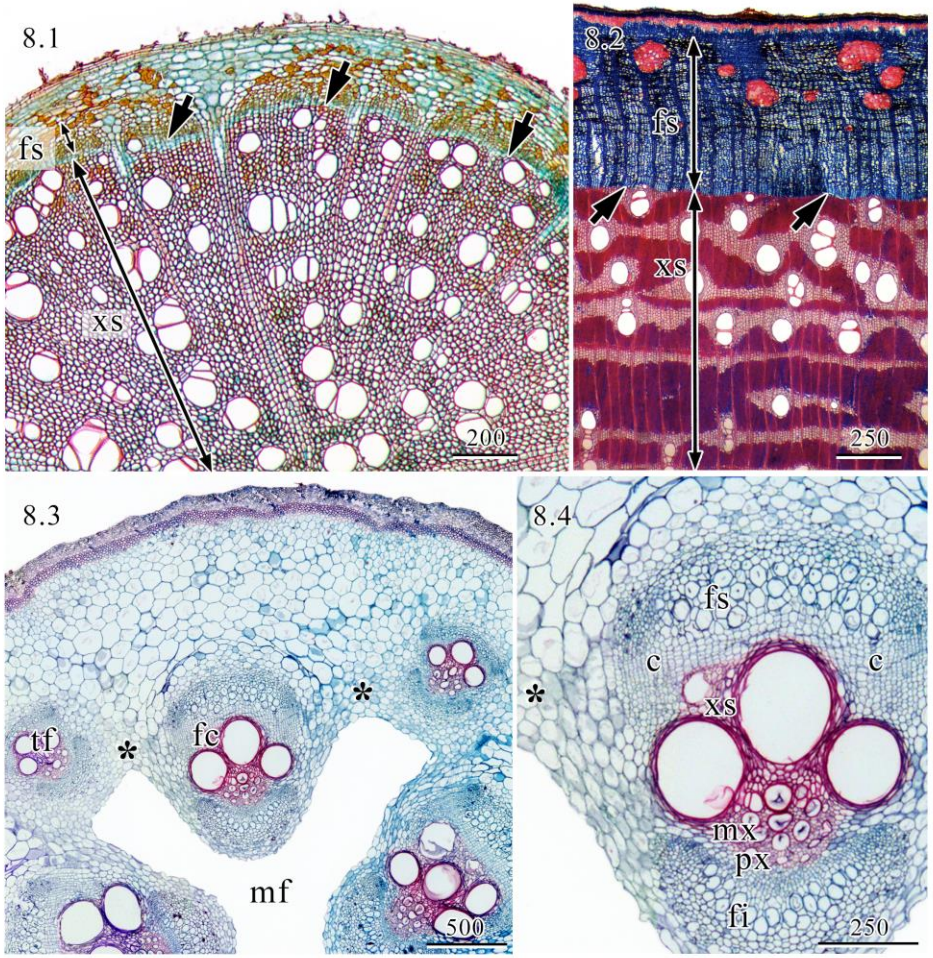


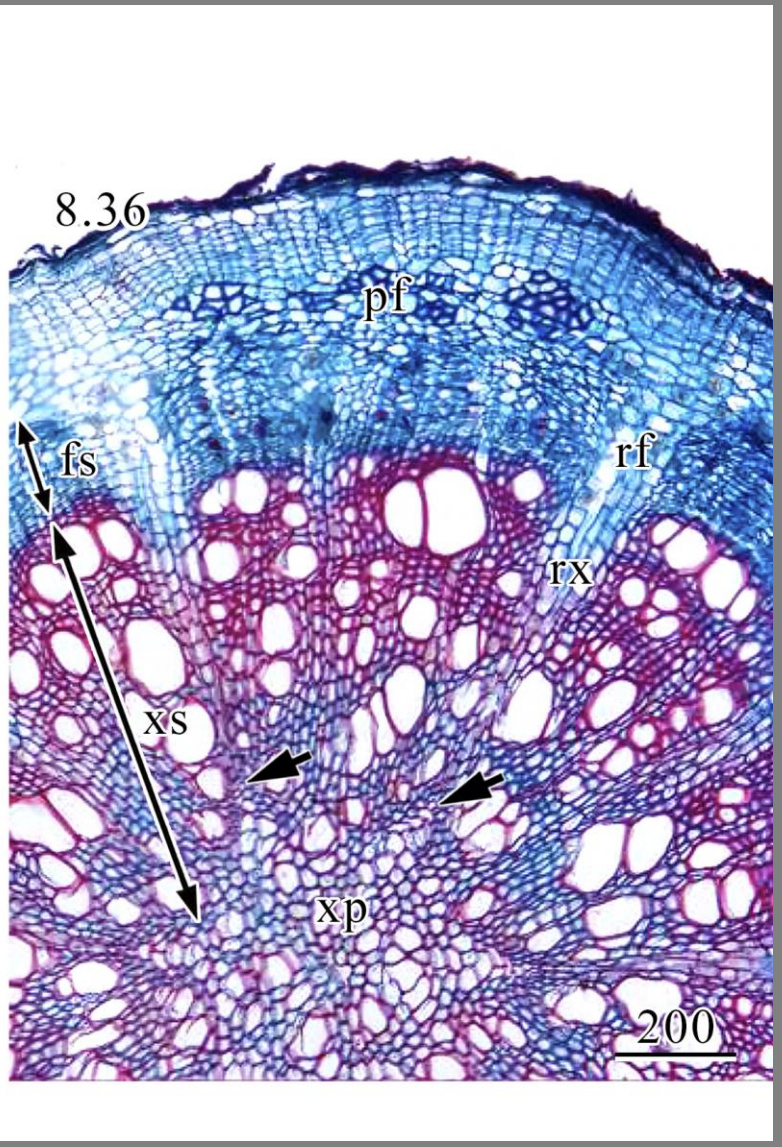

Raio floemático
Raio xilemático
Superfície transversal
Ritidoma
(várias peridermes)
Casca externa
Casca interna
(Floema)
Casca
Superfície tangencial
Superfície radial
Região do
câmbio vascular


Secções : transversal e longitudinais tangencial e radial
transversal
tangencial
radial

CAULE

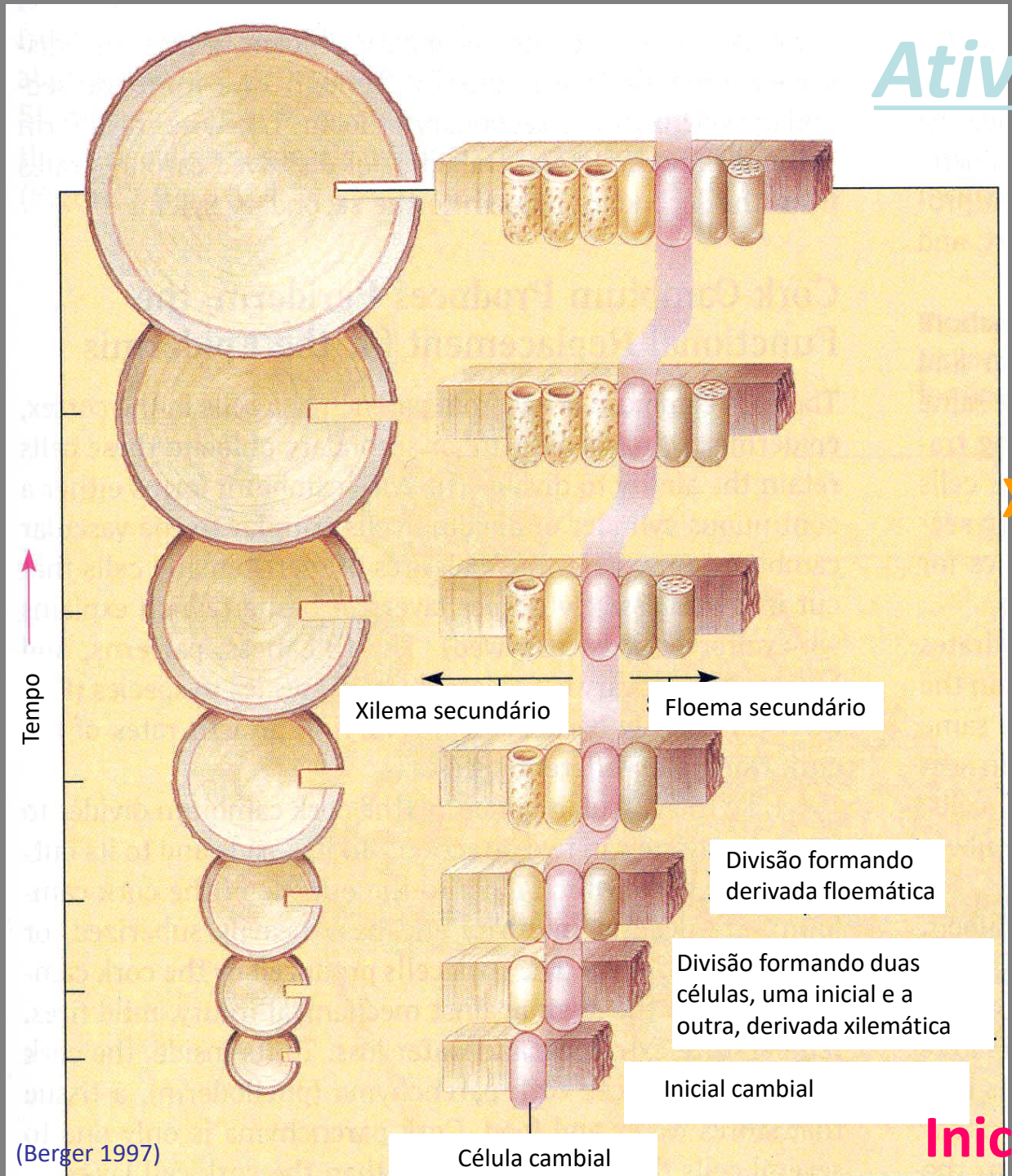
RAIZ





CRESCIMENTO SECUNDÁRIO

Atividade cambial

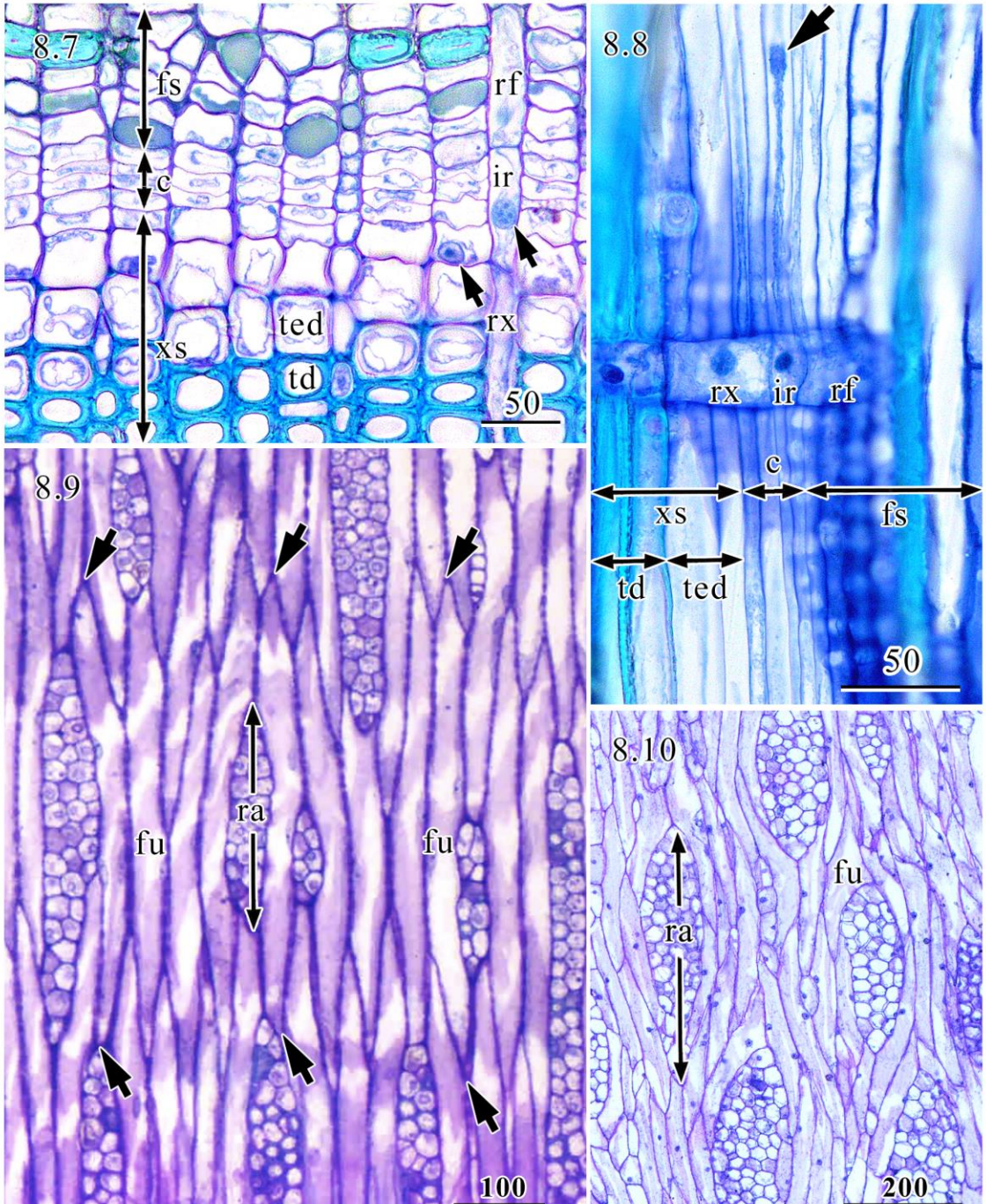


(Berger 1997)

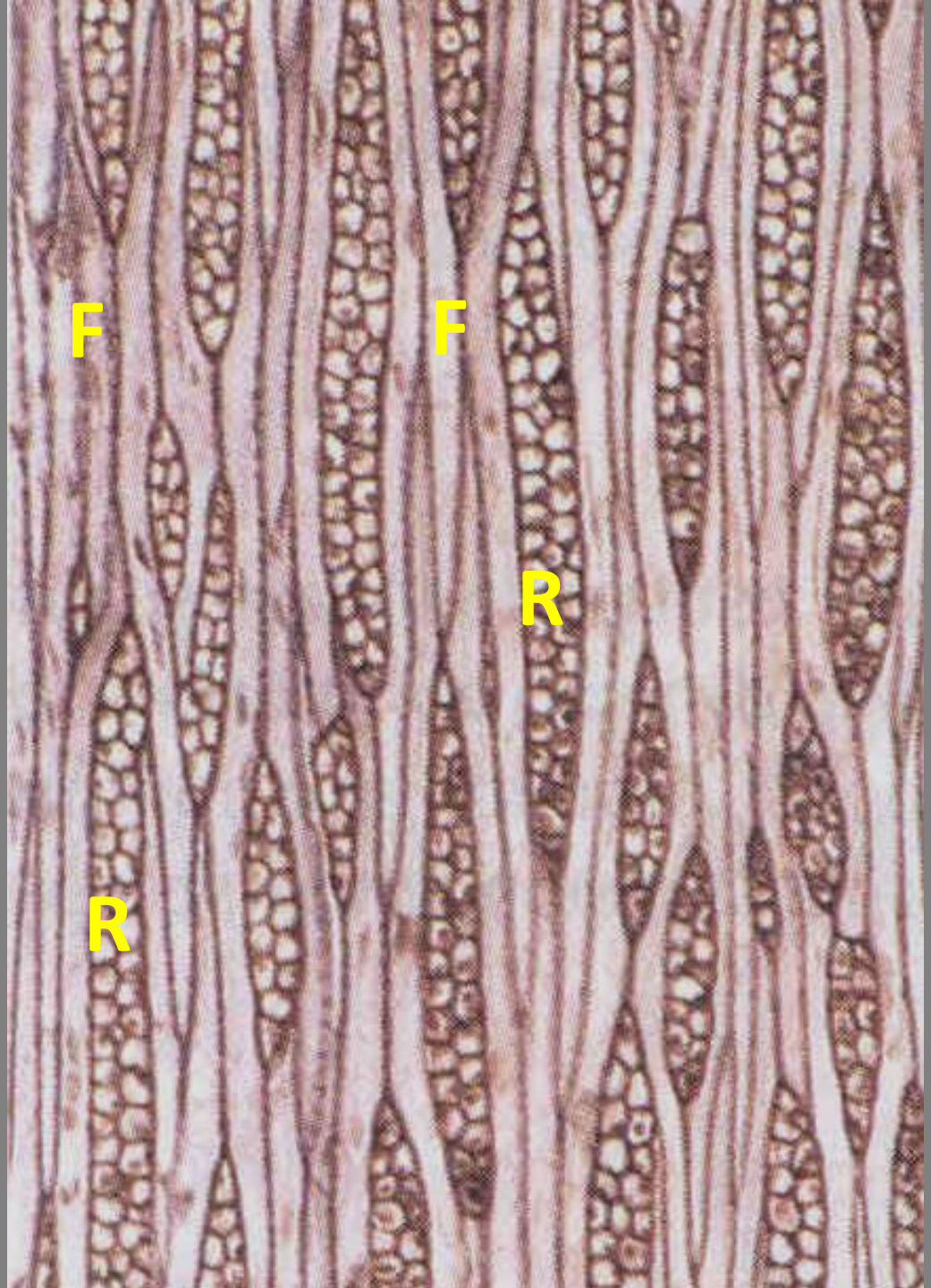
Xilema e Floema II^0

Derivadas

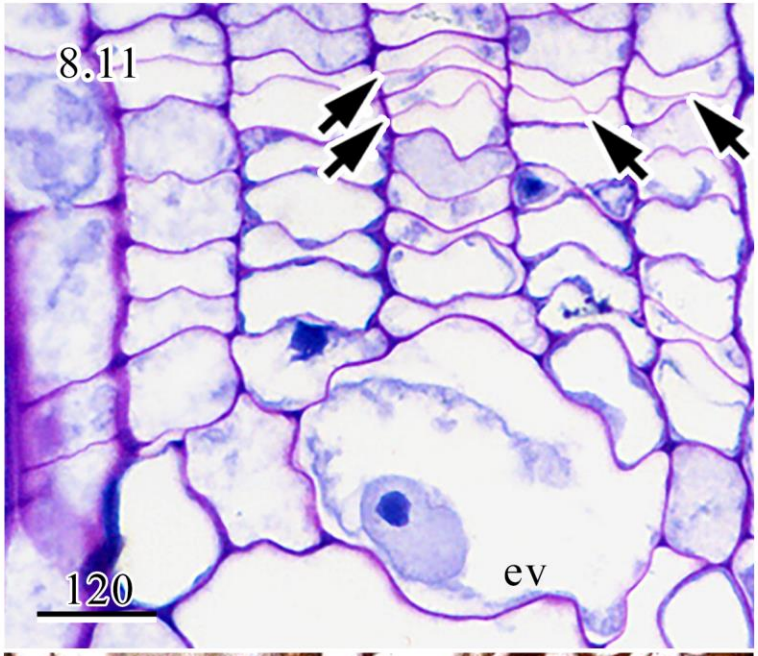
Inicial fusiforme e radial

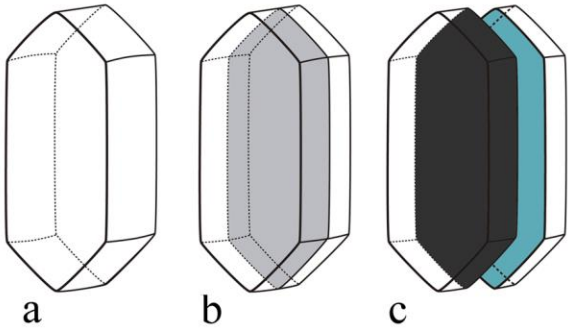

8.7
fs
c
xs
ted
td
rf
ir
rx
50
8.8
rx
ir
rf
c
xs
fs
td
ted
50
8.9
ra
fu
fu
100
8.10
ra
fu
200

Câmbio: inicial fusiforme e radial



(Raven *et al*. 2001)





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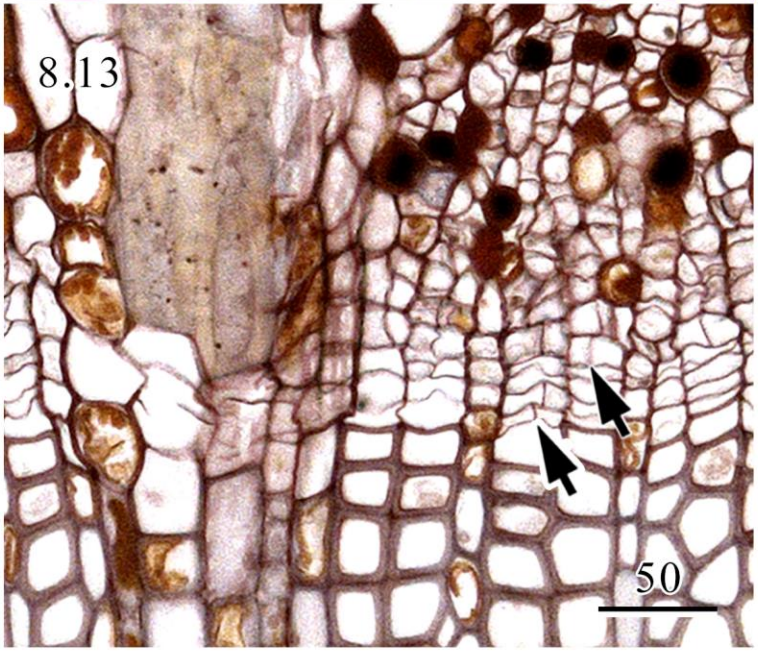
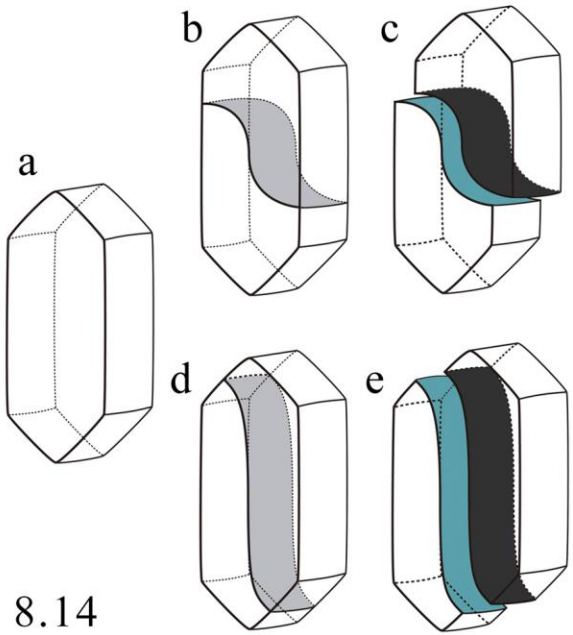
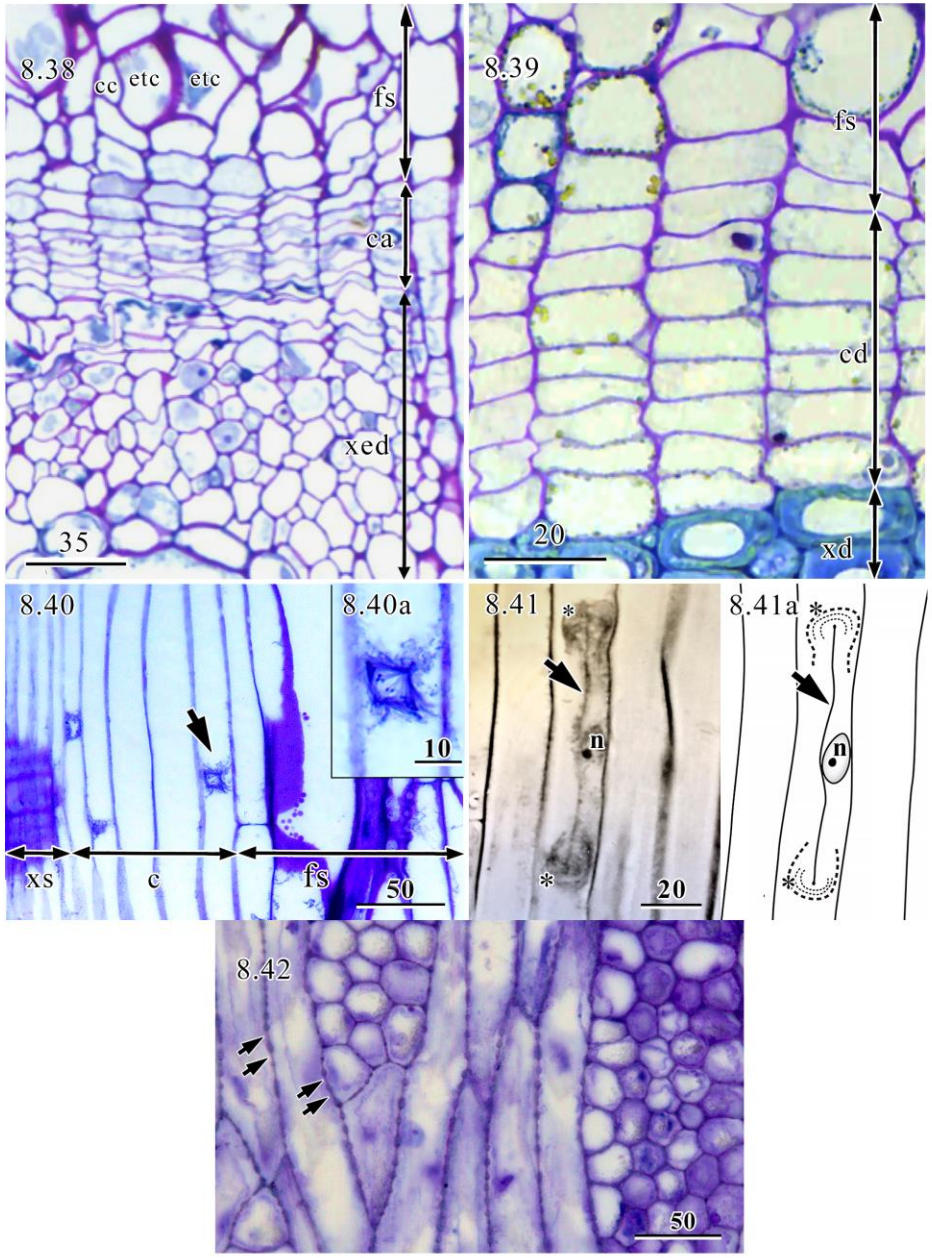




8.14


8.38
cc
etc
etc
fs
ca
xed
35
8.39
fs
cd
xd
20
8.40
8.40a
10
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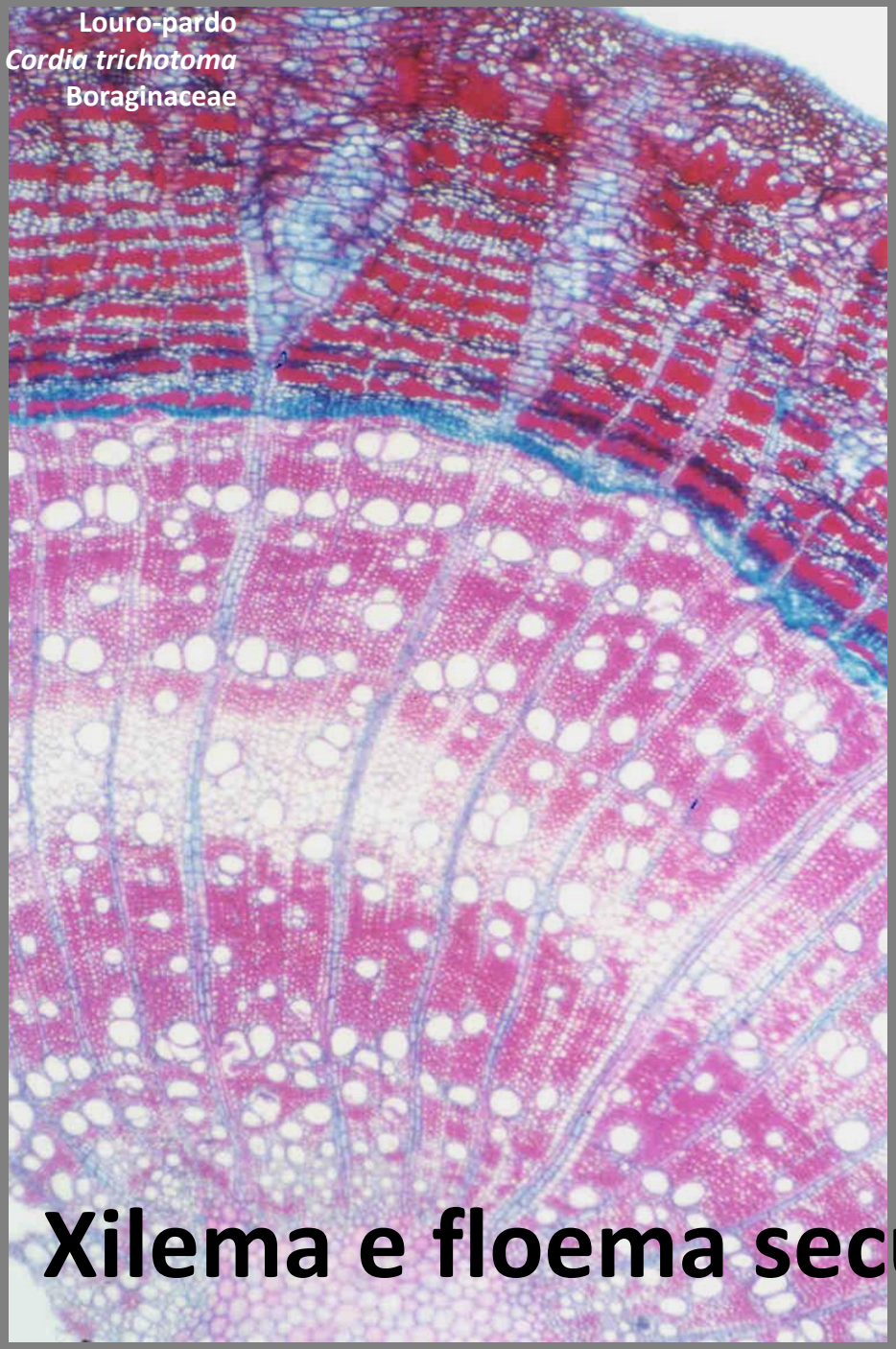
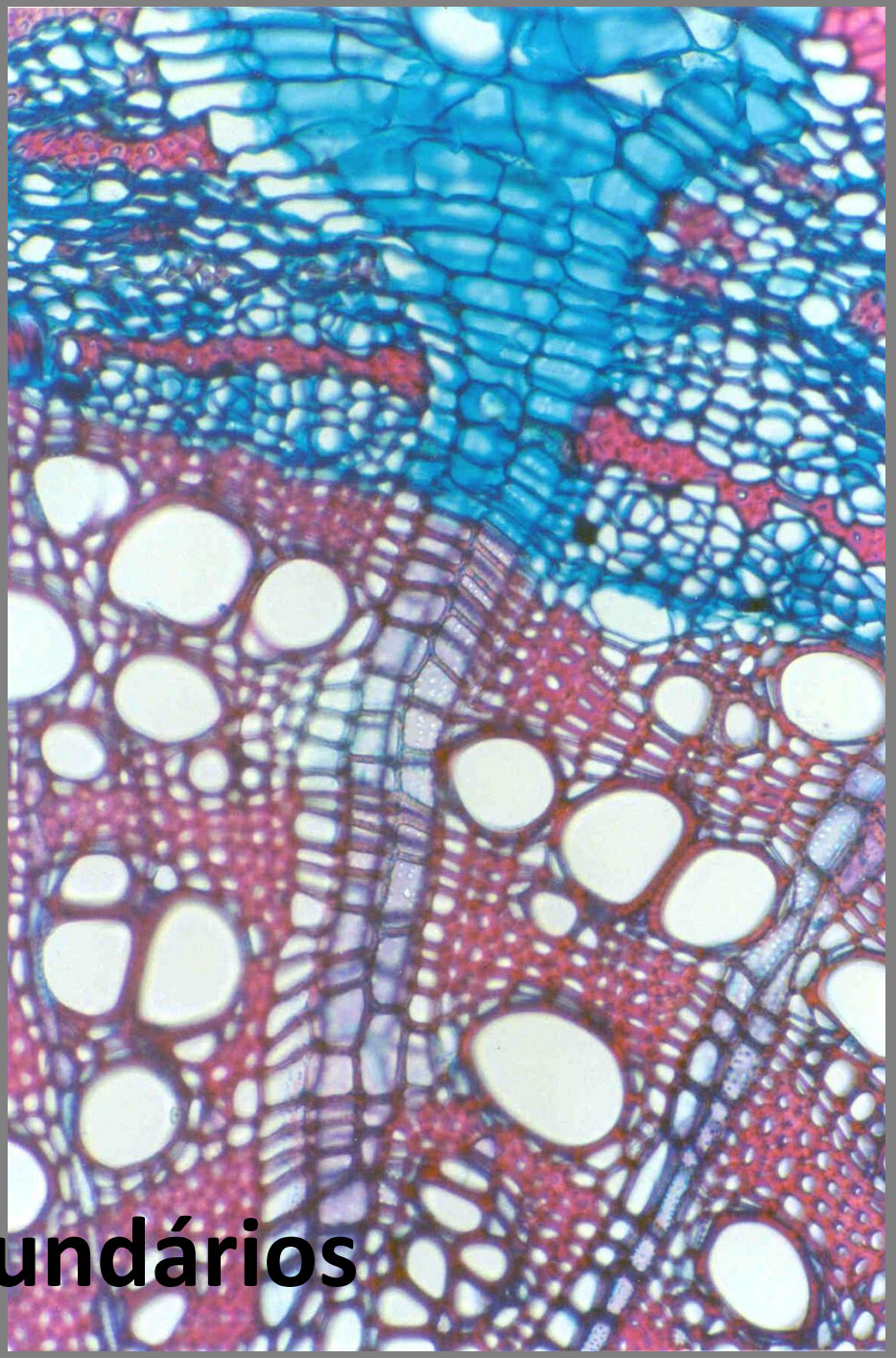
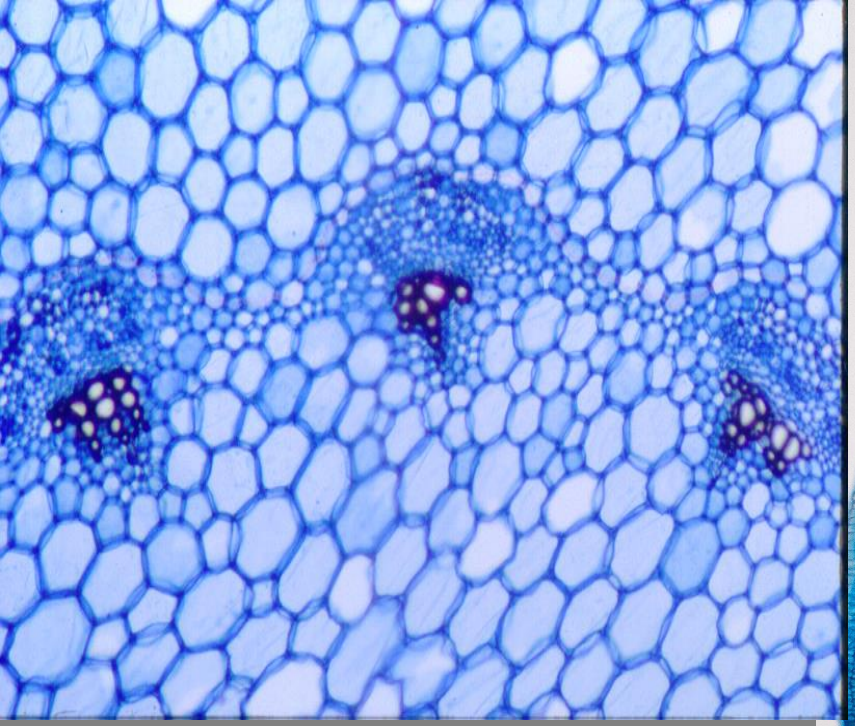
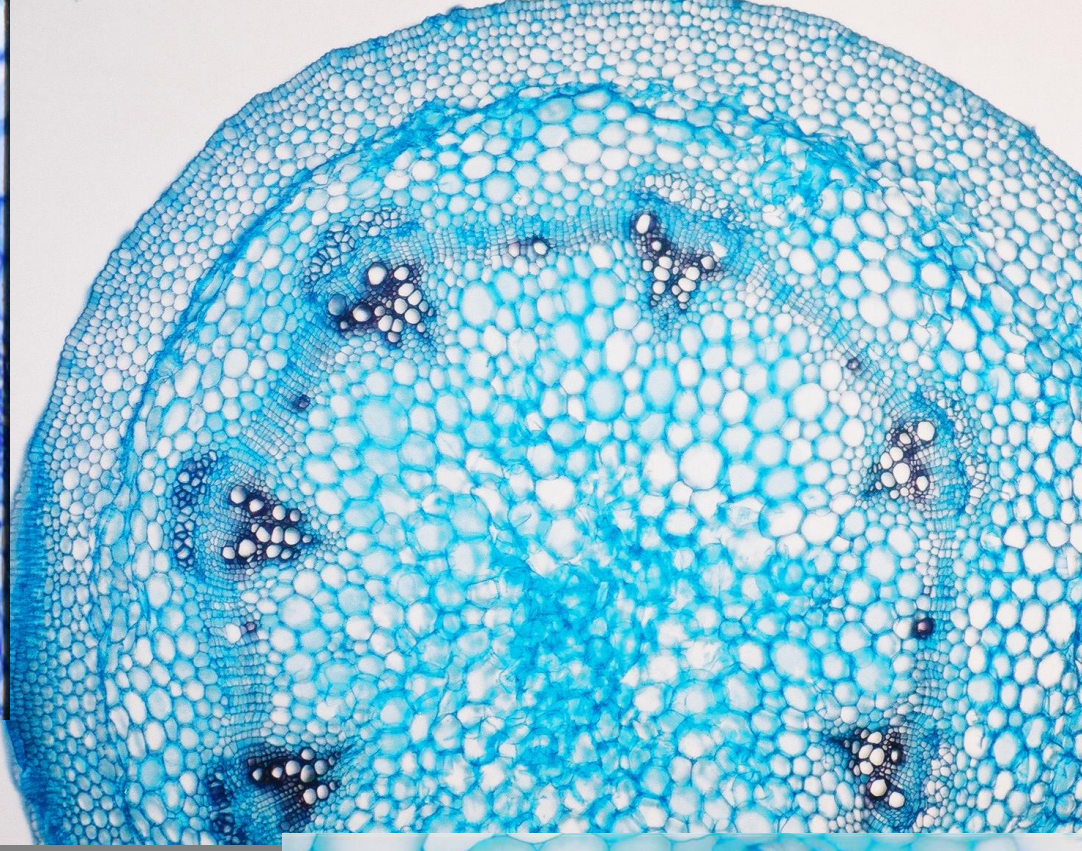
8.41
n
20
8.41a
n
8.42
50





Xilema e floema secundários





Eustelo → Instalação do câmbio vascular

Câmbio fascicular

Câmbio interfascicular

Ricinus communis
Euphorbiaceae, Angiosperma
Espermatófita

Sistema Vascular Secundário: comum