

DIVERSITY OF SPERMATOPHYTE: GYMNOSPERMS

[Classification in Gymnosperms]



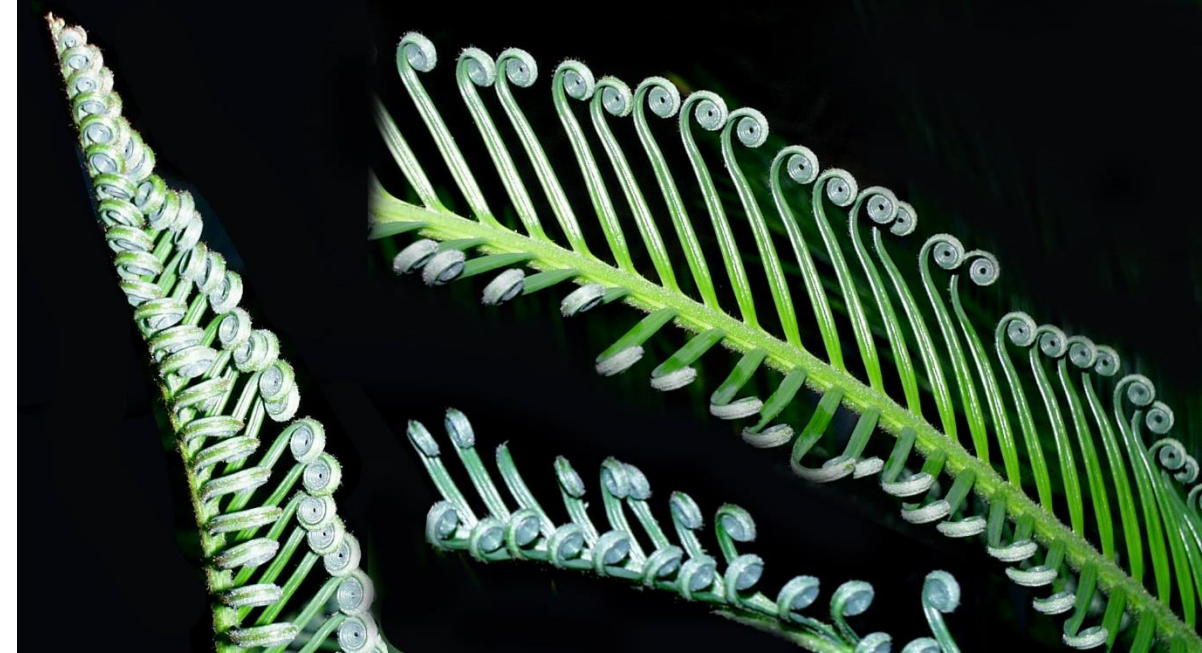
Niarsi Merry Hemelda, M.Si.

Table 6.1 **Major Groups of Living Gymnosperms**

Group	Common name	Estimated species
Cycadophyta	cycads	130–150
Ginkgophyta	ginkgos	1
Coniferophyta	conifers	600–650
Gnetophyta	gnetophytes	70–80

Cycadophyta (Cycads)

- The most primitive gymnosperm
- the leaves of cycads have **circinate vernation** as in ferns
- Dioecious
- The pollen of all cycads release **motile sperm cells**
- mostly short, erect stem or trunk, rarely tall and palm-like





Most Cycadophytes are palm-like, with pinnately compound, except for *Bowenia spectabilis* (bipinnately compound)

Two families of Cycadophyta:

1. Cycadaceae → not forming female cones
2. Zamiaceae → forming female cones

} Both have male cones



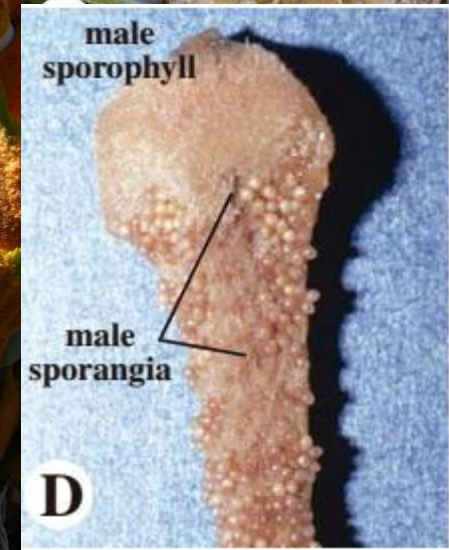
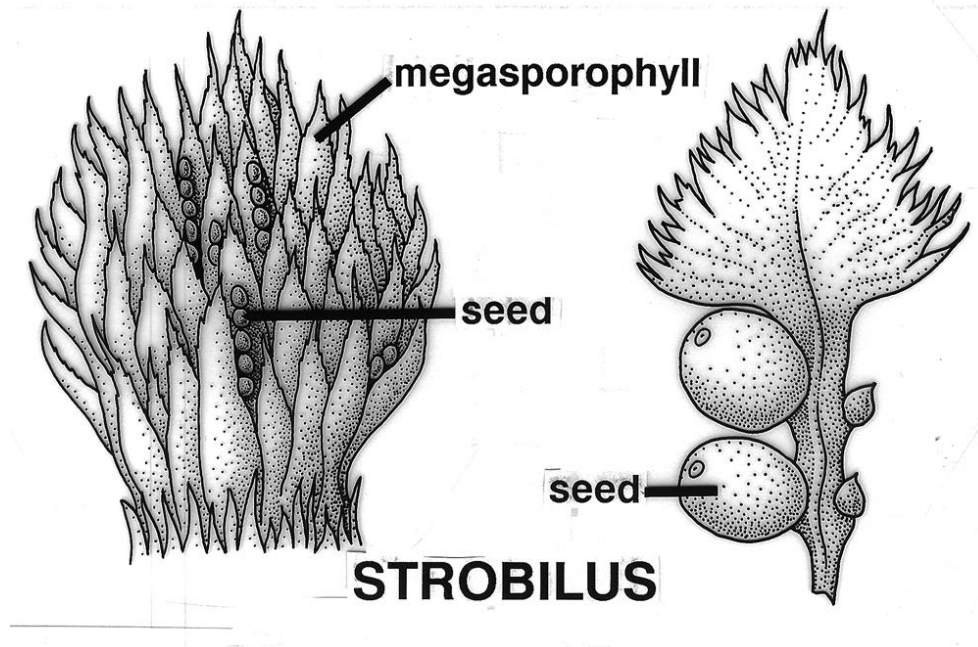
Cycadaceae Female sporophylls



Zamiaceae Female cone

Cycadaceae

- One genus → *Cycas*
- Seeds are produced on the lower margins of female sporophylls or megasporophylls
- Female sporophylls are congregated at the trunk apex in dense masses



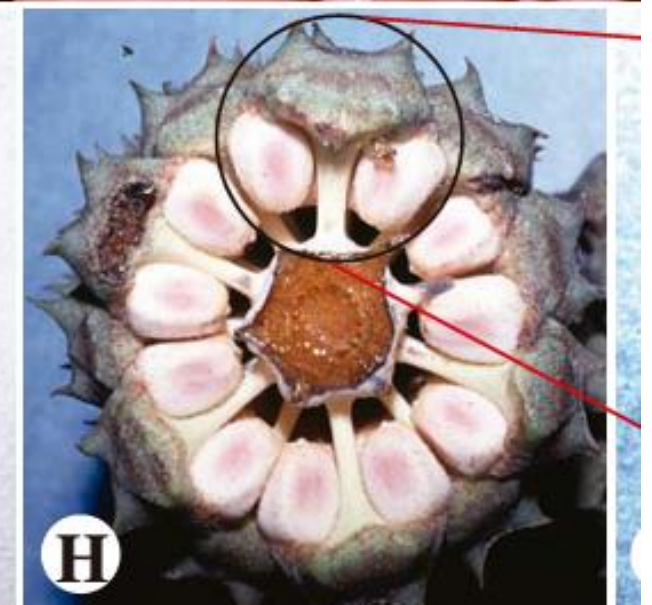
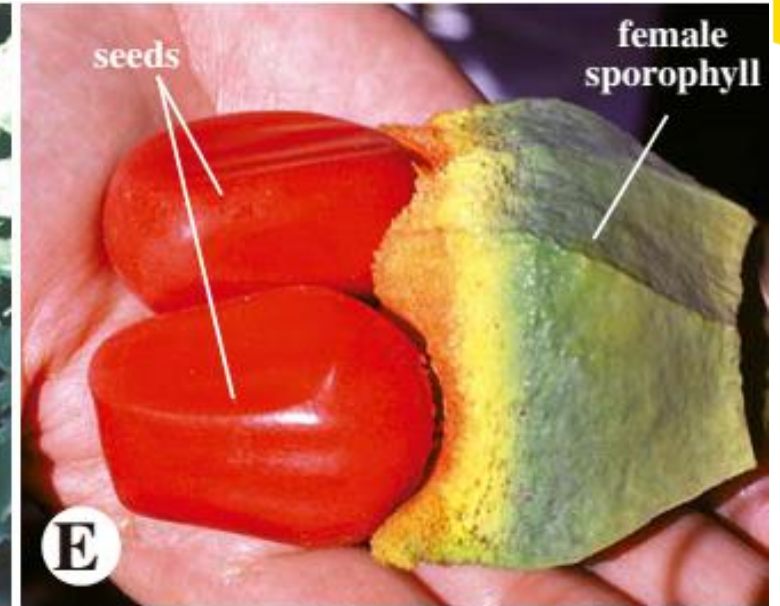
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Zamiaceae

Having both male and female cones → strobili

- Male cones have male sporophylls → microsporophylls; each of which bears numerous male sporangia
- The male sporangia, also called microsporangia, produce haploid microspores that develop into pollen grains.
- Female cones have female sporophylls → megasporophylls; each of which bears two seeds



Ginkgophyta (Ginkgos)

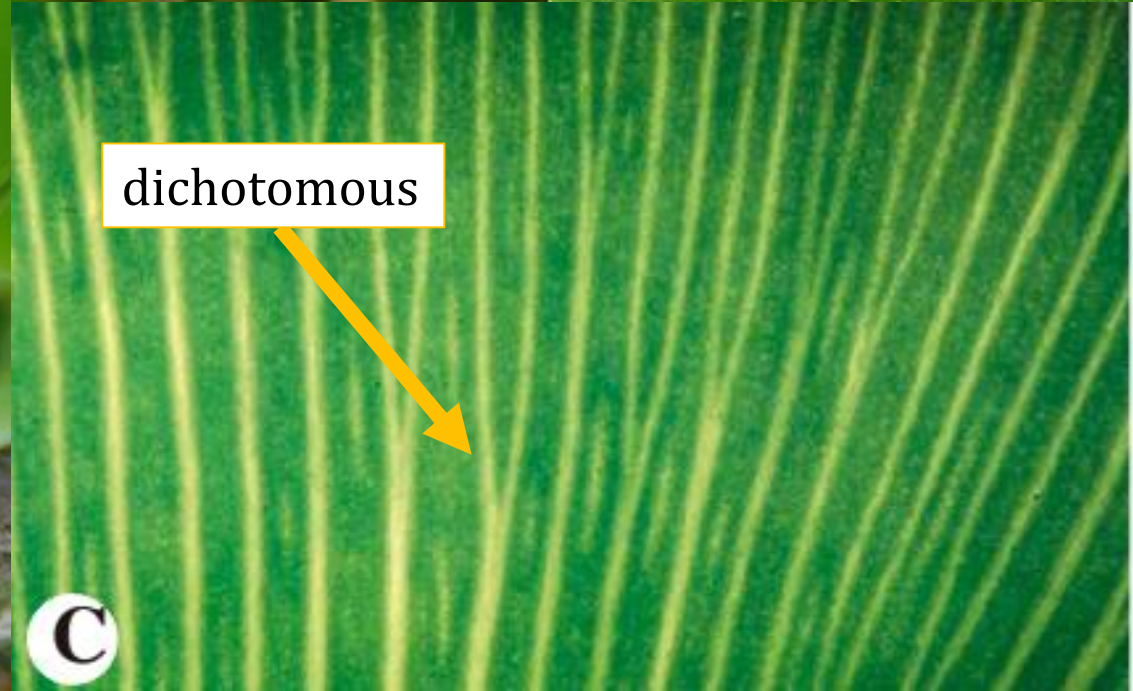
- Diverse and widespread in the fossil record (only one species, *Ginkgo biloba*, still survives).
- Highly branched, woody tree.
- Dioecious



Deciduous two-lobed, fan-shaped leaves with dichotomous venation

Male strobilus

Female strobilus



dichotomous

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Coniferophyta (Conifers)

- The largest, most well-known group
- Conifers typically produce evergreen, needlelike leaves
- The largest family is the Pinaceae



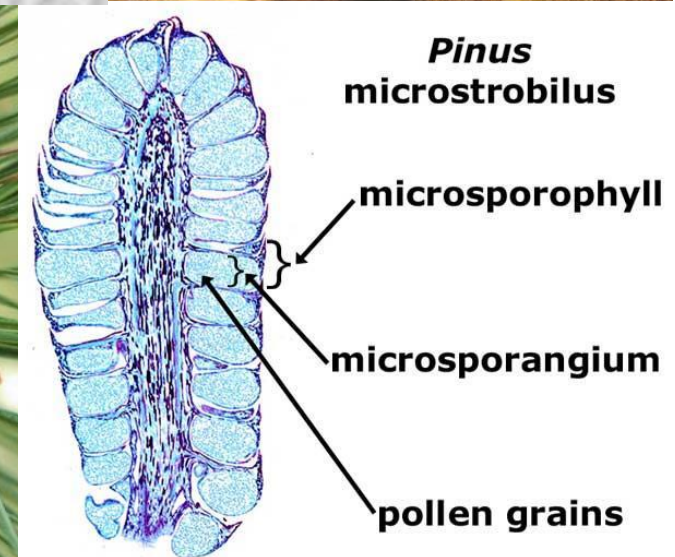
Characteristics:

- Highly branched trees or shrubs with simple leaves.
- Leave linear, acicular (needle-like), or scales.
- In some conifers the leaves are clustered into short shoots
→ adjacent internodes are very short in length.

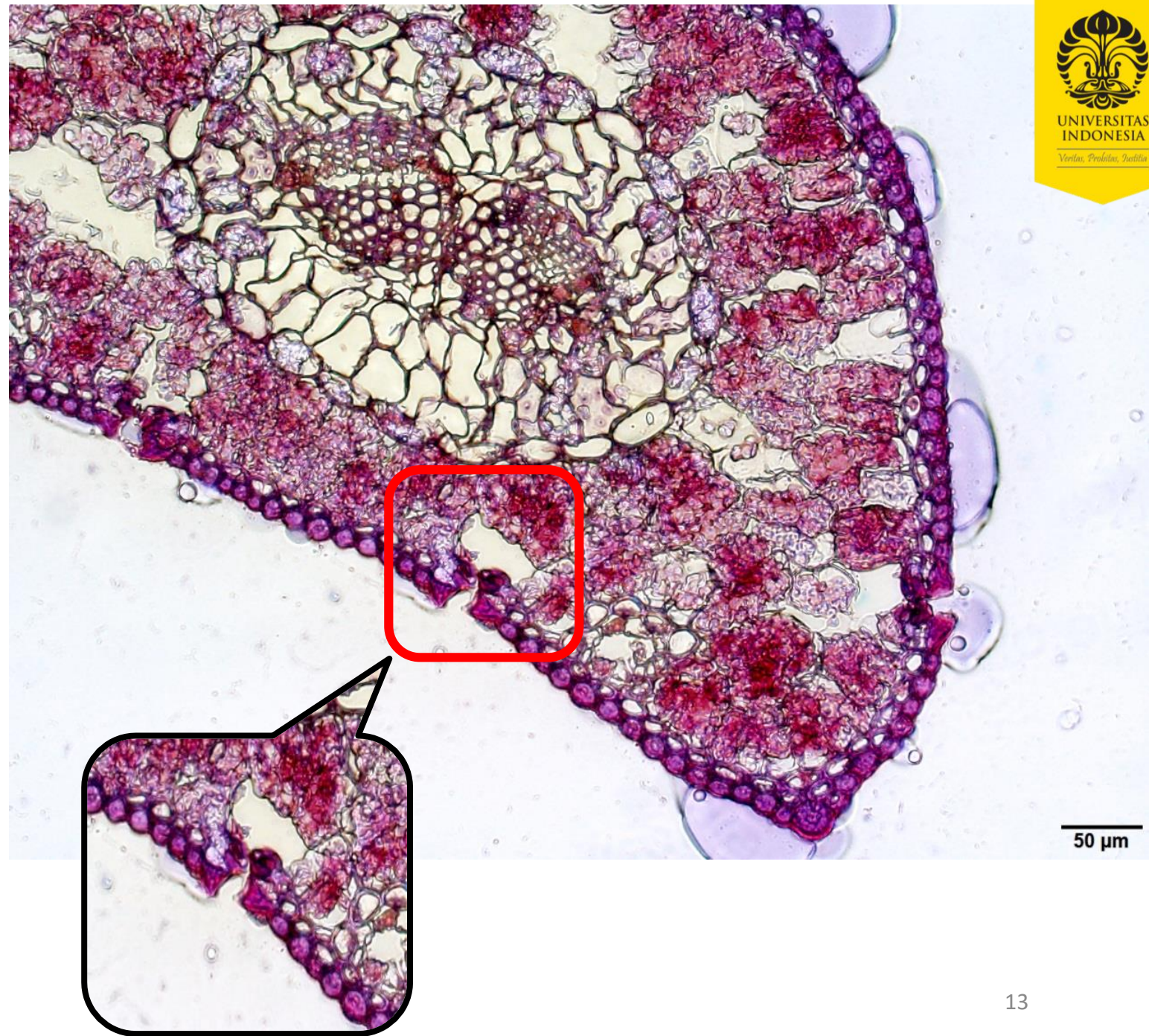


Characteristics:

- Male cones are small and papery.
- Female cones are woody and range in size .
- Loss of sperm cell motility (like Gnetophyta).
- Male gametophyte of Conifers → deliver directly to the egg by pollen tube.



- Conifers typically produce evergreen, needlelike leaves
- Conifer leaves have many traits, such as:
 - thick cuticle
 - sunken stomata
 - modifications of the xylem
 - help them survive in very cold and very dry environments



- Pines produce leaves in bundles called fascicles
- The number of needles per fascicle can be an important trait for differentiating species



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Families:

Important families:

1. Araucariaceae
2. Cupressaceae
3. Podocarpaceae
4. Taxaceae
5. Pinaceae → the largest family
Coniferophyta (Conifers)

The largest family is the Pinaceae, which contains:

- pines (*Pinus*)
- spruces (*Picea*)
- hemlocks (*Tsuga*)
- firs (*Abies*)



Araucariaceae



Cupressaceae



Cupressaceae female



Cupressaceae female



Cupressaceae leaf



Cupressaceae



Cupressaceae female



Podocarpaceae female



Taxaceae male



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Gnetophytes

- Gnetophytes are quite distinct in appearance from one another and other gymnosperms.
- Contains 3 families:
 1. **Ephedraceae** (consisting of *Ephedra*, with about 65 species)
 2. **Gnetaceae** (consisting of *Gnetum*, with 28 species, plus the monotypic genus *Vinkarella*)
 3. **Welwitschiaceae** (consisting of the sole species *Welwitschia mirabilis*).

Ephedraceae → *Ephedra*

- Most of which grow in the arid regions of the western US and Mexico
- Shrubby plants with jointed photosynthetic stems and small, scale-like leaves
- Male or female cones in the axils of the leaves



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Gnetaceae → *Gnetum*

- Woody tropical plants whose leaves resemble the broad leaves of angiosperms
- Tropical vines (rarely trees or shrubs)
- Opposite (decussate), simple leaves
- Like an angiosperm but lacking true flowers



Male strobilus



Female strobilus

Welwitschiaceae → *Welwitschia*

- *Welwitschia mirabilis* is the lone member of this genus.
- An underground caudex bears only two leaves.
- Male and female cones are born on axes arising from the apex of the caudex .



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Thank you