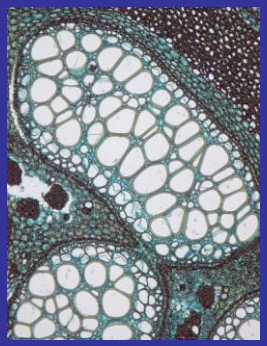
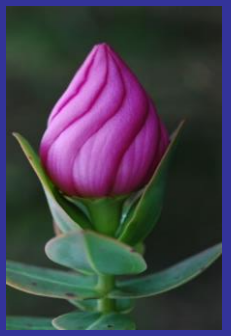
Novidades vegetativas das eufilófitas lignófitas

Gregório CECCANTINI

BIB-124- Diversidade e Evolução dos Organismos Fotossintetizantes

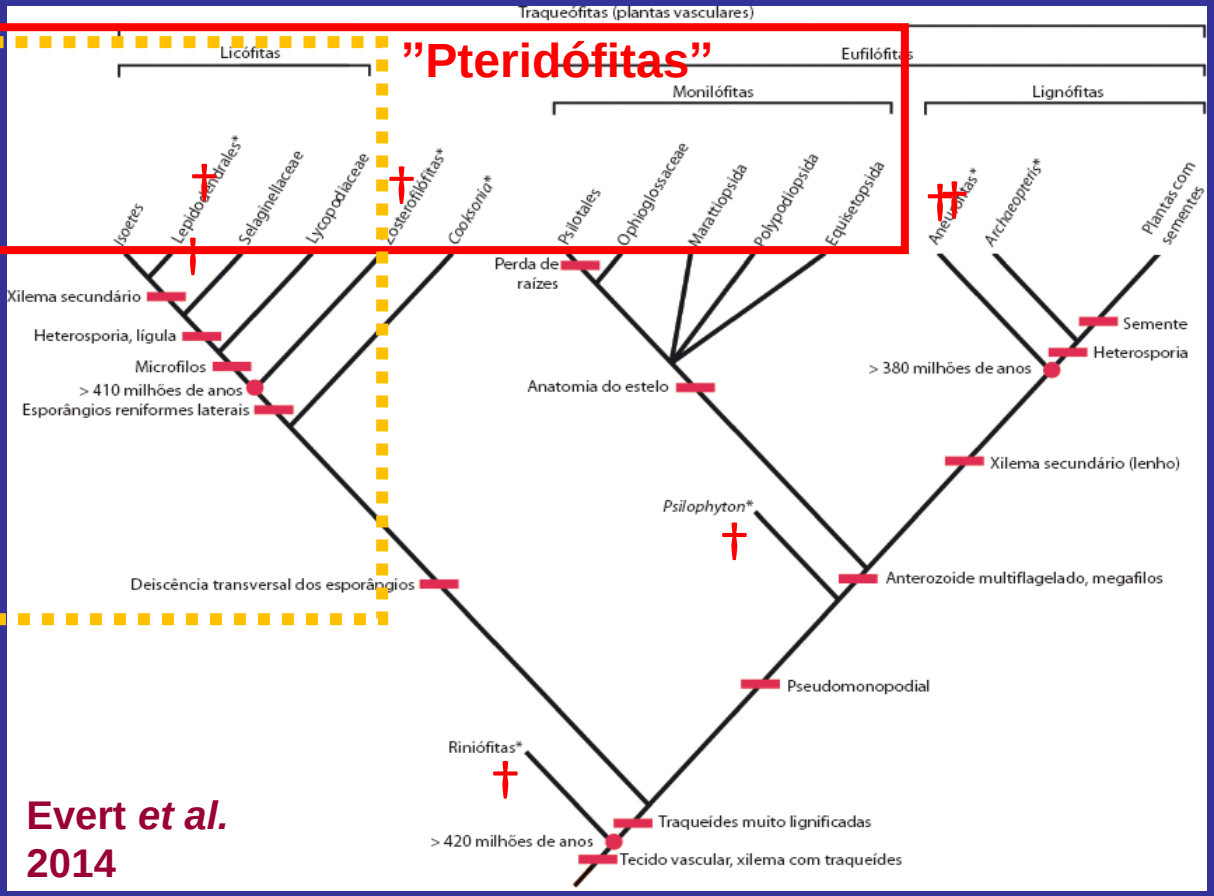




LIGNÓFITAS: novidades evolutivas

Floresta do Carbonífero: 350 milhões anos atrás

Traqueófitas = plantas vasculares



X "Pteridófitas"

Não é monofilético
São Vasculares sem sementes

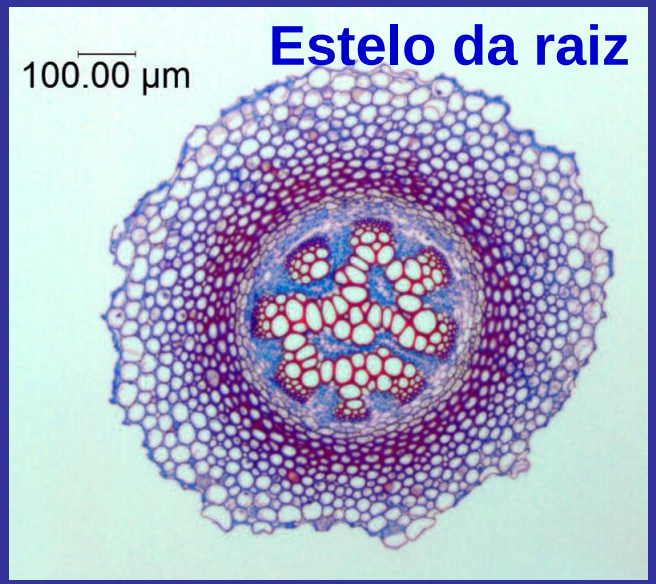
Licófitas

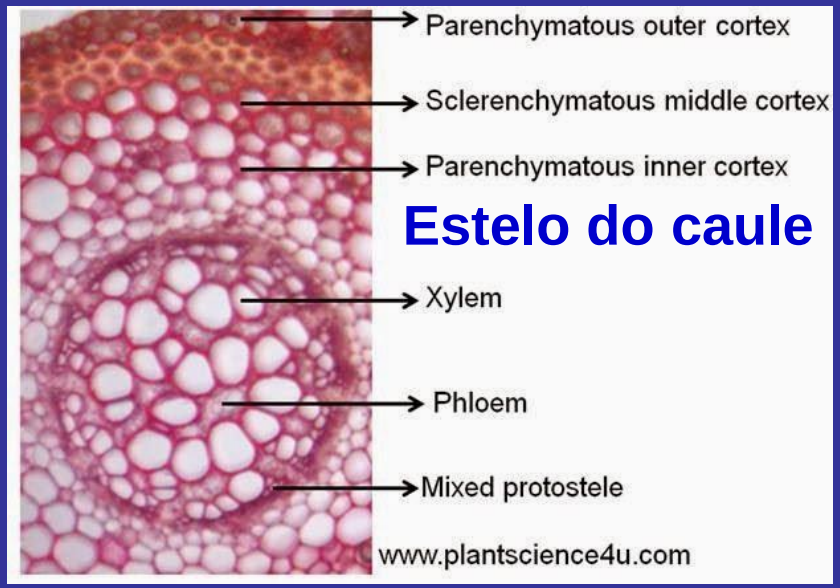
Licófitas

Estelo em Raízes e caules

PROTOSTELO = cilindro vascular maciço de células condutoras

Lycopodium

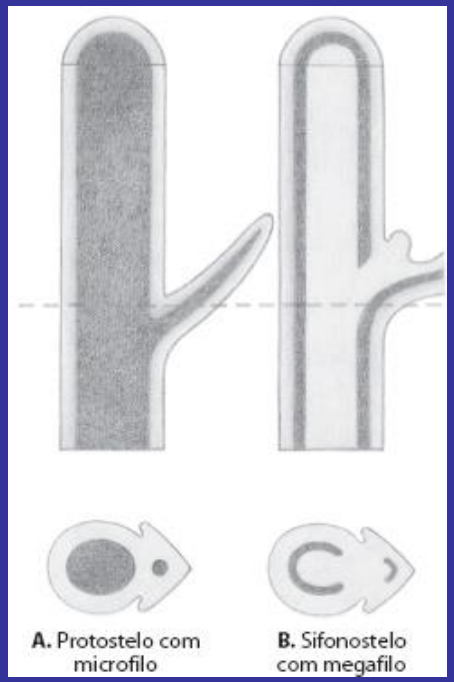


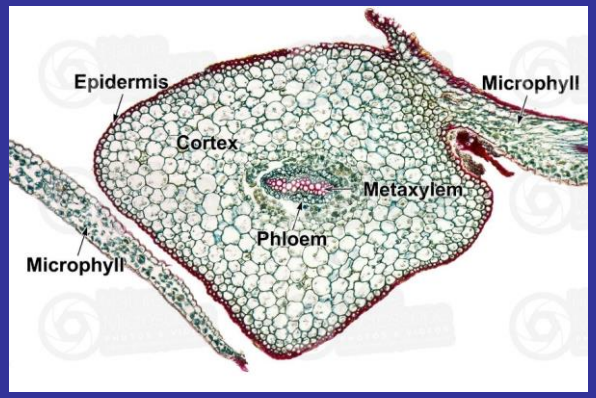


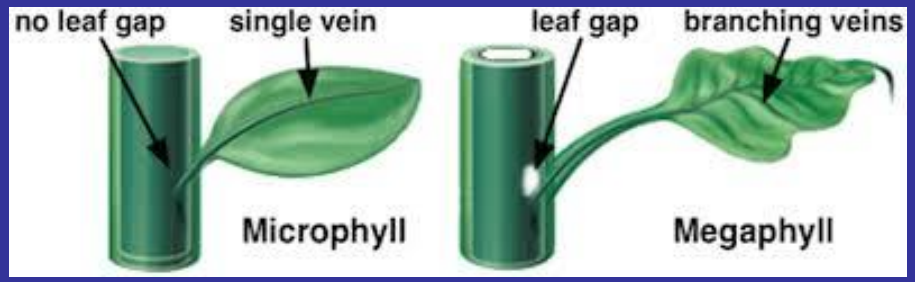
Licófitas

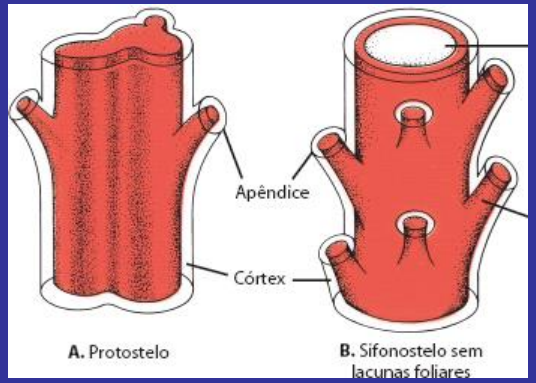
Órgãos laterais
Folhas: Microfilos

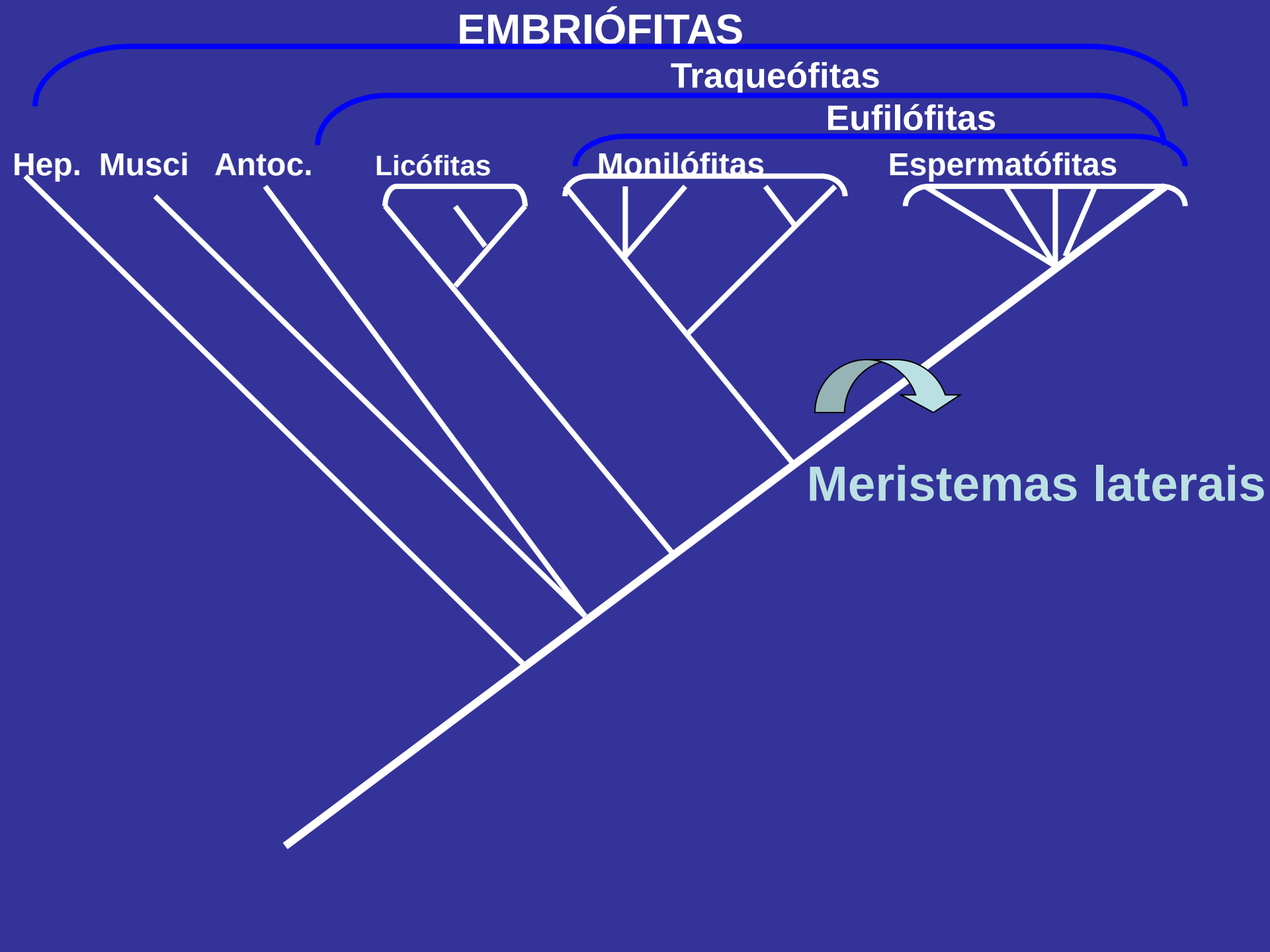
Não deixam lacuna no estelo

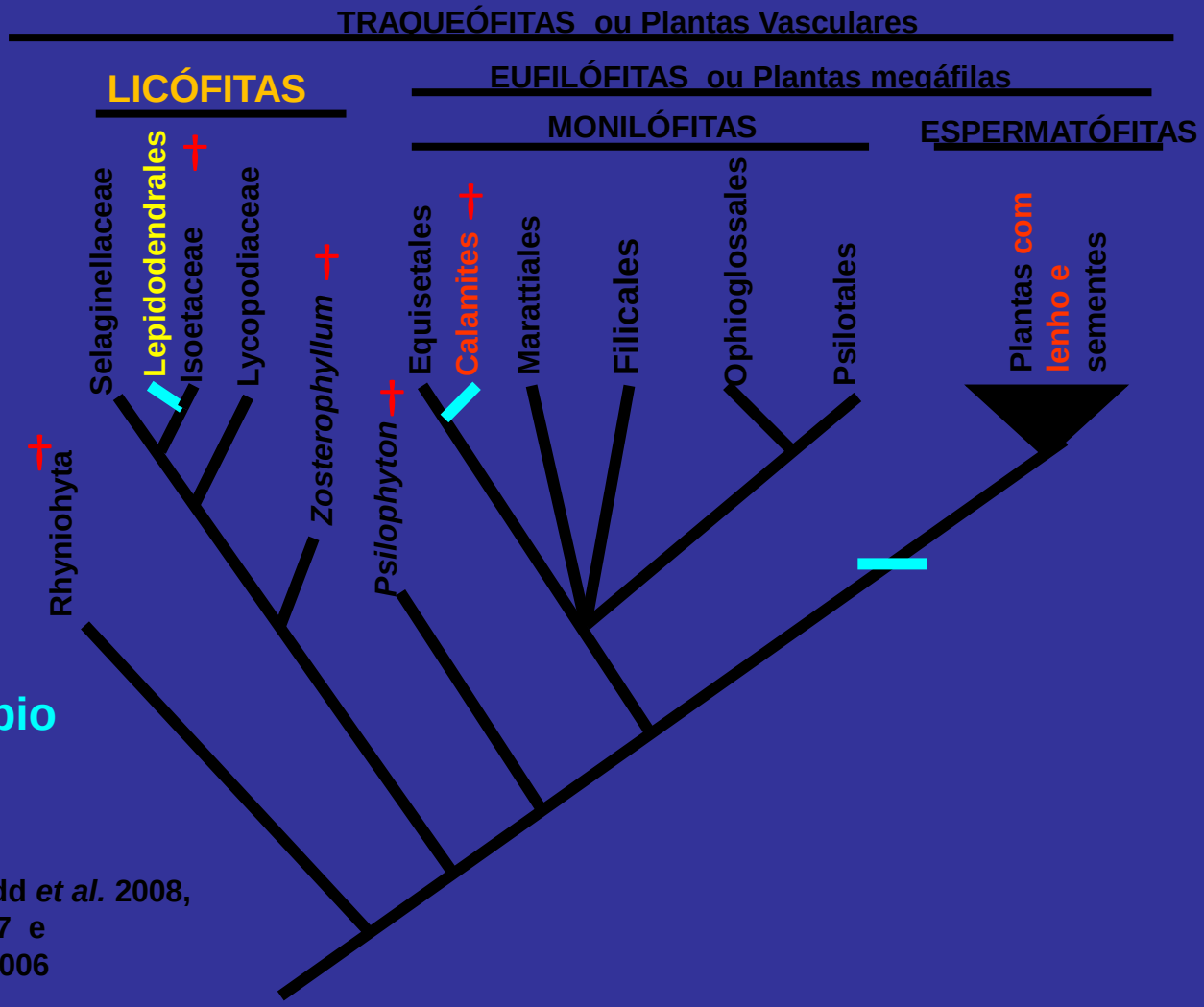




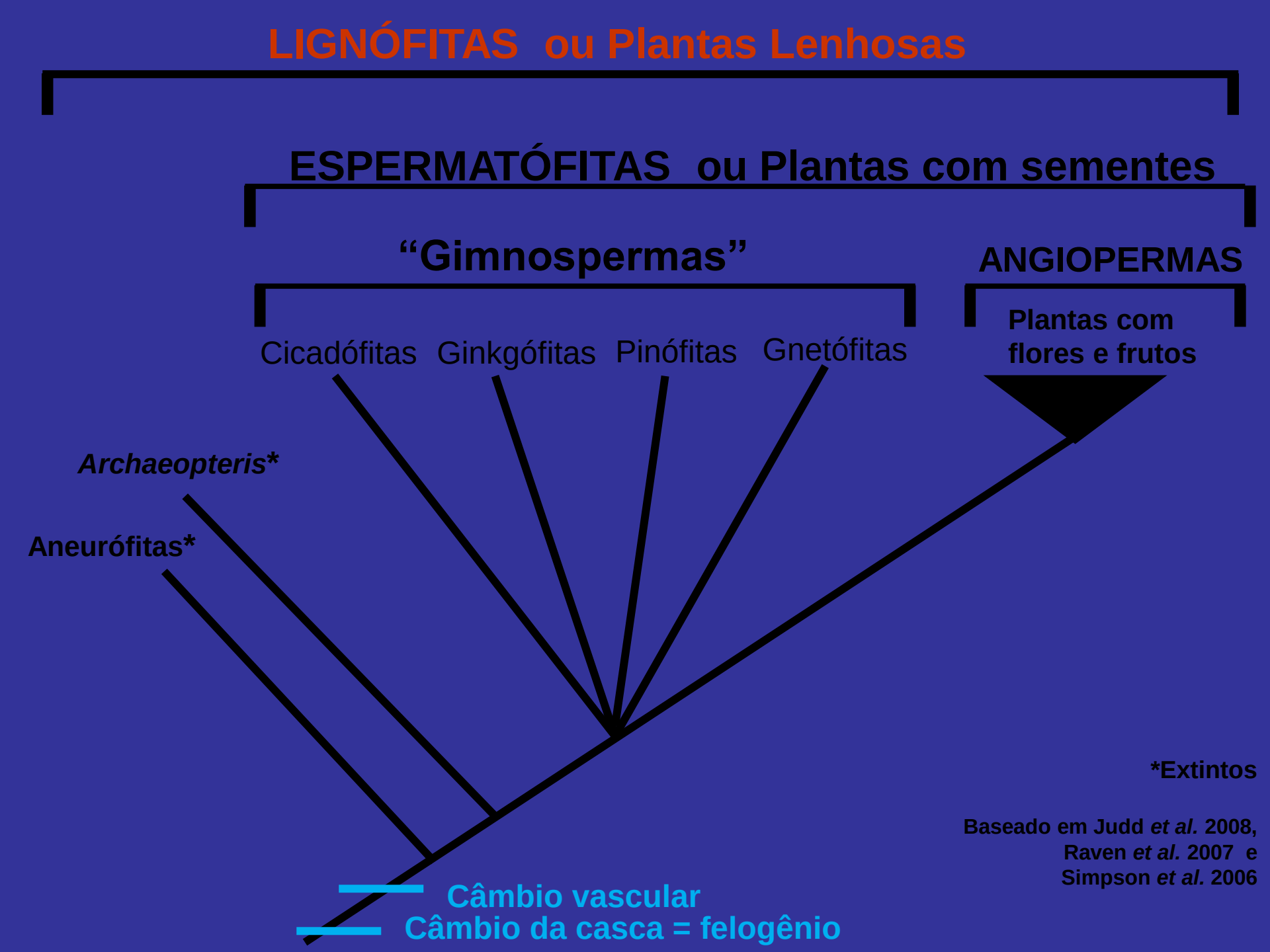


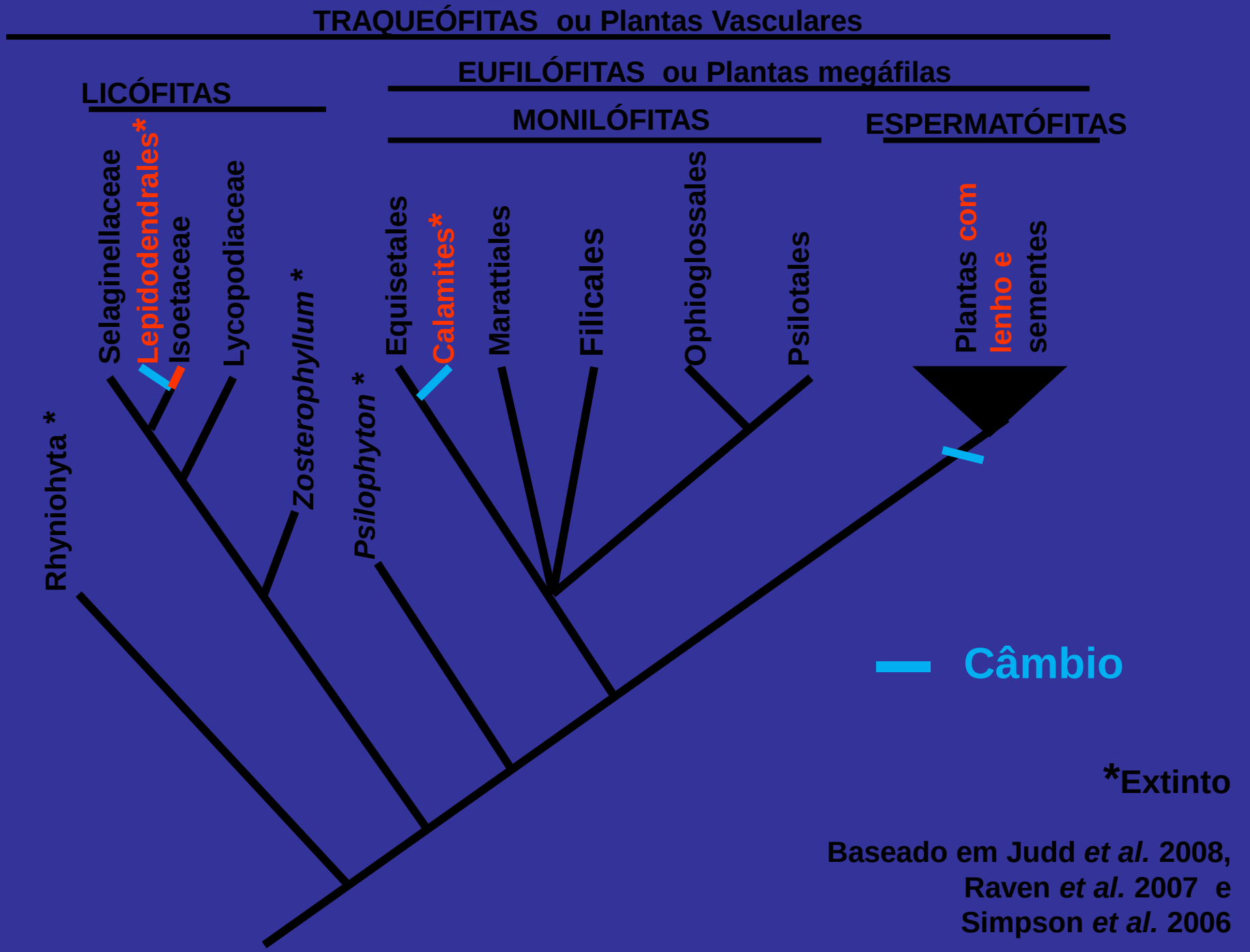


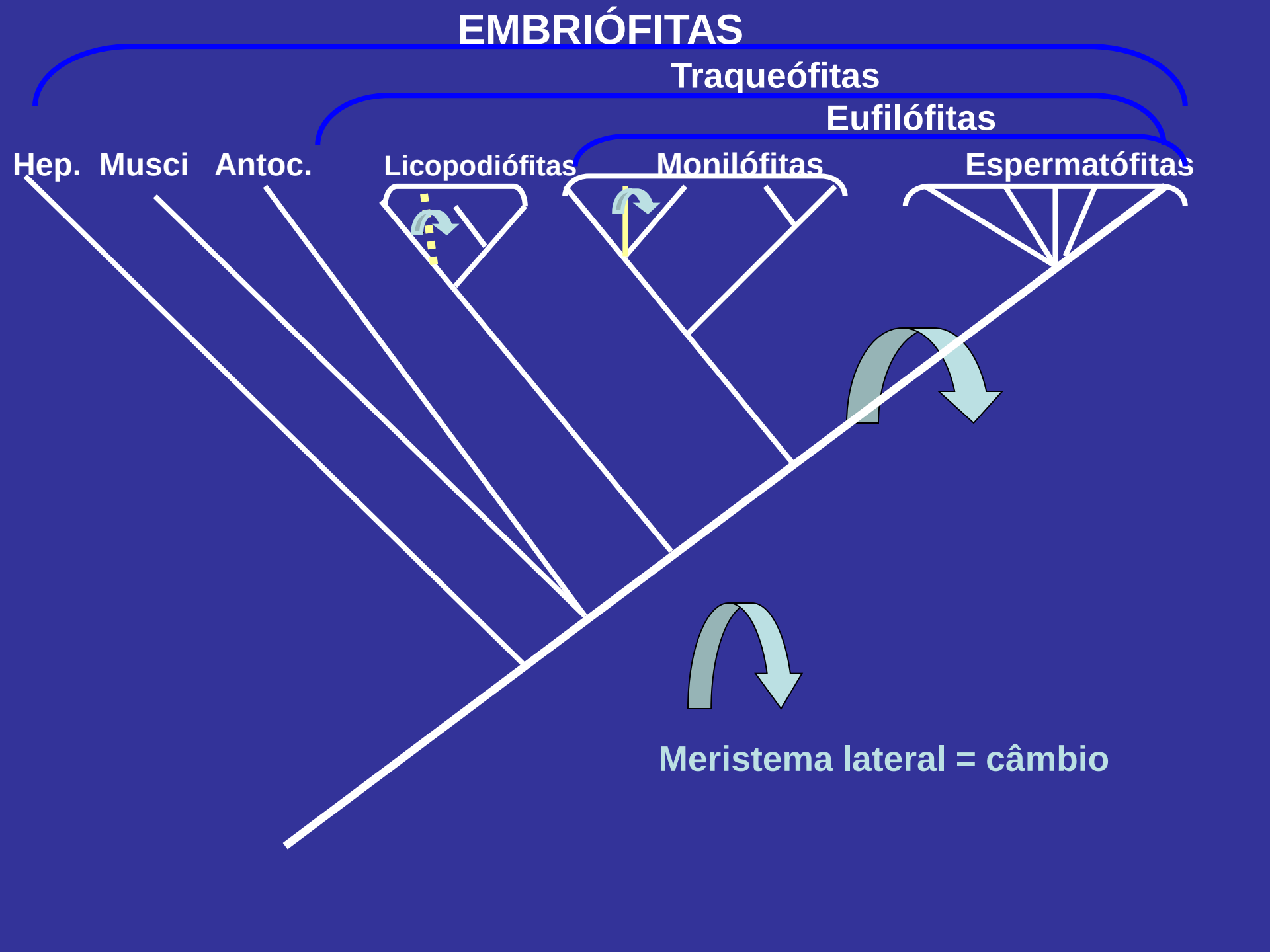

EMBRIÓFITAS
Traqueófitas
Eufilófitas
Hep.
Musci
Antoc.
Licófitas
Monilófitas
Espermatófitas
Meristemas laterais

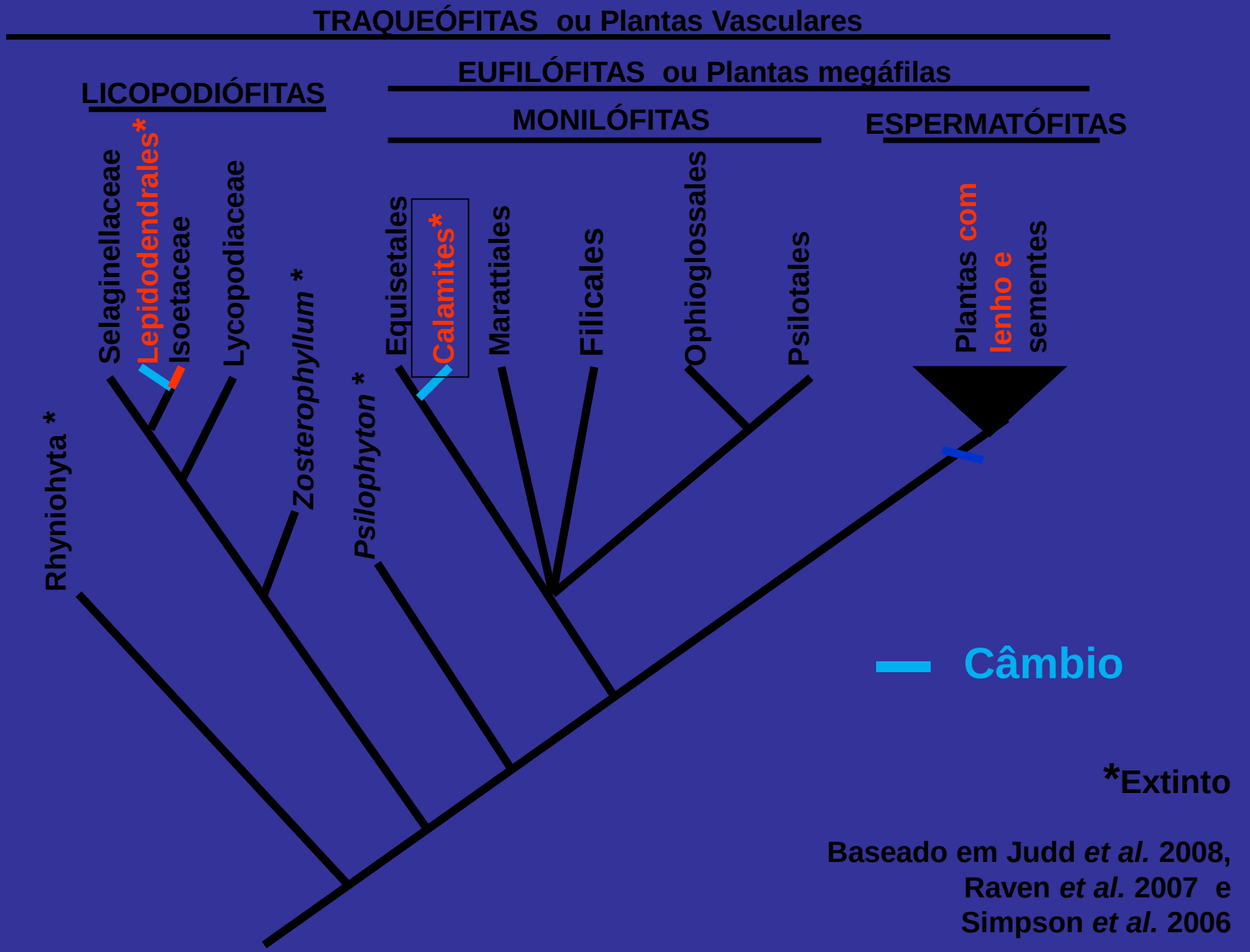


Baseado em Judd *et al.* 2008,
Raven *et al.* 2007 e
Simpson *et al.* 2006


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


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


EMBRIÓFITAS
Traqueófitas
Eufilófitas
Hep.
Musci
Antoc.
Licopodiófitas
Monilófitas
Espermatófitas
Meristema lateral = câmbio


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

Licófitas

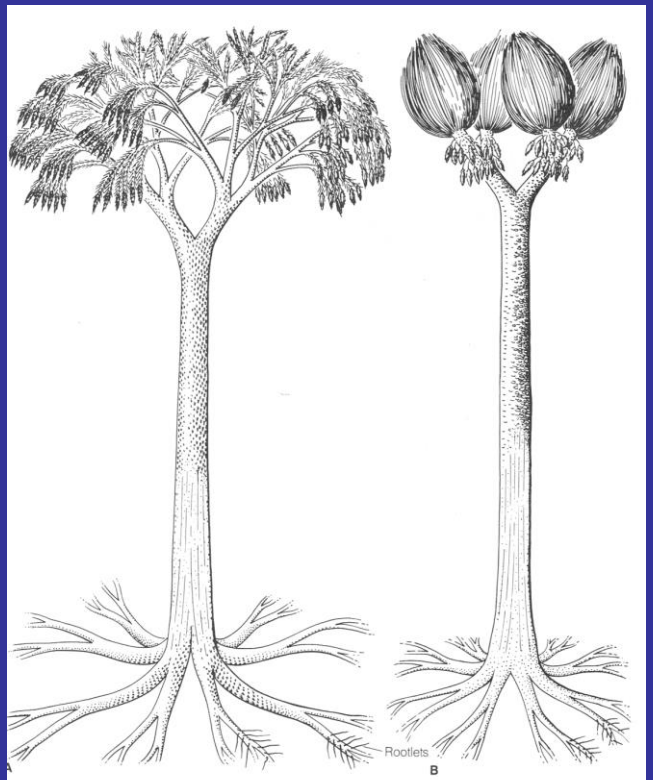


FIGURE 9-41 Suggested reconstructions. A, *Lepidodendron* sp.; B, *Sigillaria elegans*. Note strobili and the large rhizophores with attached rootlets at base of trunks. *Form* or *organ* genera exist for all basic parts of the plants. (Consult text for pertinent information.) [Modified from *Handbuch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

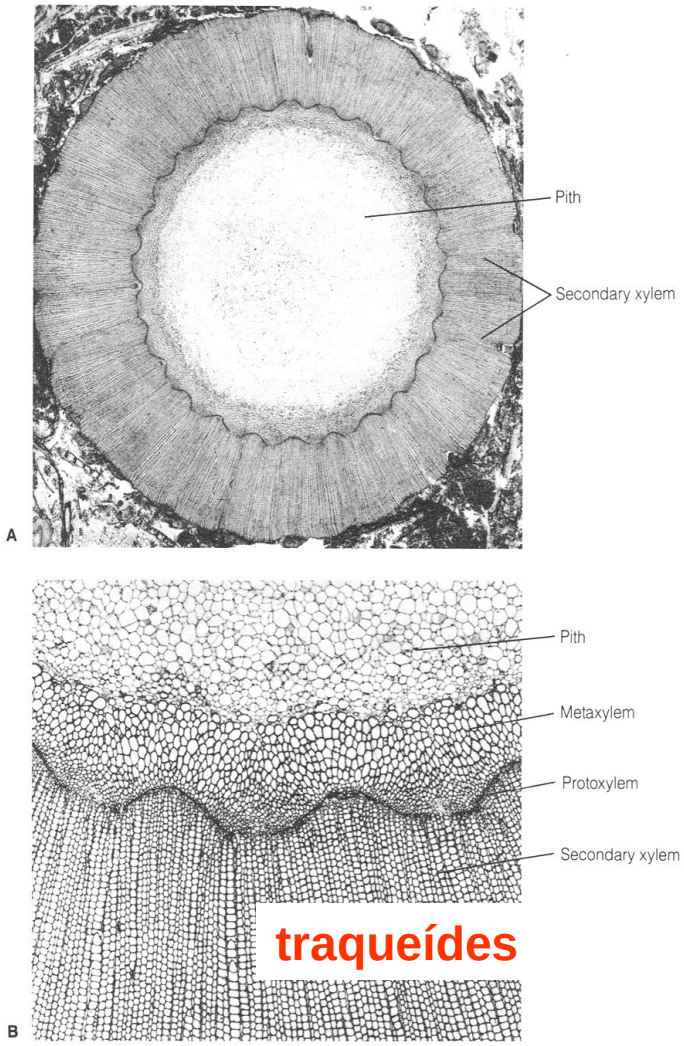
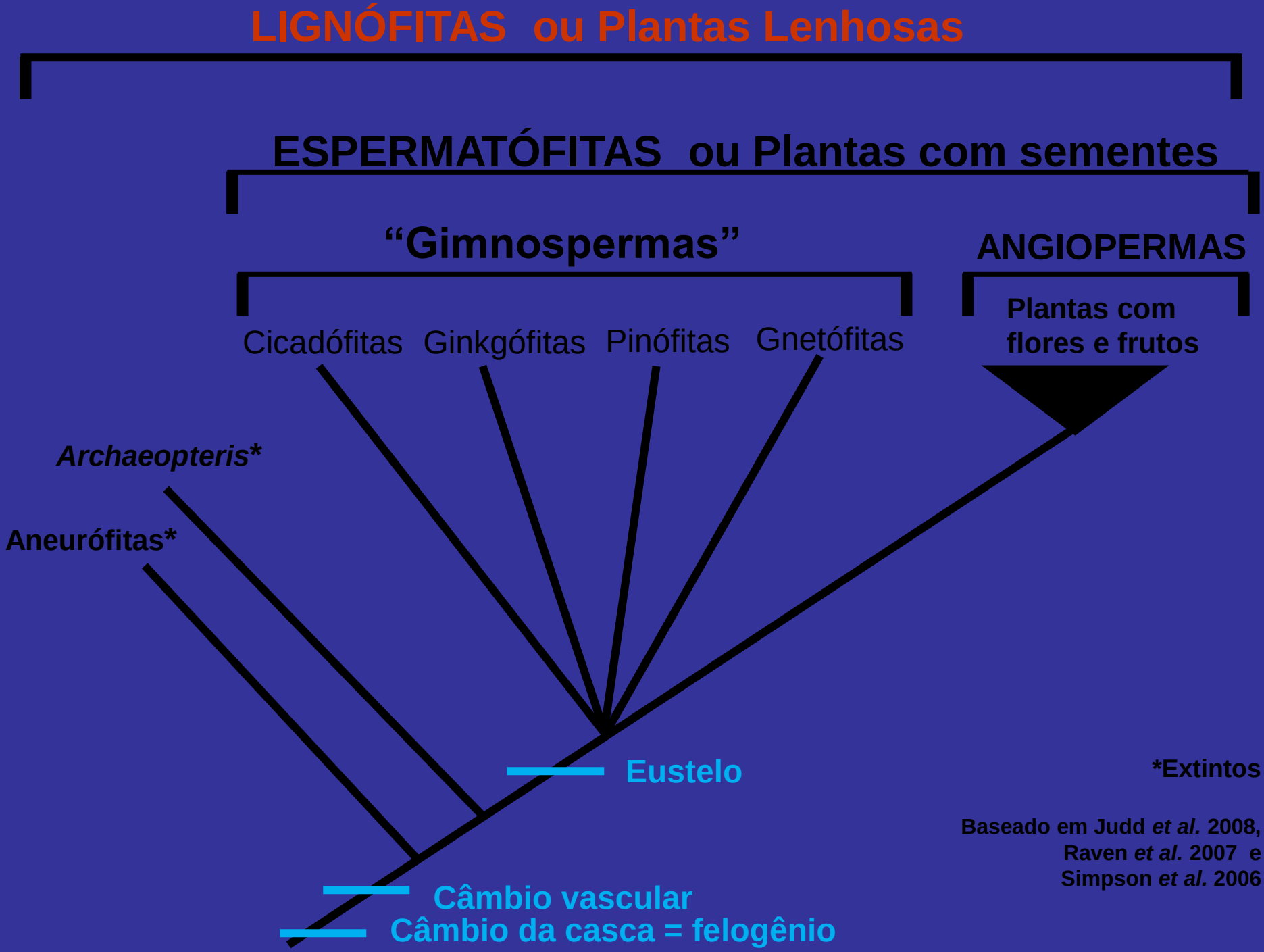


FIGURE 9-45 A, transverse section of a siphonostele of *Sigillaria approximata*. B, details of a section from A. [Courtesy of Dr. T. Delevoryas.]

Lepidodendron

Sigillaria

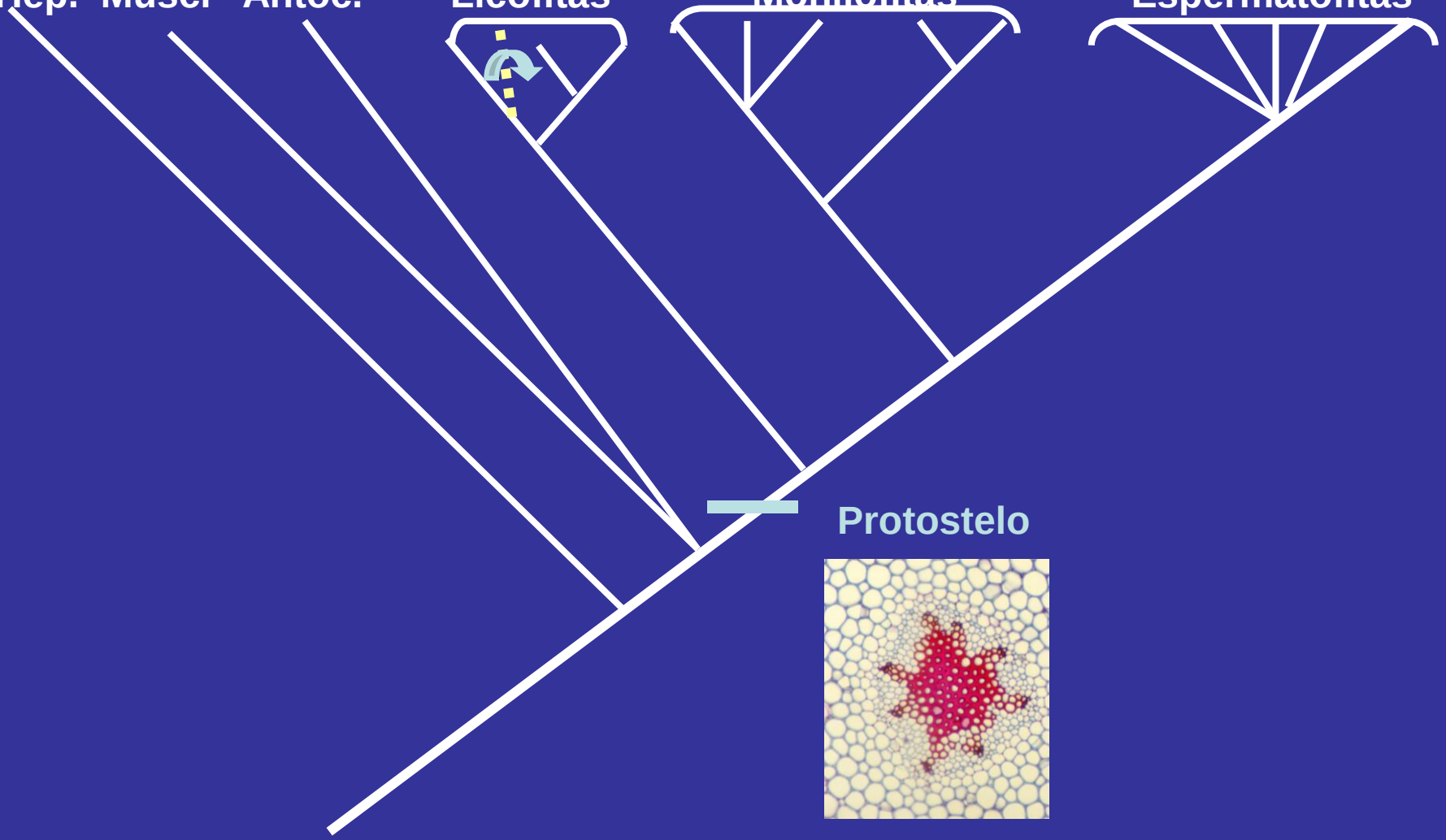

LIGNÓFITAS ou Plantas Lenhosas
ESPERMATÓFITAS ou Plantas com sementes
“Gimnospermas”
ANGIOPERMAS
Plantas com flores e frutos
Cicadófitas
Ginkgófitas
Pinófitas
Gnetófitas
Archaeopteris*
Aneurófitas*
Eustelo
Câmbio vascular
Câmbio da casca = felogênio
*Extintos
Baseado em Judd et al. 2008, Raven et al.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

EMBRIÓFITAS

Traqueófitas

Eufilófitas

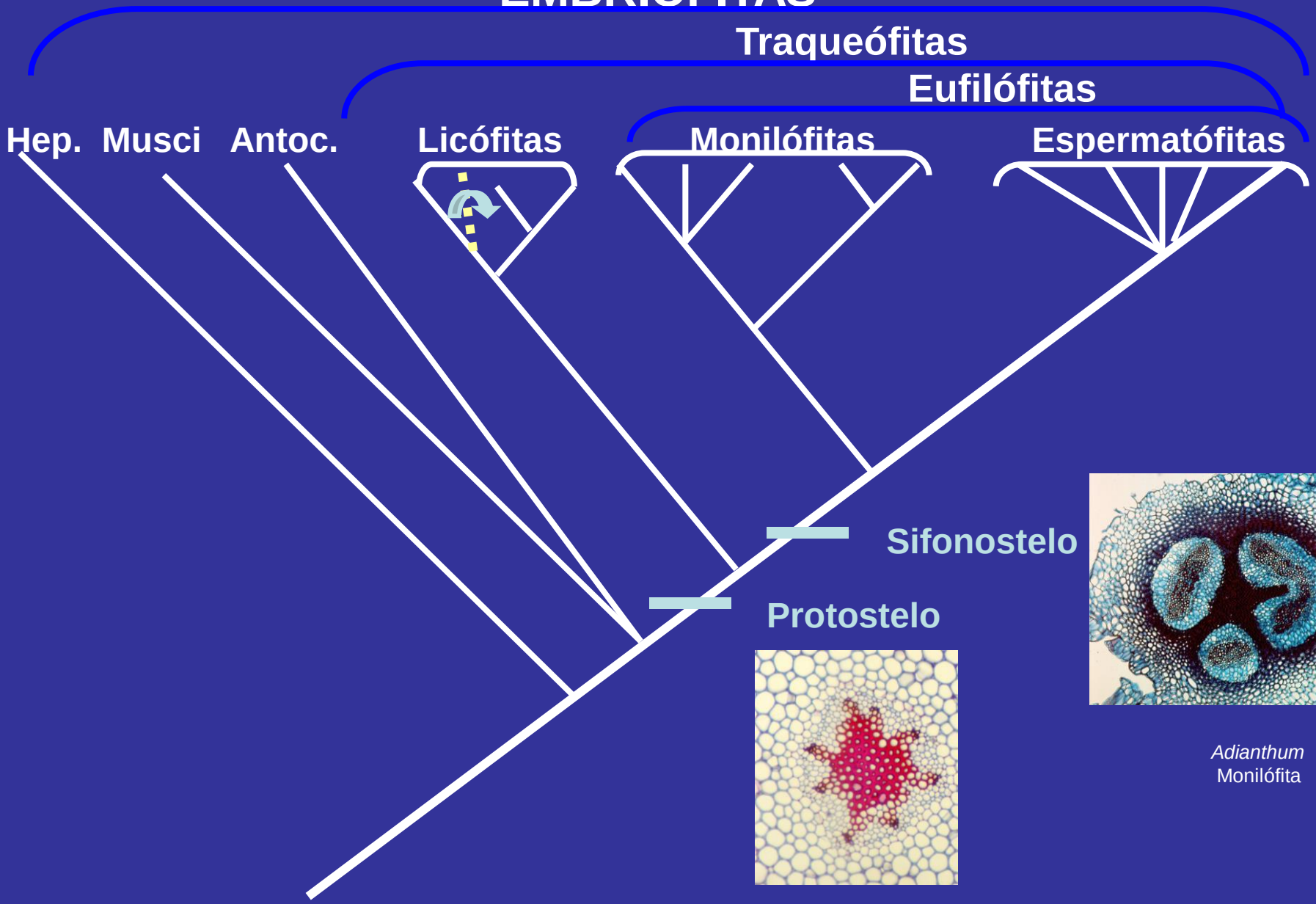
Hep. Musci Antoc. Licófitas Monilófitas Espermatófitas



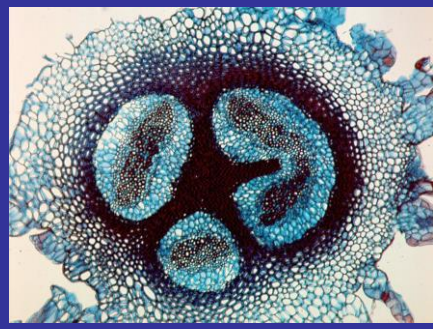
Protostelo

Psilotum
Licófita

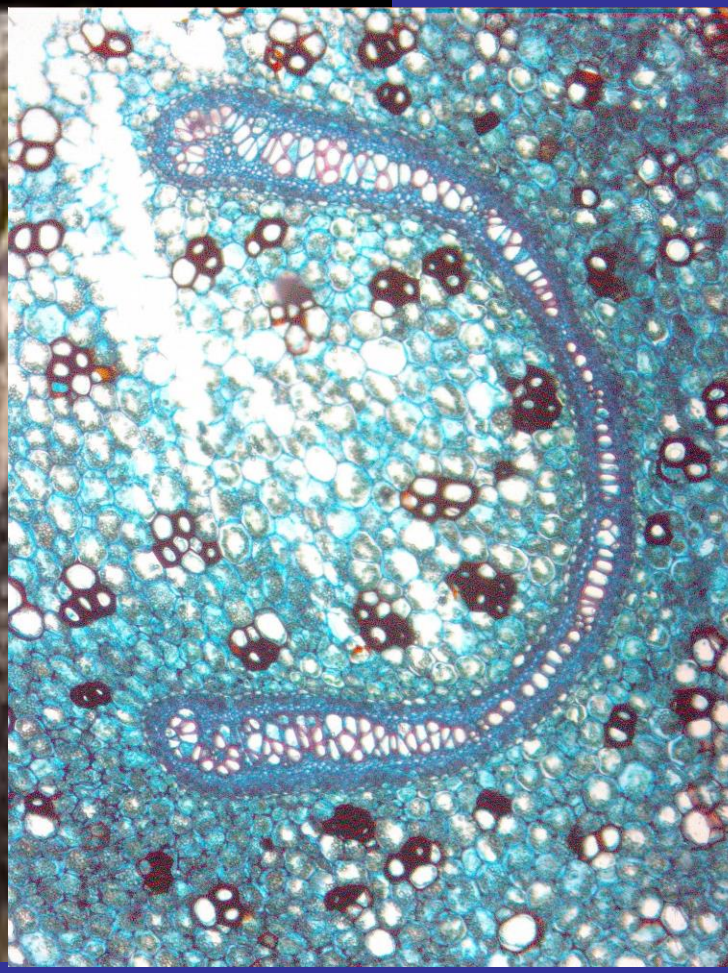
EMBRIÓFITAS



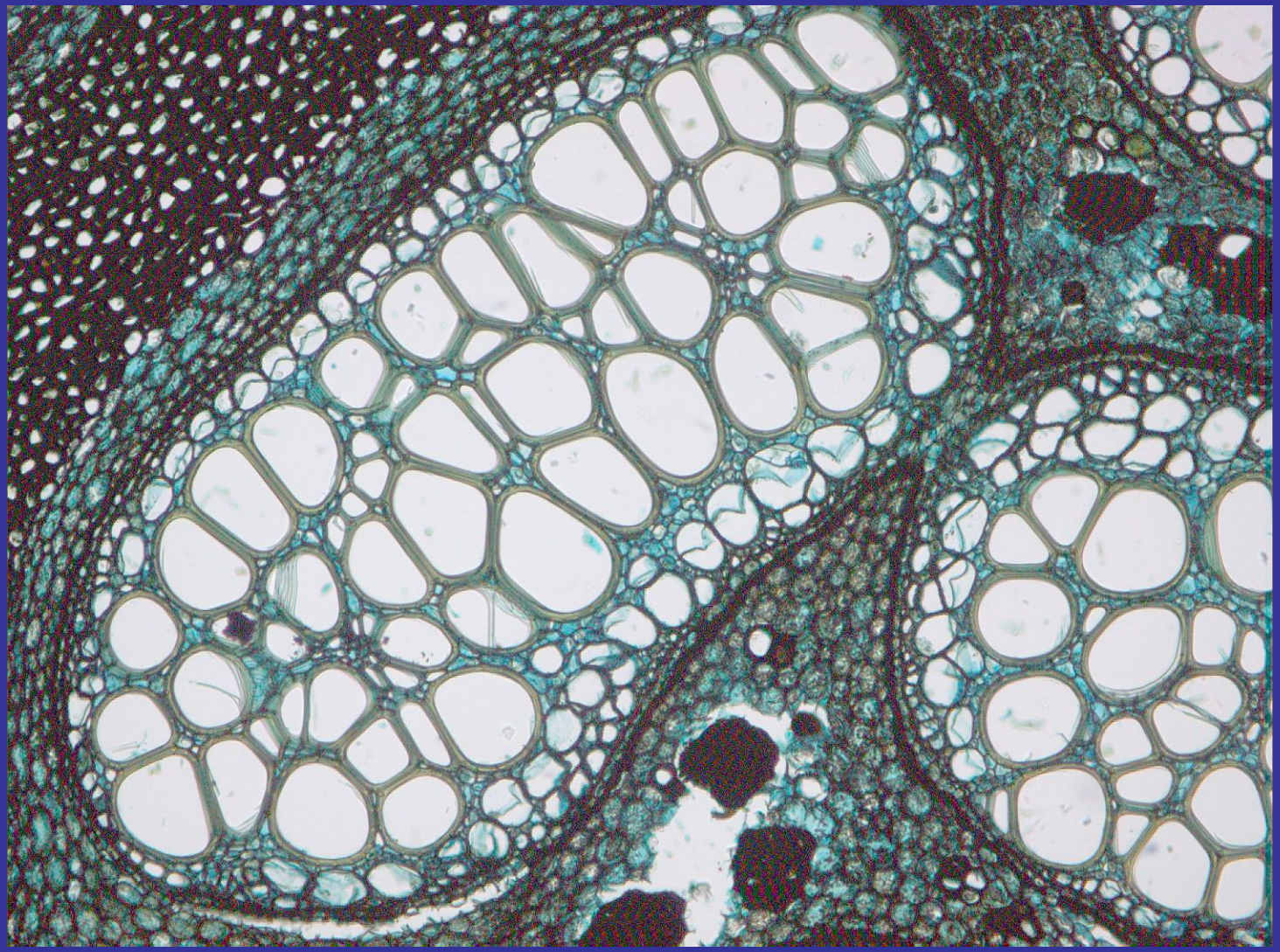
Psilotum
Licófita



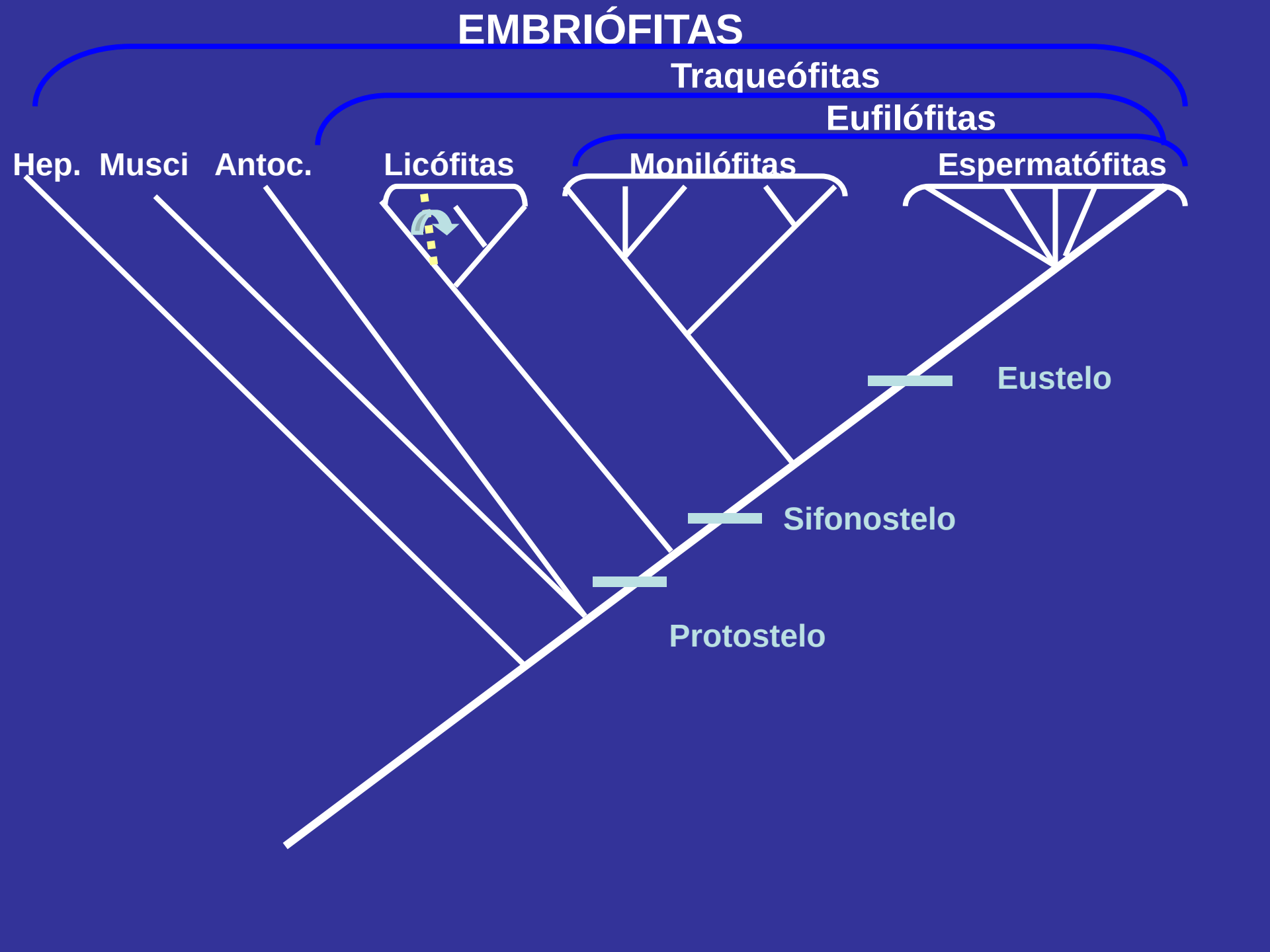
Adianthum
Monilófita



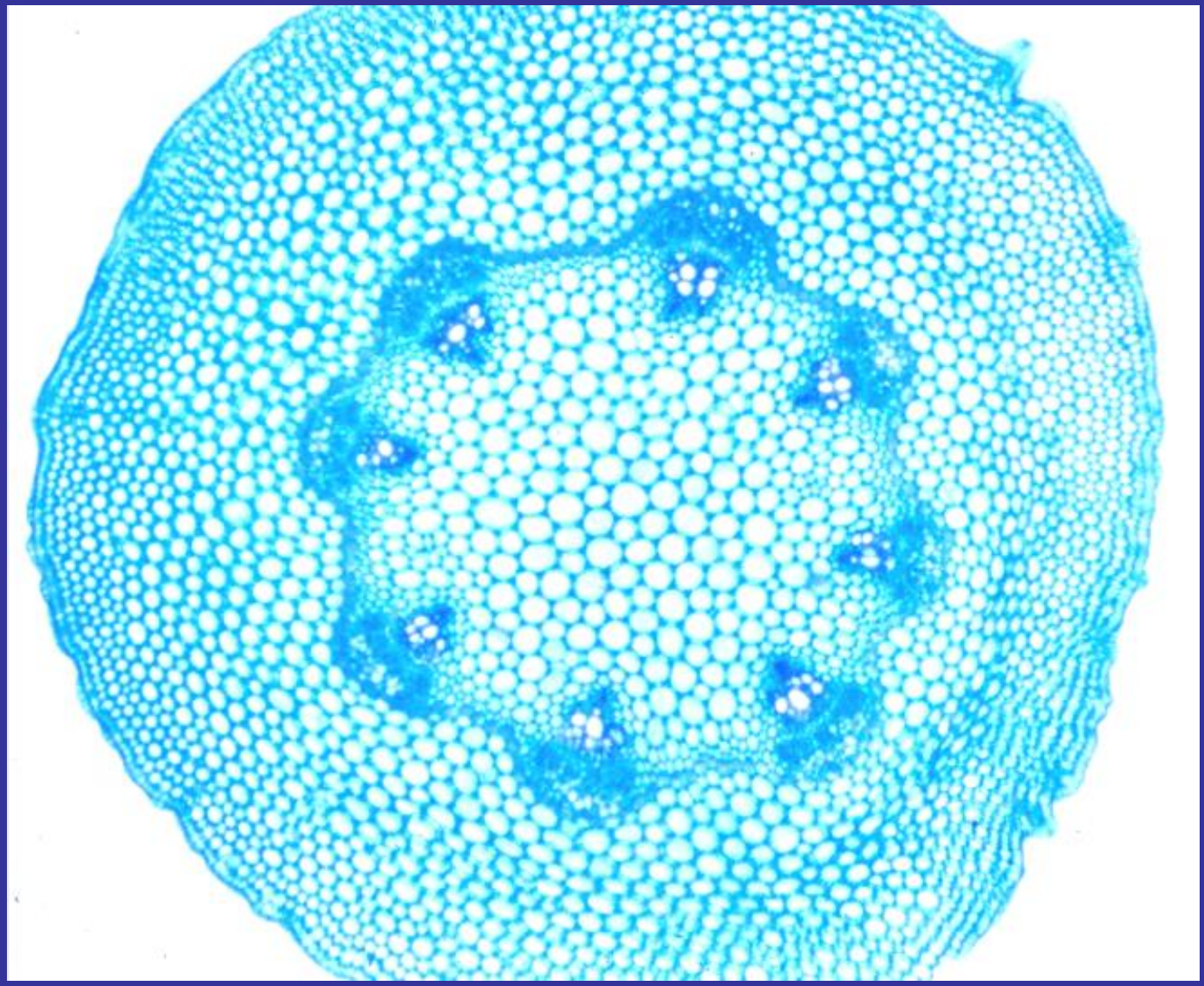
MONILÓFITA:
Monilo **(L) = colar**
Phyt **(G)= planta**



MONILÓFITA:
Xilema mesarco

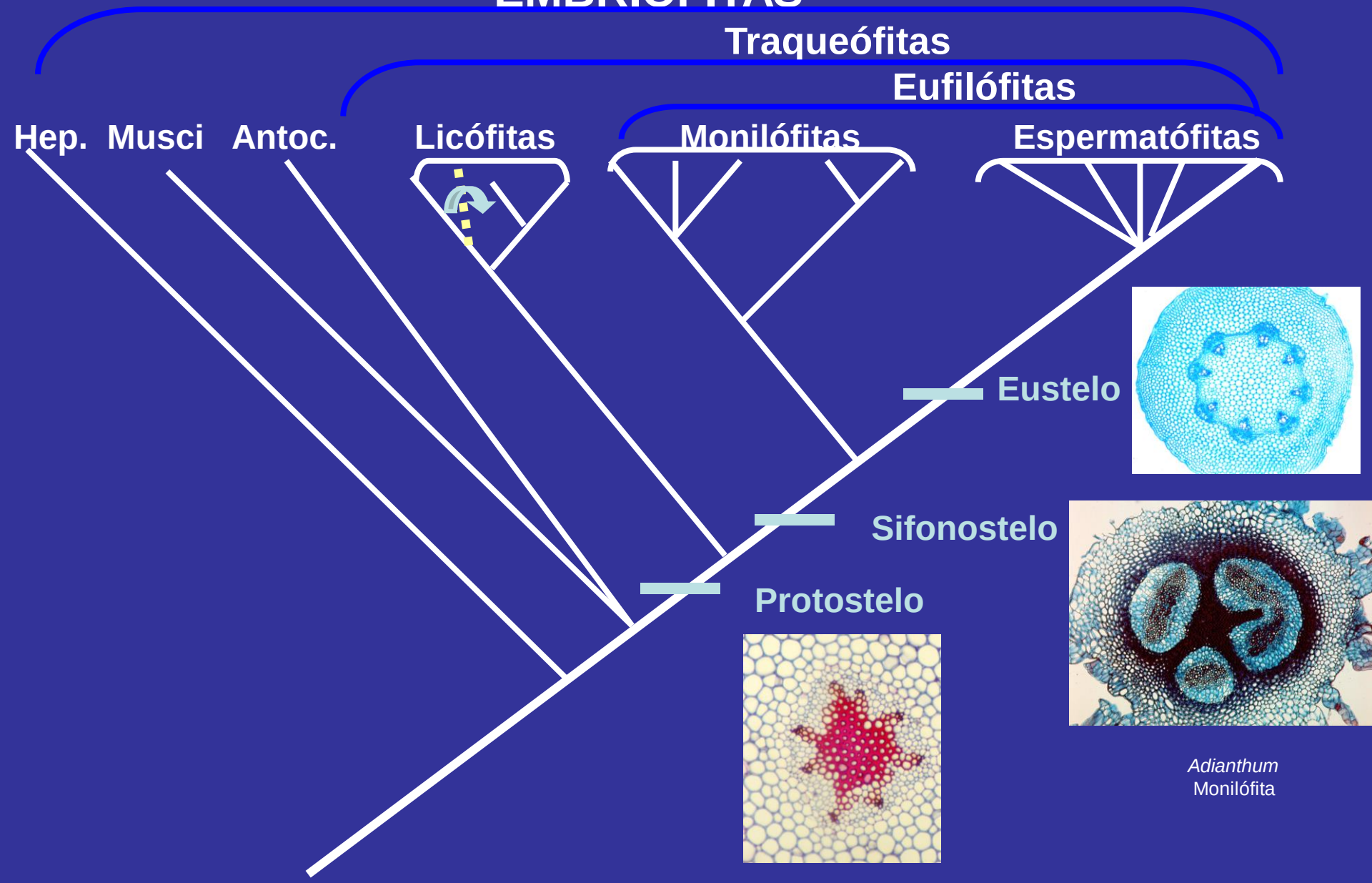

EMBRIÓFITAS
Traqueófitas
Eufilófitas
Hep.
Musci
Antoc.
Licófitas
Monilófitas
Espermatófitas
Eustelo
Sifonostelo
Protostelo

EUSTELO



Mamona
Ricinus communis
Euphorbiaceae,
Angiosperma

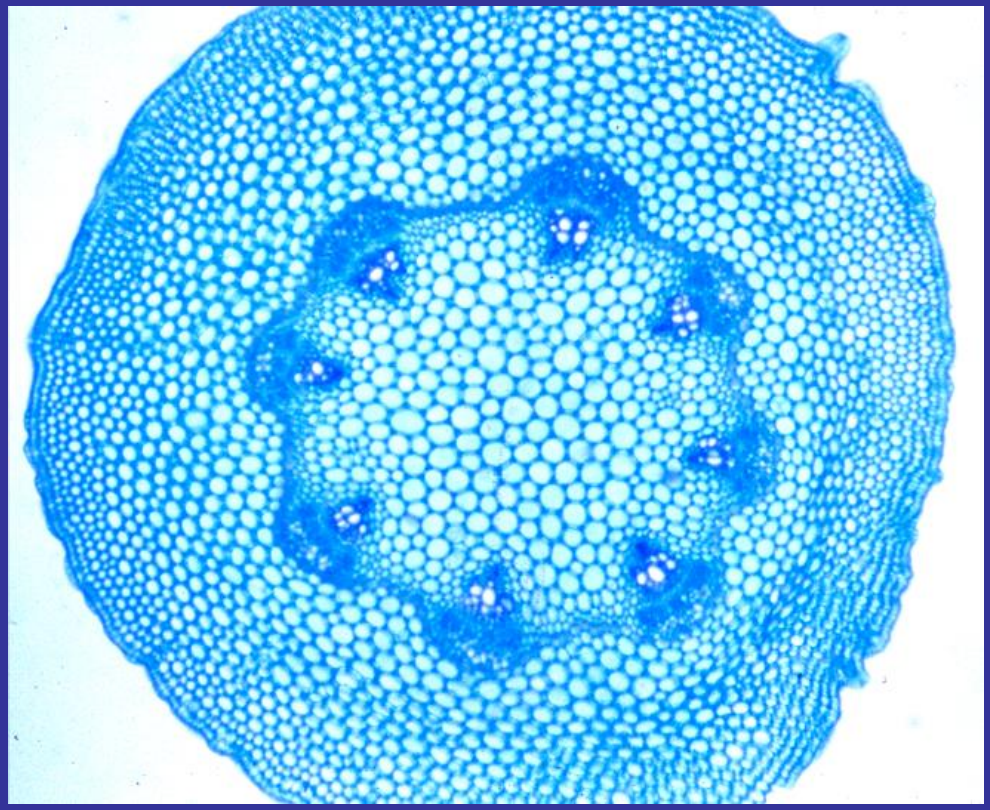
EMBRIÓFITAS

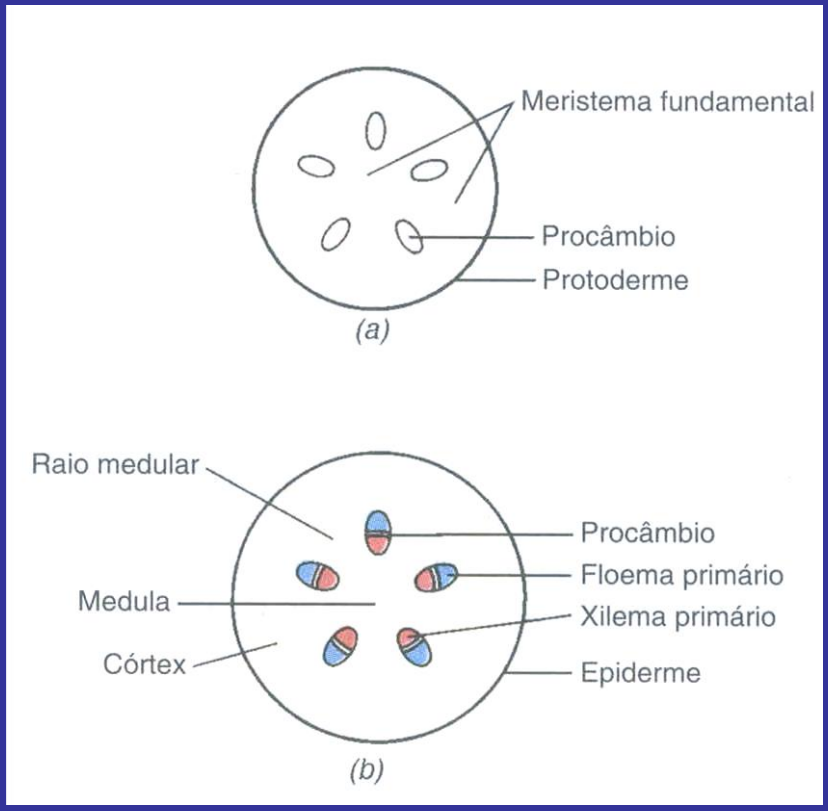


Adianthum
Monilófita

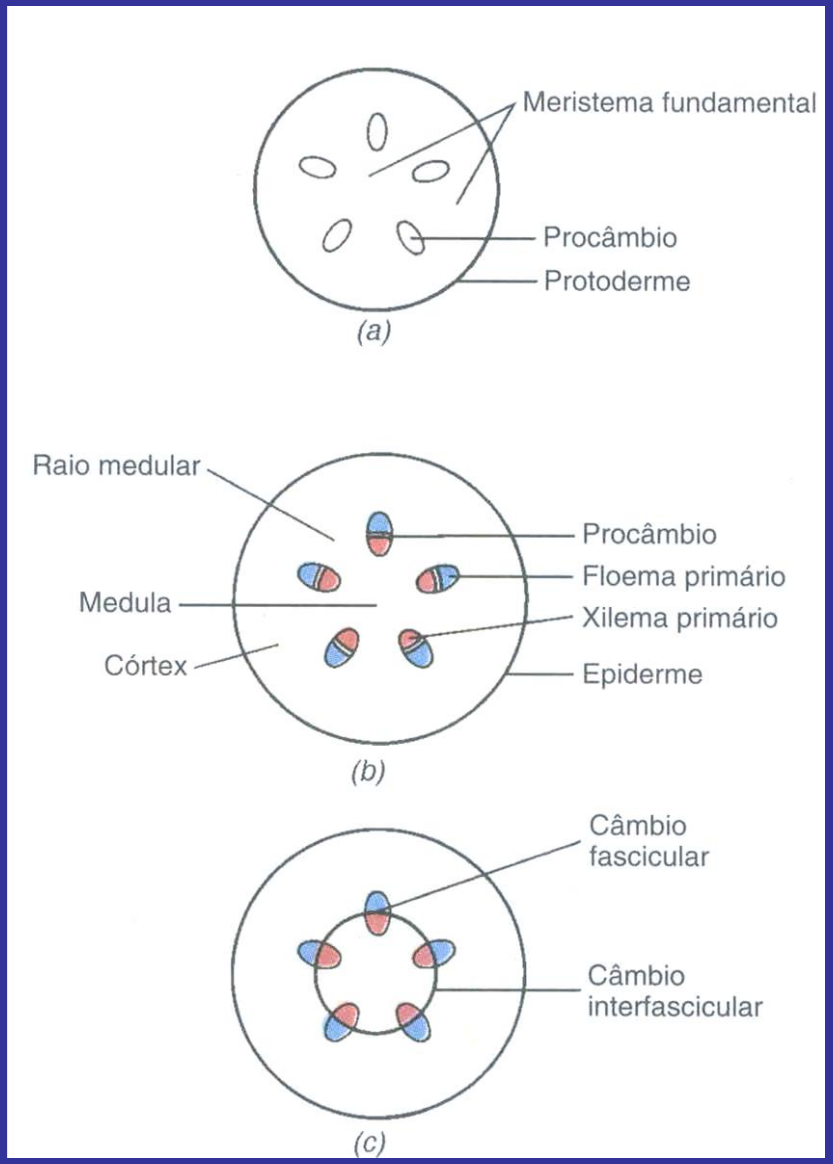
Psilotum
Licófita

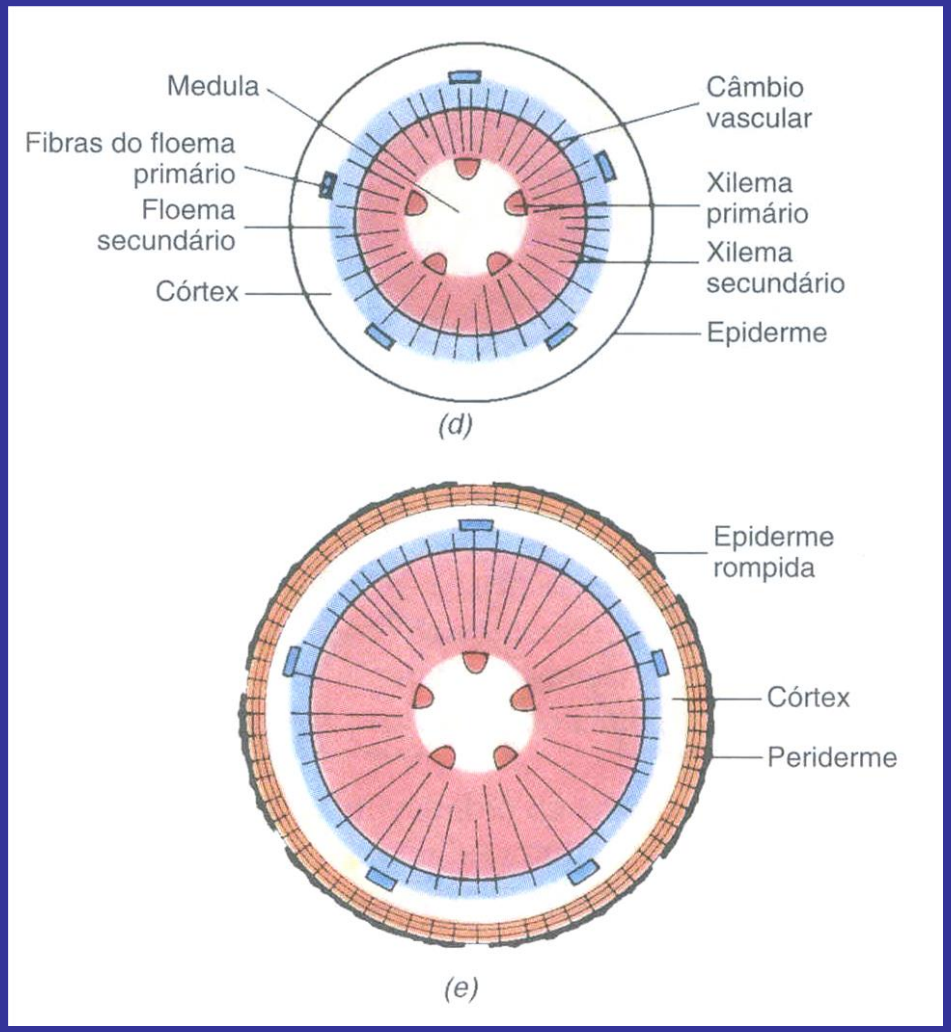
EUSTELO




Meristema fundamental
Procâmbio
Protoderme
(a)
Raio medular
Procâmbio
Floema primário
Medula
Xilema primário
Córtex
Epiderme
(b)

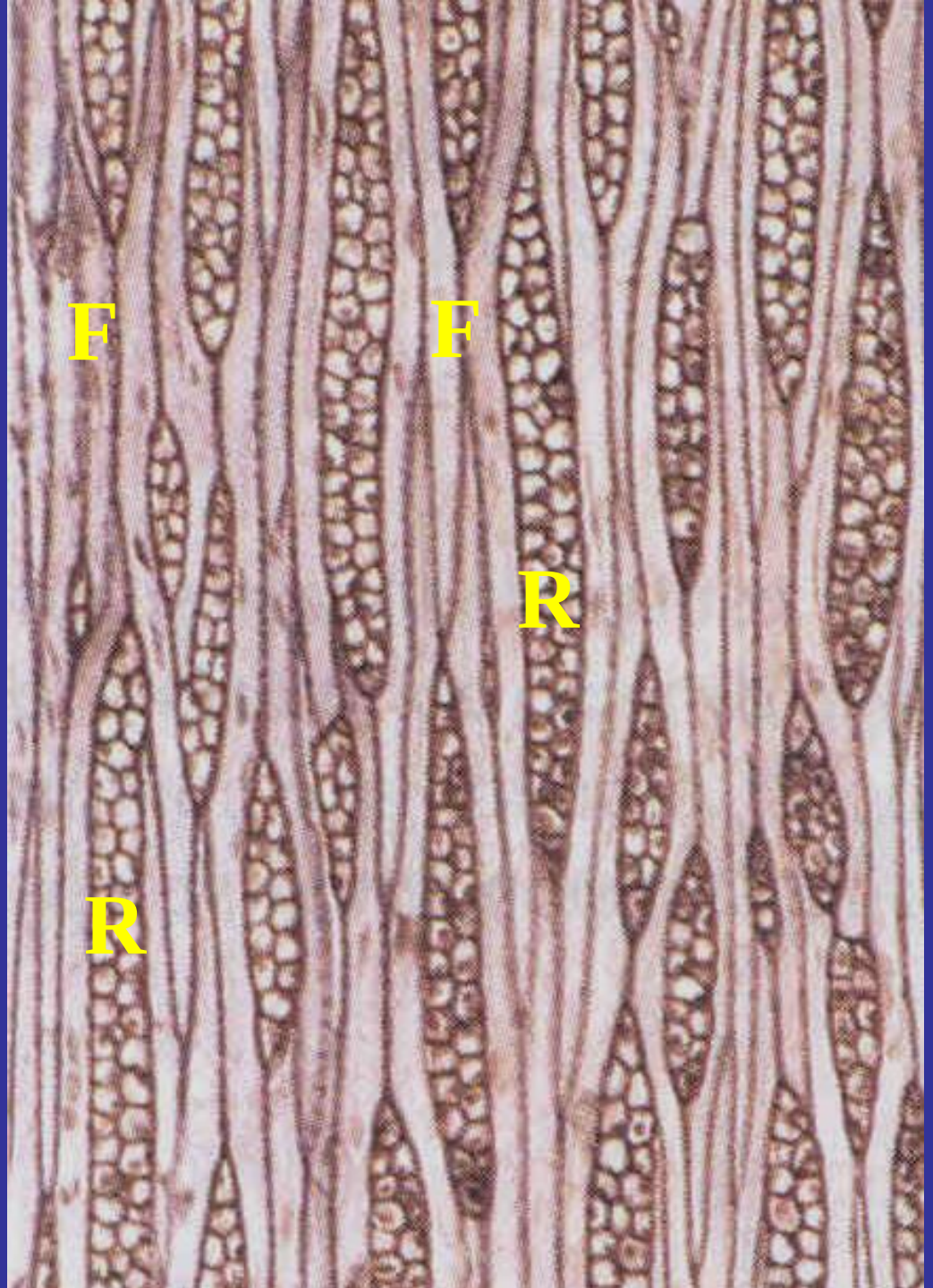
Corpo primário → corpo secundário



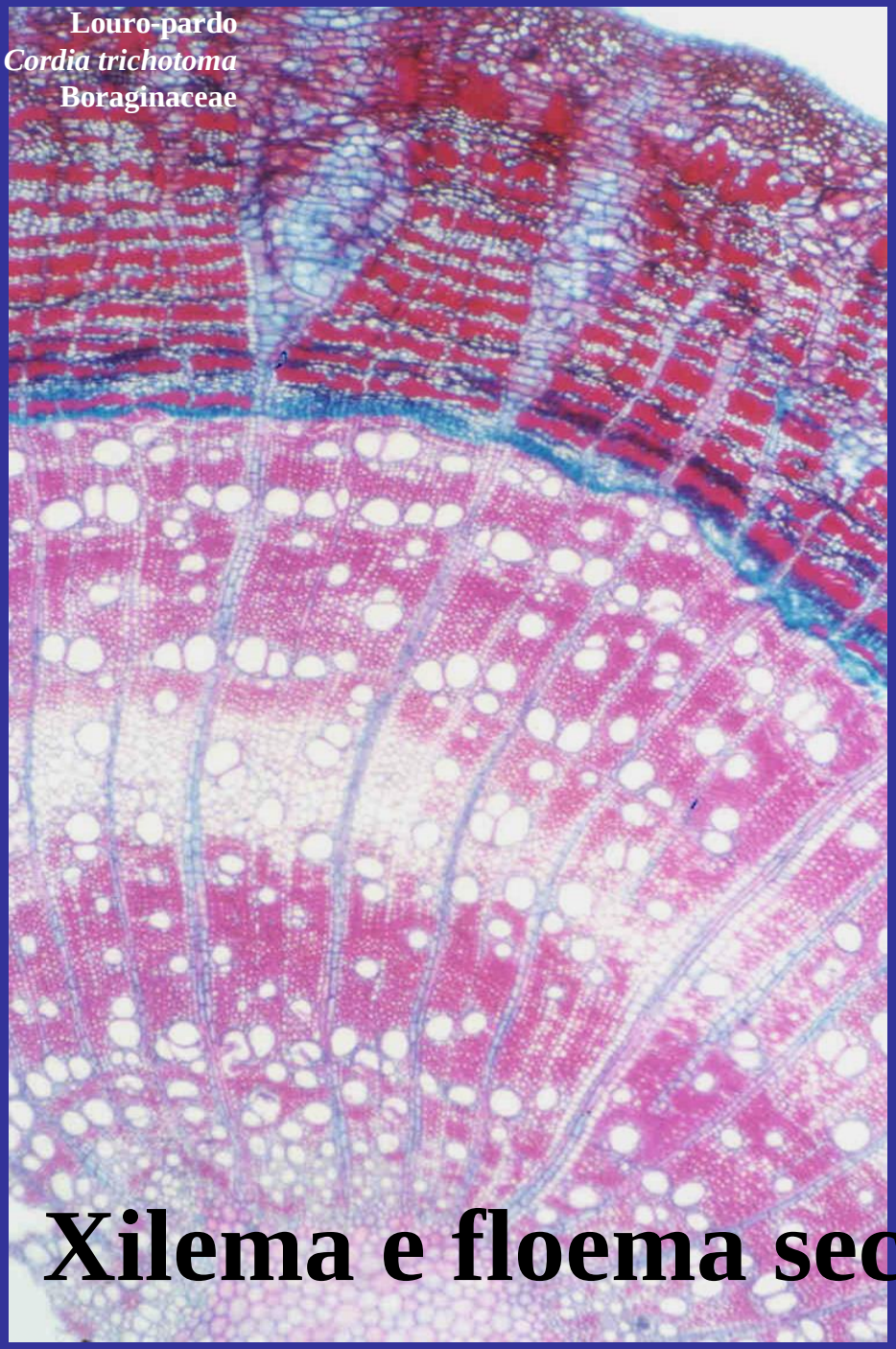


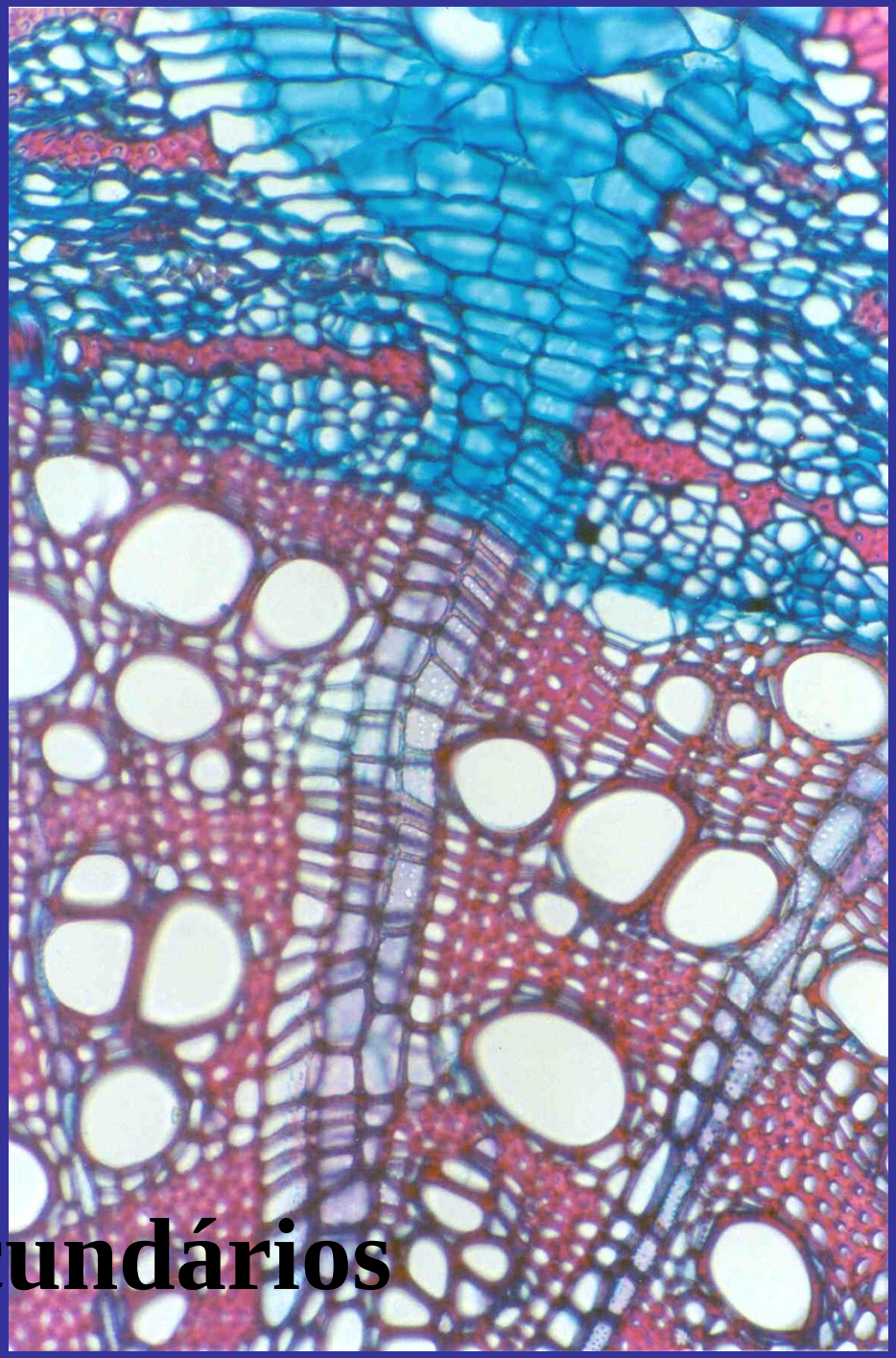
(Raven *et al*. 2001)

Câmbio: inicial fusiforme e radial



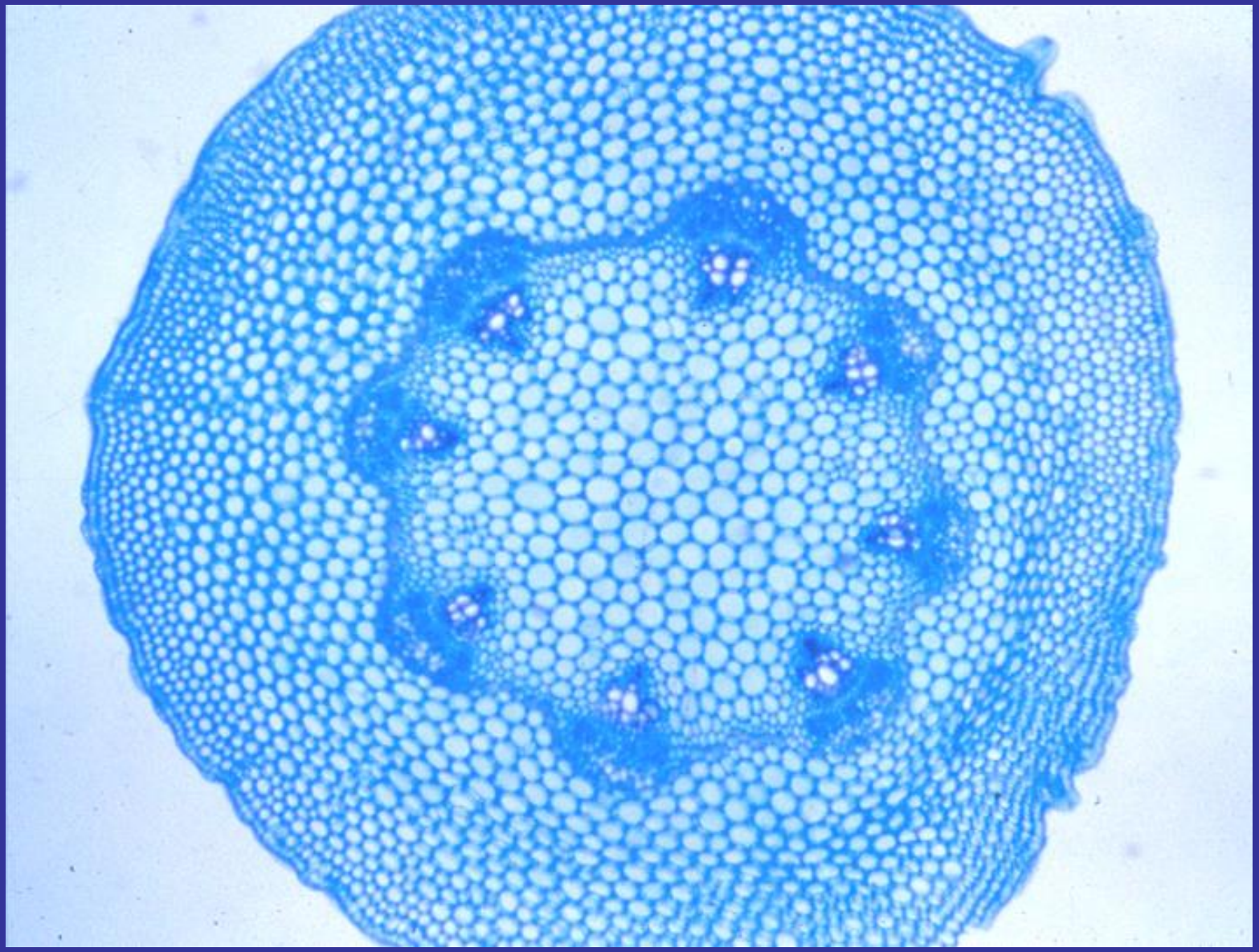
(Raven *et al*. 2001)

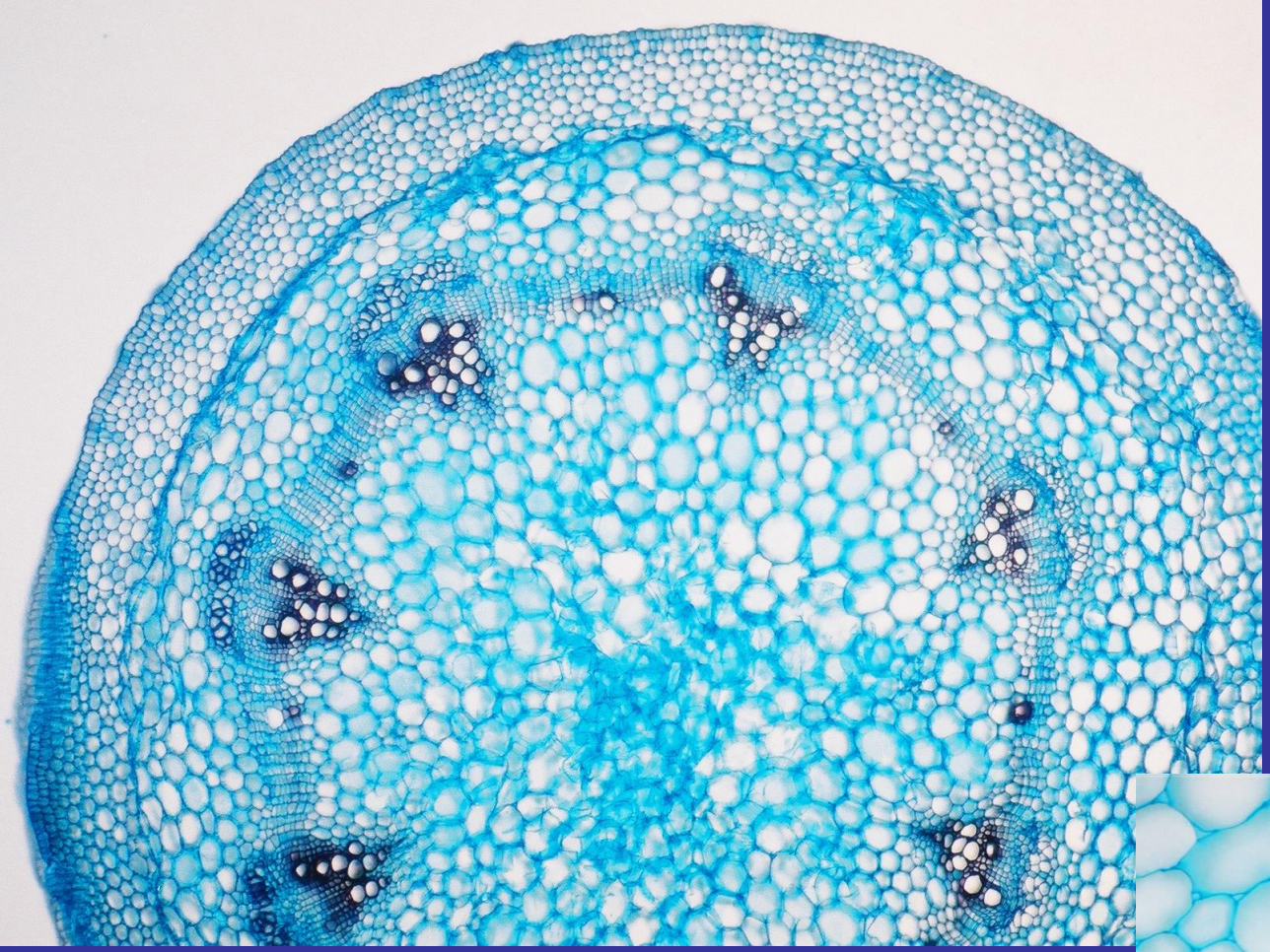




Xilema e floema secundários

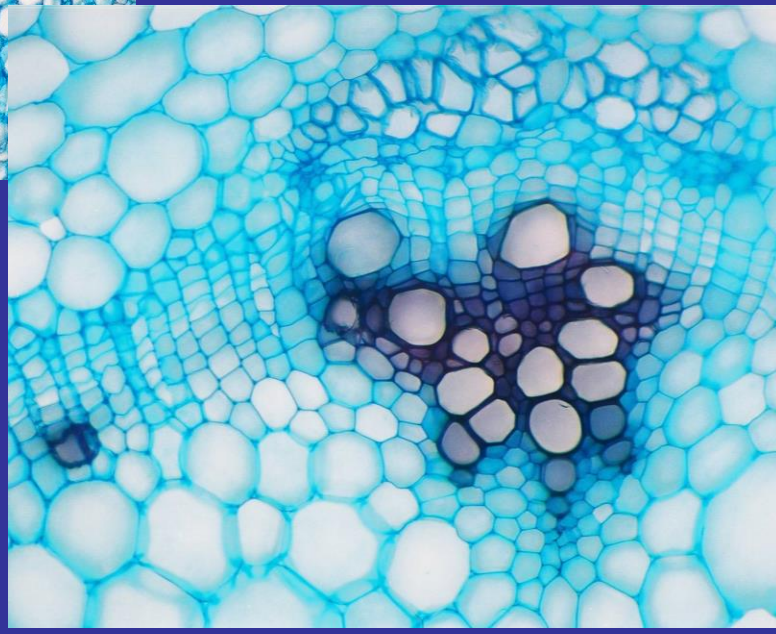
Eustelo → Instalação do câmbio vascular





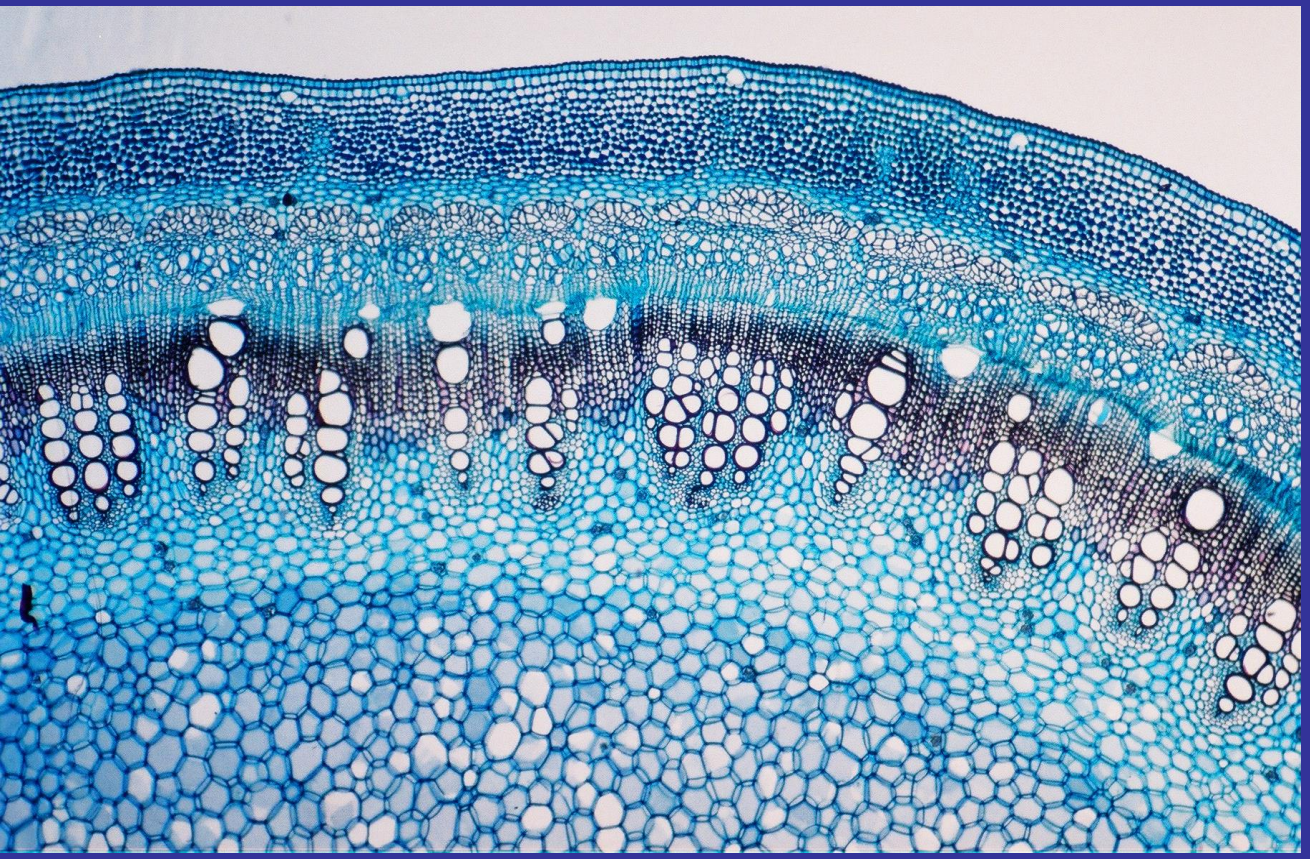
Câmbio fascicular

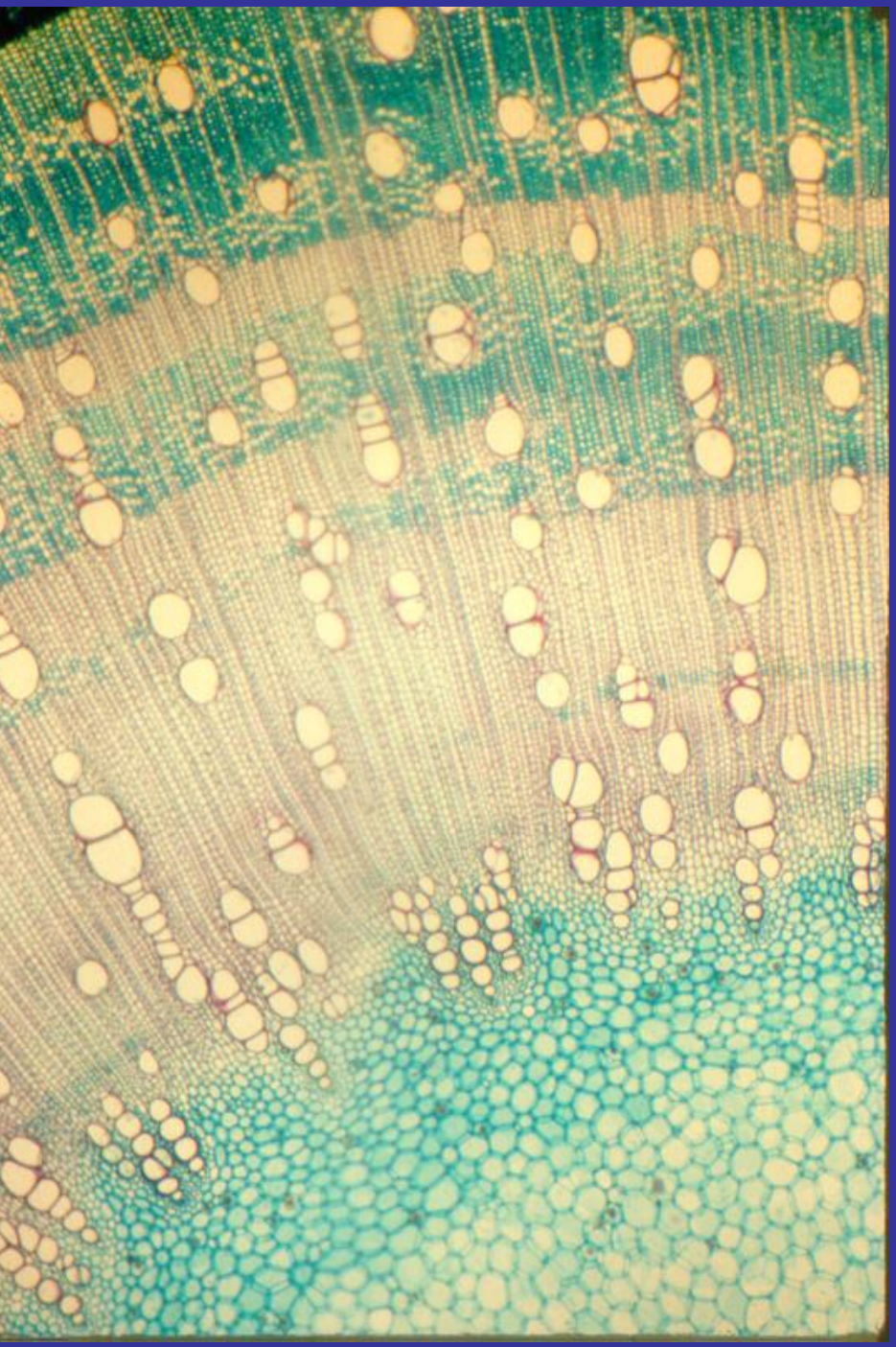
Câmbio interfascicular

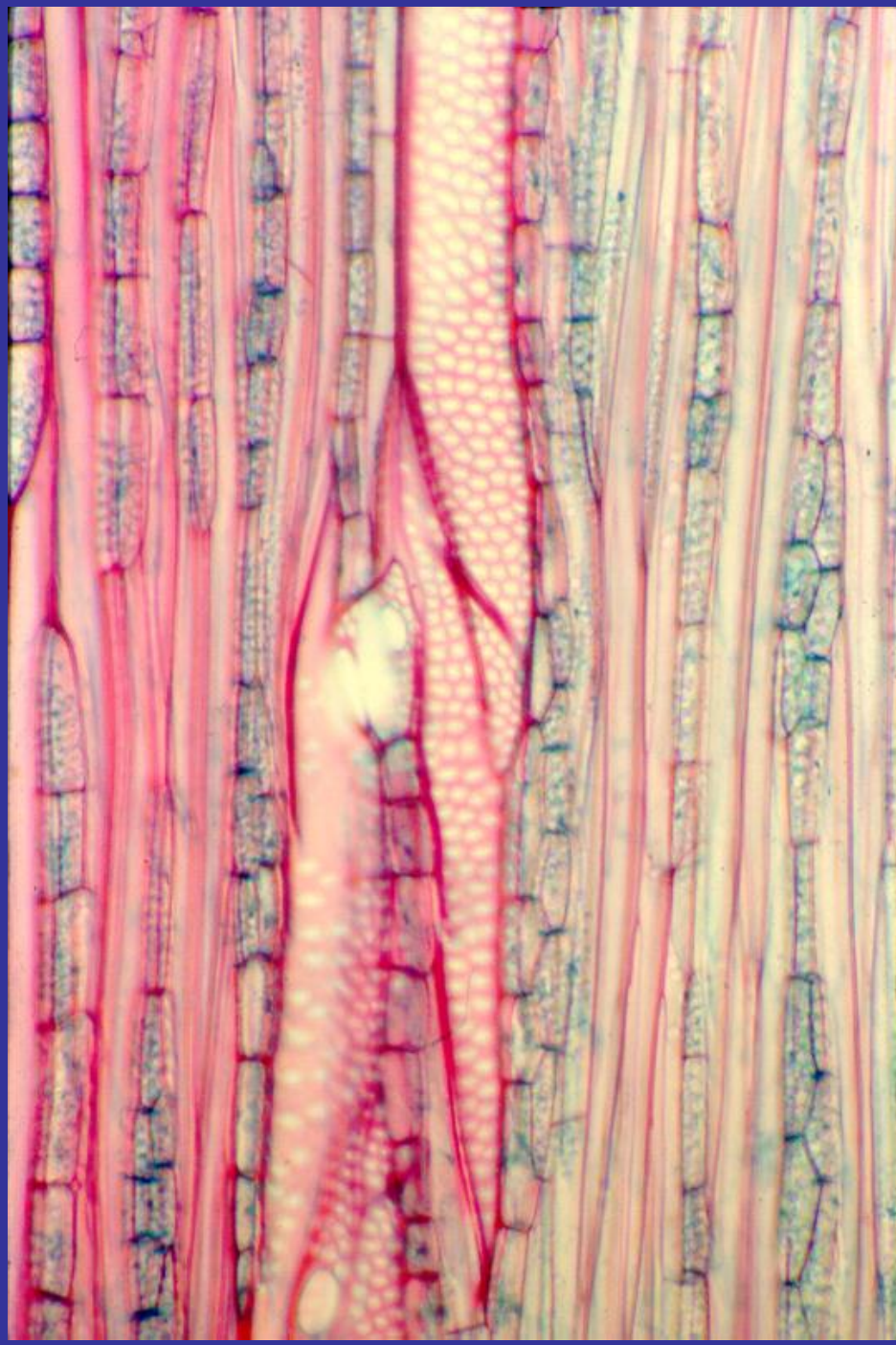


Eustelo → Instalação do câmbio vascular

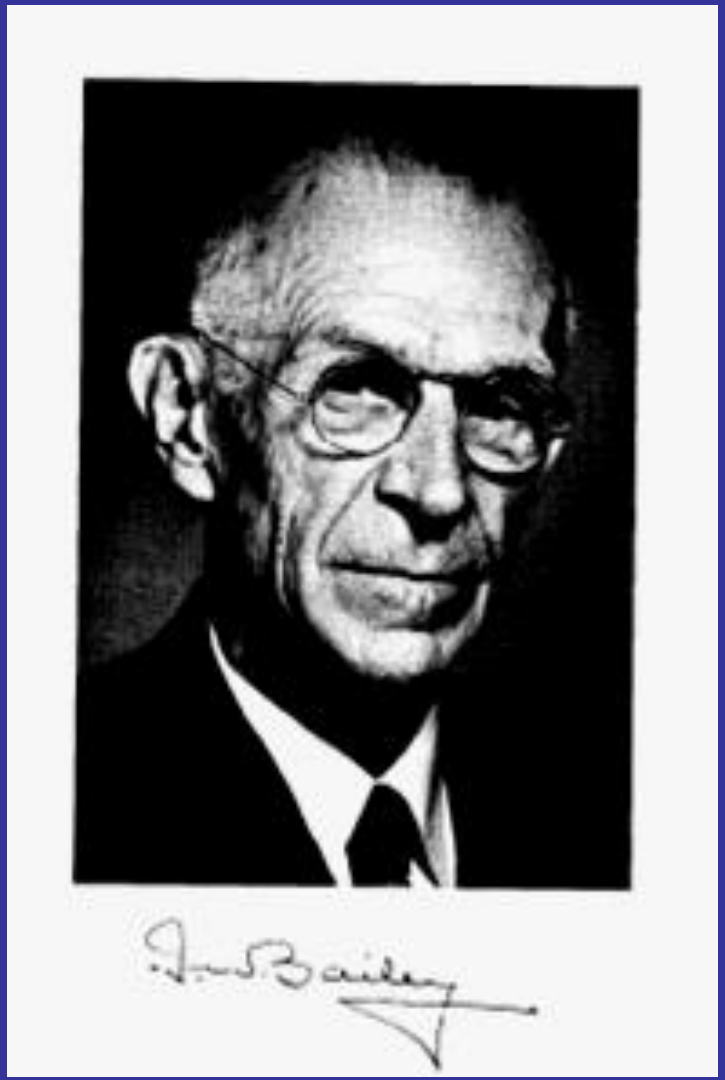
Sistema Vascular Secundário

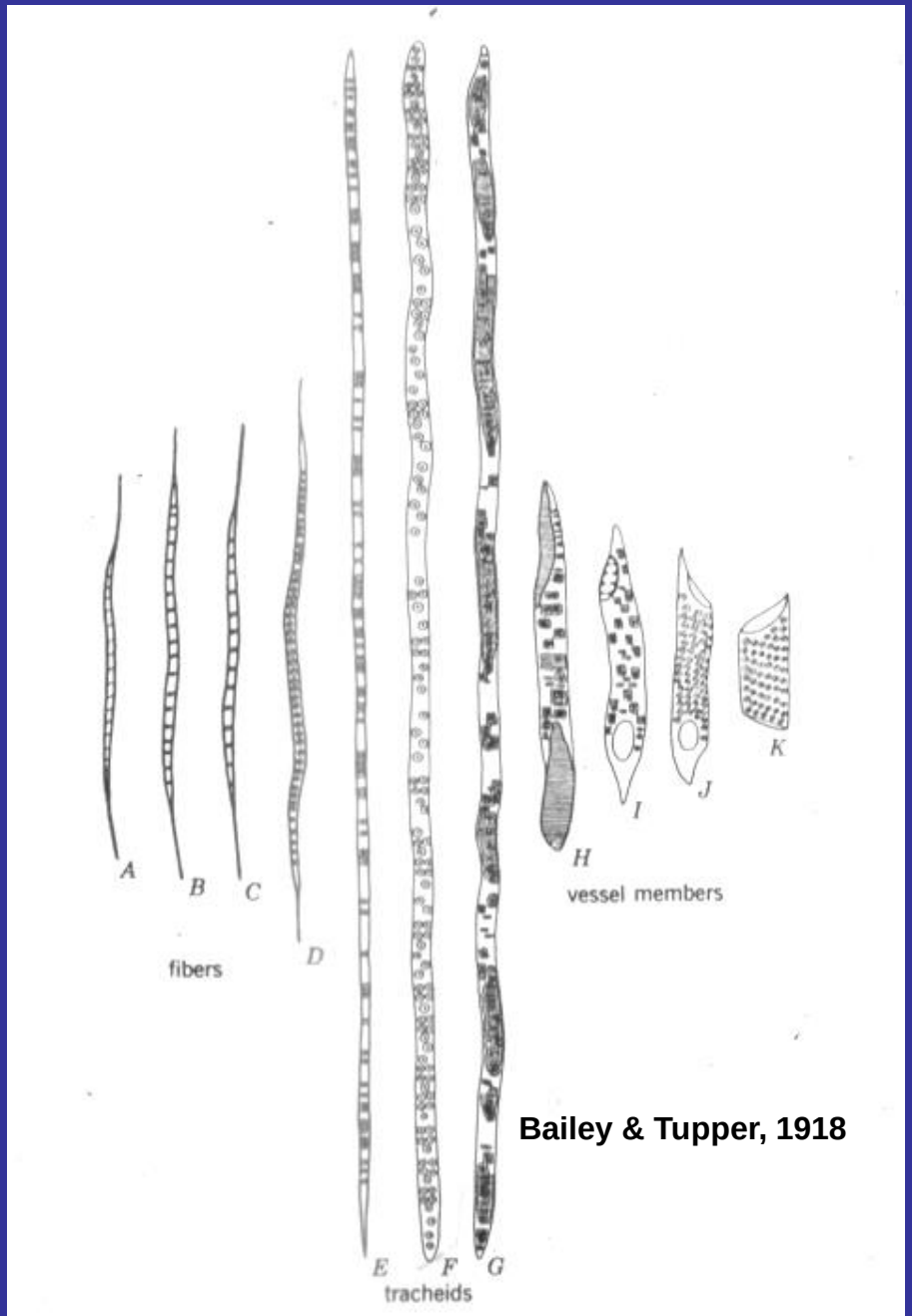




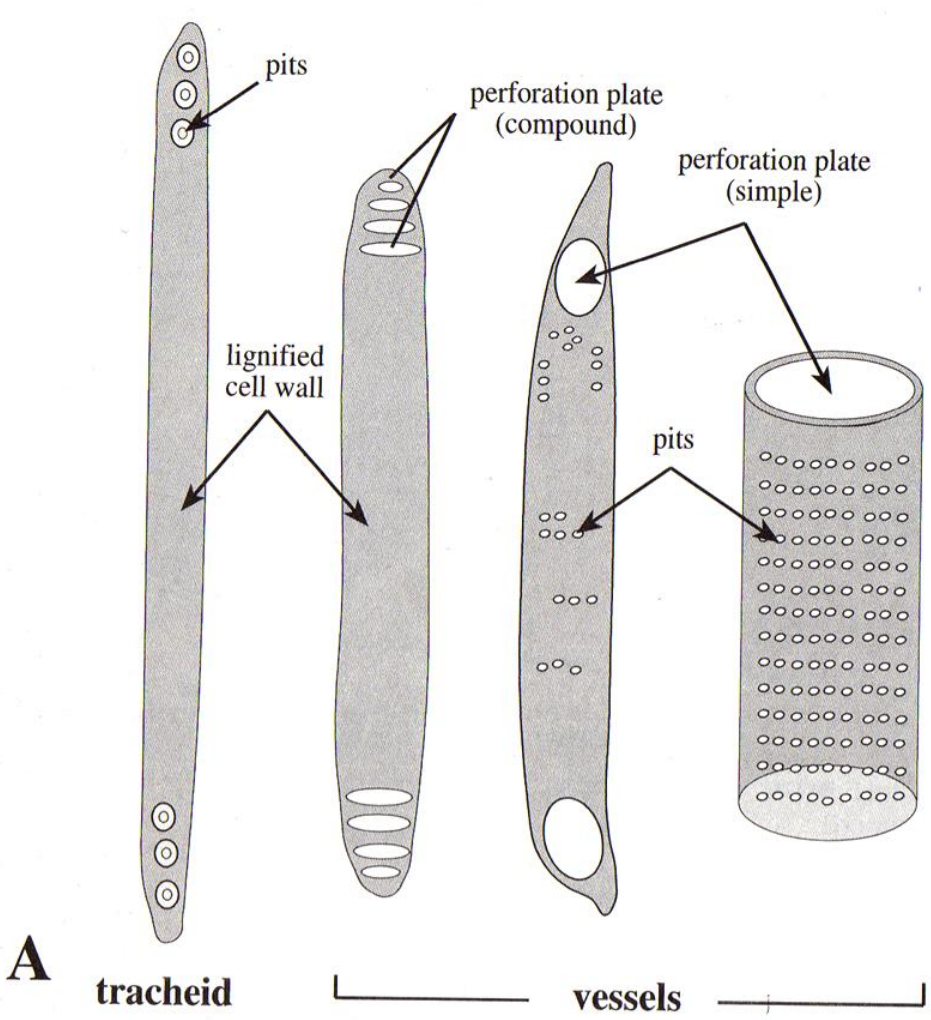


Células condutoras do xilema: traqueíde, elemento de vaso





Bailey & Tupper, 1918



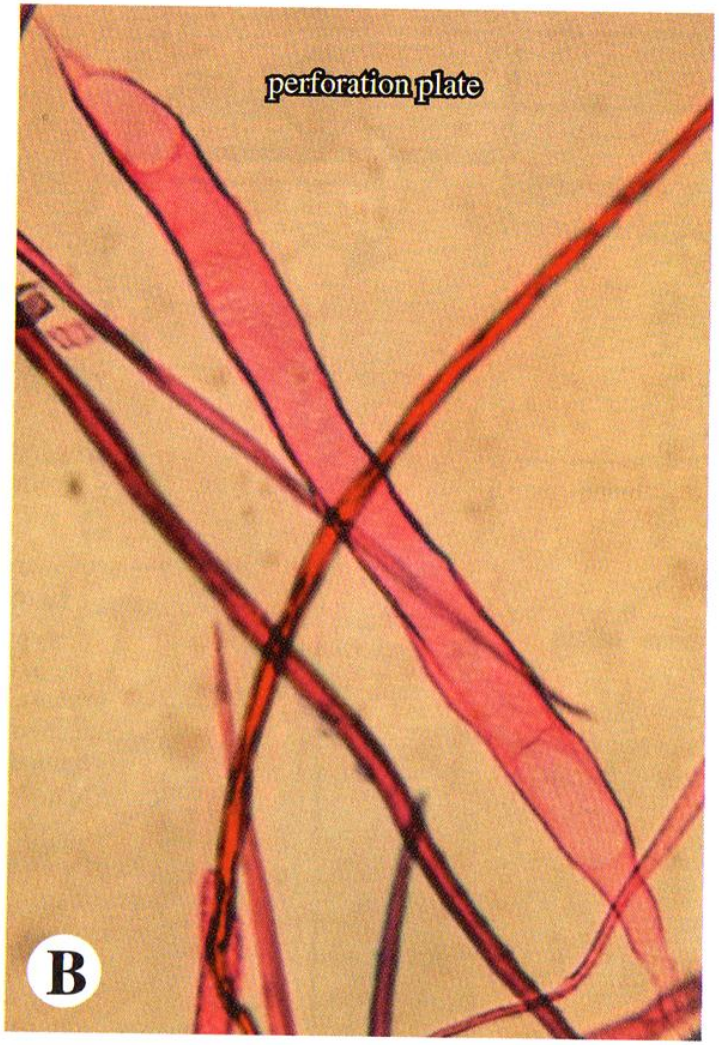
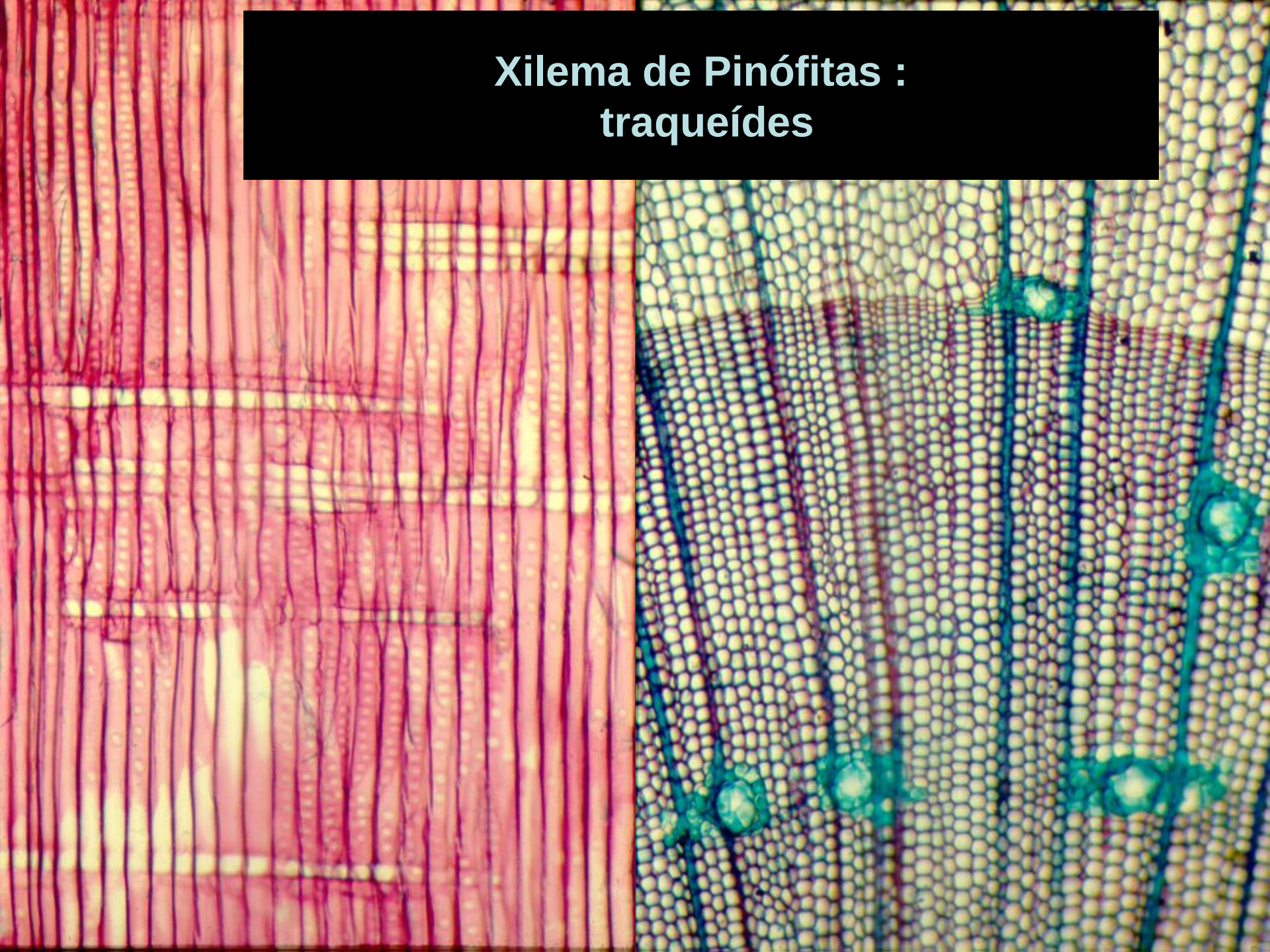


FIGURE 4.4 Conductive cells of vascular plants: tracheary elements. **A.** Types of tracheary elements. **B.** Vessel.

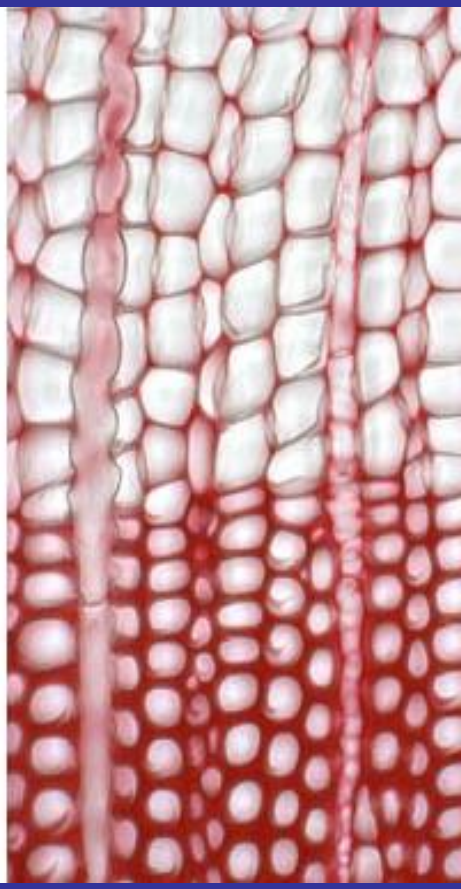
Simpson, 2006

Xilema de Pinófitas : traqueídes

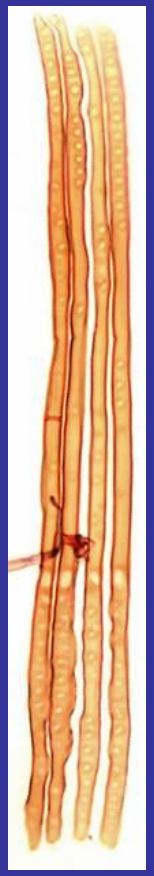


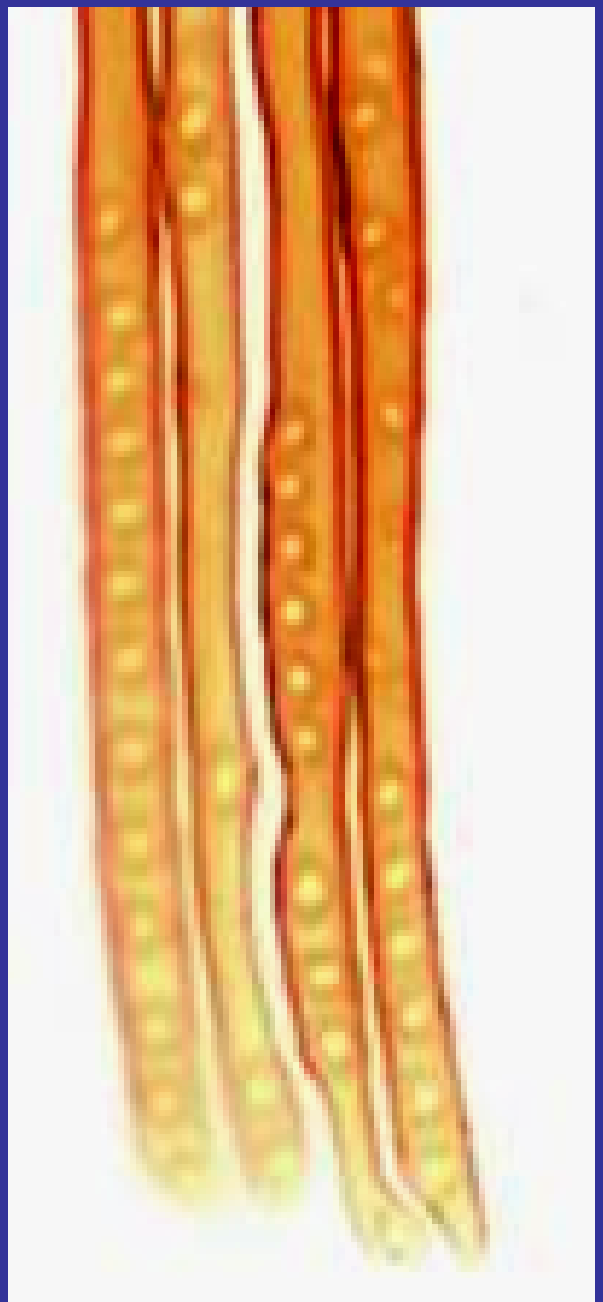
Camadas de crescimento anuais
Traqueídes

Pinófitas



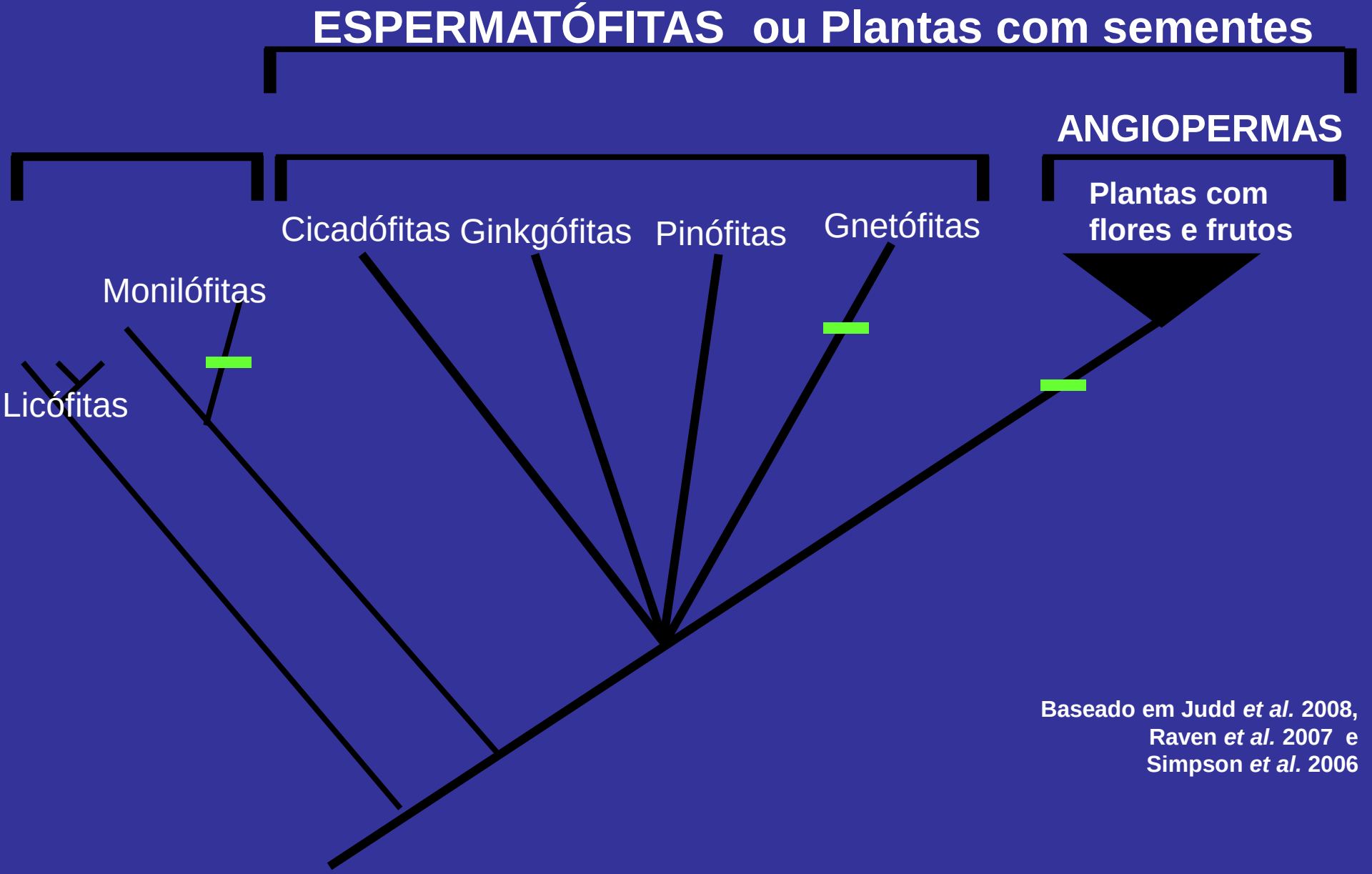
Traqueídes





O elemento de vaso na evolução das Traqueófitas

Elemento de vaso Traqueófitas

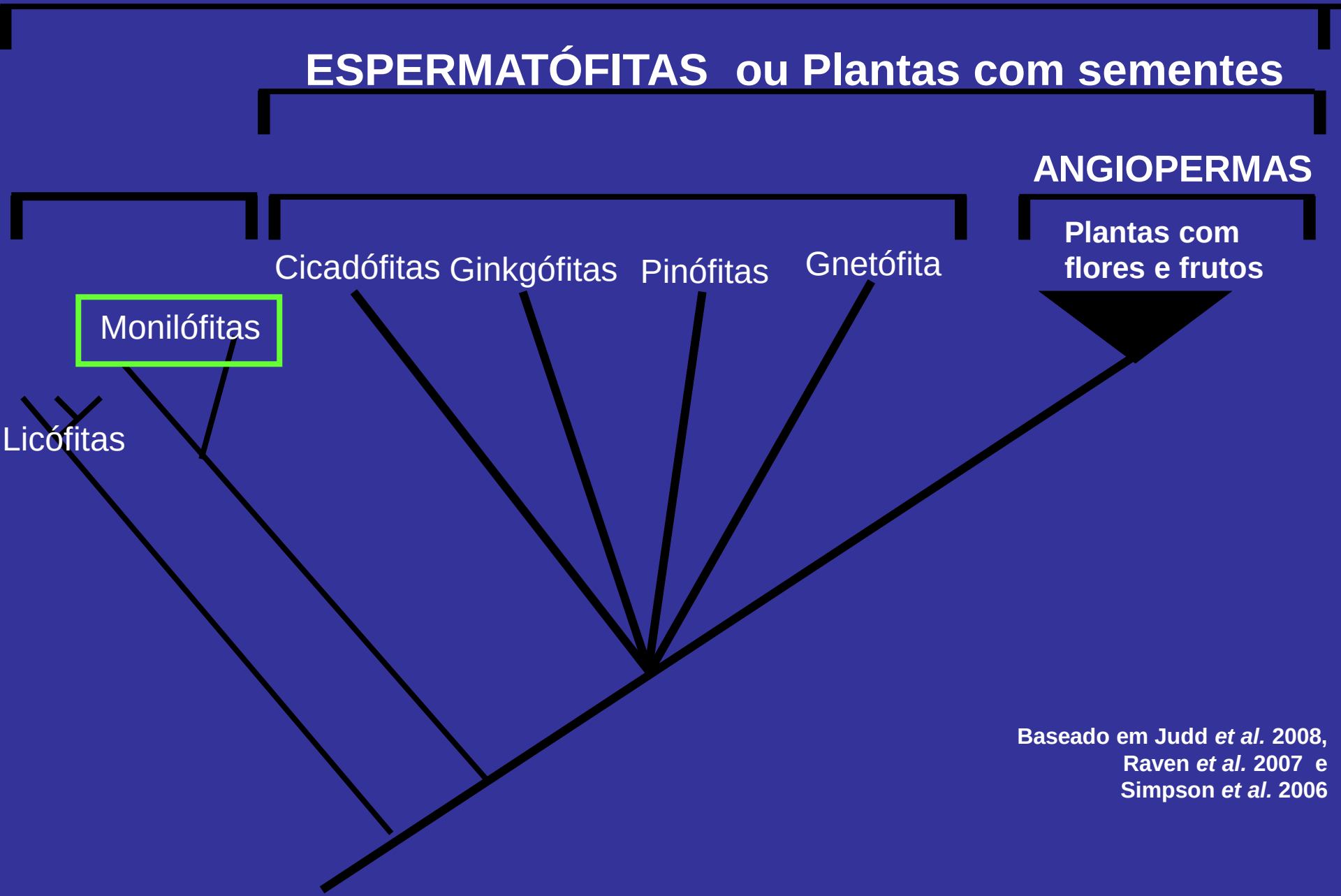


Baseado em Judd *et al.* 2008, Raven *et al.* 2007 e Simpson *et al.* 2006

elemento de vaso

TRAQUEÓFITAS

ESPERMATÓFITAS ou Plantas com sementes

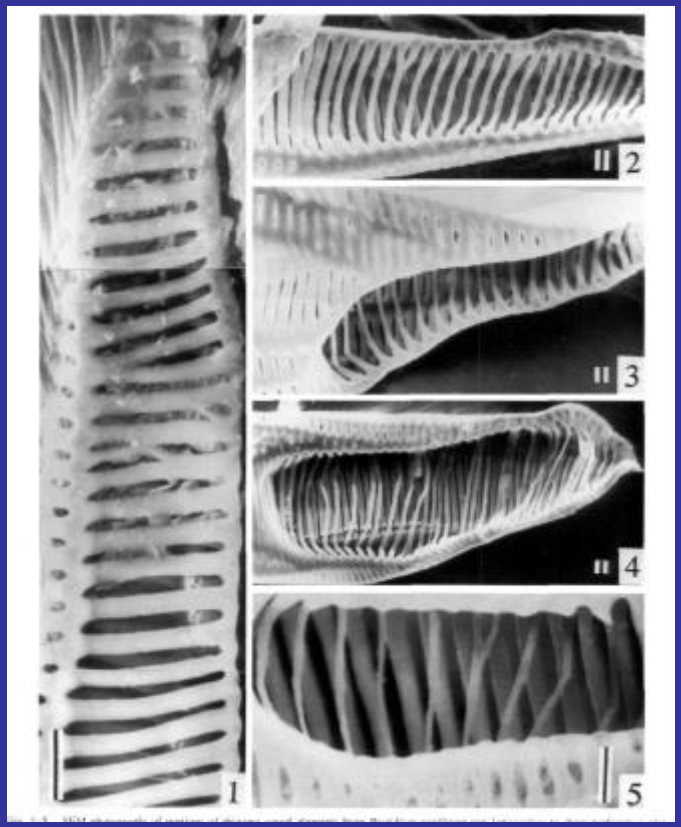


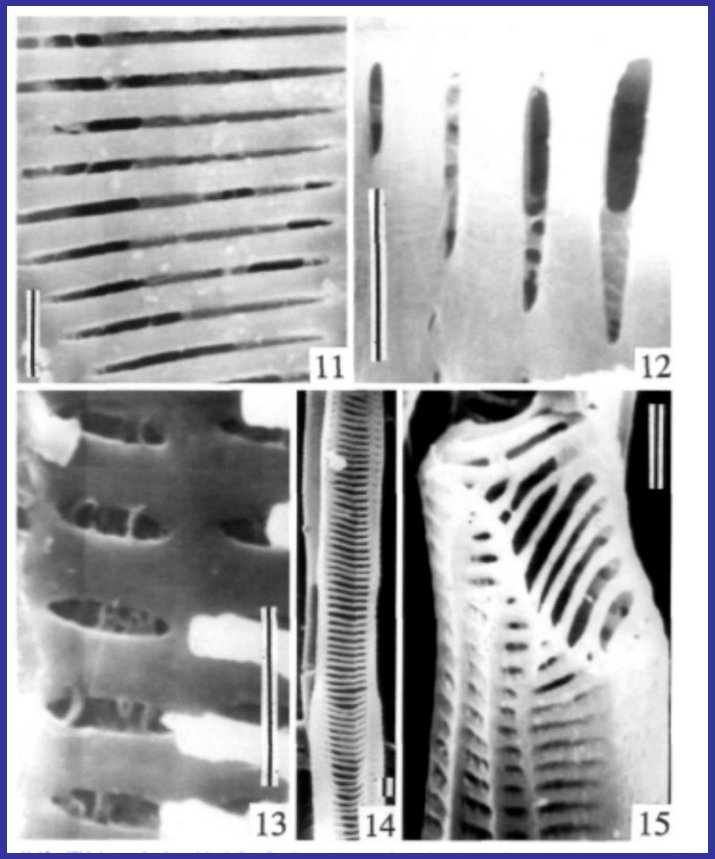
Baseado em Judd *et al.* 2008, Raven *et al.* 2007 e Simpson *et al.* 2006

American Journal of Botany 84(5): 581–587. 1997.

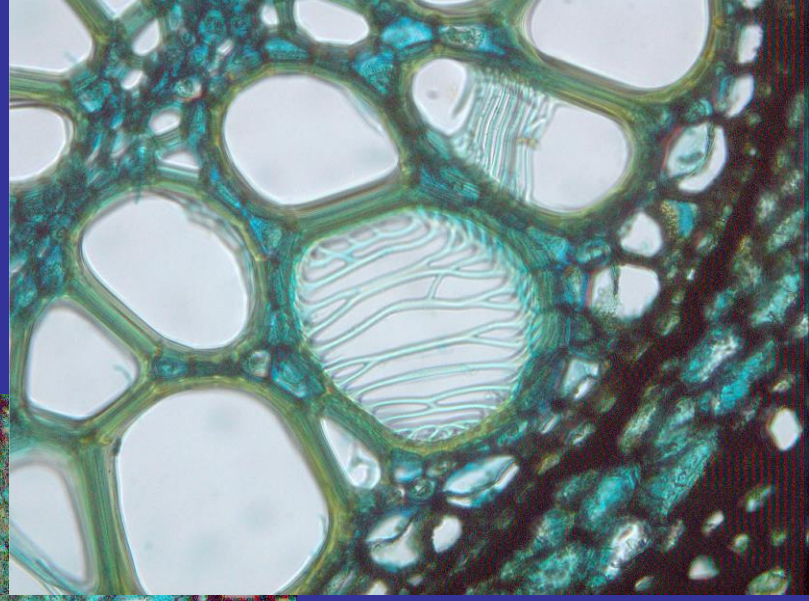
SEM STUDIES ON VESSELS IN FERNS. 2. *PTERIDIUM*[1]

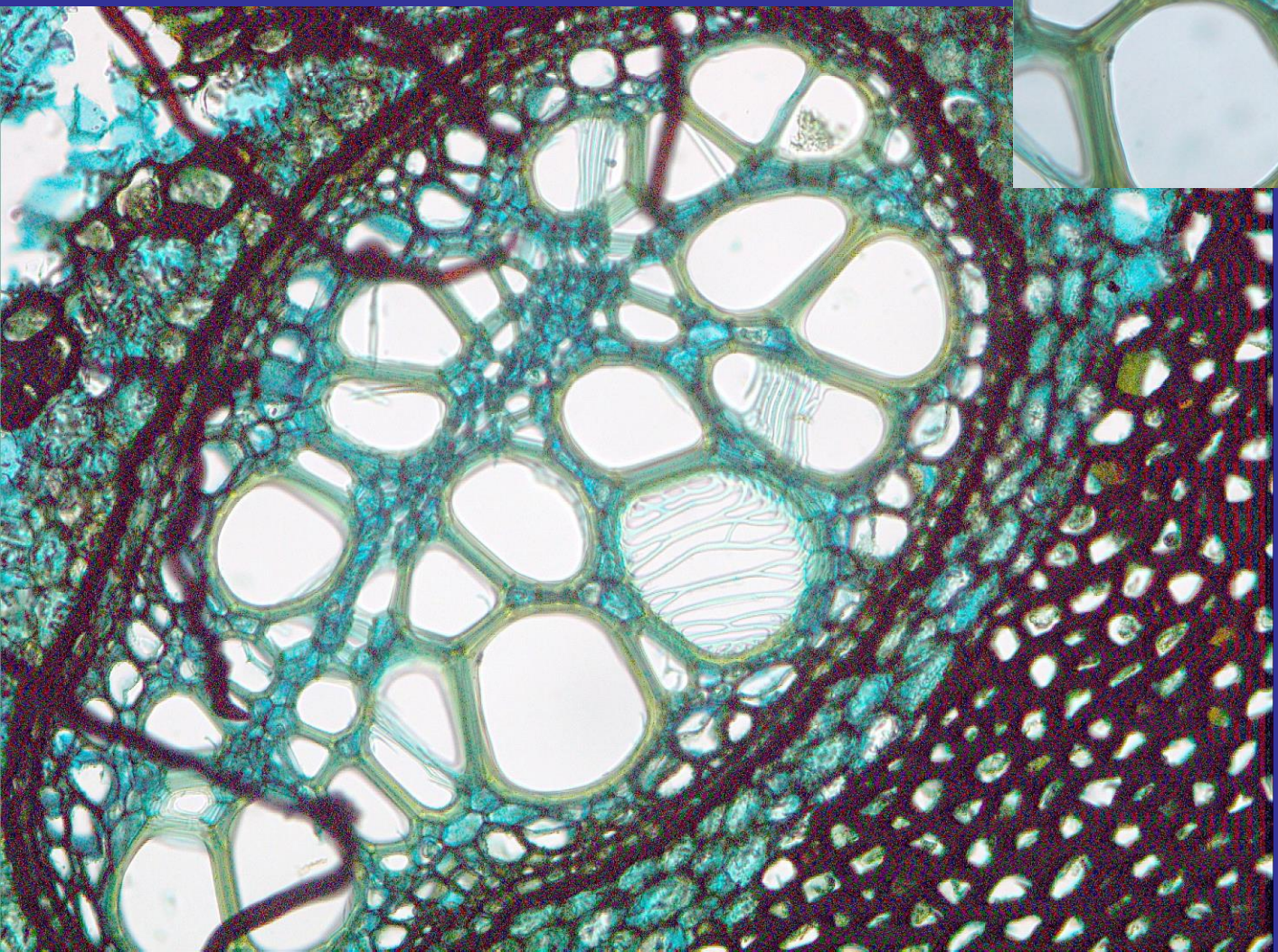
SHERWIN CARLQUIST[2] AND EDWARD L. SCHNEIDER





Elemento de vaso:
Placa de perfuração escalariforme



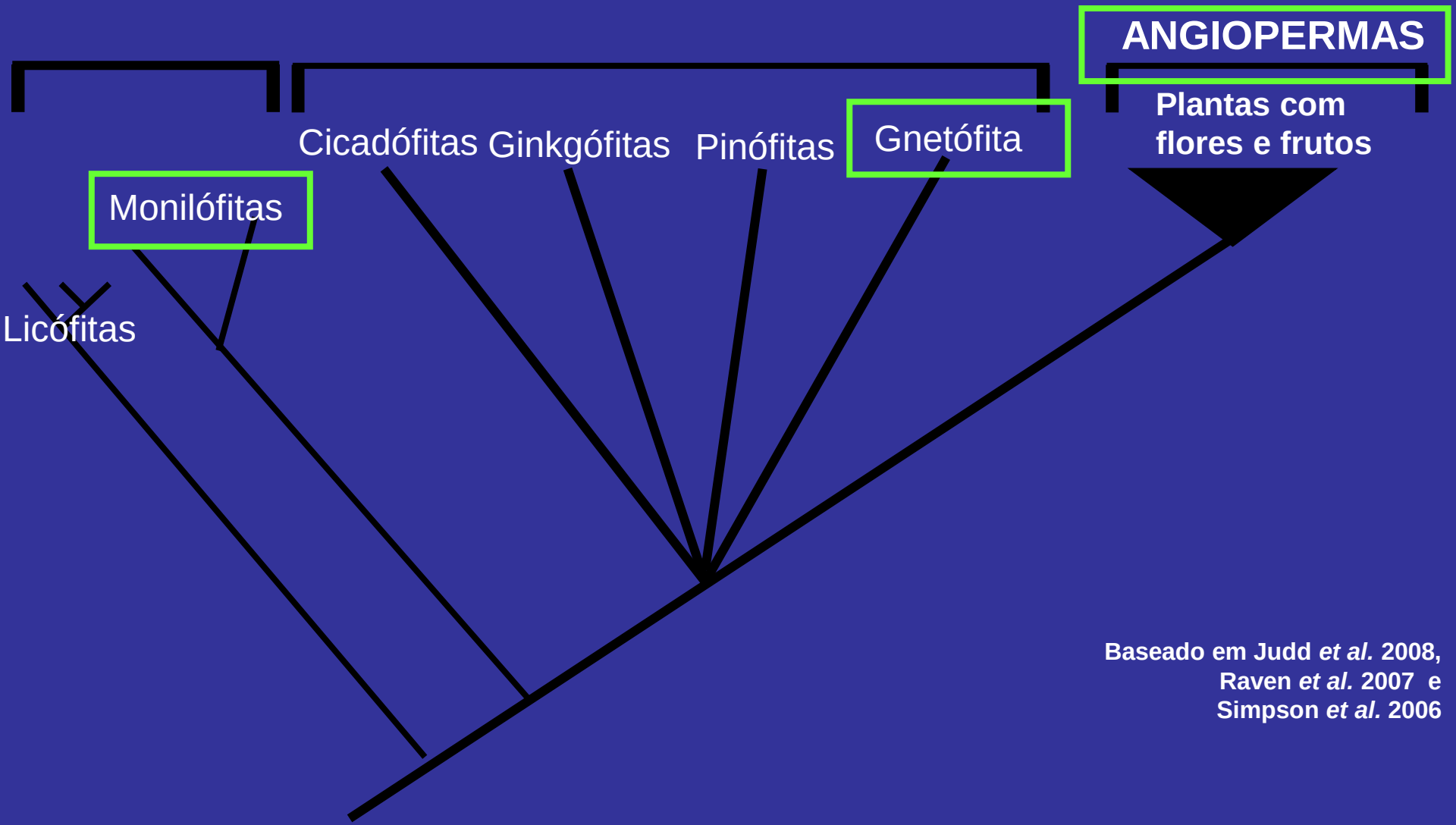


Pteridium
Polypodiaceae

elemento de vaso

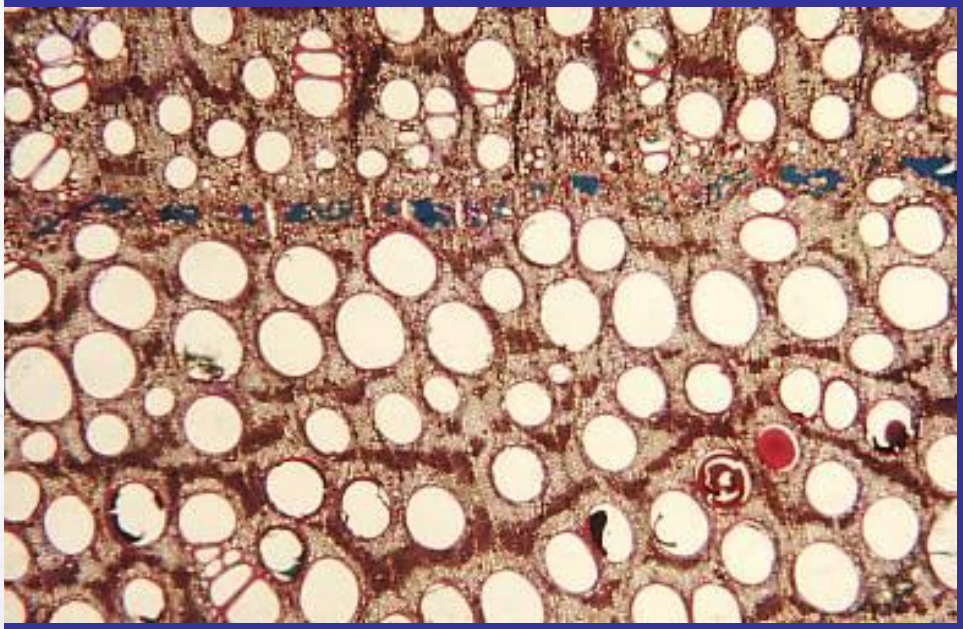
TRAQUEÓFITAS

ESPERMATÓFITAS ou Plantas com sementes

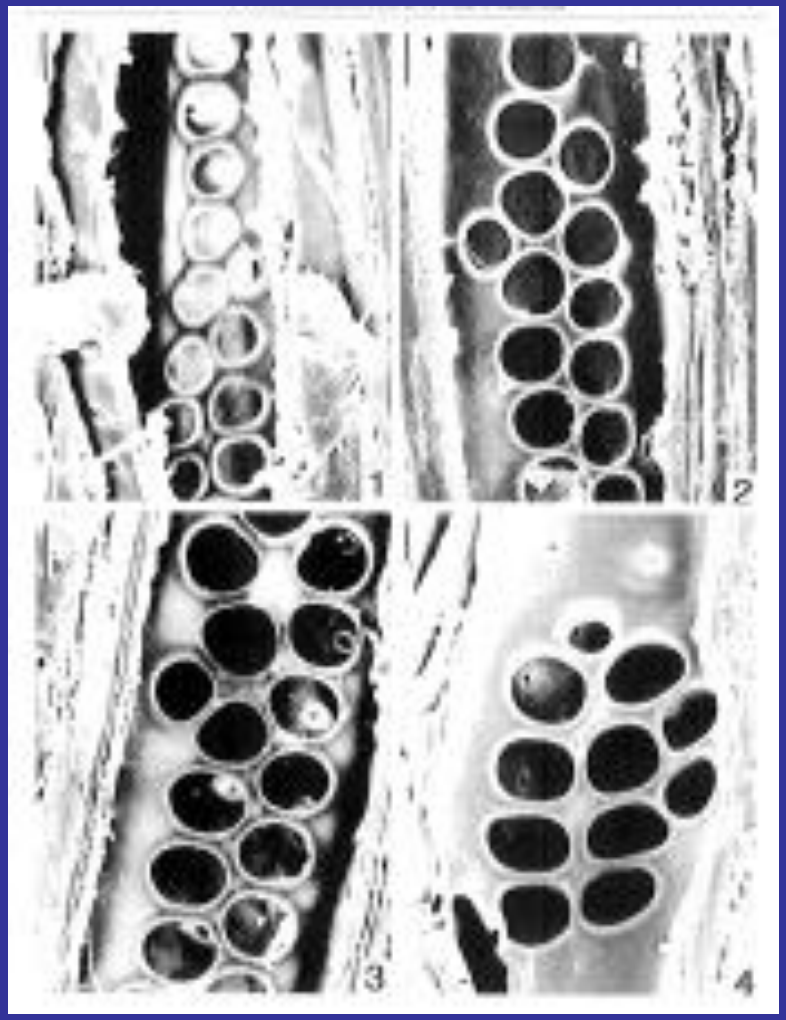


Baseado em Judd *et al.* 2008, Raven *et al.* 2007 e Simpson *et al.* 2006

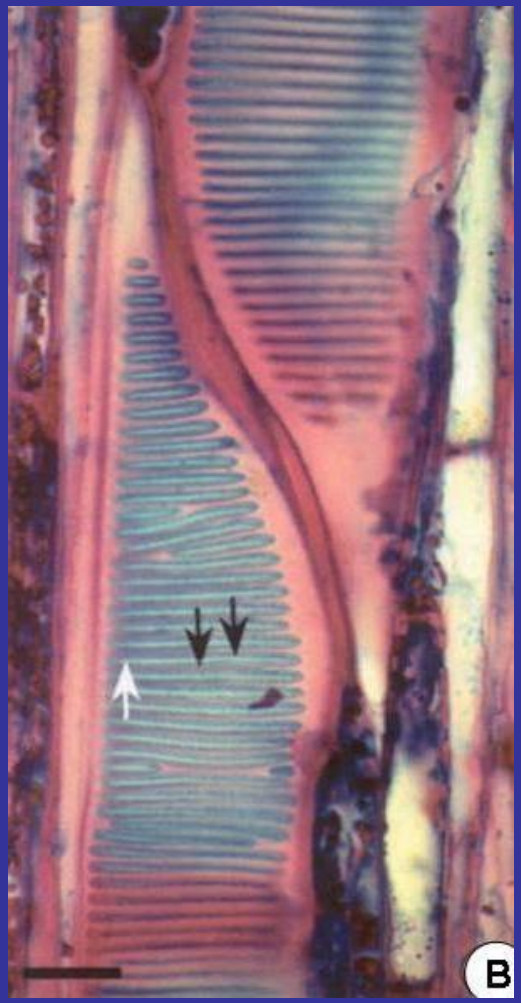
Gnetum, Gnetaceae



Gnetum, Gnetaceae



Carlquist 1966

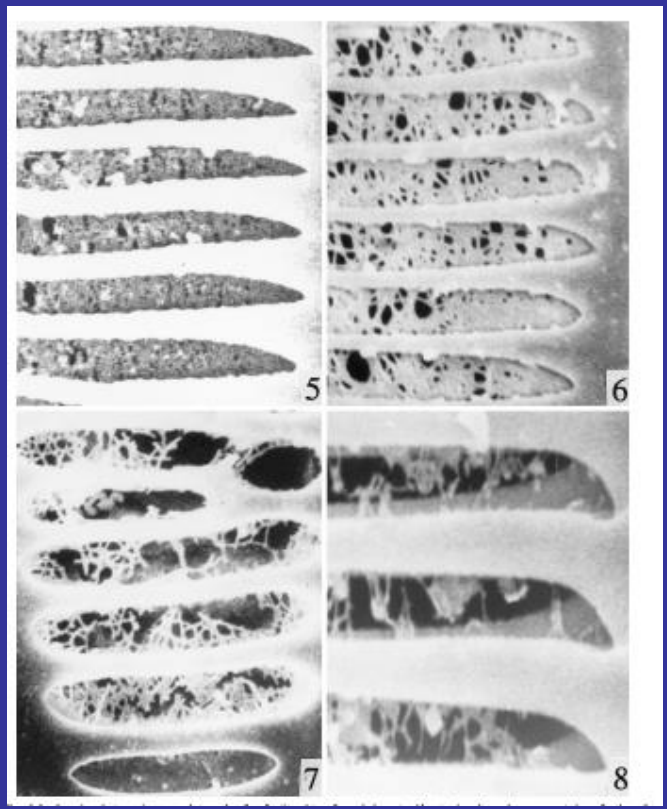


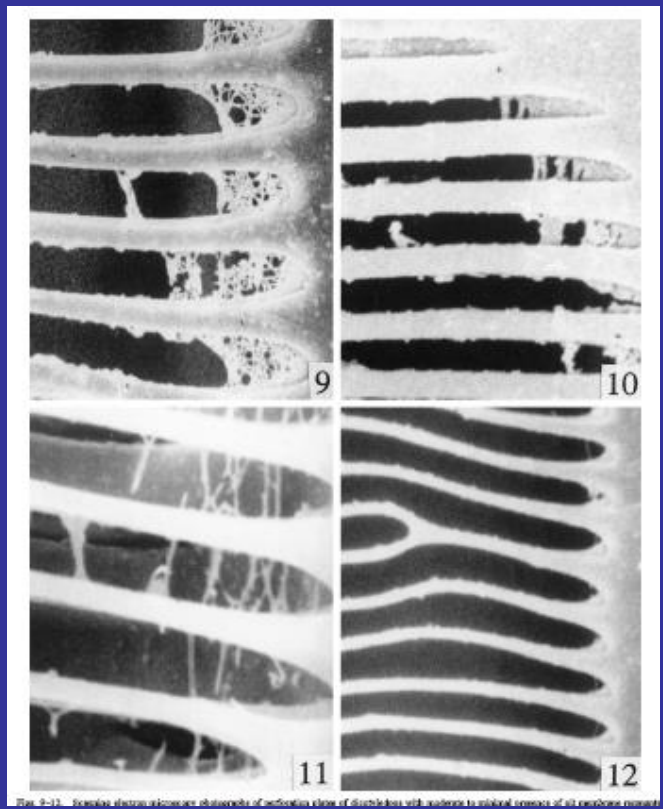
Esemann-Quadros & Angyalossy, 2009
Clusia, Clusiaceae

American Journal of Botany 89(2): 185–195. 2002.

THE TRACHEID–VESSEL ELEMENT TRANSITION IN ANGIOSPERMS INVOLVES MULTIPLE INDEPENDENT FEATURES: CLADISTIC CONSEQUENCES[1]

SHERWIN CARLQUIST AND EDWARD L. SCHNEIDER[2]

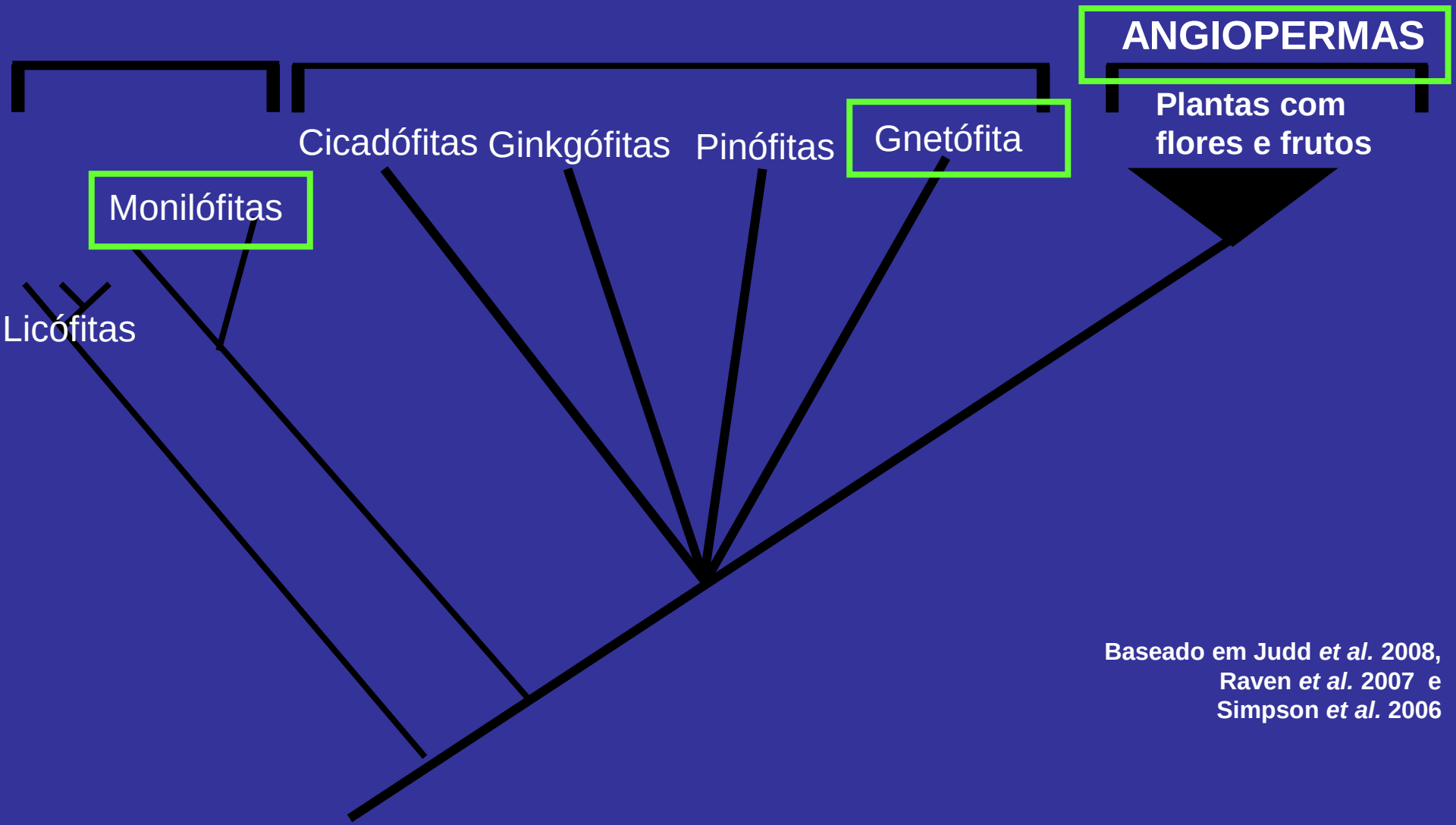




elemento de vaso

TRAQUEÓFITAS

ESPERMATÓFITAS ou Plantas com sementes



Baseado em Judd *et al.* 2008, Raven *et al.* 2007 e Simpson *et al.* 2006

Células condutoras do floema: célula crivada; elemento de tubo crivado

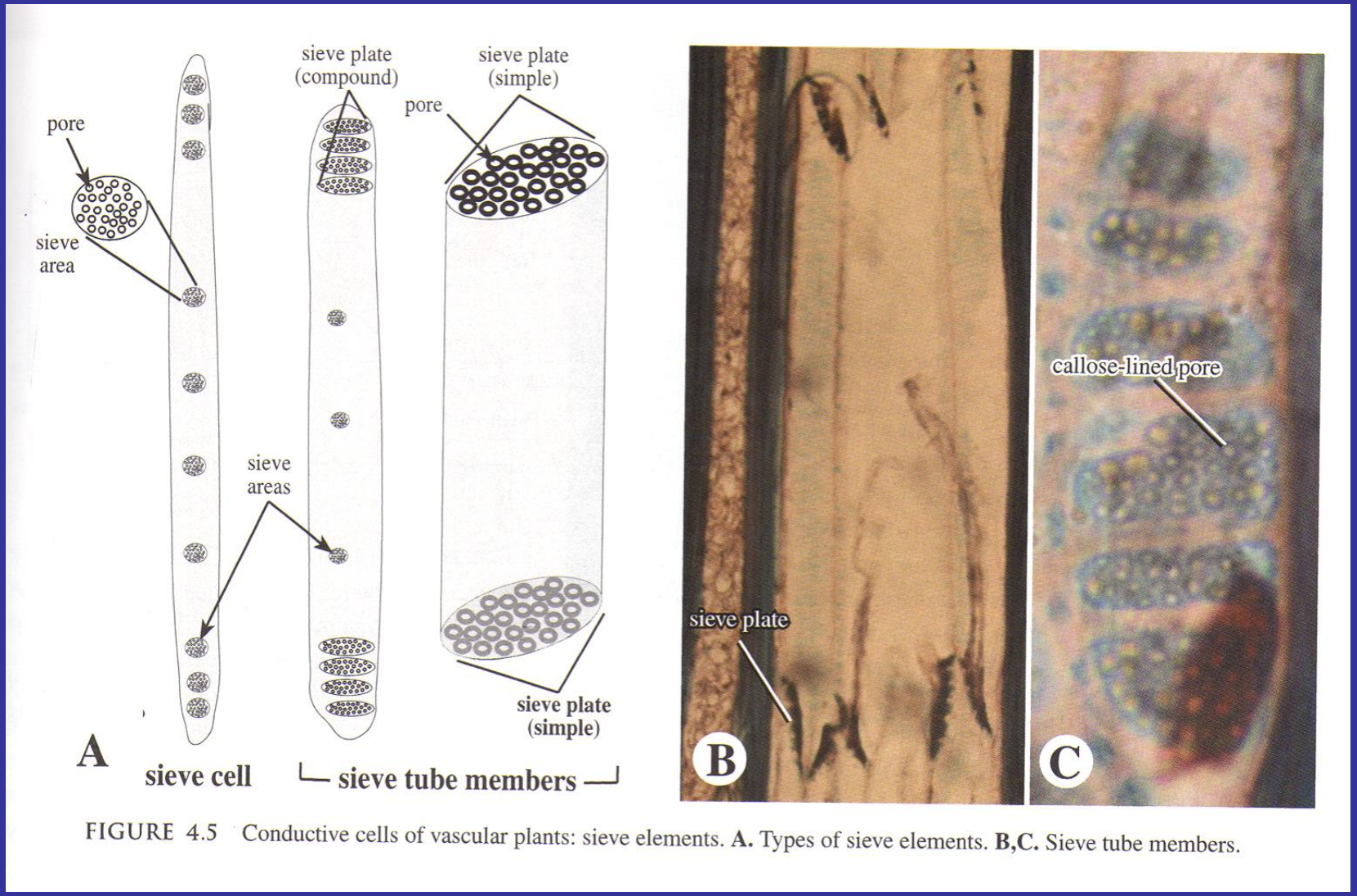
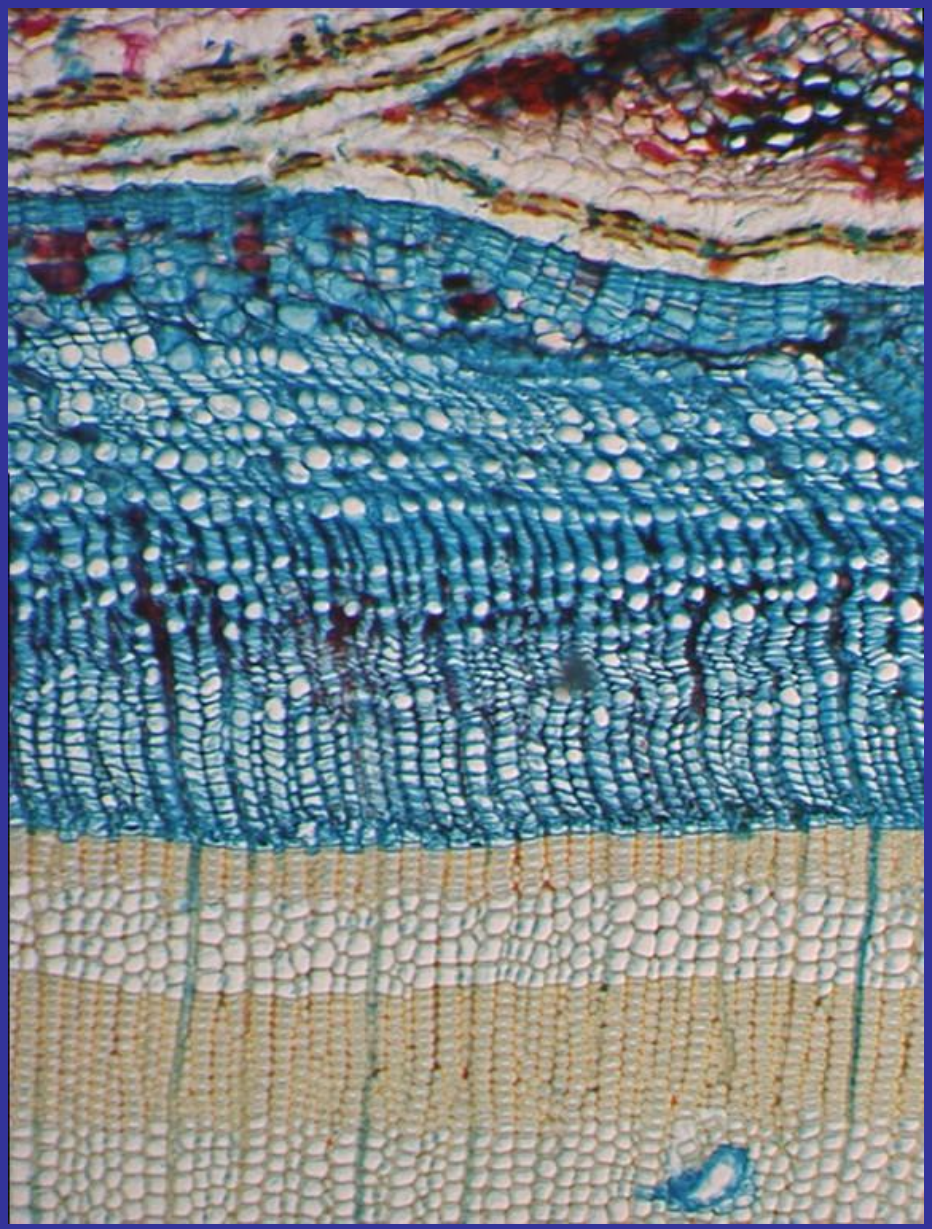


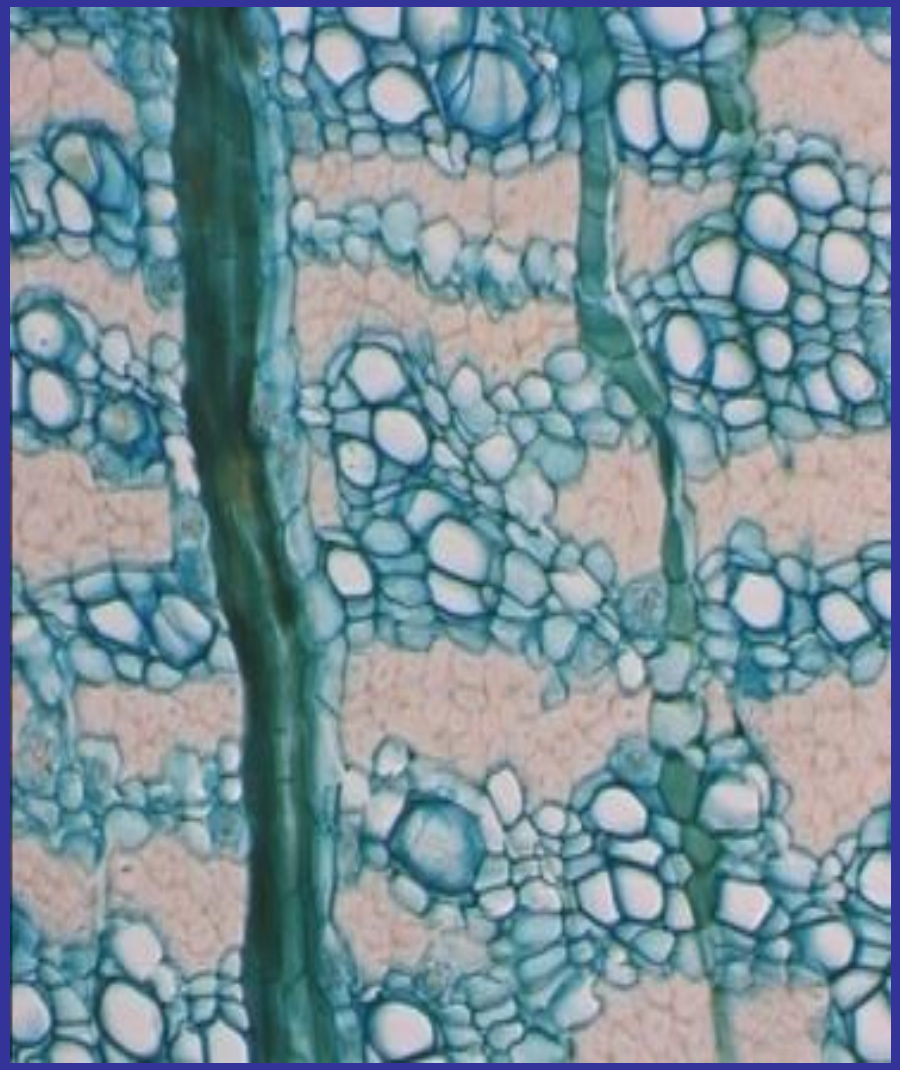
FIGURE 4.5 Conductive cells of vascular plants: sieve elements. **A.** Types of sieve elements. **B,C.** Sieve tube members.

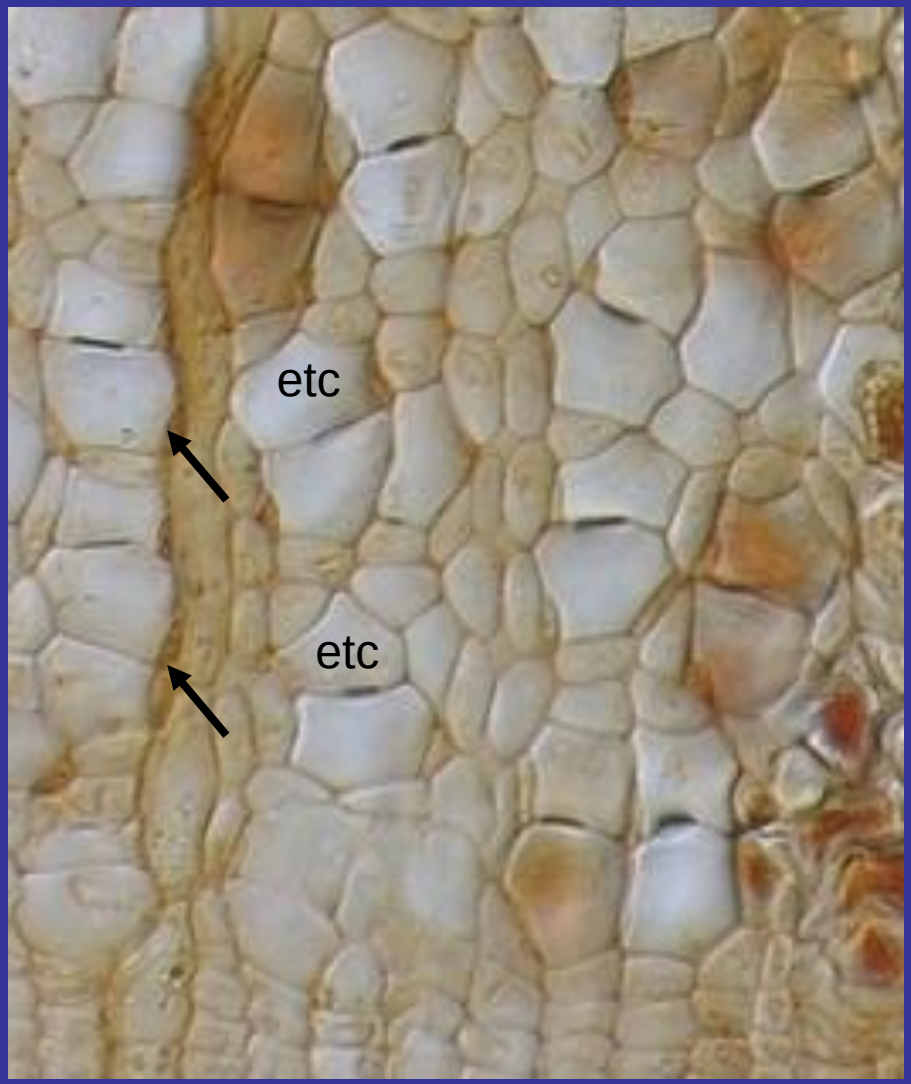
Simpson, 2006

Floema de “Gimnospermas”: células crivadas

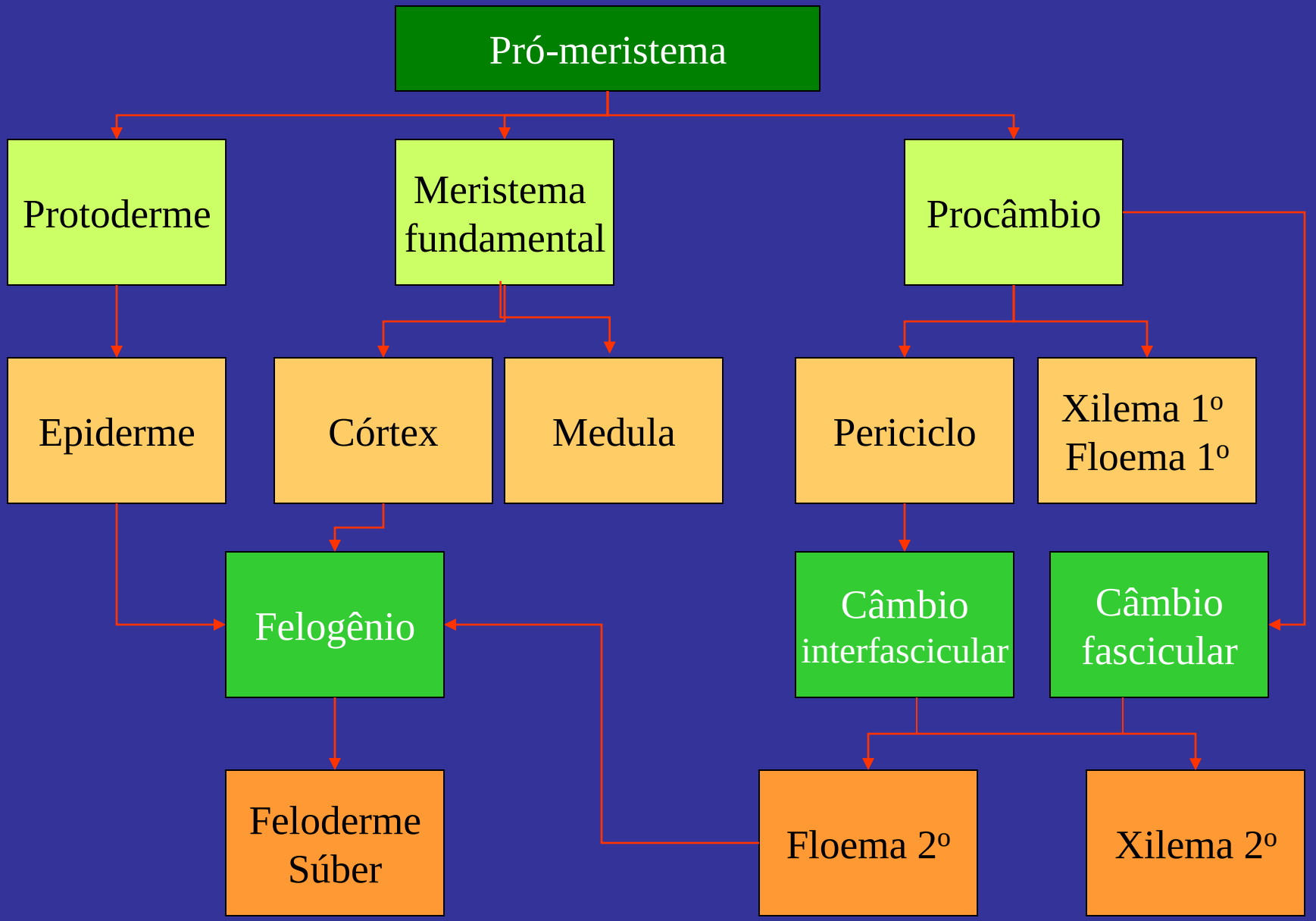


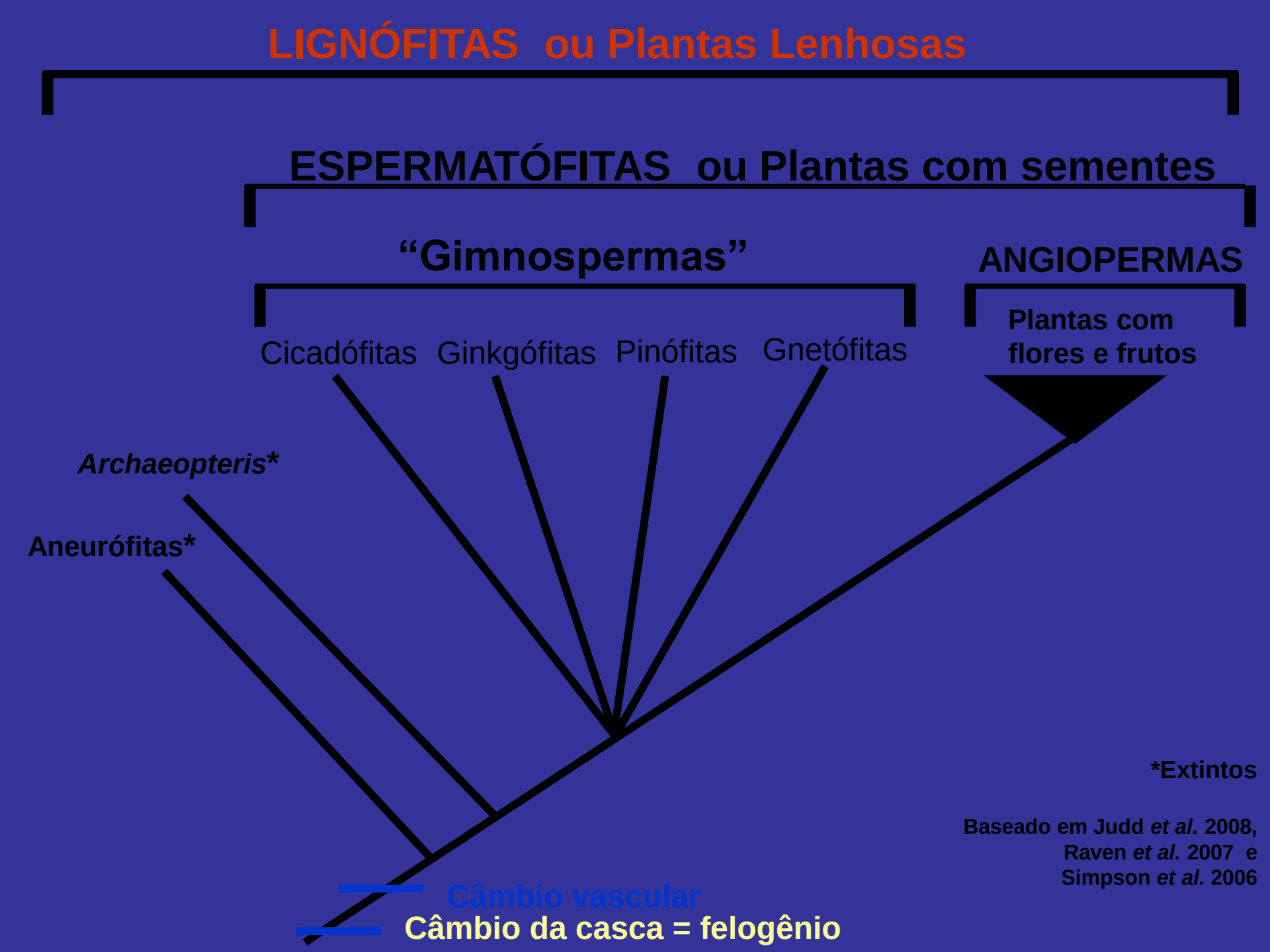
Floema de Angiospermas: elementos de tubo civado (+ célula companheira)



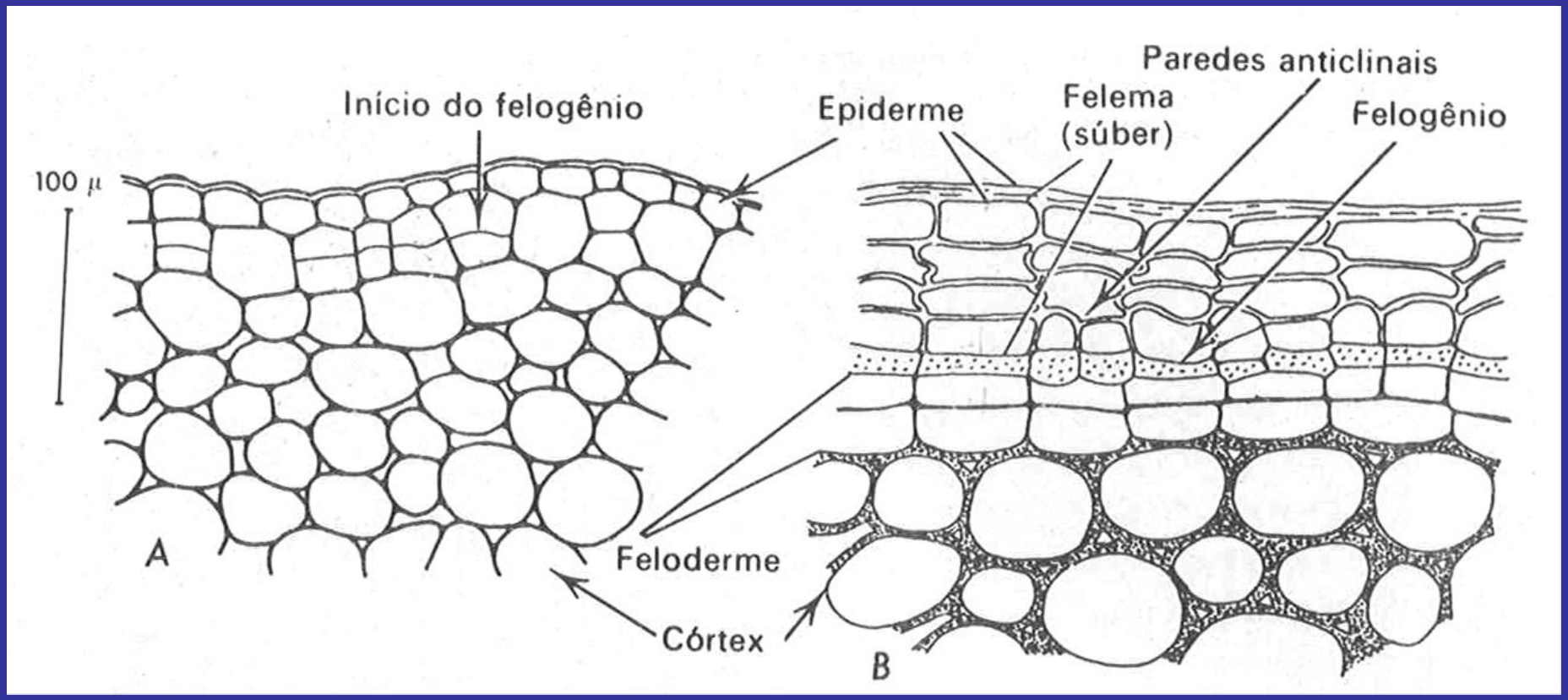


Corpo secundário da planta




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

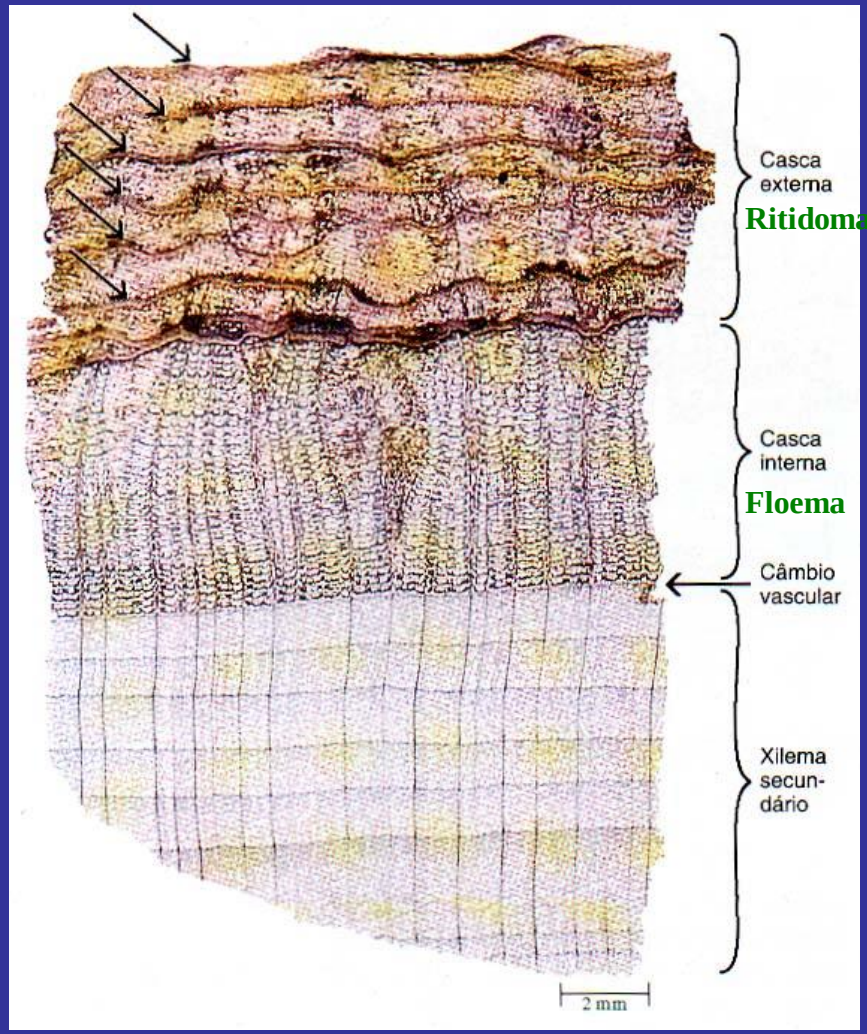
Felogênio dá origem à periderme

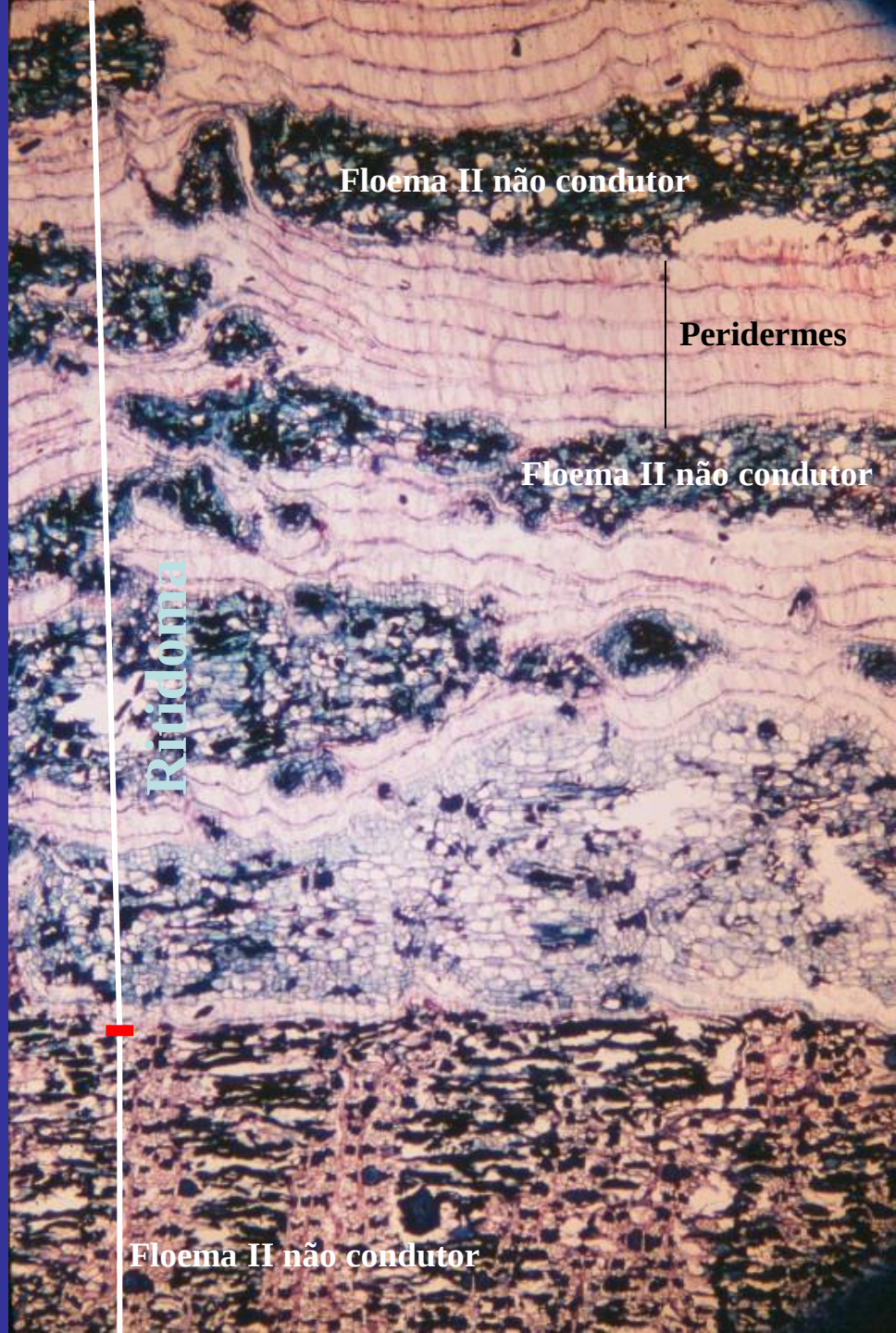


(Esau 1974)

Felogênio = câmbio da casca

Periderme/Ritidoma





Súber