



Ginkgo biloba

Ginkgophyta

- Maidenhair tree
- Only 1 extant species! – Extensive fossil record
- Living fossil
 - Found in fossils before living
- Excellent street tree
 - Deciduous
 - Drought & Disease resistant
 - Wide climatic tolerance



- Dioecious

very slowly

Branches

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- Male trees more desirable

- Short shoots grow very,

Leaves fan-shaped with dichotomous venation

- Short & long shoots

 Chromosomal sex determination





Microstrobilus



Microsporangia borne in loose microstrobilus Stamen-like appearance Motile sperm – Evolutionary vestige

Megastrobilus

- 2 ovules per strobilus
- Collar remnant of megasporophyll
- Pollen reaches ovule while still on tree
- Fertilization happens months later after ovule has fallen from tree

Ovules about to fall from tree











General Cycad Information

- Cycadaceae & Zamiaceae
- Mostly S Hemisphere, now
- Jurassic known as "Age of Cycads"

 To some as the Age of Dinosaurs, ...
- 1 native to US: Zamia integrifolia
 - Sago palm
- Dioecious





Synapomorphic Features

- Girdling leaf traces
- Specialized (omega) pattern of vascular bundles in the petiole
- Presence of mucilage canals
- Toxic glycosides cycasins
 - Defense against bacteria, fungi & animals





Cycad Leaves Photosynthetic Cataphylls (scale-like leaves) Protect buds Production alternates with photosynthetic leaves Cataphylls Photosynthetic

Photosynthetic leaves

Coralloid Roots

- Root structures that house symbiotic cyanobacteria
 - Fix atmospheric nitrogen
 - Allows growth in poor soils







Microstrobilus

- Microsporangia form in dense microstrobili
- Abundant pollen
 - Not wind pollinated (as might be expected)
- Beetle pollinated
 - Beetles eat pollen, but get covered in it, too
 - Move to female plant to lay eggs and take pollen with them



Megastrobilus

- Simple cone
- Not always a strobilus
 - E.g., Cycas has megasporophylls that are spirally arranged, just like regular leaves
- Evolutionary progression from the *Cycas*type to those in Zamiaceae with a regular cone structure

Megastrobilus





Gnetophyta

- Ovules with 2 integument layers
 - -Inner forms micropylar tube
 - Outer derived from a fused pair of bracts (not true integument)

























