

GYMNOSPERMS



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MORPHOLOGICAL PARTS

- Middle sized or tall trees and shrubs
- There are no herbs and climbers



- 70 genera and 725 species
- There are no herbs and climbers in gymnosperms
- They do not reproduce by cuttings, budding and layering
- But cycas reproduce vegetatively by bulbils



The roots are generally **tap root** but mycorrhizic (e.g. *Pinus*)

Coralloid roots are also known (e.g. *Cycas*)



- The stems are aerial, erect, underground, unbranched, branched



Branched: PINUS



Unbranched: CYCAS

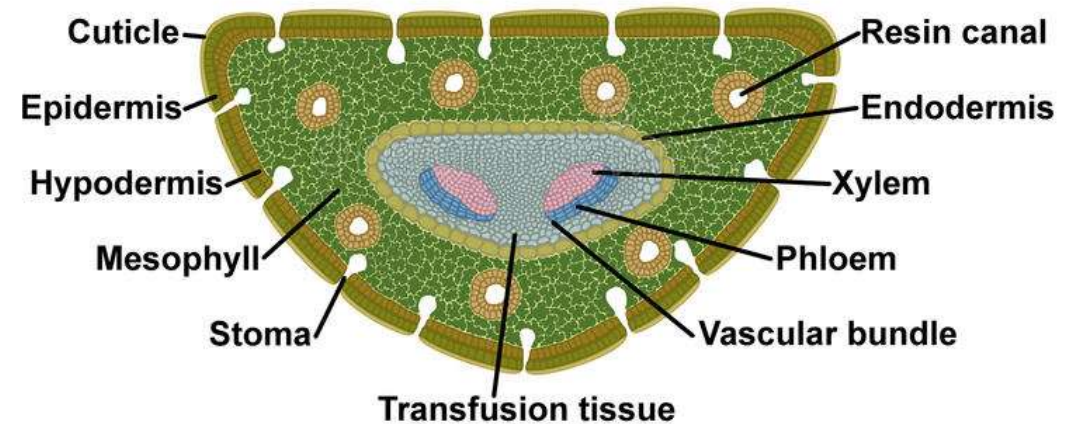


Underground: Welwitschia

- Both **microphyllus** and **megaphyllus** leaves are present
- The leaves are mostly evergreen and may have **resin passages**
- The leaves of **Gnetales** lack resin passages
- The leaves of conifers and cycads posses a **transfusion tissue**
- The stomata are **sunken**



PINE LEAF (NEEDLE) ANATOMY



- The leaves may be

- TRIANGULAR (*P. roxburgii*)
- SEMI-CIRCULAR (*P. sylvestris*)
- BIFACIAL (leaflets of cycas)

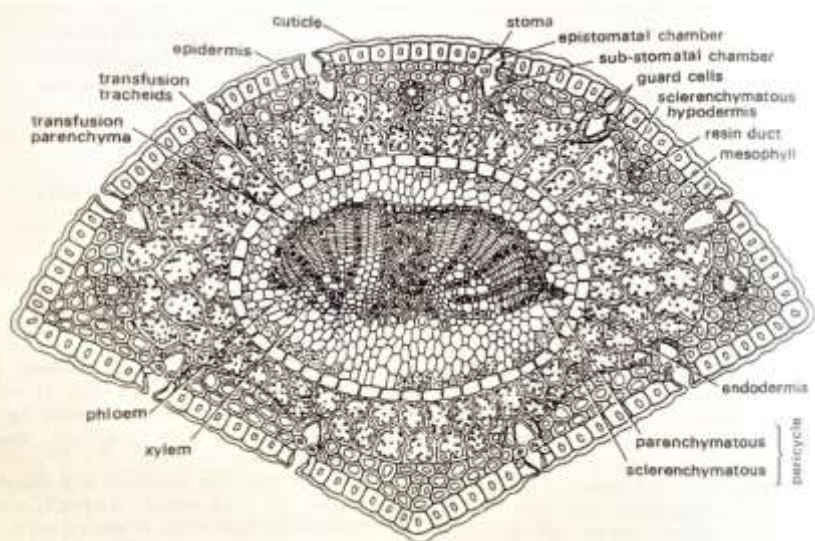
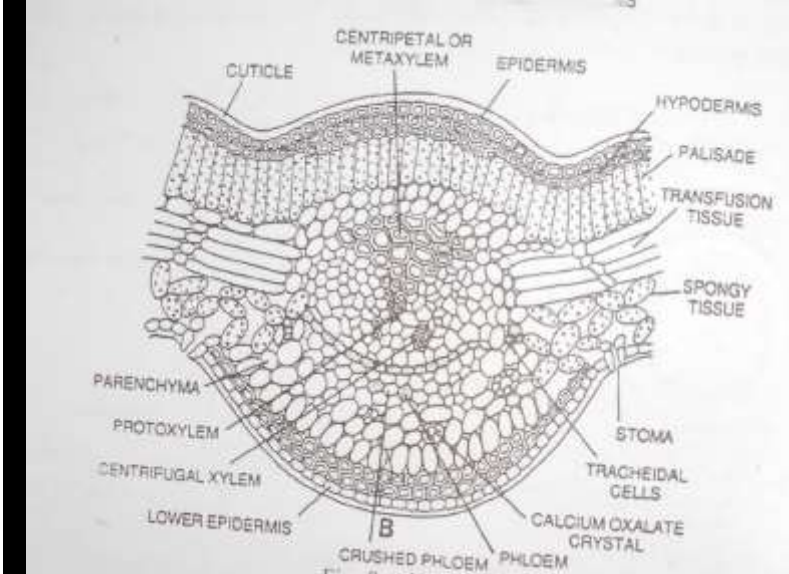
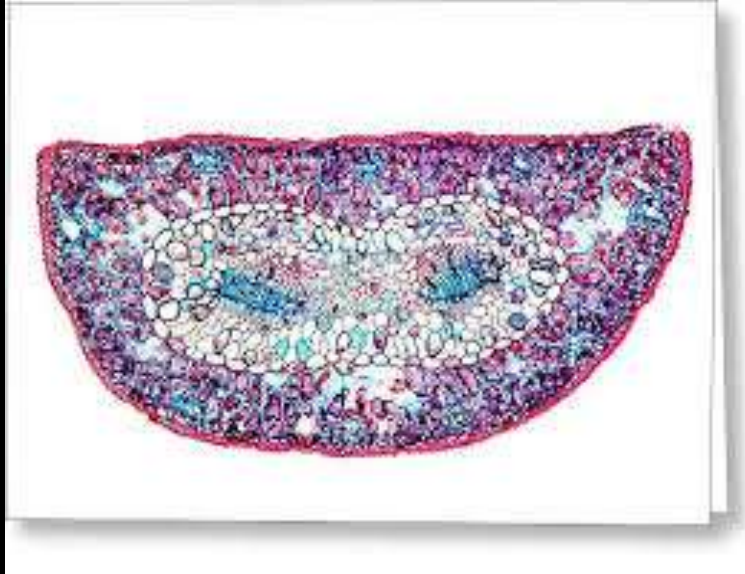
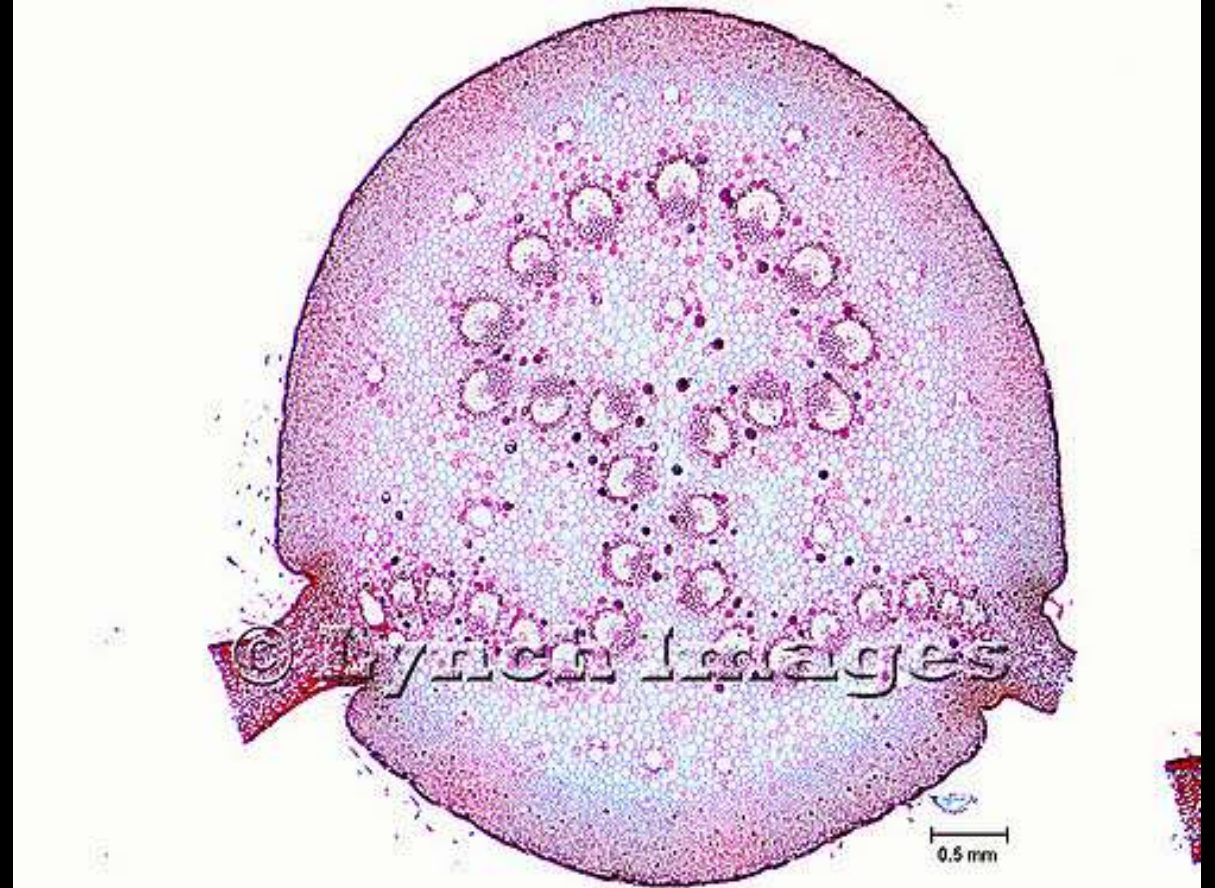


Fig 13. *Pinus* : Transverse section of needle



- The vasculature of the petiole of cycas shows omega shaped deposition
- Cycas leaf shows diploxylic xylem



- Secondary wood may be

- Manoxylic (or)
- Pycnoxylic

- Manoxylic

- Found in cycadophyte
- Porous
- Soft
- More parenchymatous
- Wide medullary rays
- Useless commercially

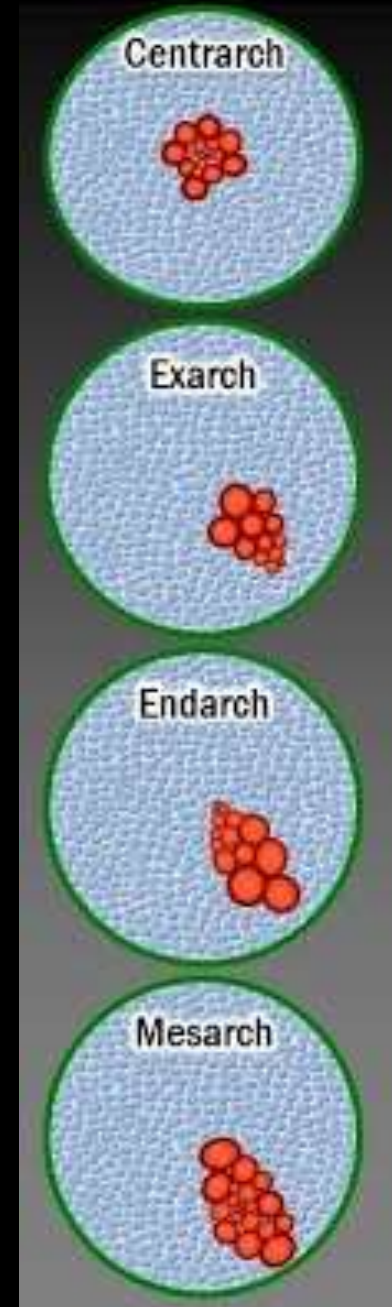


- **Pycnoxylic wood**

- Found in coniferophyte
- Compact
- Narrow medullary rays
- Great commercial uses



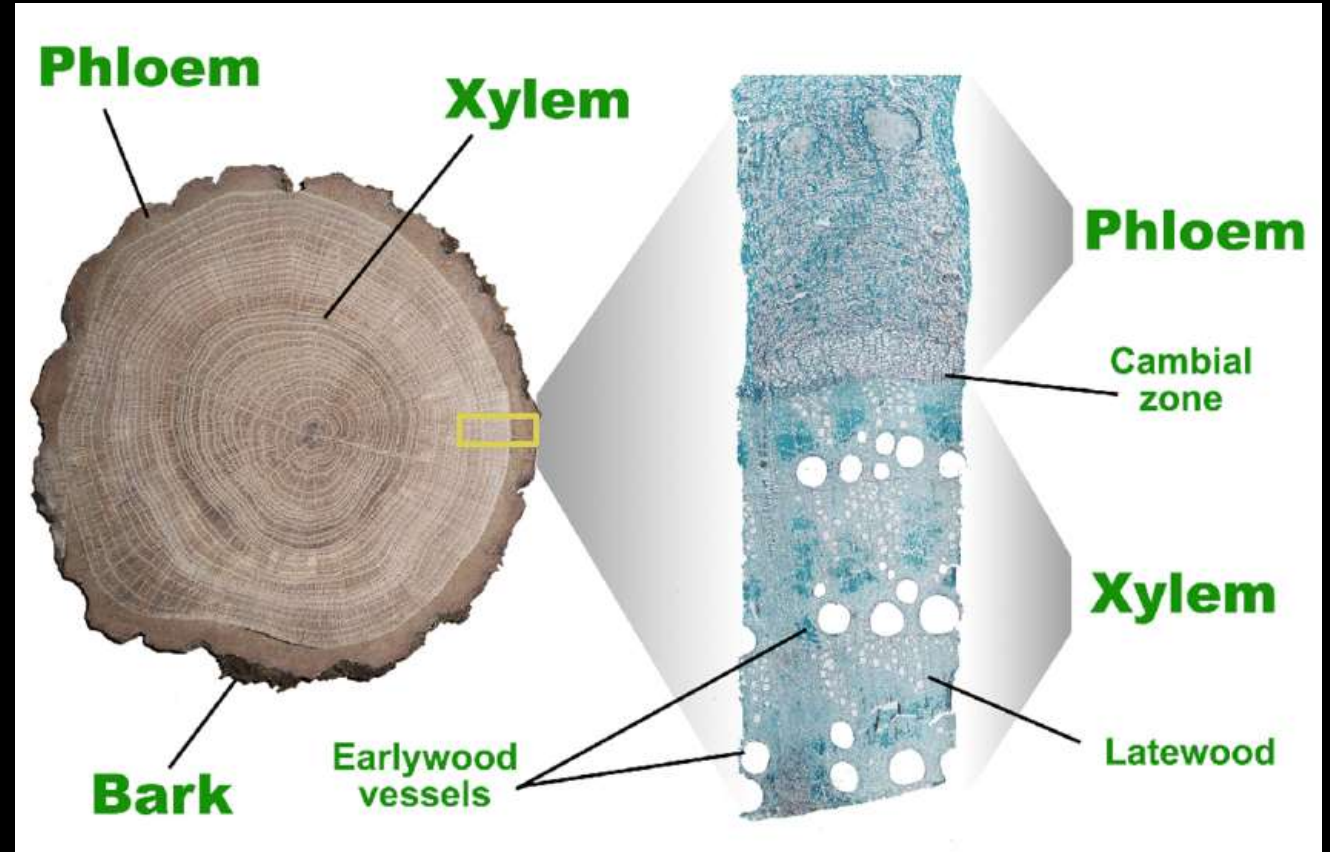
- The xylem lacks wood vessels
- Phloem is devoid of companion cells
- The xylem is usually mesarch or endarch
- Exarch in roots



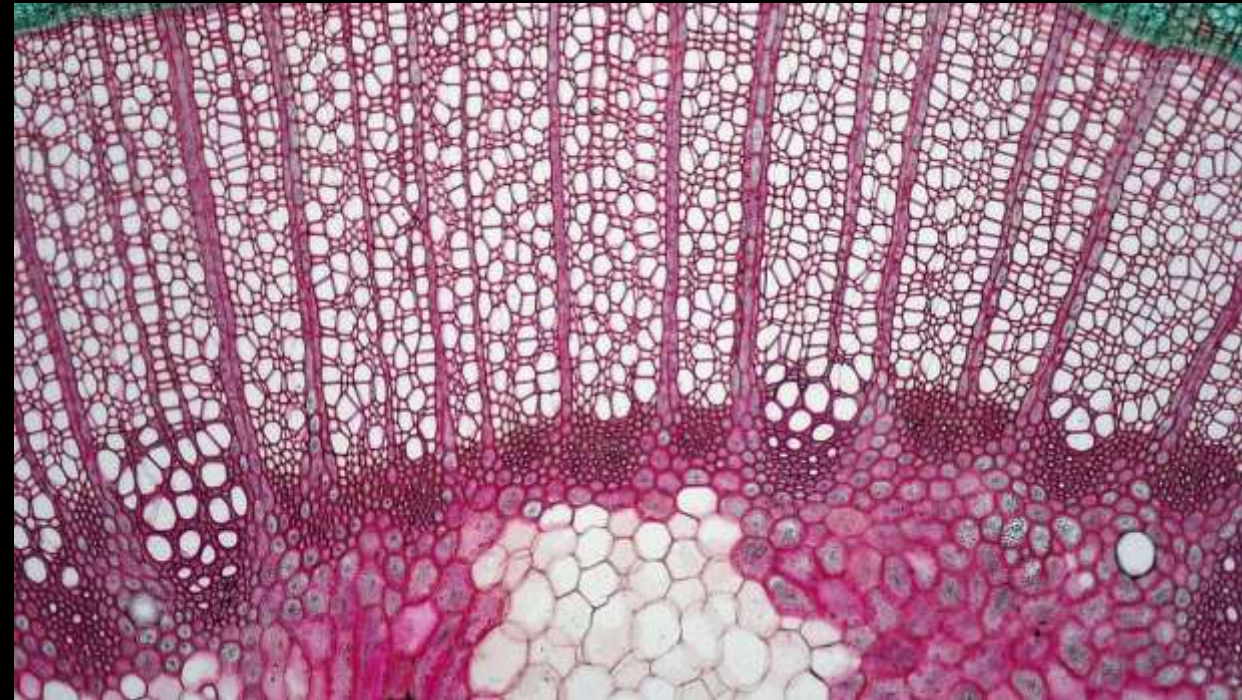
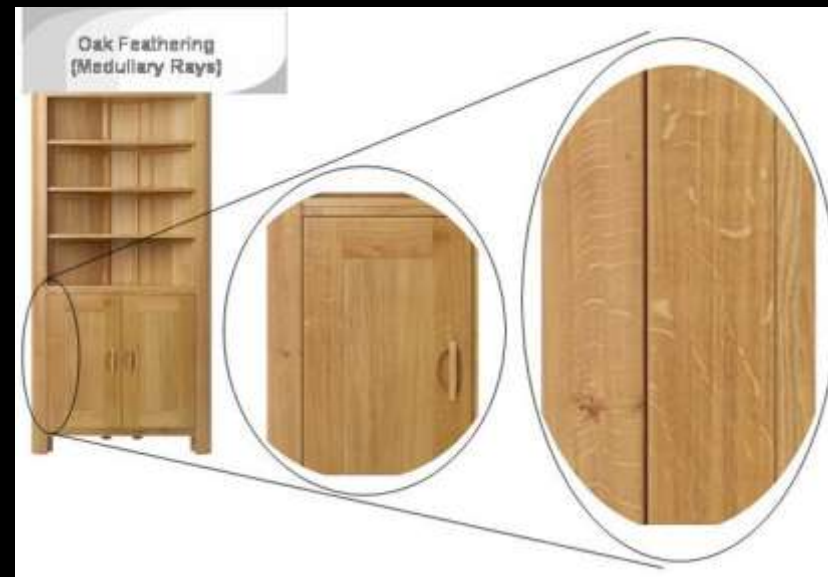
- The secondary vasculature may be

- Monoxylic (or)
- Polyxylic

Different layers of cambium appears distinct concentric rings of secondary xylem and phloem

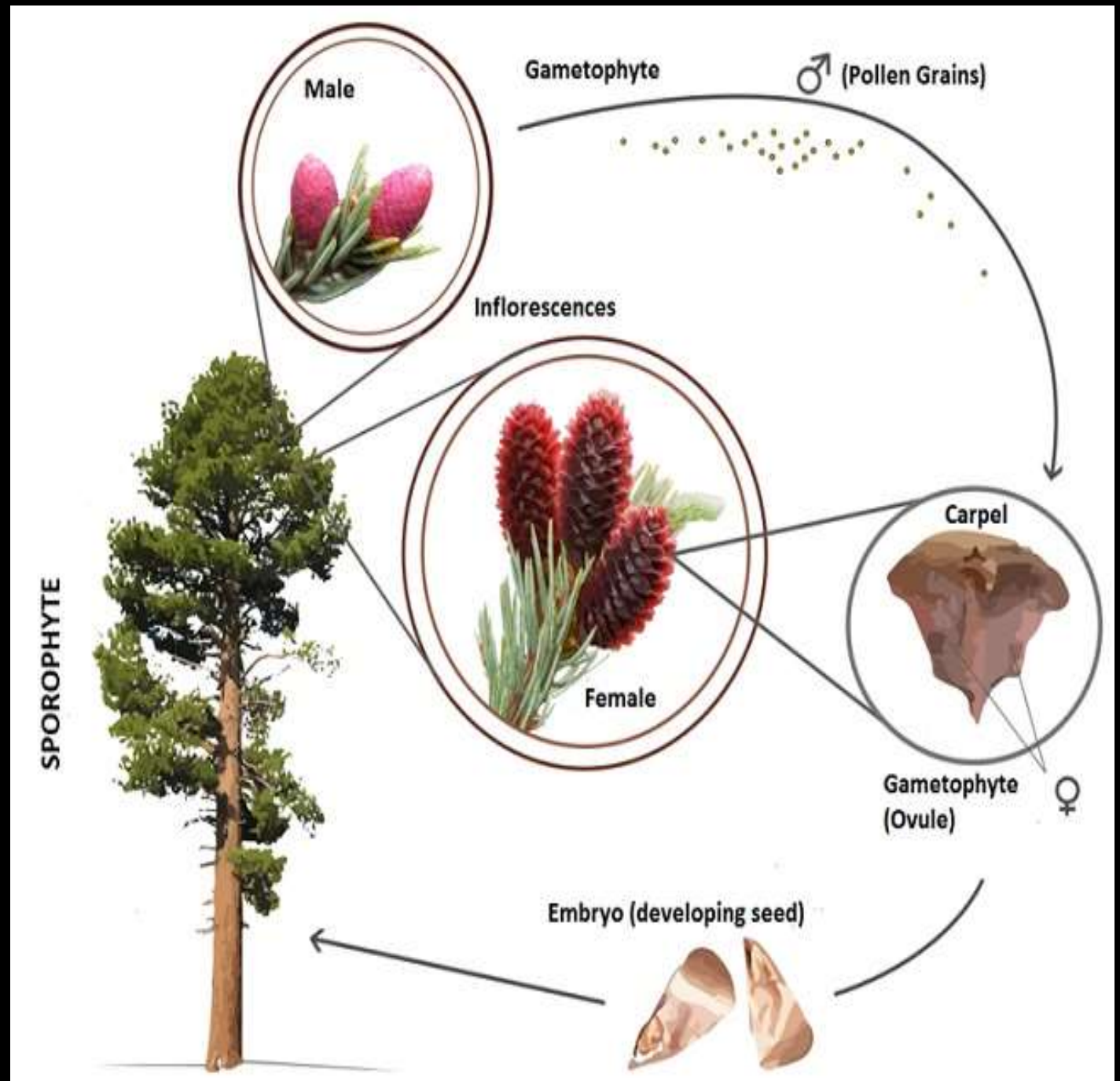


- The meduallary rays may be uniseriate or multiseriate and may be homogenous (e.g., Ginkgo) or heterogenous (e.g., Pinus)



Reproductive Organs:

- The gymnosperms are **heterosporous**
- the microspores or the pollen grains produce male gametophytes
- whereas the single megaspore enclosed within the megasporangium (nucellus) develops into a female gametophyte



- The strobili bearing **microsporophyll's** and microsporangia are called microsporangiate or **male strobili**
- whereas those bearing megasporophylls with ovules or megasporangia are called **macrosporangiate** or **female strobili**.



- The two types of cones or strobili may be borne on the same tree (e.g., *Pinus*)



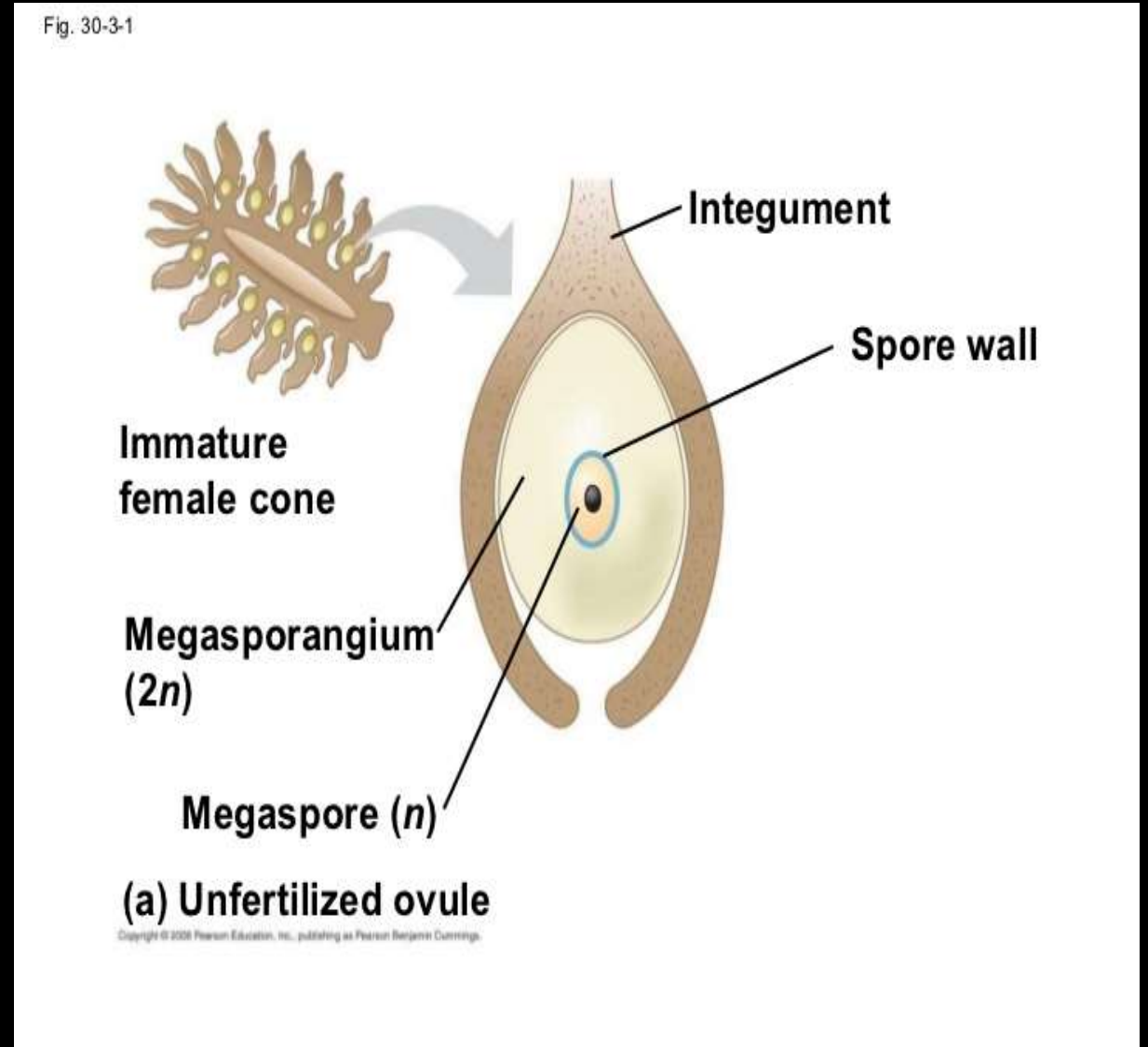
- on different trees (e.g., Cycas, Ginkgo)



- The microsporangium contains numerous **microspores**
- whereas the megasporangium contains **only one megaspore**.

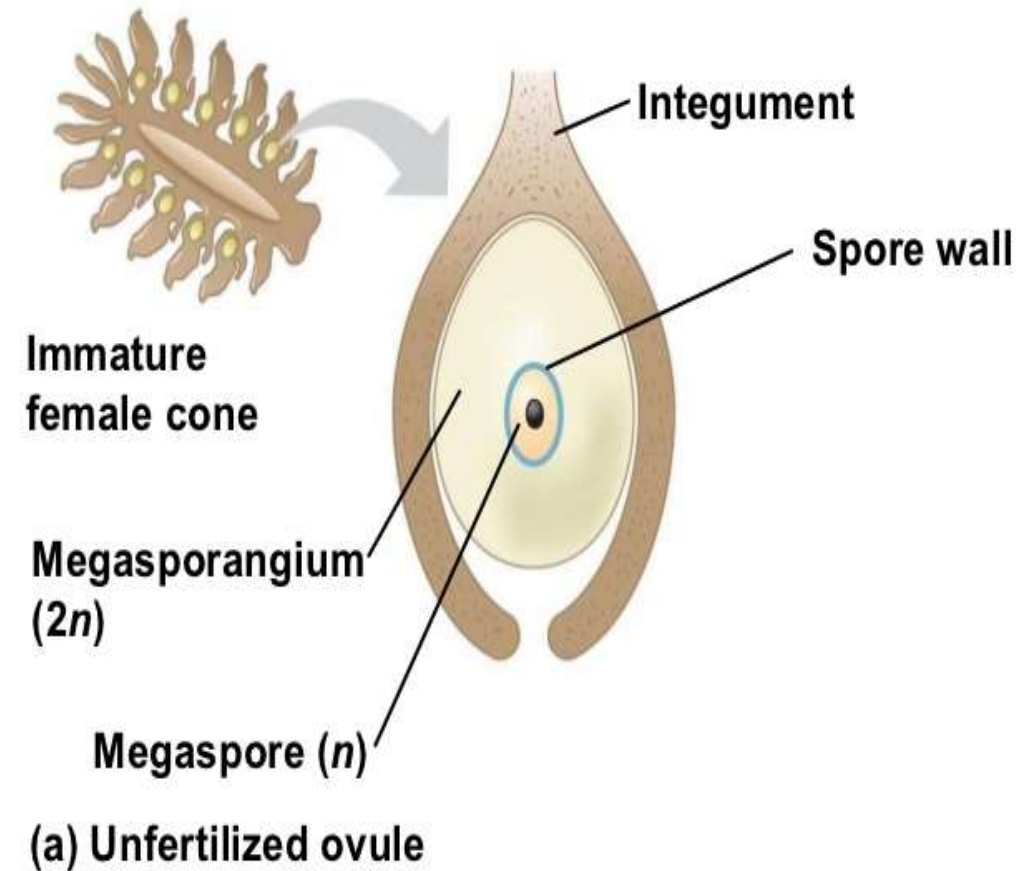


- The gametophytes are **endosporic**, i.e., they develop within the **respective spore wall**.
- The ovules are naked and are borne on megasporophylls that are **usually spirally arranged** around a central axis
- The **ovules are sessile**
- The ovule consists of a parenchymatous mass of cells called the **nucellus** or the megasporangium



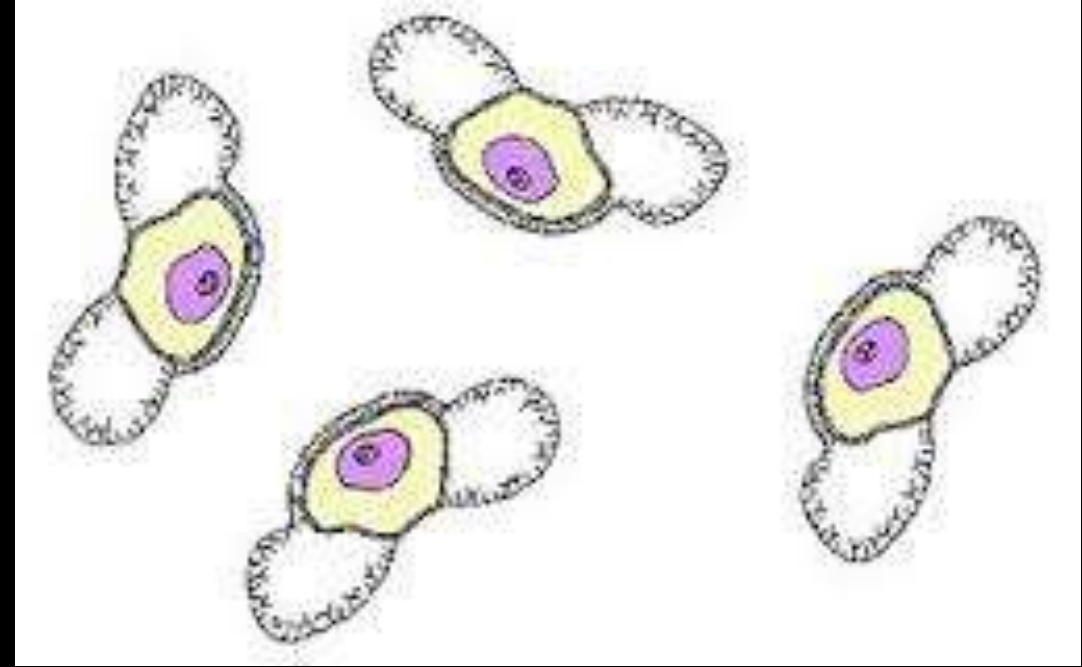
- The nucellus encloses a single diploid megaspore mother cell that **undergoes meiosis** to form a linear tetrad of 4 haploid **megaspores**.
- Out of which only lower one remains functional, whereas the rest degenerate
- This is the young female gametophyte which develops within the megaspore

Fig. 30-3-1



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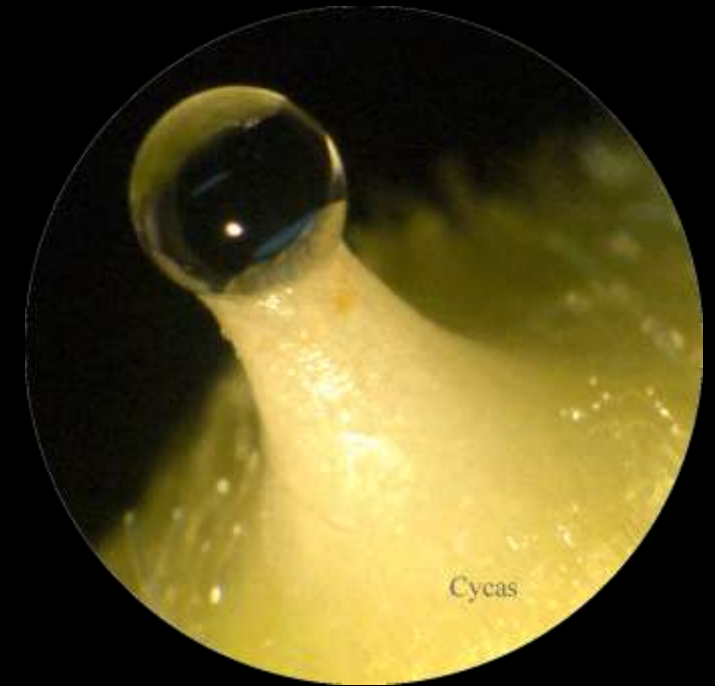
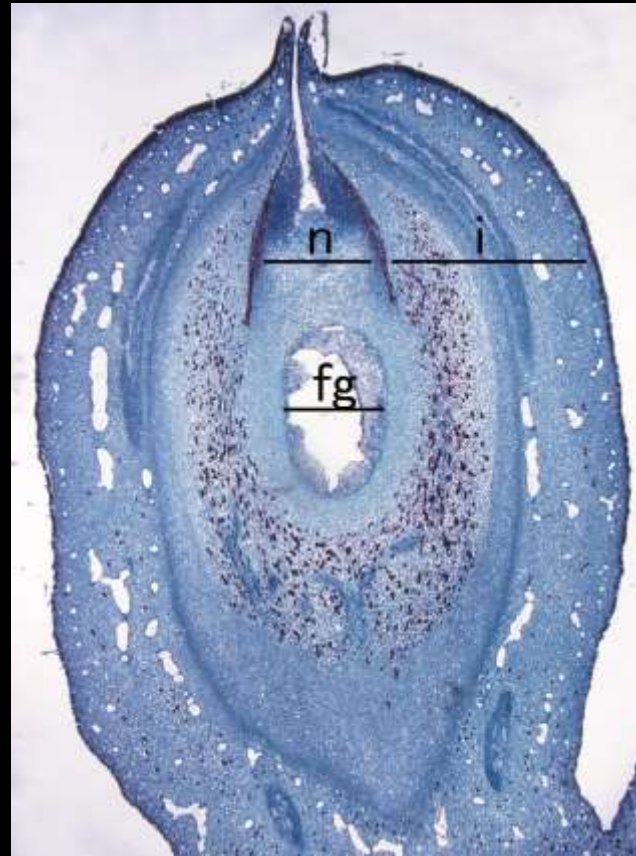
- **Microspores:**
- The microspores or the pollen grains are **unicellular and haploid**
- In *Cycas* the microspores are **tetrahedral in shape**
- The microspores of *Pinus* are **winged or saccate**
- The development of wings is considered to be a significant development during the course of **pollen evolution**



- The pollination in gymnosperms takes place by means of wind



- The transference of **semigerminated** pollen grains on the micropyle of the ovule
- The semigerminated microspores are drawn into the ovule by the drying of the **pollination drop**
- The **micropyle** closes after the act of drawing in of the microgametophyte.



References

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