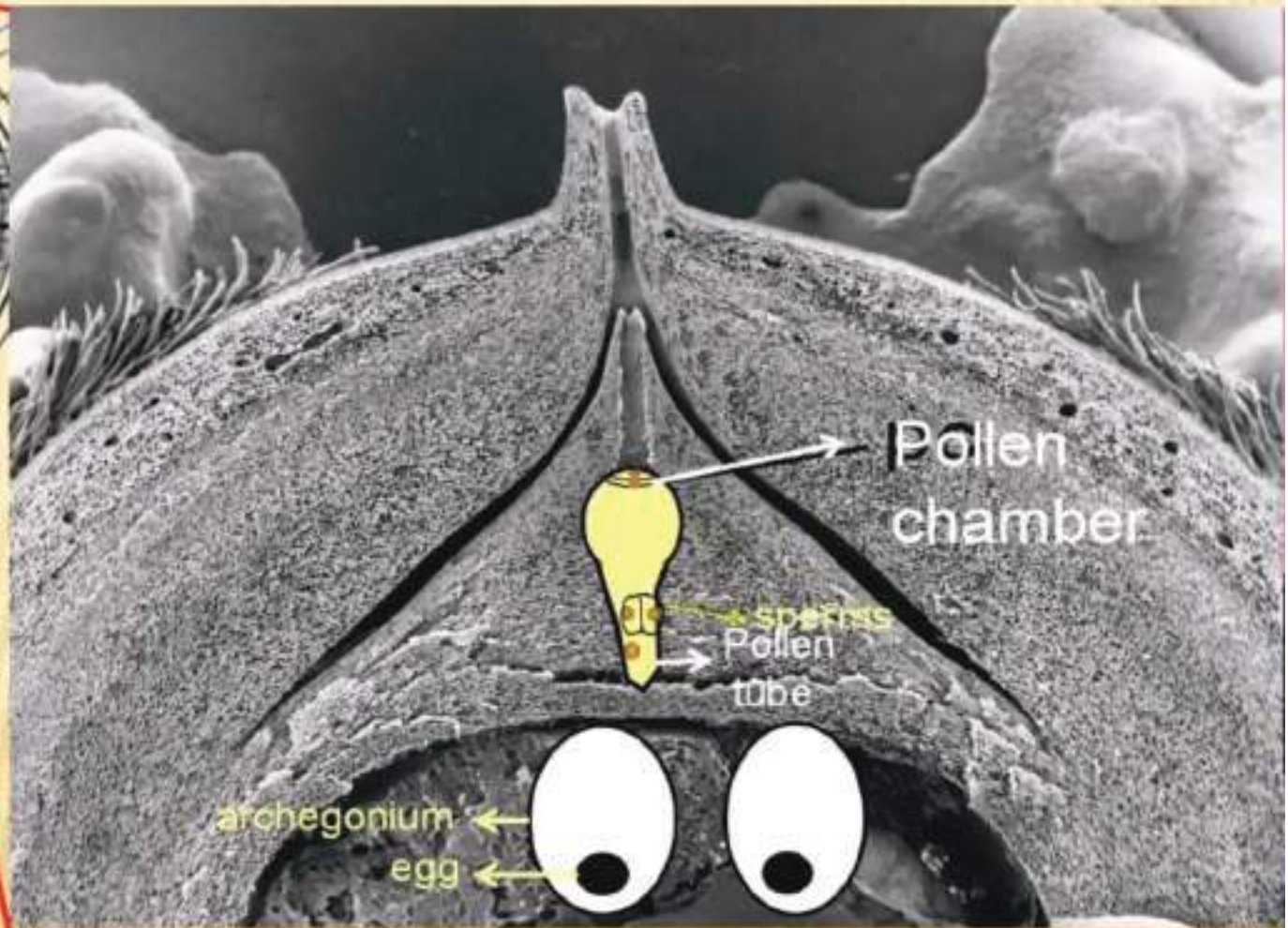
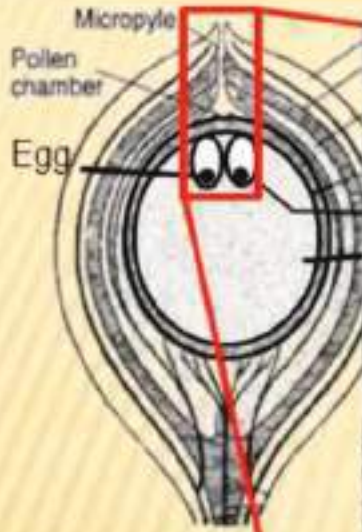


GYMNOSPERMS

Dr. Vivek Kumar Pandey

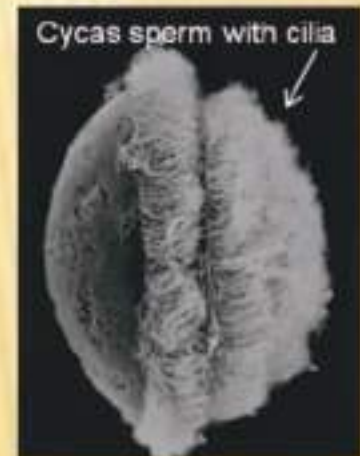
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Gymnosperms



Gymnosperms

- If ciliated sperms (eg. *Cycas* and *Ginkgo*) then they move to the egg by themselves.



- If non-ciliated sperms (eg. *Pinus* and *Gnetum*) then the sperms move to the egg along with the pollen tube.

Gymnosperms

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- If non-ciliated sperms (eg. *Pinus* and *Gnetum*) then the sperms move to the egg along with the pollen tube.
- One sperm fuses with the egg, other degenerates.

Gymnosperms

- The sperm nucleus and the egg nucleus fuse to form a **diploid zygote**.
- There was **no requirement of water for the fertilization** (fusion of sperm nuclei with egg nuclei) to occur.
 - Pollen grains reached the ovule by **wind** and the sperms reached the egg with the help of the **pollen tube**.

Gymnosperms

Zygote + cell wall \longrightarrow Oospore \longrightarrow Young embryo
(inside the ovule)

➤ **Polyembryony** is the phenomenon of the development of more than one embryo in one ovule.

-Only one embryo will reach maturity

Ovule \longrightarrow Seed

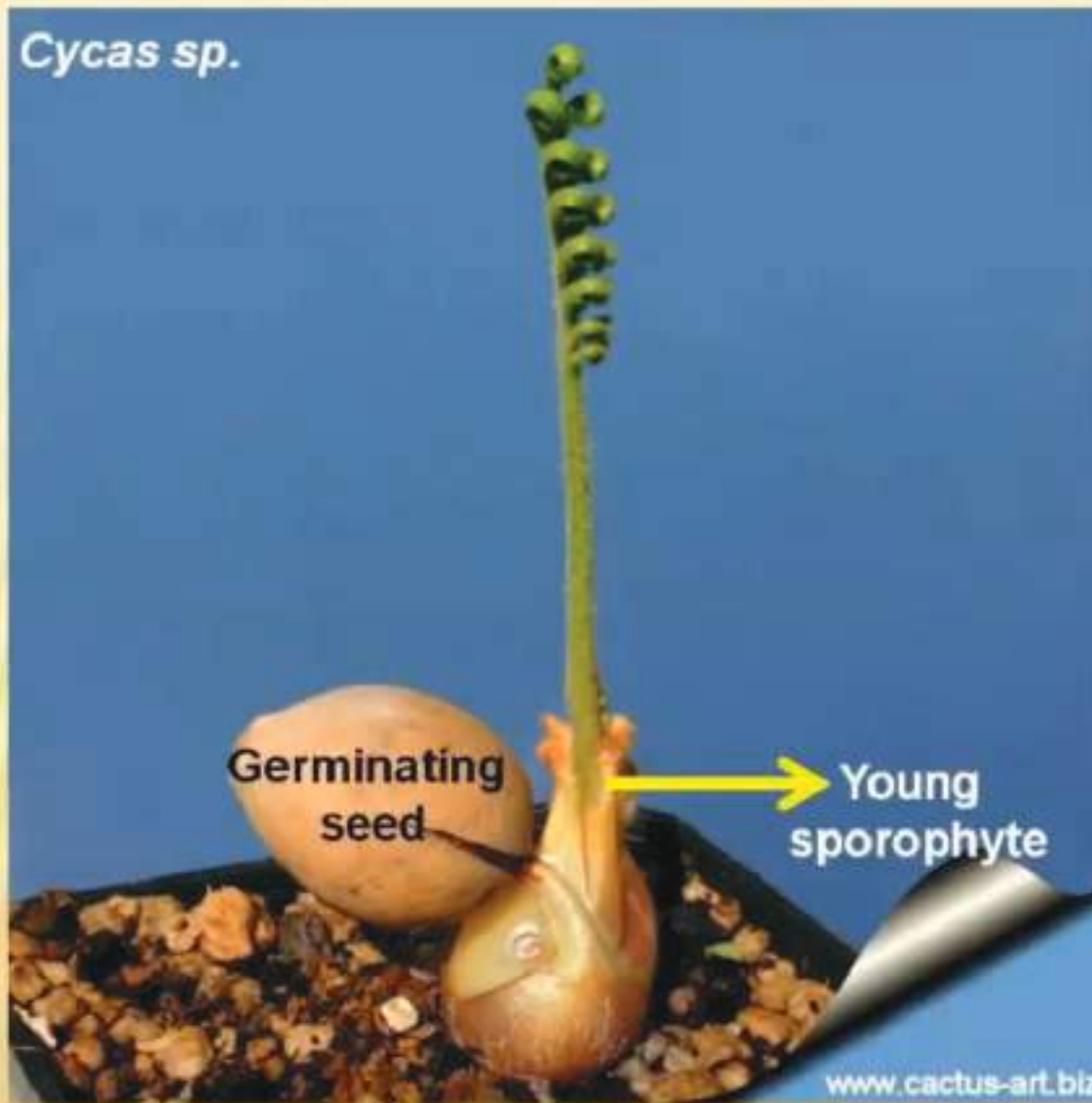
Gymnosperms



Seed= fertilized ovule

- Seeds are **protected** with many layers of cells.
- They can be **dispersed by wind, water or animals.**
- They can **remain dormant** till the conditions are suitable for germination.
- The **food stored inside (endosperm) can be used up by the embryo** at the time of germination.

Gymnosperms



Gymnosperms

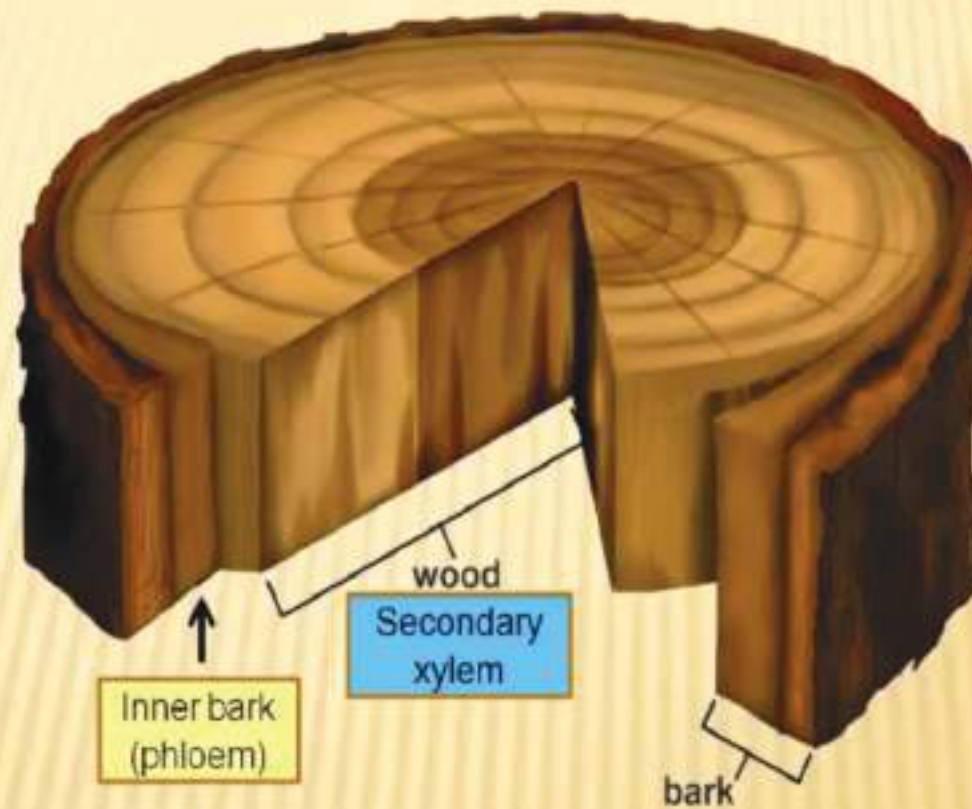
- Gymnosperms are vascular plants which show **secondary growth (thickening)**.

Ginkgo biloba



- During secondary growth great amount of **secondary vascular tissues are produced** inside stem and roots.

Gymnosperms



Gymnosperms

Xylem

- **Tracheids and vessels** are the actual water conducting cells

-Tracheids are primitive than vessels

- In pteridophytes and most of the gymnosperms-

Tracheids

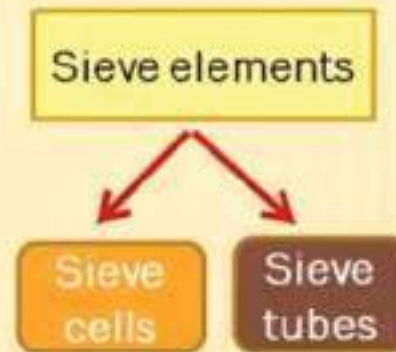
- In angiosperms-

Vessels



Gymnosperms

Phloem



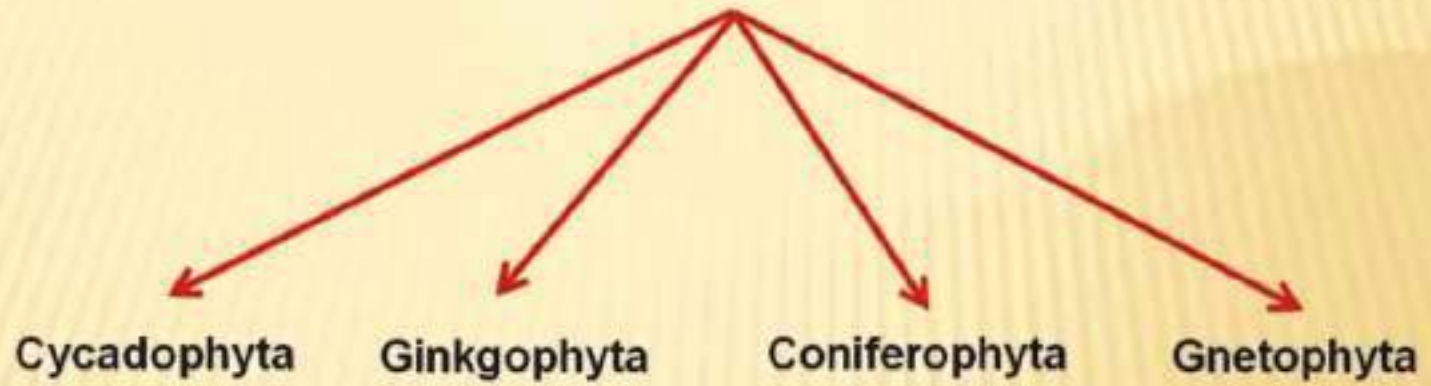
Sieve cells

only type of food-conducting cells in **pteridophytes** and **most gymnosperms**.

Sieve tubes

only type of food-conducting cells in **angiosperms**.

Gymnosperms



Gymnosperms

Cycadophyta

- The members are called **cycads**
- **Unbranched** stem
- **Pinnately compound** leaves
 - Leaflets have **thick cuticle**, **sunken stomata**
 - They help to **reduce water loss**
- Root system consists of **one main root called tap root** and many small lateral roots



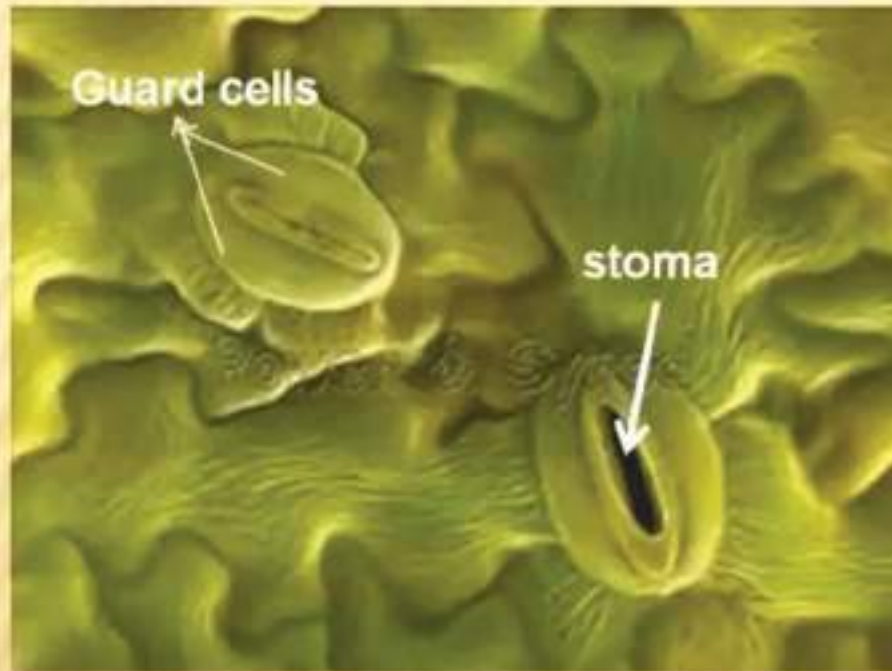
Gymnosperms

Stomata



Gymnosperms

Stomata



Sunken stoma



Gymnosperms

Cycadophyta

Cycas coralloid roots



Gymnosperms

Cycadophyta

Cycas coralloid roots



Gymnosperms

Ginkgophyta



Ginkgo biloba
(Ginkgo tree)

Maidenhair
tree



Ginkgo biloba



Adiantum sp.
(Maiden hair fern)



Ginkgo biloba (in autumn)

- *G. biloba* may be the oldest living seed plant.
- *Ginkgo biloba*, which is only found in the wild in China, is cultivated and protected across the world.

members are called **conifers**.
seen in the **snow forests**



Gymnosperms

- *Araucaria* can be seen in lower elevation and in warmer climates.
- Conifers have **branched stem**.
- **Needle-like leaves** reduce the surface area which reduces the loss of water.



Needle like leaves of *Pinus* sp.



Araucaria sp.

Gymnosperms coniferophyta

- Roots of some conifers (eg. *Pinus* sp.) have **symbiotic** association with fungi called **mycorrhiza**.



Pinus roots with mycorrhizal fungi

Gymnosperms

Gnetophyta



Gymnosperms

General characteristics

- They are the **primitive vascular seed plants**.
- They form **naked seeds**.
- The main plant body is **diploid and sporophyte**.
- Their leaves have **thick cuticle** and **sunken stomata** which are adaptations to withstand extreme temperatures, wind and humidity.
- They have **tap root system**.
- They are **heterosporous**.
- They have **male and female cones**.
- They show **polyembryony**.

Gymnosperms

Economic uses

- Gymnosperms provide large amount of timber for construction, packing, paper industry, plywood and particle board manufacturing.



Gymnosperms

Economic uses

- Cycas trees are grown for **ornamental purposes**.



■ *Cycas sp.*

- The chemical **terpentine** prepared **from the pine resin** is used in paint and wood industry.

Gymnosperms

Economic uses

- Cycas trees are grown for **ornamental purposes**.



- The chemical **terpentine** prepared **from the pine resin** is used in paint and wood industry.

- **Pine seeds** are roasted and eaten as snacks.



Gymnosperms

Economic uses

- **Ephedrine** a drug from Ephedra is used for respiratory ailments and asthma.



THANKS