Pteridophyte Diversity: Lycophyte



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OUTLINE

- Pteridophyte as a vascular plants
- What is Lycophyte and Pteridophyte
- Diagnostic characters of 3 Families of Lycophytes

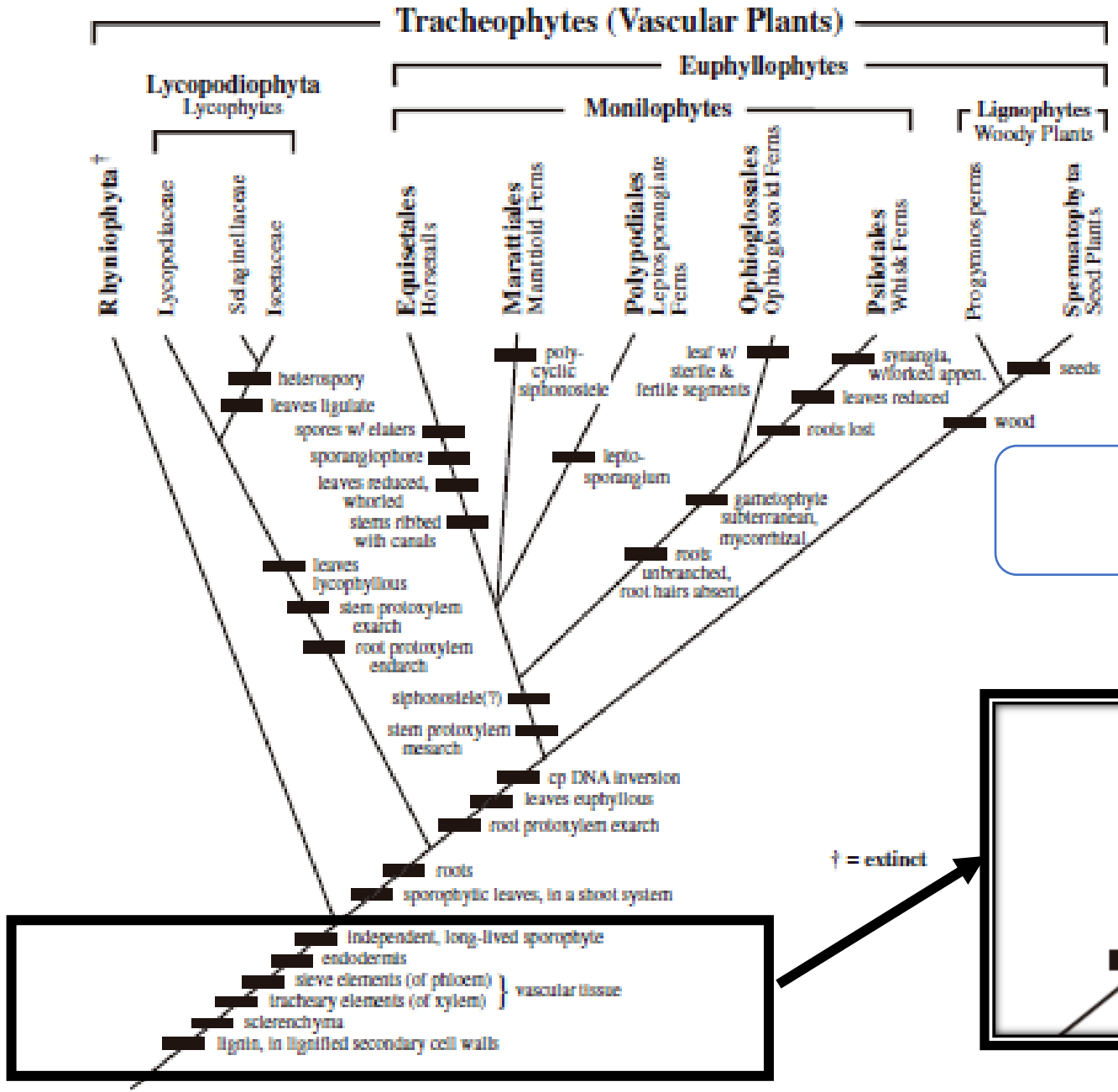
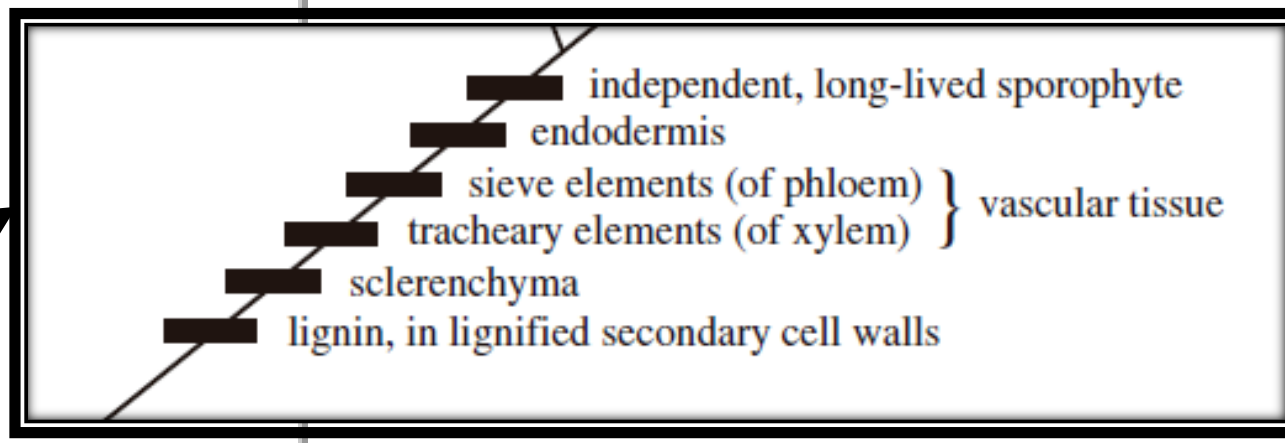
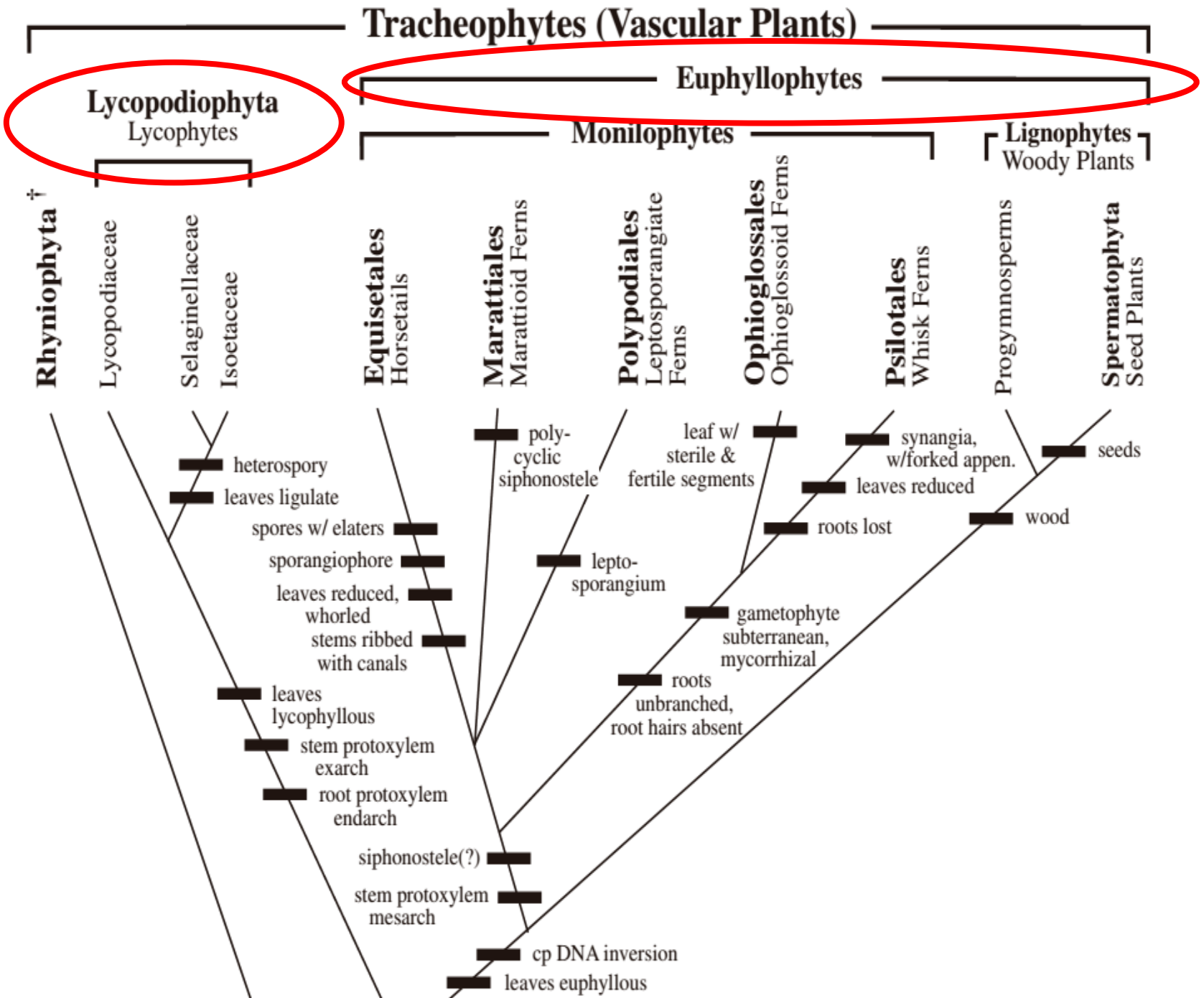
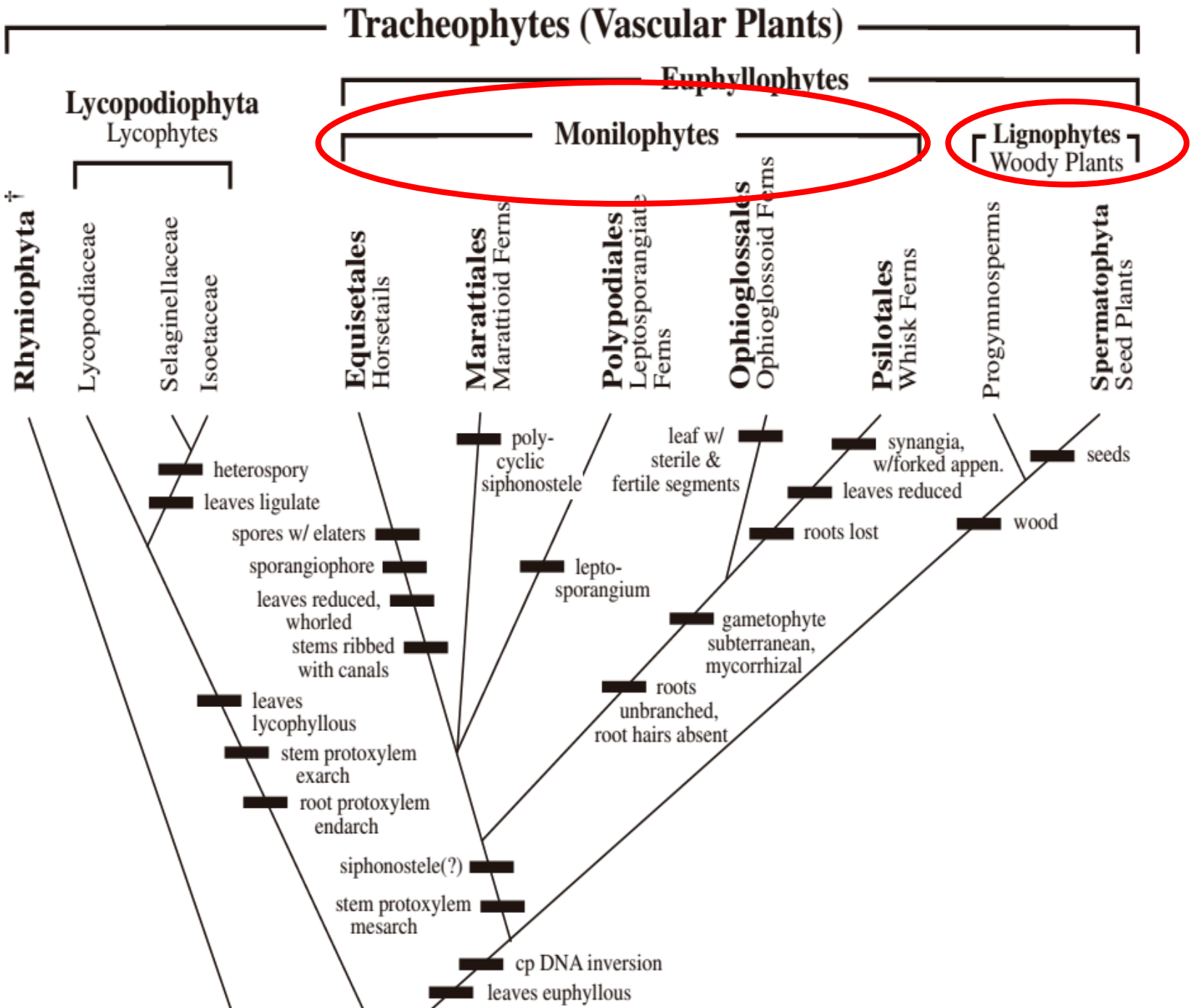


FIGURE 4.1 Phylogeny of the tracheophytes, the vascular plants, modified from Pryer et al. (2001, 2004a).

Apomorphy characters of Tracheophytes/vascular plants




Tracheophytes (Vascular Plants)
Euphyllophytes
Lycopodiophyta
Lycophytes
Monilophytes
Lignophytes
Woody Plants
Rhyniophyta †
Lycopodiaceae
Selaginellaceae
Isoetaceae
Equisetales
Horsetails
Marattiales
Marattioid Ferns
Polypodiales
Leptosporangiate Ferns
Ophioglossales
Ophioglossoid Ferns
Psilotales
Whisk Ferns
Progymnosperms
Spermatophyta
Seed Plants
heterospory
leaves ligulate
spores w/ elaters
sporangiophore
leaves reduced, whorled
stems ribbed with canals
leaves lycophyllous
stem protoxylem exarch
root protoxylem endarch
poly-cyclic siphonostele
lepto-sporangium
leaf w/ sterile & fertile segments
synangia, w/forked appen.
leaves reduced
roots lost
gametophyte subterranean, mycorrhizal
roots unbranched, root hairs absent
seeds
wood
siphonostele(?)
stem protoxylem mesarch
cp DNA inversion
leaves euphyllous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Pteridophytes

Monilophyta

Ferns

Lycophyta

Fern Allies

What is Lycophyte and Pteridophyte

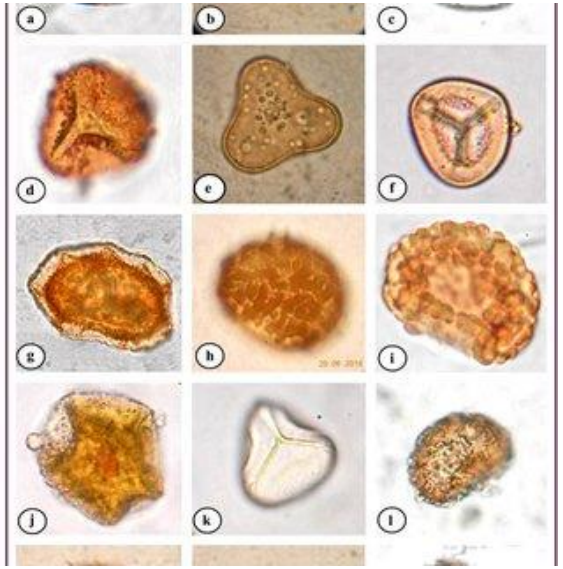
Traditional classification
Pteridophyta divided into 4 classes:
1. Pteropsida (tumbuhan paku)
2. Lycopsida (paku ekor kuda)
3. Psilopsida (kumpai)
4. Sphenopsida

According to molecular character analysist these groups are paraphyletic

Modern classification
Pteridophyte divided into 2 groups:
1. Lycophytes (likofit / fern alies).
2. Monilophytes → fern

Lycophyte and Pteridophyte

- Green plants without flowers as a reproductive organ
- Reproduced by Microsporic spores
- Leafy plant that produces spores is the dominant phase



Diagnostic characters of 3 Families of Lycophyte

Lycophytes are of an ancient lineage, no more closely related to ferns than to seed plants, and therefore inappropriately called ‘fern allies’

Lycophodiophyta / Lycophyta

Apomorphies:

- Roots: endarch protoxylem (C→Px→Mx)
- Stems: exarch protoxylem (C→Mx→Px)
- Sporophytic leaf structural type → lycophyll or microphyll.

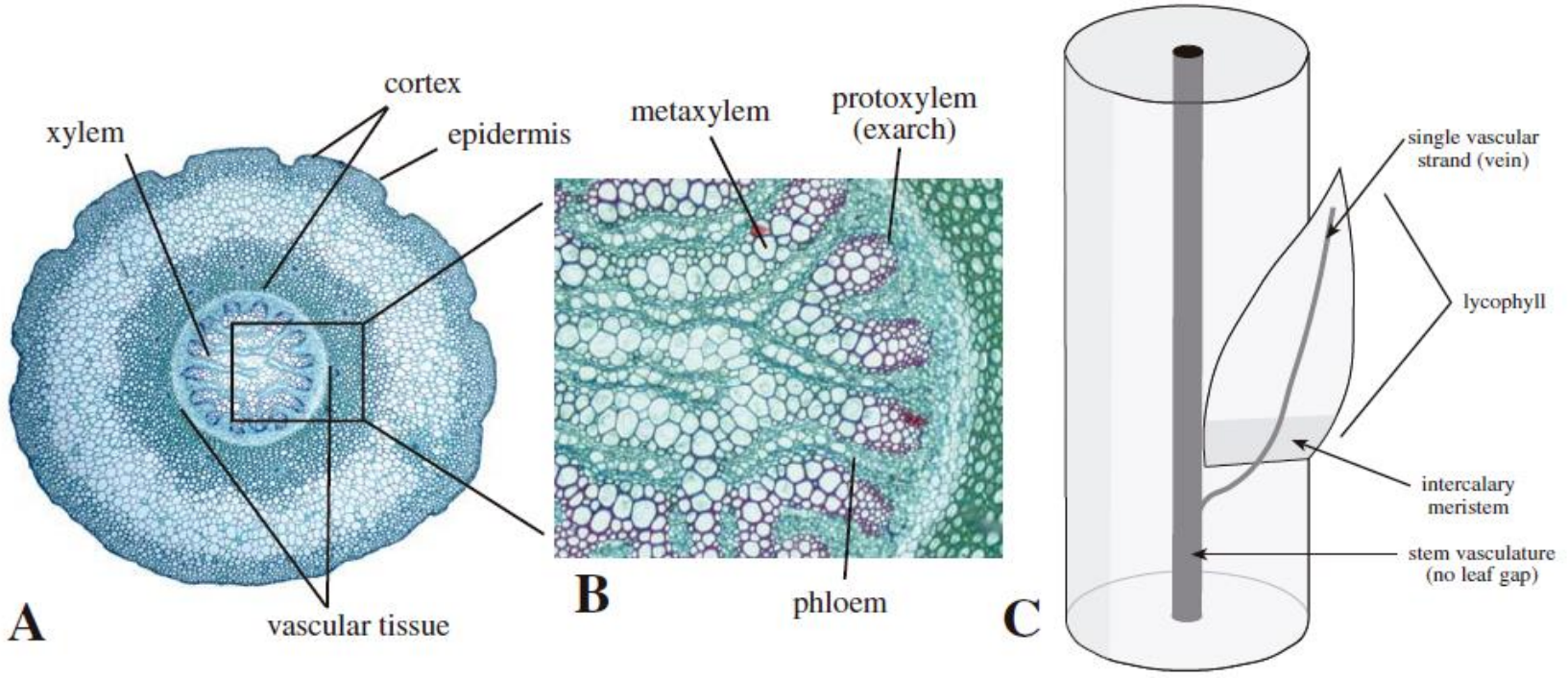
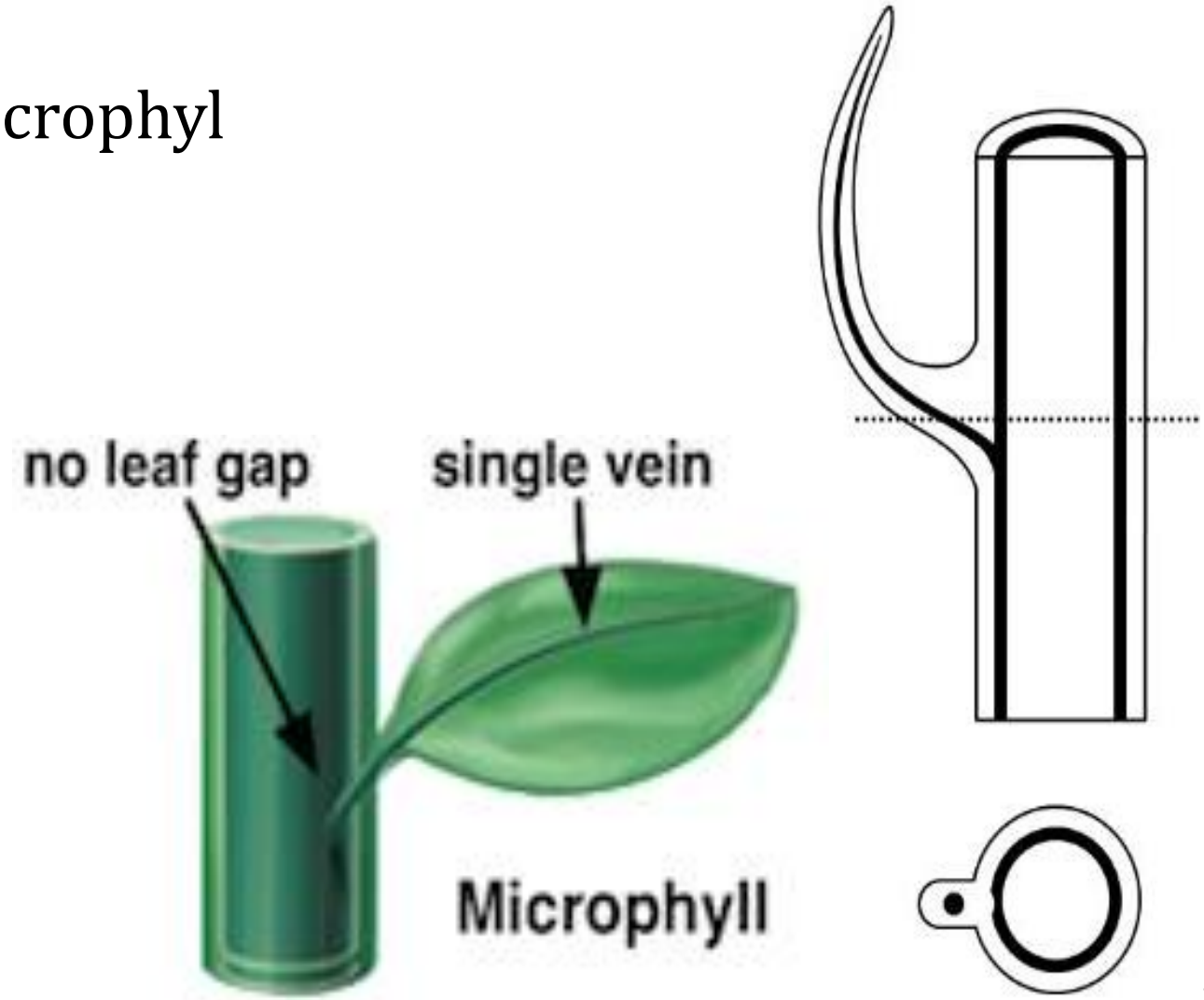


FIGURE 4.12 **A,B.** *Lycopodium* stem cross-section, showing protoxylem that is exarch (to periphery of stem). **C.** Lycophyll structure.

Lycophyta

- Leaf characteristics:

a. Small → lycophyl / microphyl
b. Single vein
c. No leaf gap

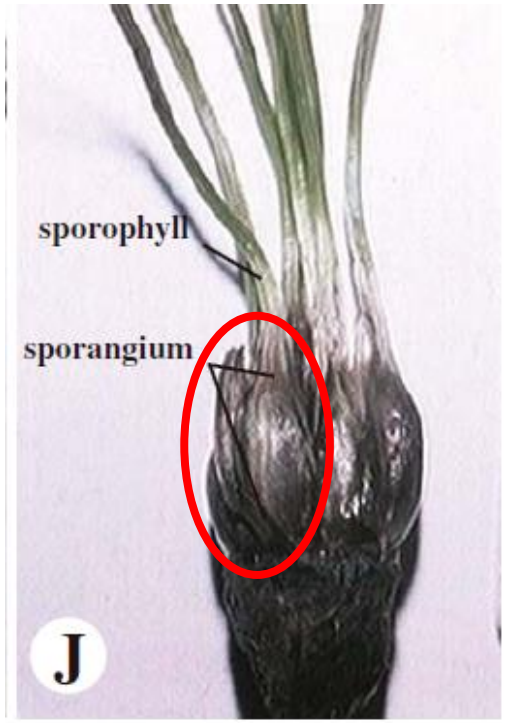


Lycophodiophyta / Lycophyta

- Lycopodiaceae
- Selaginellaceae
- Isoetaceae

Sporangia aggregate into strobilus

Sporangia sunken at base of leaf



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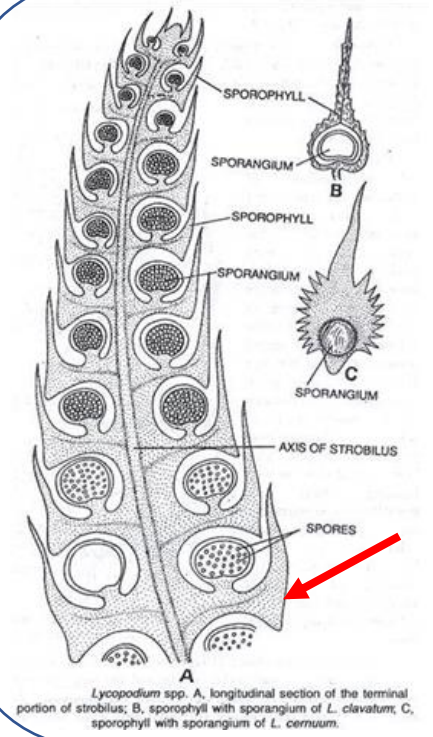
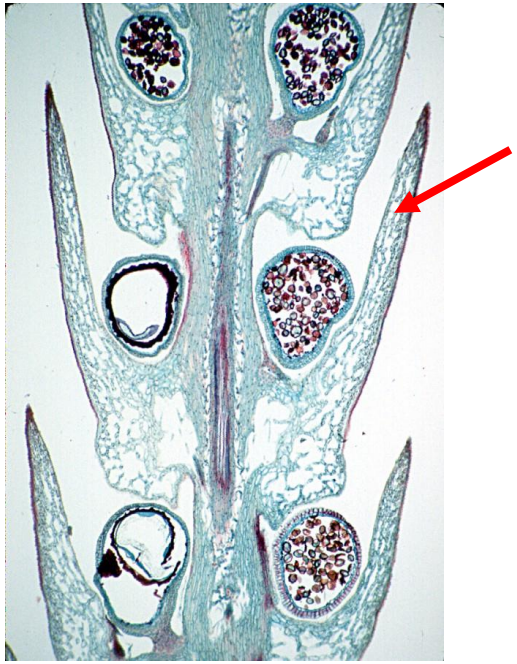
Sporangia in axis of sporophyll



Lycopodium spp. A, longitudinal section of the terminal portion of strobilus; B, sporophyll with sporangium of *L. clavatum*; C, sporophyll with sporangium of *L. cernuum*.

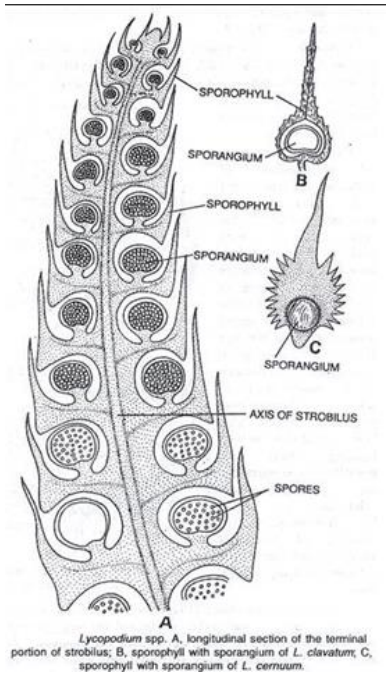


Sporangia adaxially embedded in cavity of swollen base of sporophylls

Lycophodiophyta / Lycophyta

- Lycopodiaceae
  - Homospore
- Selaginellaceae
- Isoetaceae

Selaginellaceae, Isoetaceae → Heterospore



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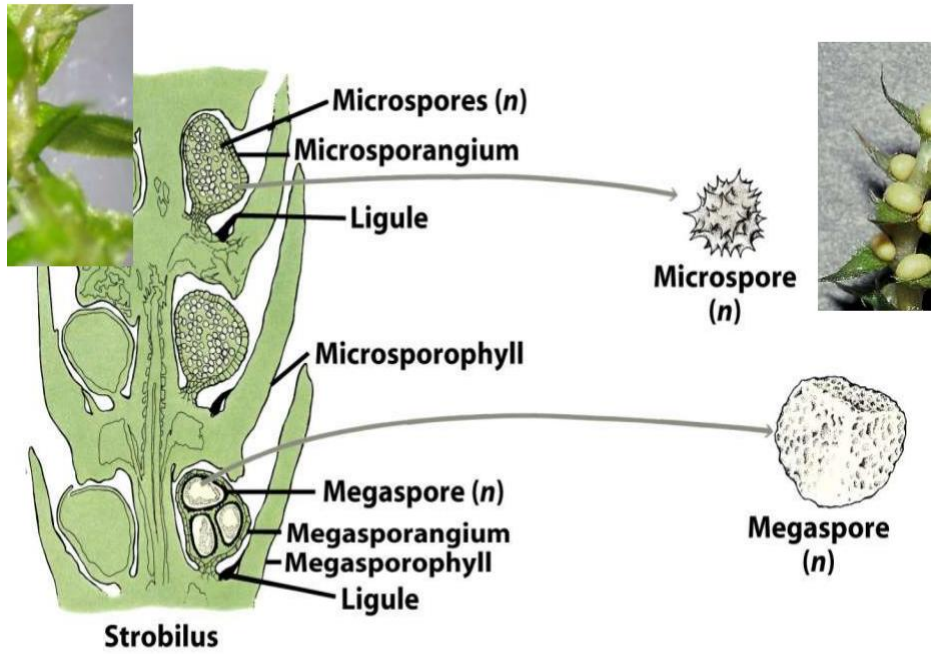
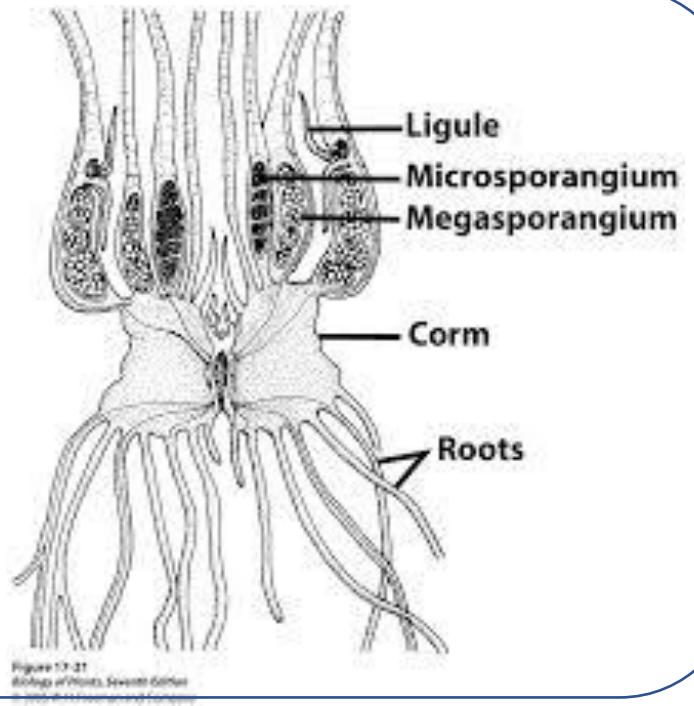
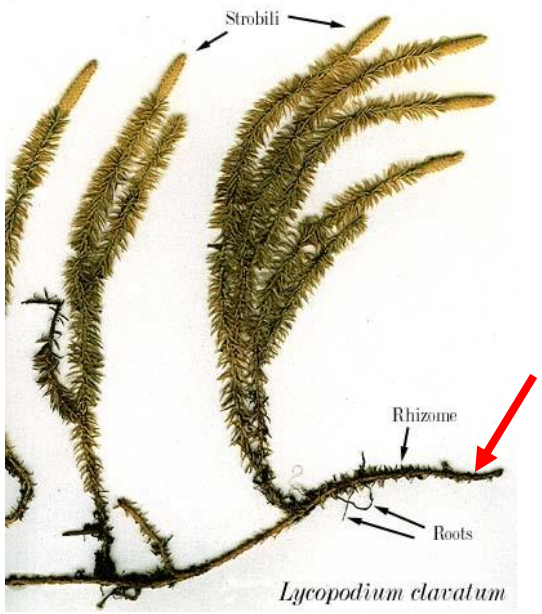




Lycophodiophyta / Lycophyta

Lycopodiaceae

Stem creeping with rhizom



Selaginellaceae

Stem creeping and erect without rhizom

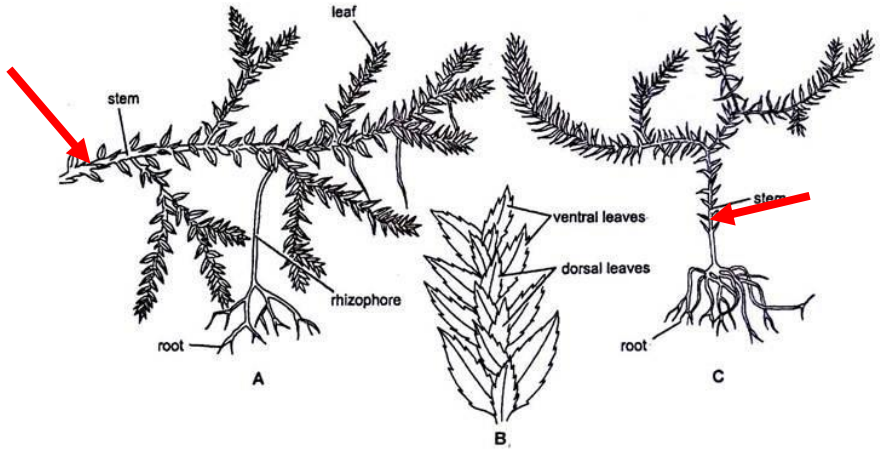
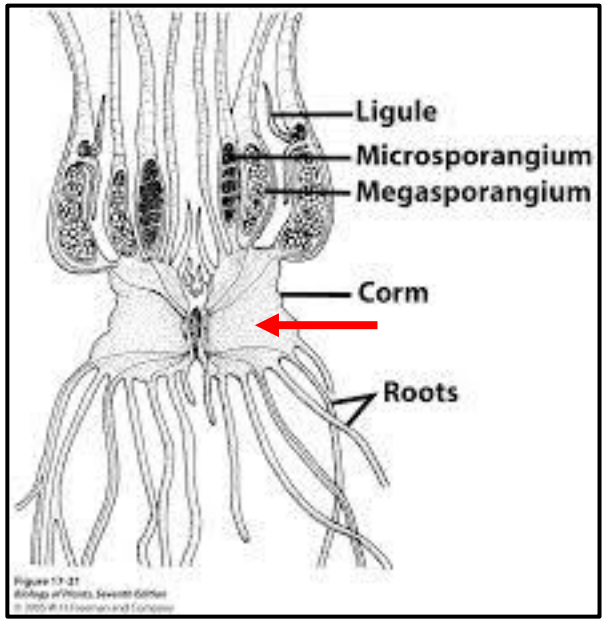


Fig. 1 (A–C). *Selaginella*. External features : A. *S. kraussiana*, B. Leaf arrangement in a branch of *S. kraussiana*, C. *S. spinulosa*

Isoetaceae

Stem short with cormous

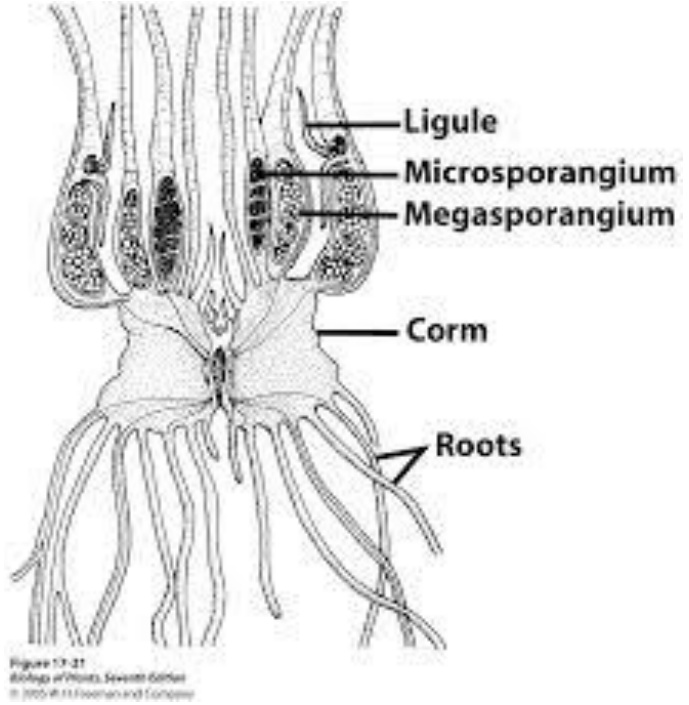


Lycophodiophyta / Lycophyta

- Lycopodiaceae
- Selaginellaceae
- Isoetaceae

Stem with dicotomously branch

Stem without branch



Lycophodiophyta / Lycophyta

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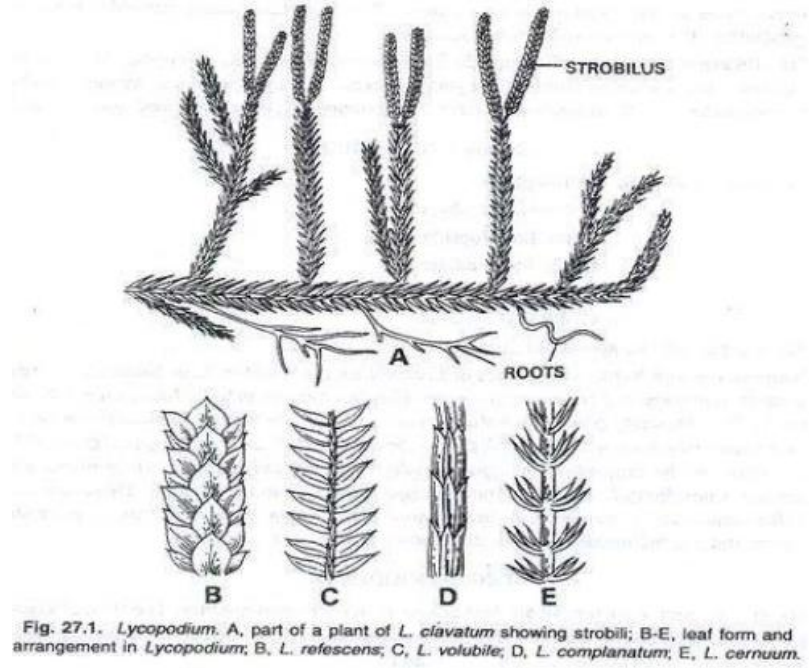
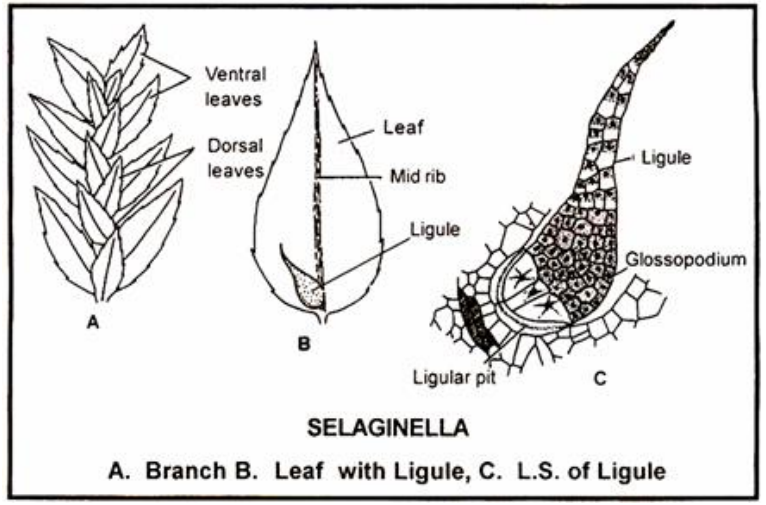


Fig. 27.1. *Lycopodium*. A, part of a plant of *L. clavatum* showing strobili; B-E, leaf form and arrangement in *Lycopodium*; B, *L. refescens*; C, *L. volubile*; D, *L. complanatum*; E, *L. cernuum*.

- Leaf simple, linear or scale like
- Spirally arrange



- Leaf simple, lanceolate, or fan shape like
- Spirally arrange

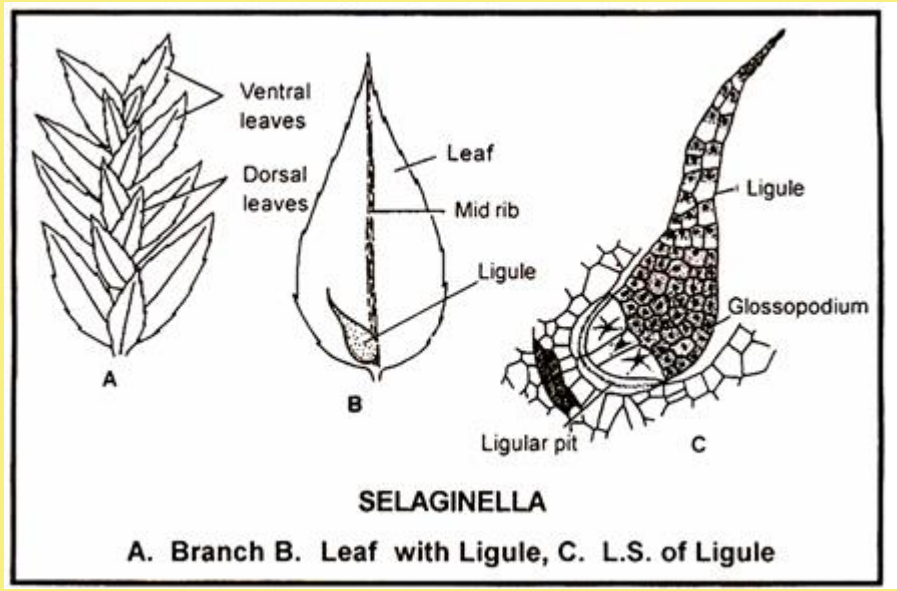
- Leaf simple,long, linier
- Leaf swollen at base

Lycophodiophyta / Lycophyta

- Lycopodiaceae
- Selaginellaceae
- Isoetaceae

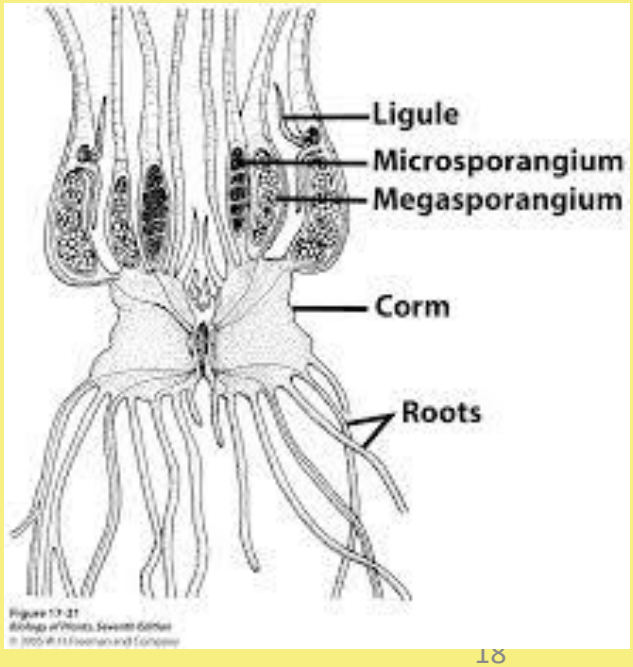
Without Ligule

Ligule at the base of dorsal leaf

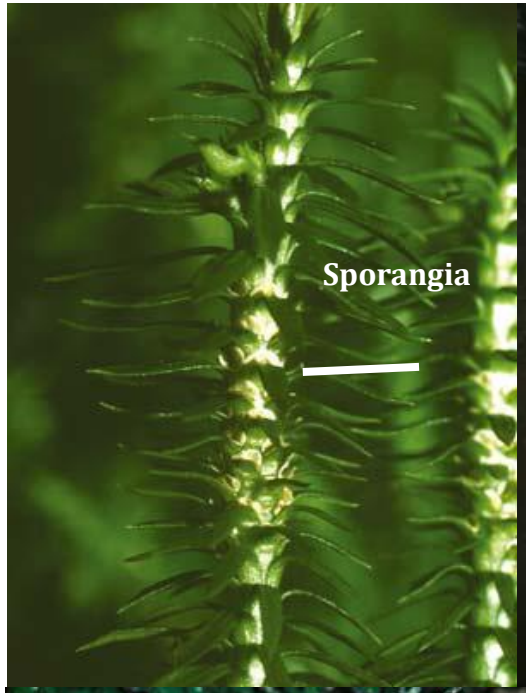


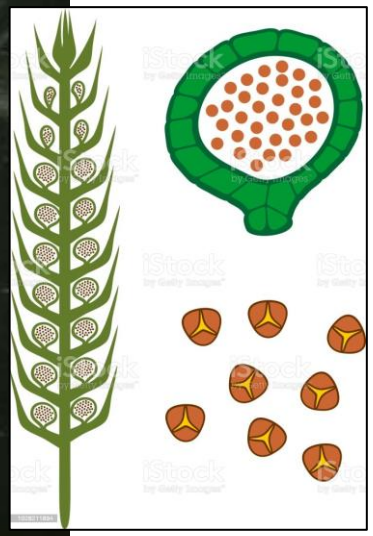
SELAGINELLA

A. Branch B. Leaf with Ligule, C. L.S. of Ligule



Lycopodiaceae





Resembles mosses in larger size → *Club mosses*

- **Homospory**
- Rhizome
- Scale-like leaf
- Opposite leaves
- Sporangia develop in the axils of specialized leaves → **sporophylls**
- Sporophylls:
  a. Similar to vegetative leaf, co-occur on indeterminate shoot.
  b. Different from veg. leaf, aggregated into determinate terminal shoot system → **stobilus**.

Selaginellaceae

→ Spike moss

Only 1 genus → *Selaginella*

2 vegetative leaf arrangements

Isomorphic

- Only one shape and size
- Spirally arranged

Heteromorphic

- 2 lateral rows of larger leaves
- 2 upper/dorsal rows of smaller leaves

Isoetiaceae

Only 1 genus → *Isoetes*

quillwort or Merlin s-grass

- Cormose stem, rarely rhizomatous
- Swollen base, contains micro- and megaspores
- Needle-like leaves
- Aquatics


Thank you