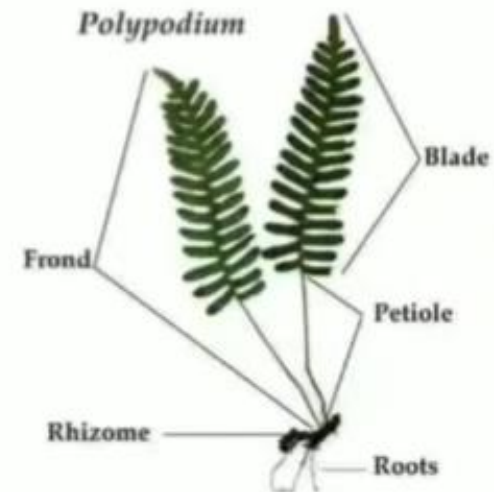
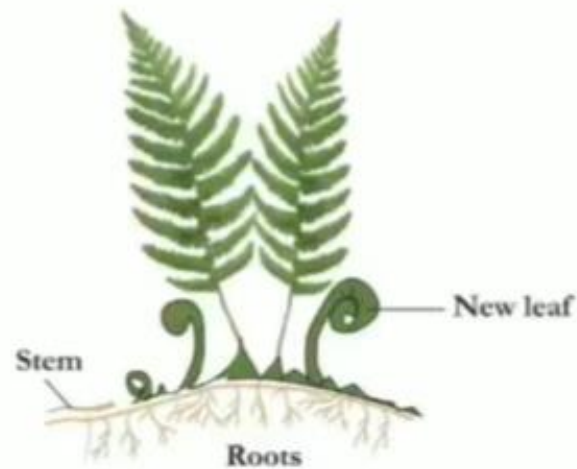
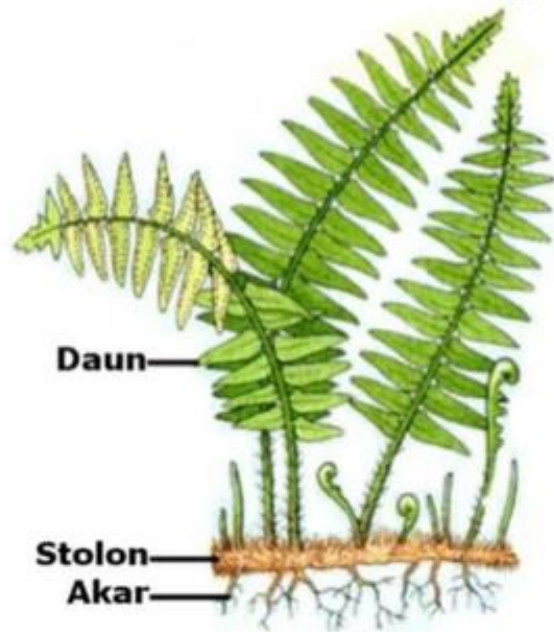


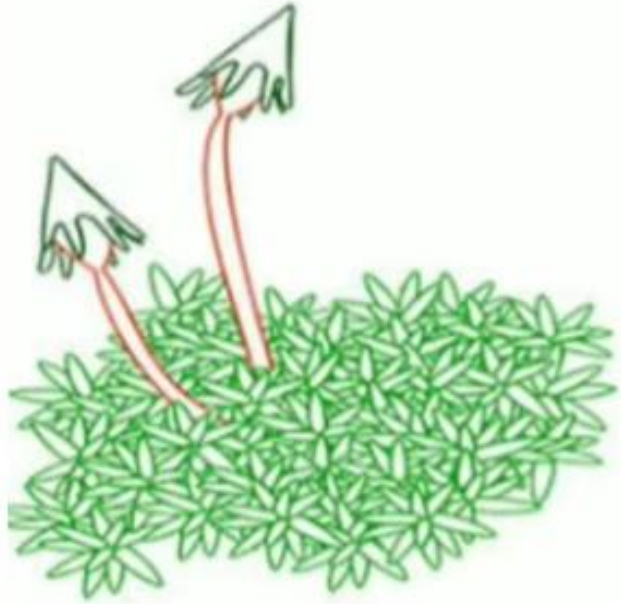
PTERIDOPHYTES

1. Meaning of Pteridophytes:

Pteridophyta (Gr, Pteron = feather, phyton = plant), the name was originally given to those groups of plants which have well developed pinnate or frond like leaves. Pteridophytes are cryptogams (Gr. kruptos = hidden, and Gamos = wedded) which have well developed vascular tissue.



Major Plant Groups



Mosses
(Bryophytes)



Ferns
(Pteridophytes)



Gymnosperms
(‘Naked Seed’)



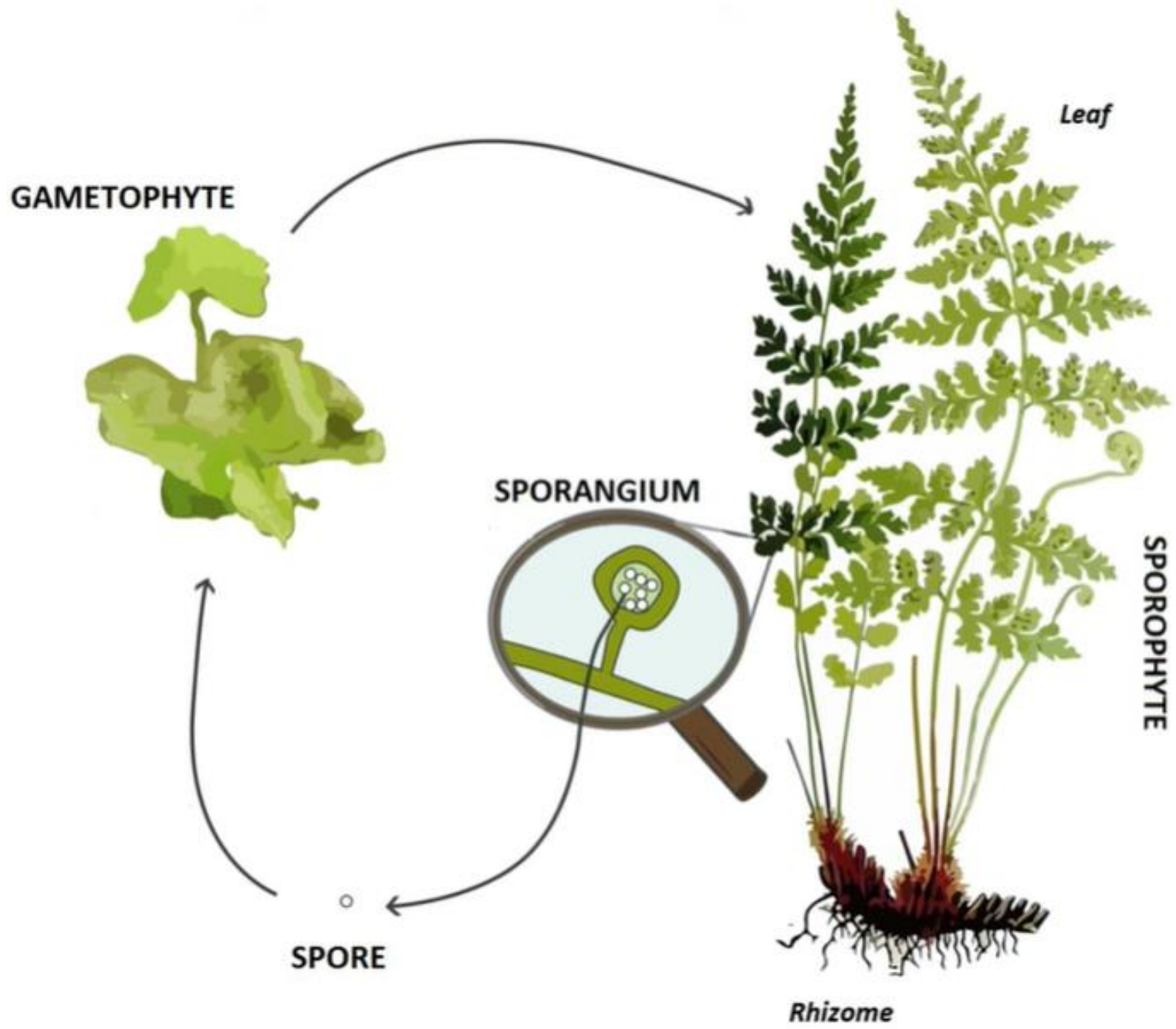
Angiosperms
(‘Enclosed Seed’)

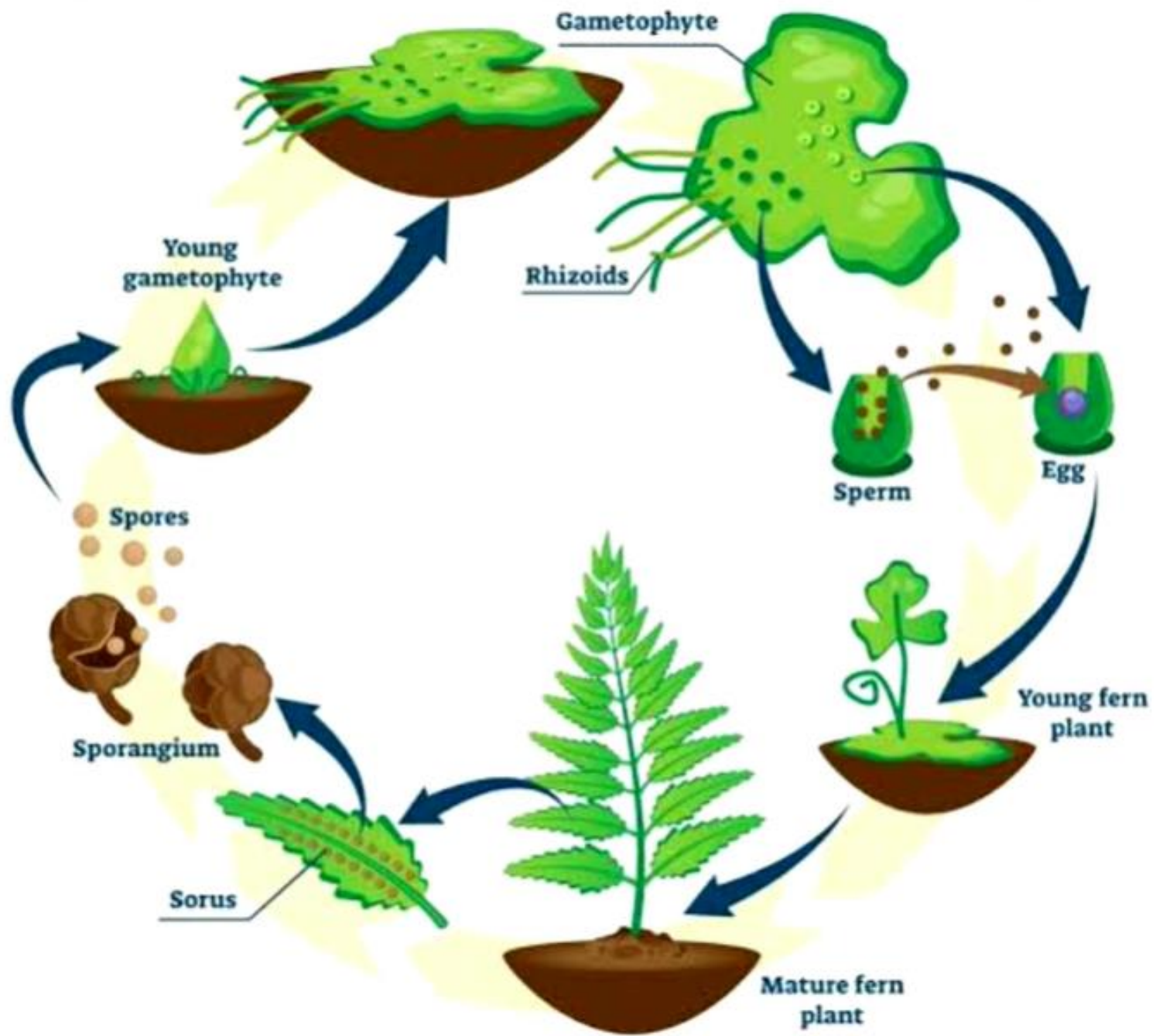






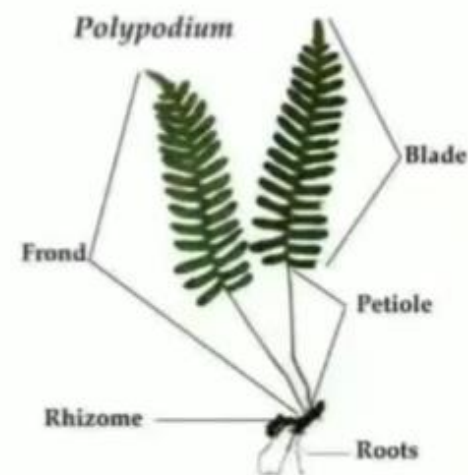
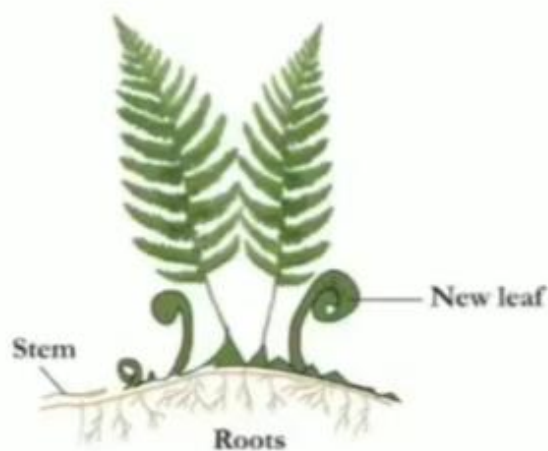
Any plant that reproduces using spores (rather than seeds), formerly placed in the taxonomic group Cryptogamae, which included ferns, mosses, algae, fungi, lichens and liverworts.





1. Meaning of Pteridophytes:

- Pteridophytes: the ferns
- Plant with feather like leaves ,Pteron = feathers; phyton = plant
- They are the first terrestrial organisms to have well developed vascular tissues
- Vascular cryptogams: cryptogams with vascular system)
- Plant body is sporophytic, differentiated into stem, root and leaves (true vegetative structure)



Therefore, these plants are also known as vascular cryptogams or snakes of plant kingdom. They are represented by about 400 living and fossil genera and some 10,500 species. Palaeobotanical studies reveal that these plants were dominant on the earth during the Devonian period and they were originated about 400 million years ago in the Silurian period of the Palaeozoic era.



2. General Characters of Pteridophytes:

(i) Majority of the living Pteridophytes are terrestrial and prefer to grow in cool, moist and shady places e.g., ferns. Some members are aquatic (e.g., Marsilea, Azolla), xerophytic (e.g., *Selaginella rupestris*, *Equisetum*) or epiphytic (e.g., *Lycopodium squarrosum*) (Fig. 1).



Psilotum



Selaginella



Lycopodium

(ii) Majority of the Pteridophytes are herbaceous but a few are perennial and tree like (e.g., Angiopteris). Smallest Pteridophyte is Azolla (an aquatic fern) and largest is Cyathea (tree fern).

(iii) Plant body is sporophytic and can be differentiated into root, stem and leaves.

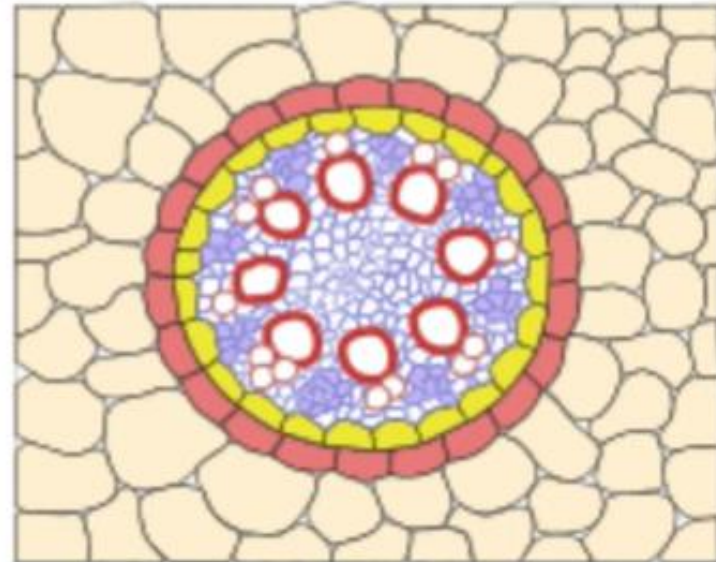
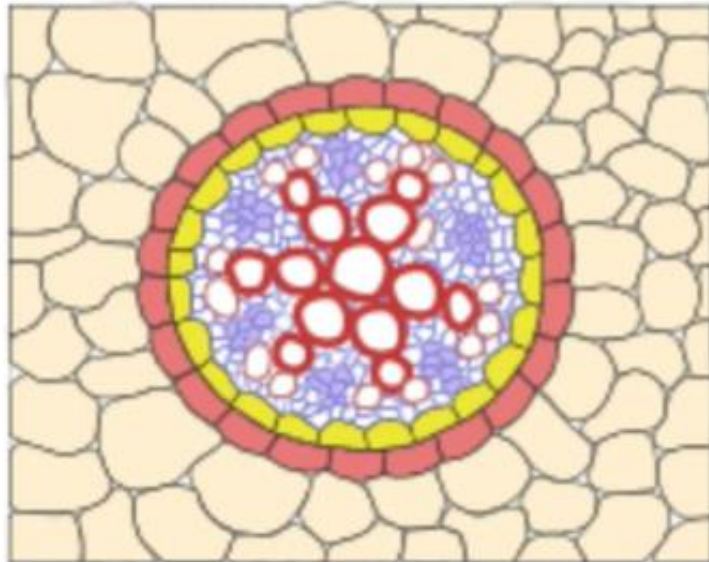
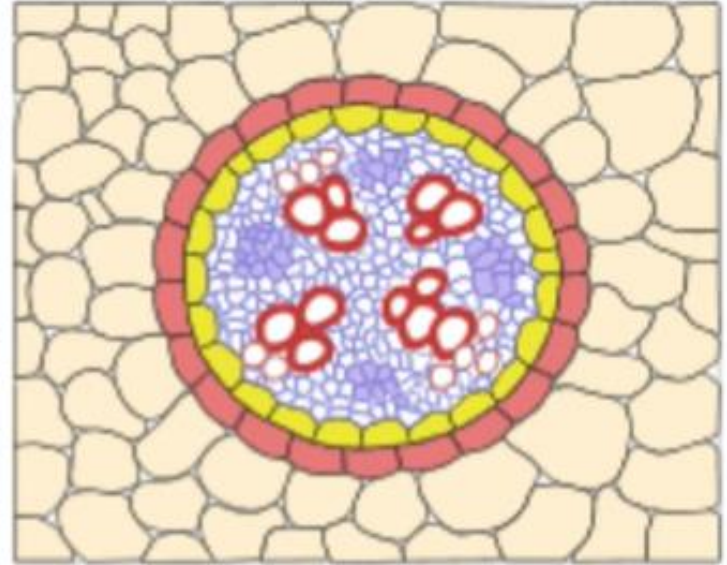
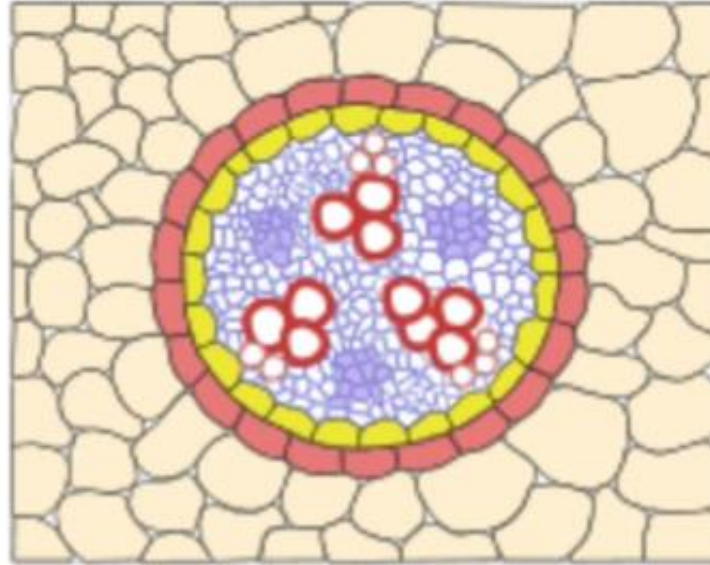
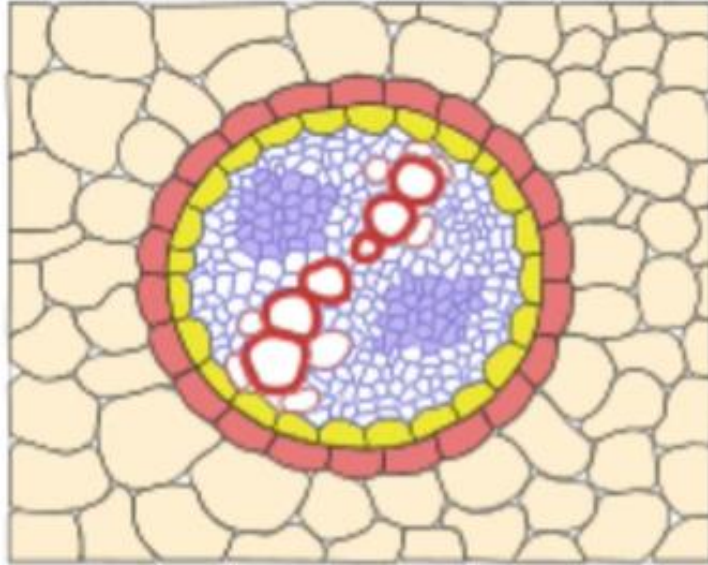
(iv) Roots are adventitious in nature with monopodial or dichotomous branching. Internally usually they are diarch.

(v) Stem is usually branched. Branching is monopodial or dichotomous. Branches do not arise in the axil of the leaves. In many Pteridophytes stem is represented by rhizome.

Diarch

Triarch

Tretarch



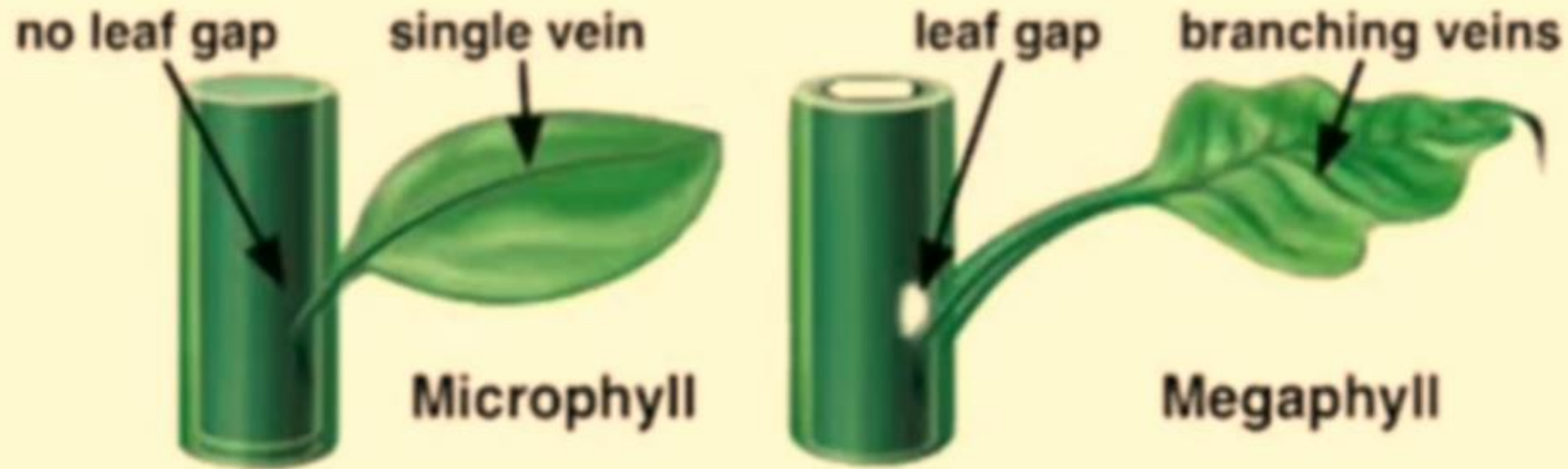
Hexarch

Polyarch

(viii) The stele is protostele (e.g., *Rhynia*, *Lycopodium*), siphonostele (e.g., *Equisetum*), dictyostele (*Adiantum*) or polycyclic (e.g., *Angiopteris*).

(ix) Cambium is absent; hence, they do not show secondary growth.

- On the basis of leaf we can classify Pteridophytes:
 - Microphyllous:** Simple leaf, single vein, do not form leaf gap in stele, e.g. *Equisetum*, *Lycopodium*, *Selaginella*.
 - Megaphyllous:** Compound leaf, complex veins, form leaf gap in stele, e.g. *Pteris*, *Dryopteris*, *Lastrea*.



- In *Salvinia* leaves are modified into adventitious roots.
- Stele is protosteles, siphonostele, dictyostele or polycyclic (will discuss it later).
- Root and stem has well developed vascular system (xylem and phloem; vessels absent in xylem only tracheids (except *Equisetum* & *Selaginella*) and companion cells absent in phloem only sieve cells (except *Equisetum arvense* and *E. giganteum*). Cambium absent that is why secondary growth absent (except *Botrychium*, *Isoetes*).

Types of Protosteles



dictyostele



haplostele



actinostele

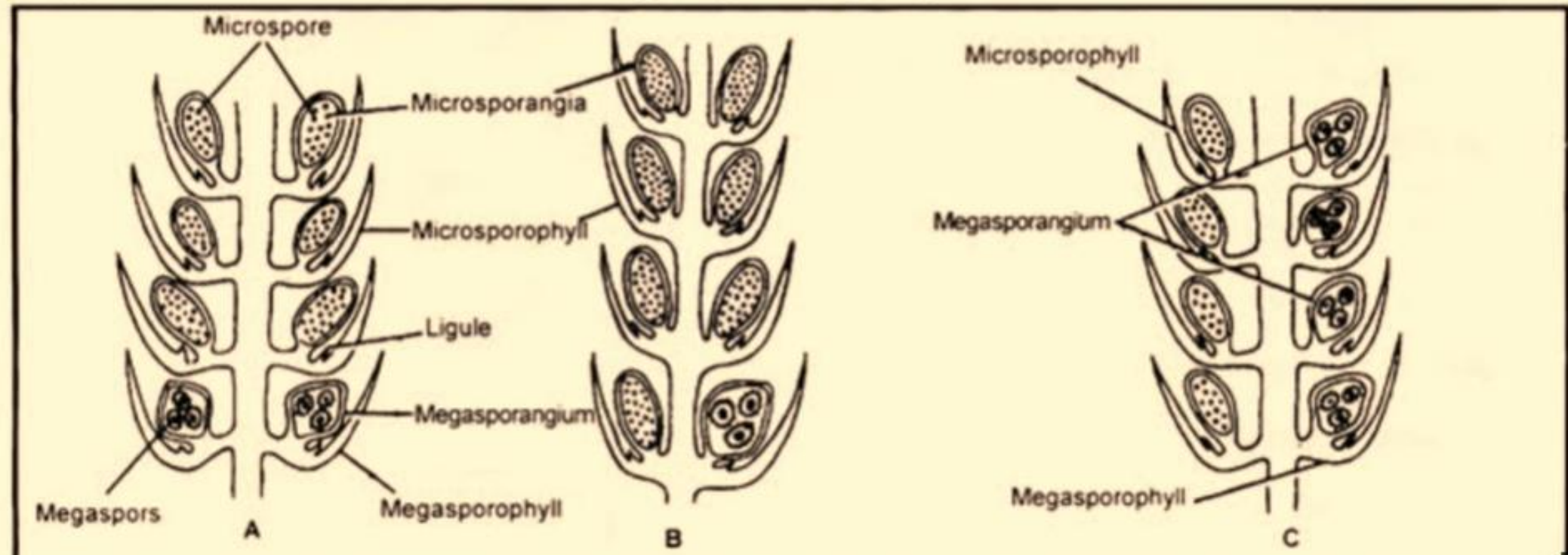


plectostele

- Plants reproduce by spores, produced in sporangia (borne on ventral surface of leaves; in some a fertile spike arise from axil of leaf bearing sporangia, e.g. *Ophioglossum*; in some cauline, e.g. *Psilotum*). In some specialized structures 'sporocarp' present, e.g. *Marsilea*.



- Plants homosporous (*Adiantum*, *Dryopteris*, *Lycopodium*, *Pteris*) or heterosporous (*Azolla*, *Isoetes*, *Marsilea*, *Salvinia*, *Selaginella*).
- Leaves bearing sporangia known as sporophylls. Microsporangia bearing leaves known as microsporophyll and megasporangia bearing leaves known as megasporophyll.



A-C. L.S of *Selaginella* Strobilus : Distribution of Sporophyll in different species of *Selaginella*
 (A) *S.rupestris*, *S. selaginoides* and *S. helvatica* (B) *S. kraussiana* (C) *S. inaequalifolia*

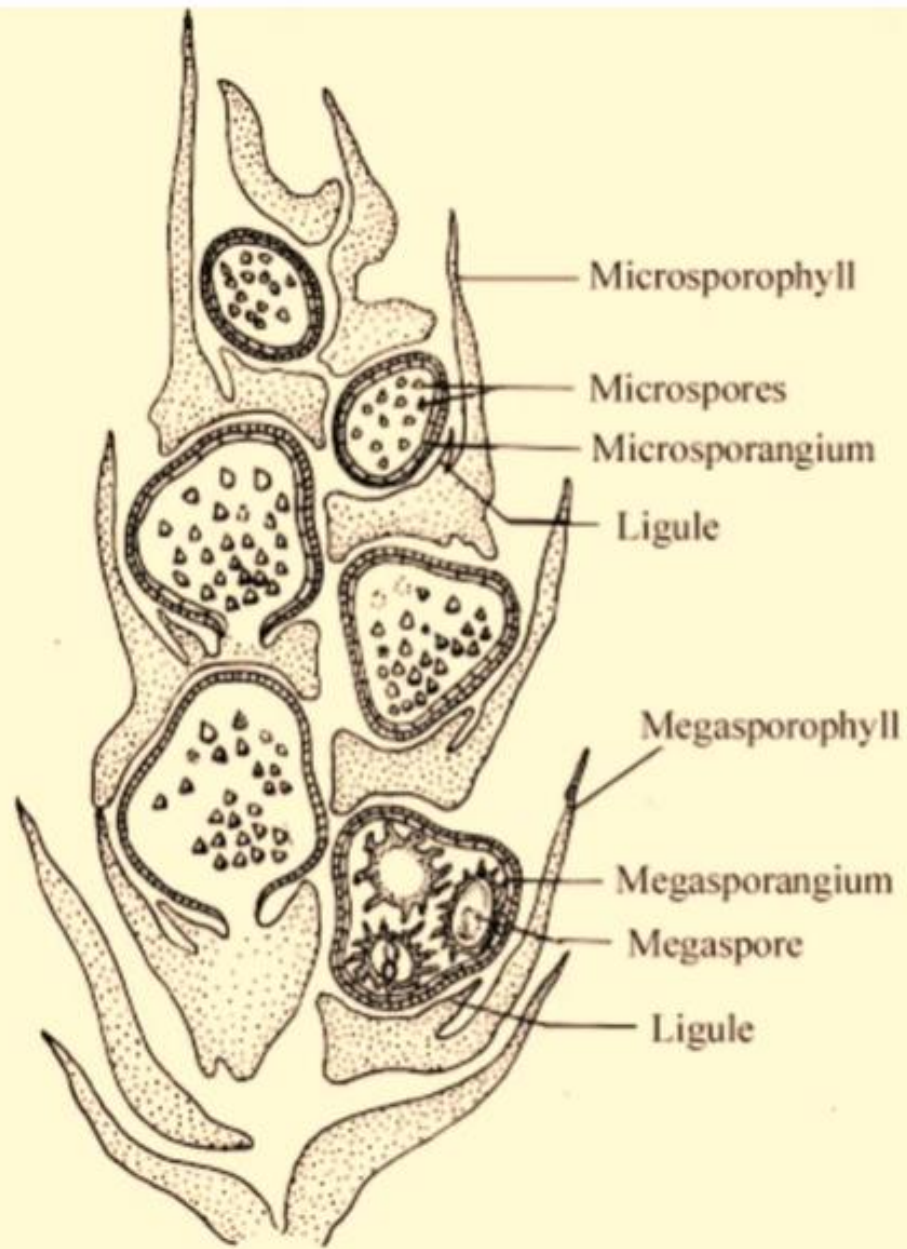
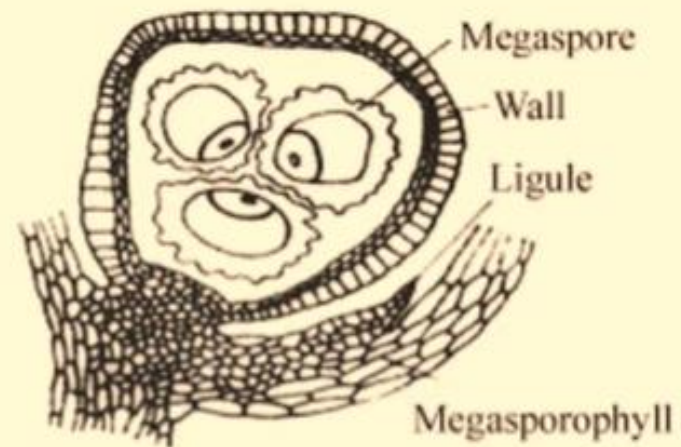
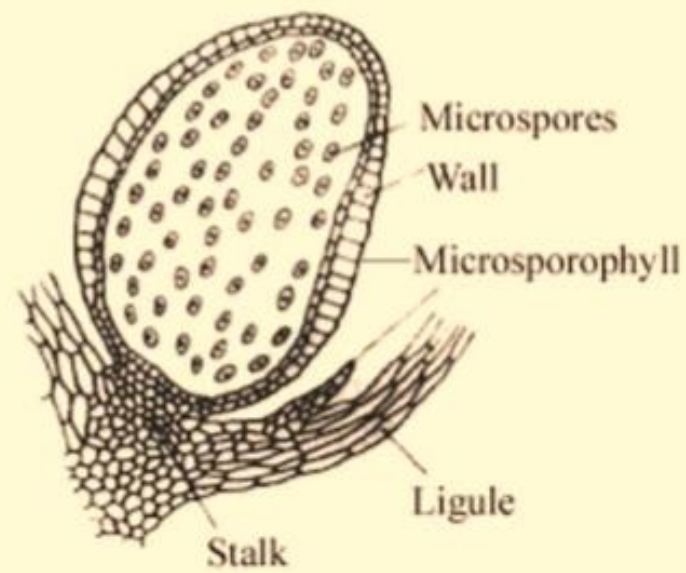


Fig: *Selaginella* spp. L.S of strobilus.



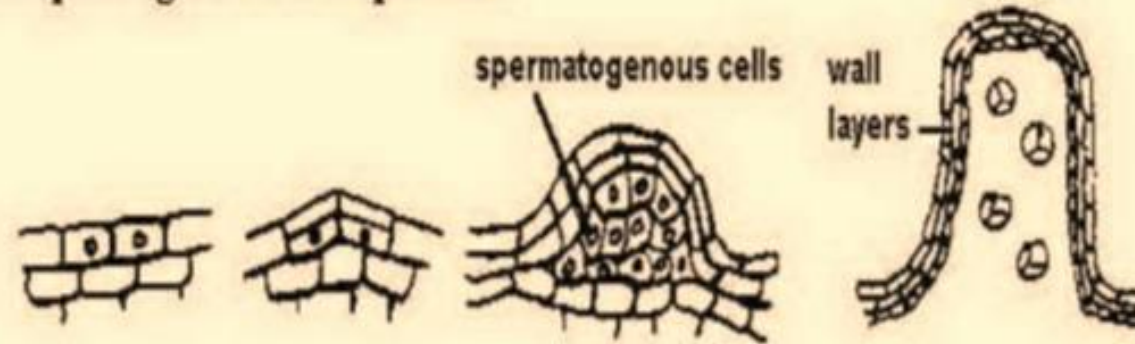
Mature megasporangium



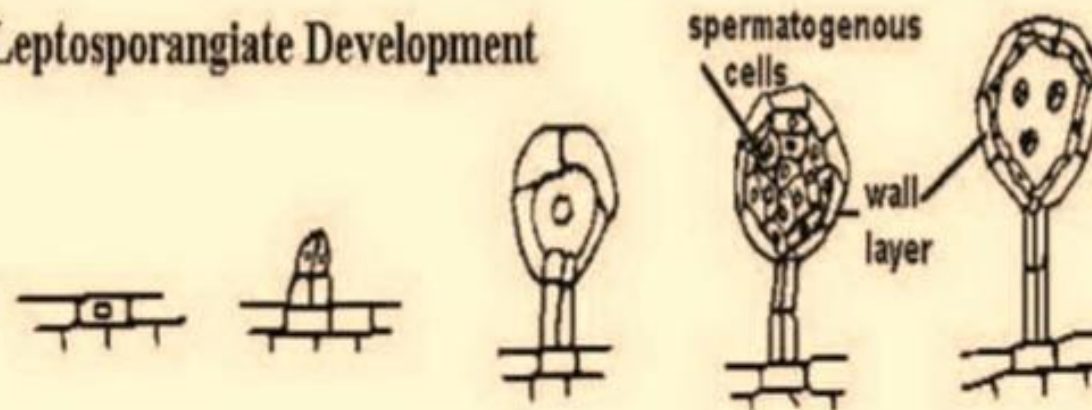
Mature microsporangium

- Leaves bearing sporangia known as sporophylls. Microsporangia bearing leaves known as microsporophyll and megasporangia bearing leaves known as megasporophyll.
- The development of sporangia may be **eusporangiate** (sporangium initiate from group of cells) or **leptosporangiate** (sporangium initiate from single initial cell).

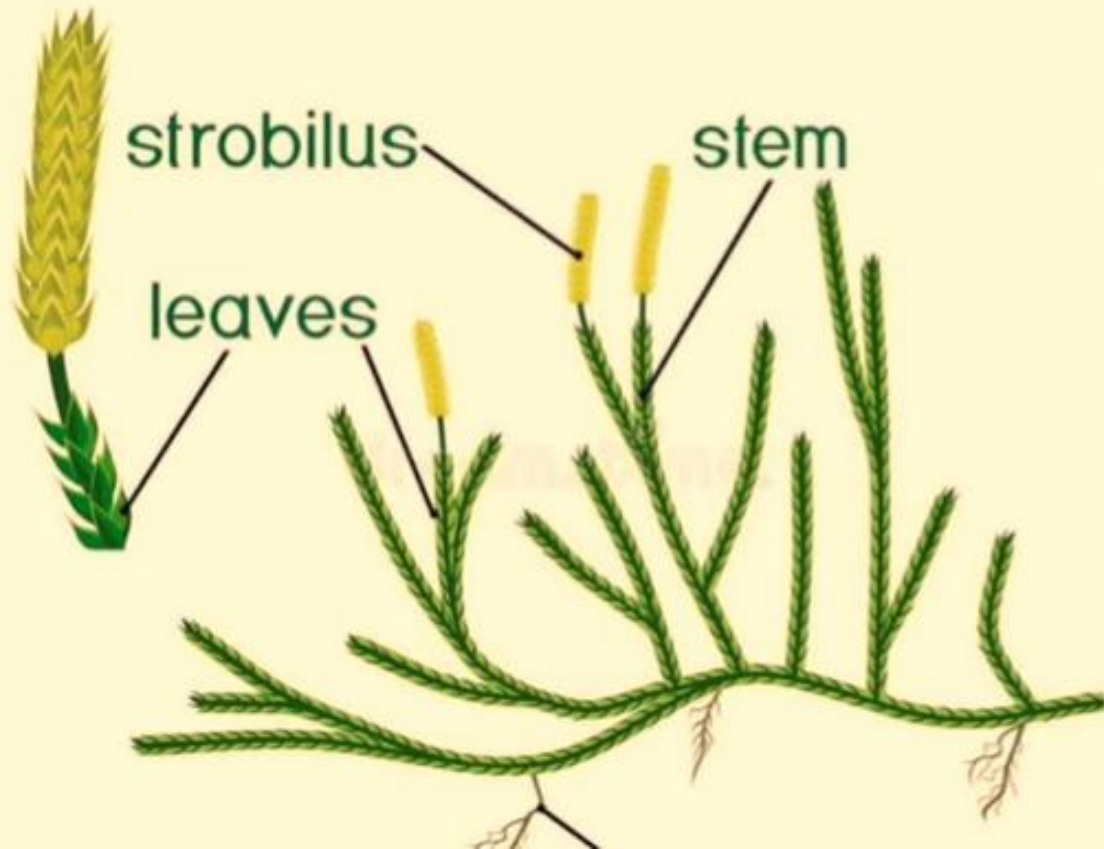
Eusporangiate Development



Leptosporangiate Development

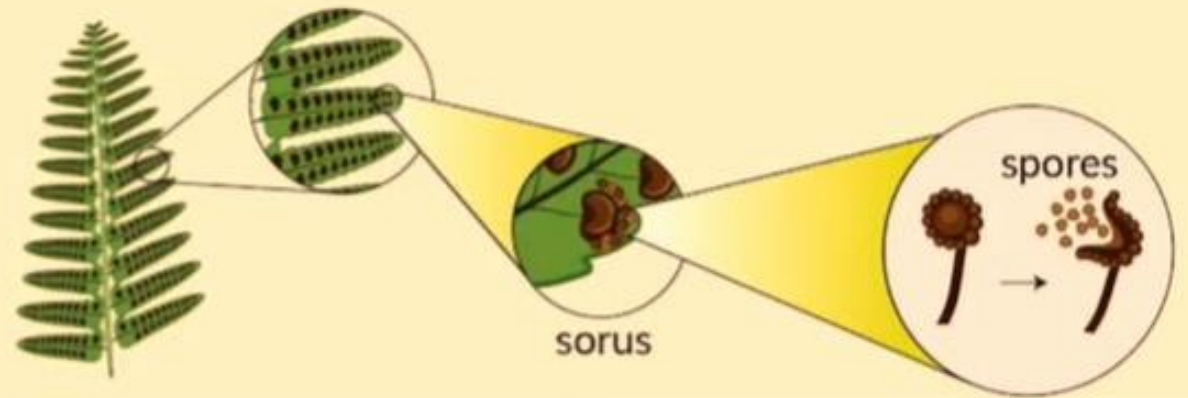


- Sporophylls either uniformly distributed (*Adiantum*, *Pteris*) or are aggregated into cones (strobili) at apex (*Equisetum*, *Selaginella*).
- Sporangia are aggregated in clusters, known as sori in some that may be simple, graded or mixed.



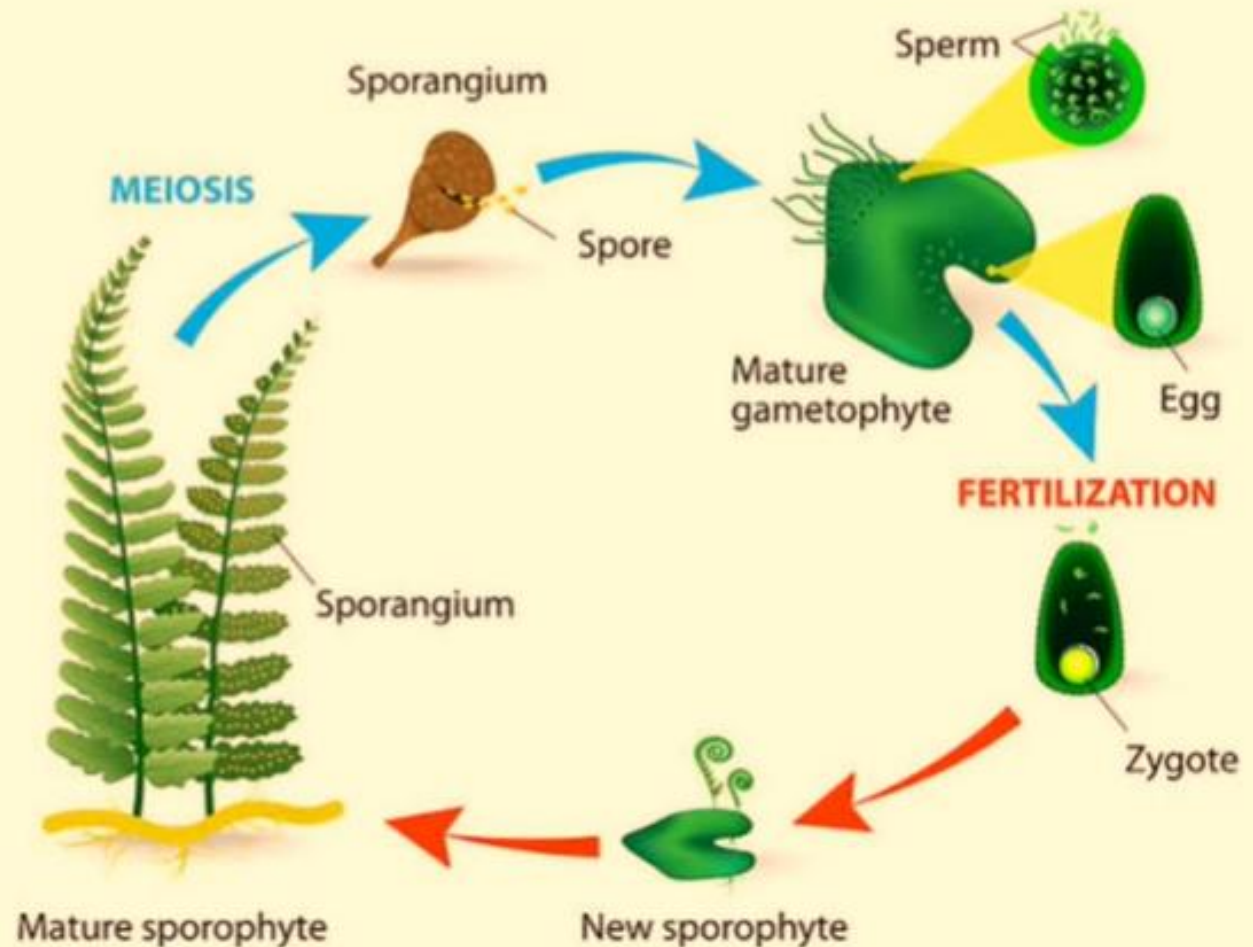
Fern spores

under a microscope



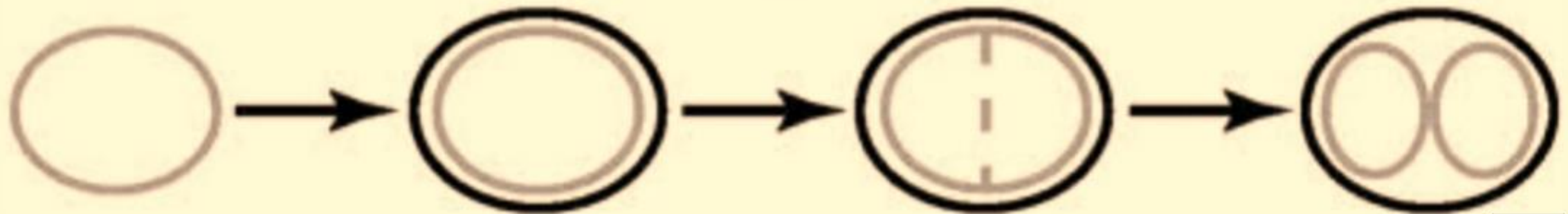
- Spore on germination give rise to gametophytic generation (**prothallus**), which is monoecious in **homosporous species** and dioecious in heterosporous species.

LIFE CYCLE OF THE FERN



- In homosporous development of gametophyte is exosporic (gametophyte develops outside the spore wall), in heterosporous it is endosporic (gametophyte develops inside the spore wall).
- Sex organs projecting or embedded type and they are multicellular and jacketed.

endosporic cell division



- Antheridia have single layered jacket with short or no stalk, whereas archegonia have neck (neck has 4 vertical rows of cells and each rows has 2-6 cells) and venter. Neck canal cells also varies from 1-14.
- Antherozoids (spermatozoids) biflagellated or multiflagellated (ferns).

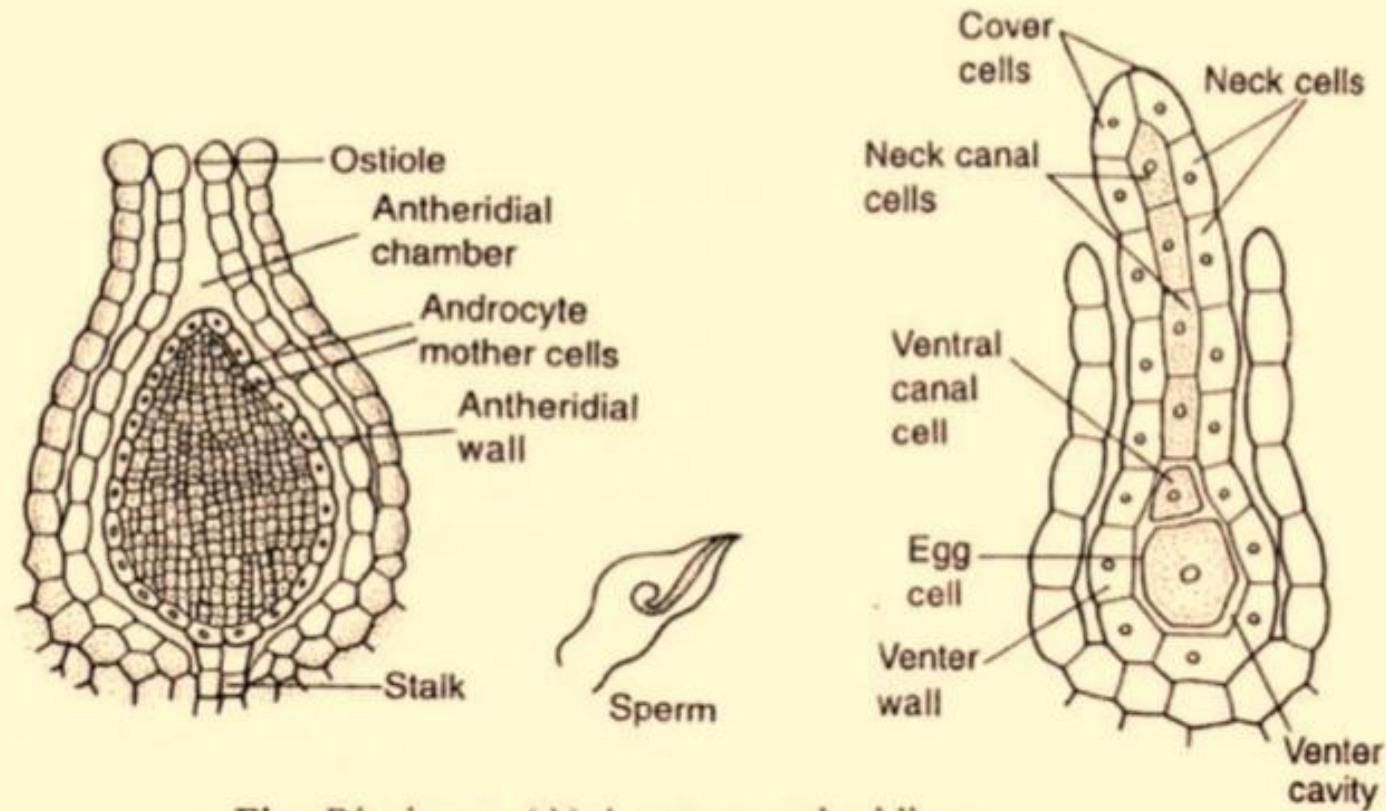
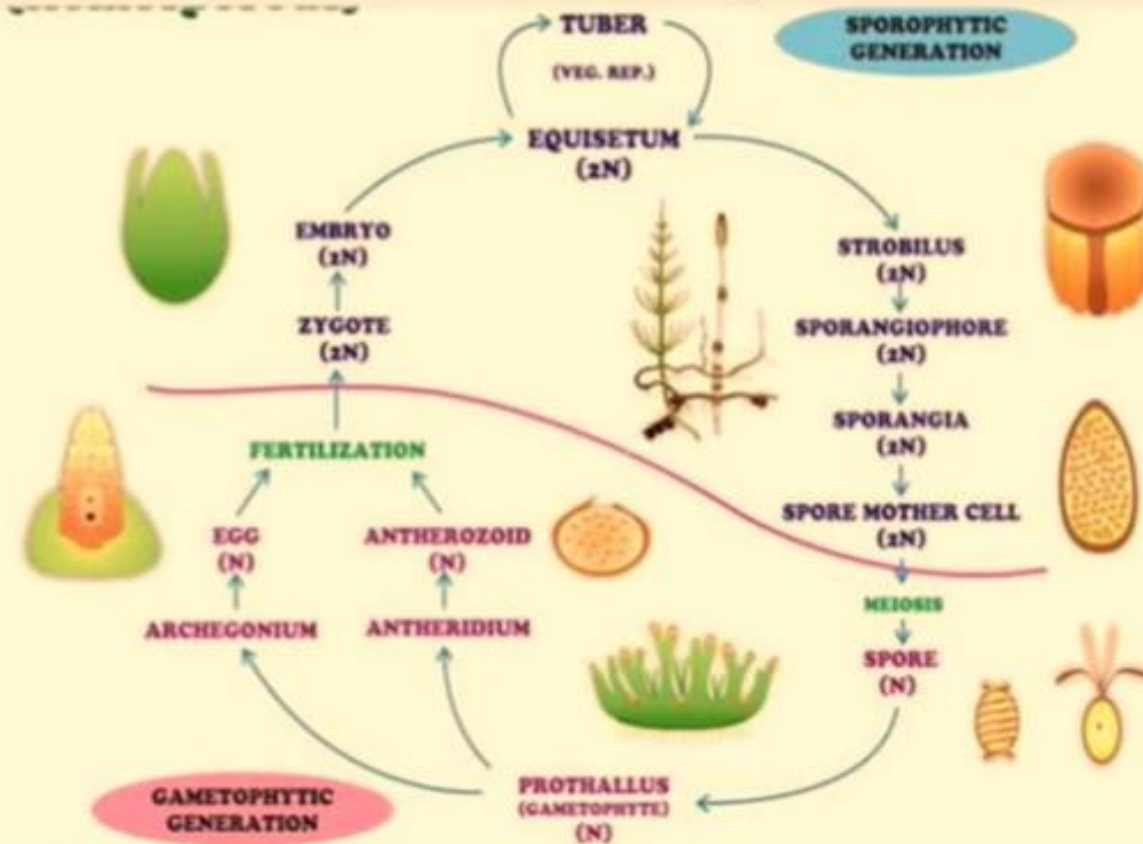


Fig: *Riccia* spp. (A) A mature antheridium;
(B) A mature archegonium.

- Zygote (mother cell of sporophytic generation) formed by fertilization undergoes holoblastic development or meroblastic development to form embryo.
- Embryo soon develop into new sporophyte.
- Pteridophytes show '**heteromorphic alternation of generations**' (term first used for mosses and ferns by Hofmeister, 1851).



THANK YOU