

## Gymnosperms: naked seeds

- Non-angiosperm seed plants
  - heterosporous
  - microgametophytes (males) = pollen
  - seed: sporophyte + nutritive gametophyte tissue

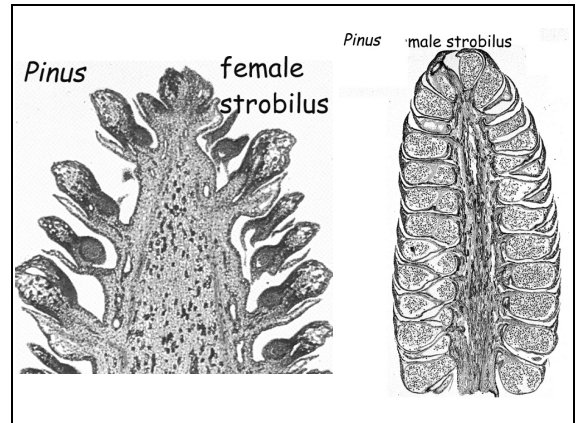
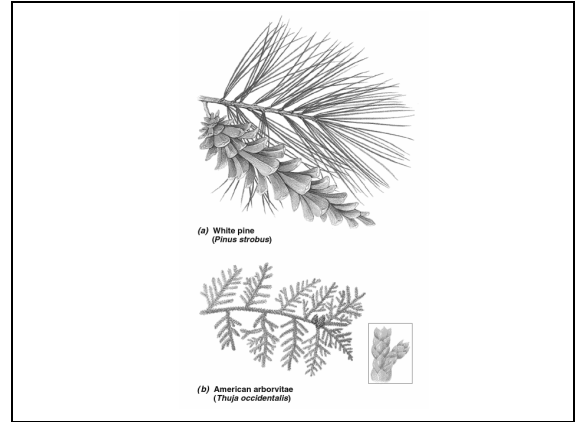
## Gymnosperms, cont'd.

- Cycads (Cycadophyta)
- Ginkgos (Gingkoophyta)
- Gnetophytes (Gnetophyta)
- Conifers (Coniferophyta)

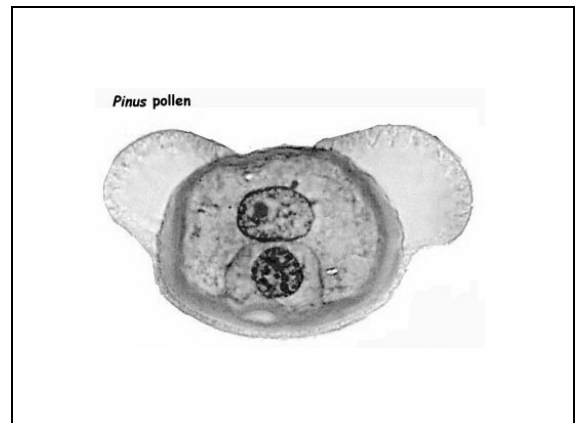
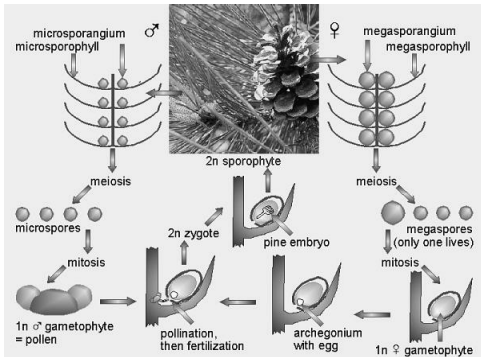


## Gymnosperms, cont'd.

- pollen: no water needed for fertilization
- cones
  - clusters of modified leaves
  - seed cone bears megasporangia
  - pollen cone bears microsporangia



## Gymnosperm life cycle





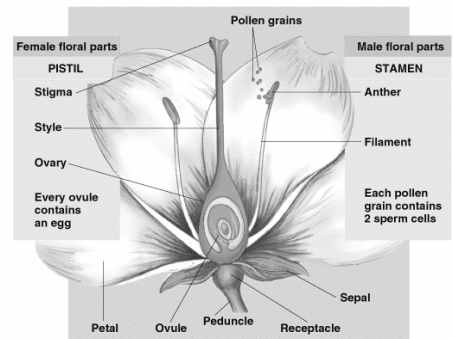
## Angiosperms: the flowering plants

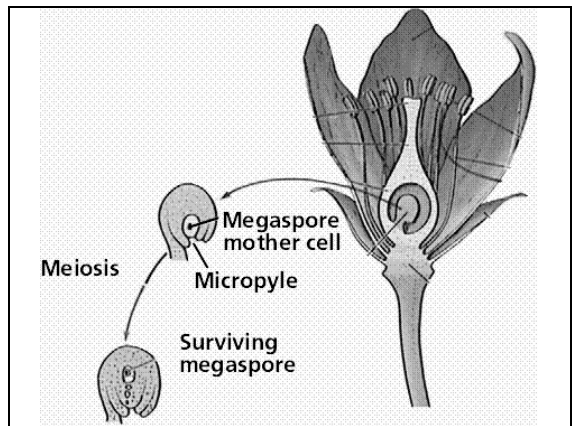
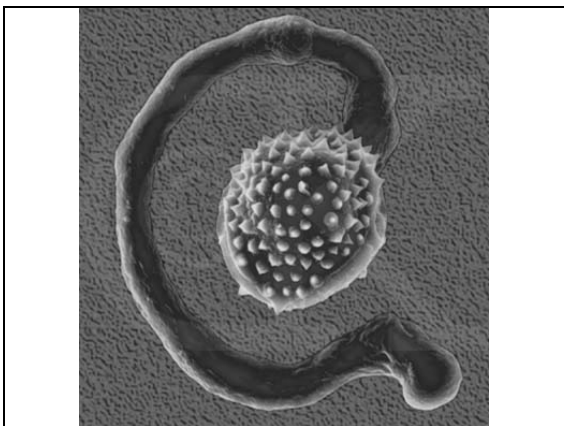
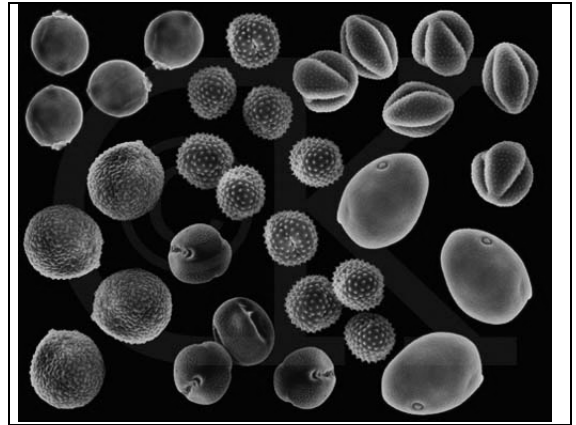
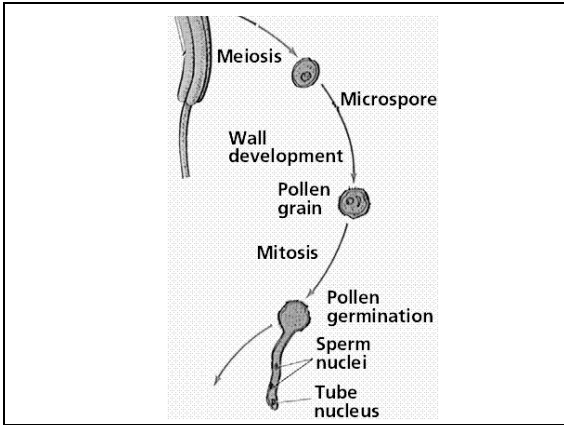
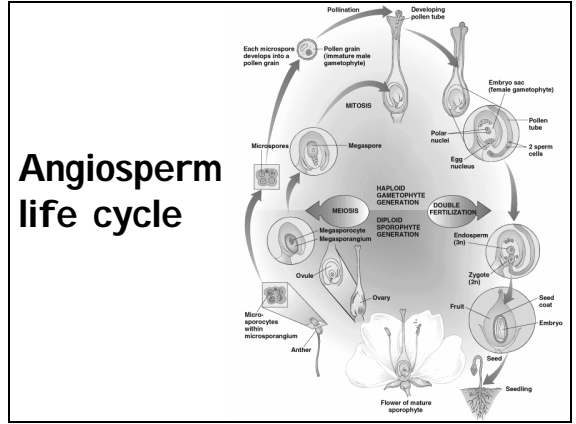
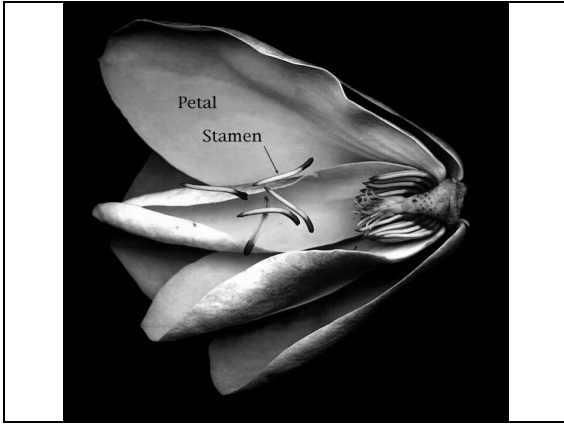
- flowers (of course)
  - male, female, or both
  - modified leaves
- fruit
- double fertilization

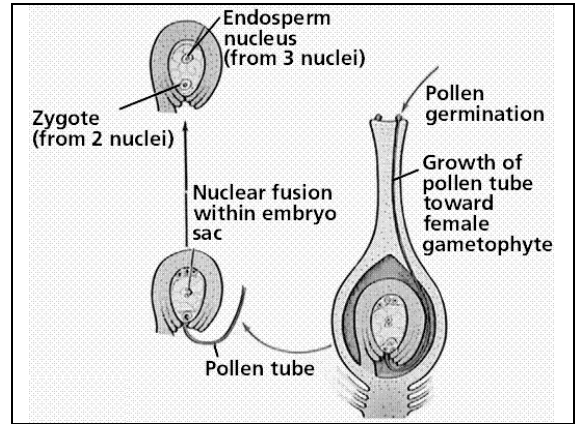
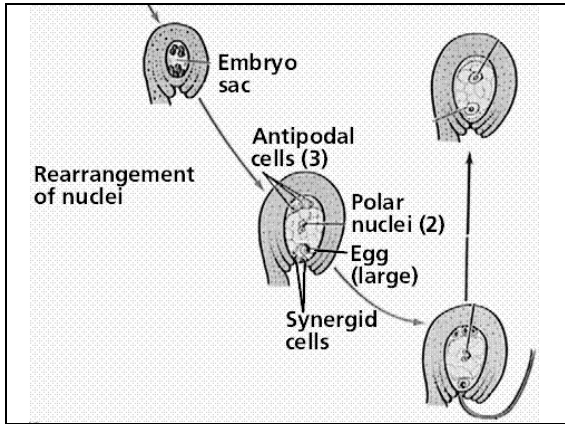


## Flower structure

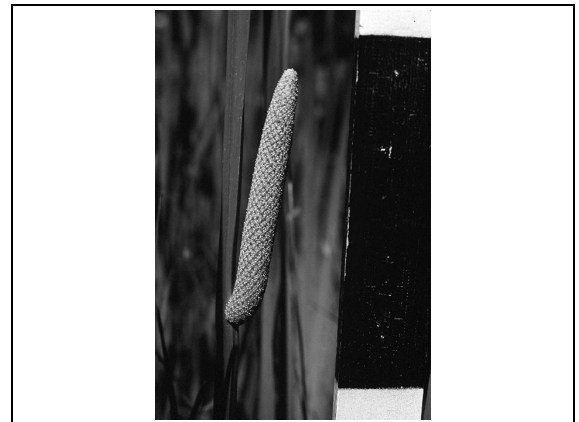
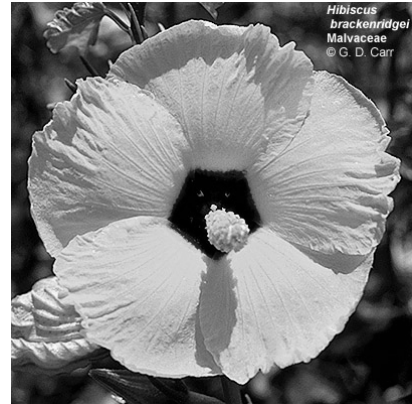
- whorls of modified leaves
- sepal
- petal
- anther
  - microsporangia
- pistil
  - ovary, ovule, megagametophyte, egg







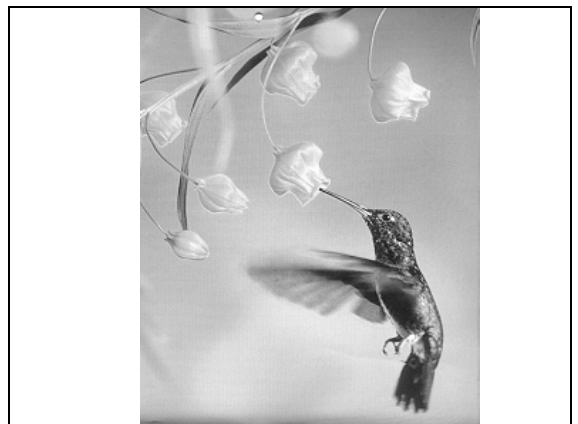
## Flower types





## Pollination

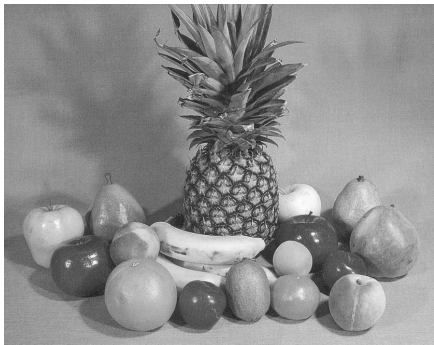
- wind
- animals
  - insects
  - birds
  - mammals

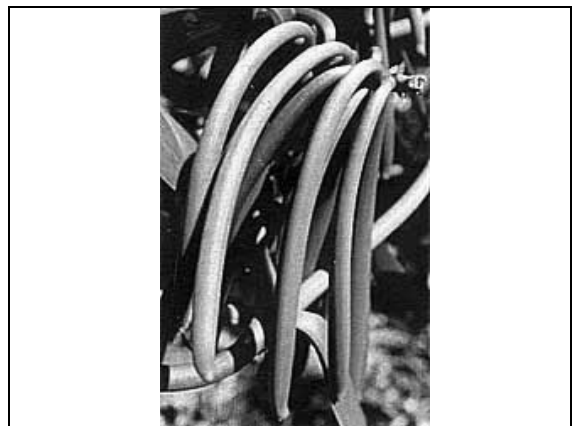
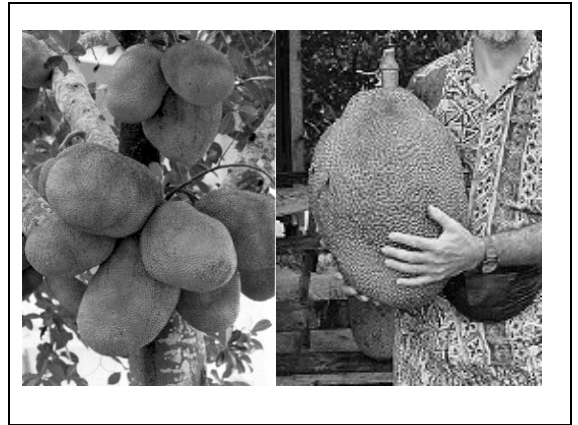


**I'iwi**



**Fruits: dispersal**



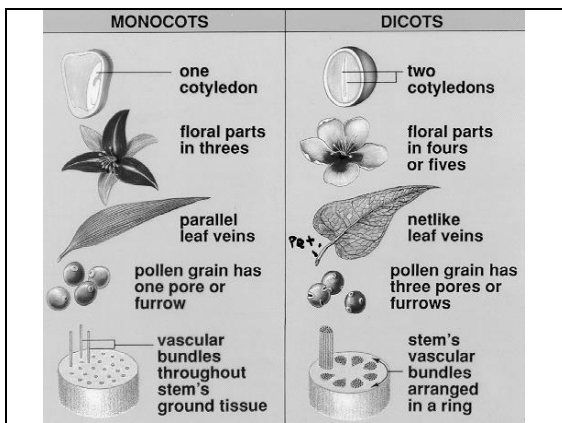






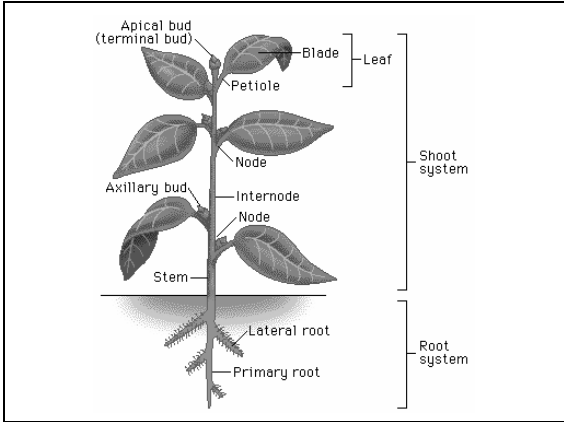
## Monocots & dicots

- monocots
  - 1 cotyledon ("seed leaf")
  - parallel venation
- dicots
  - 2 cotyledons
  - netlike venation



## Plant Structure & Function

- shoot system
  - stem
    - nodes
    - internodes
    - buds
  - leaves
    - flowers
- root system
  - taproots, fibrous roots

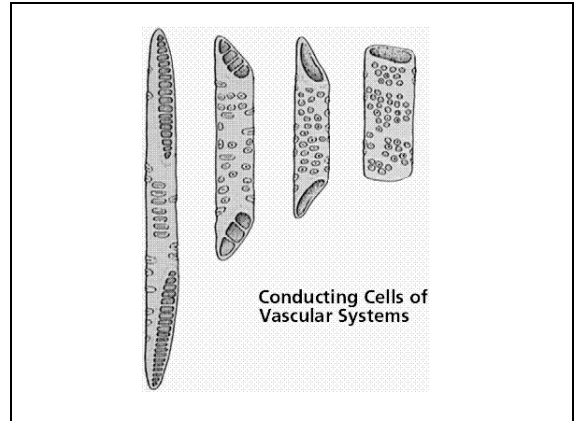


## Plant Tissues

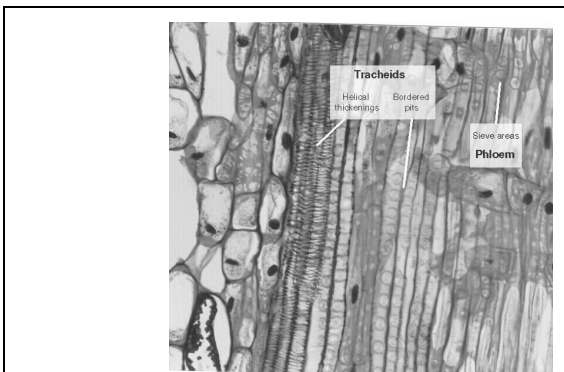
- plant cells: chloroplasts, vacuoles, cell walls
- dermal tissue
  - epidermis
  - cuticle
- vascular tissue
- ground tissue

## Plant Vascular Tissues

- xylem: water transport
  - vessel elements, tracheids
- phloem: solute transport
  - sieve tube members, companion cells



Conducting Cells of Vascular Systems

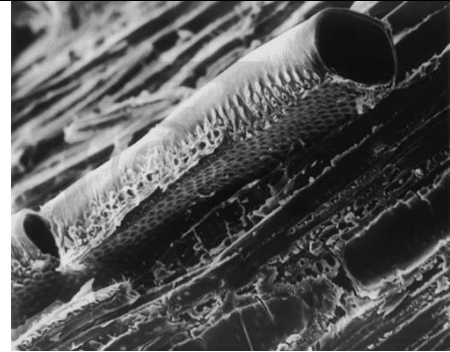
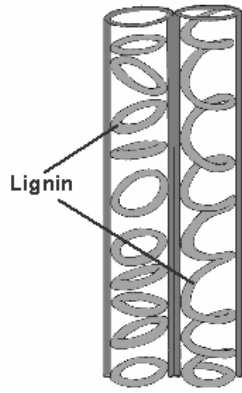


xylem & phloem in pine

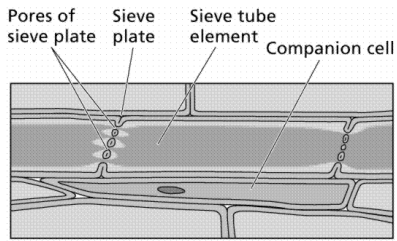


Pine pulp

**Xylem structure**

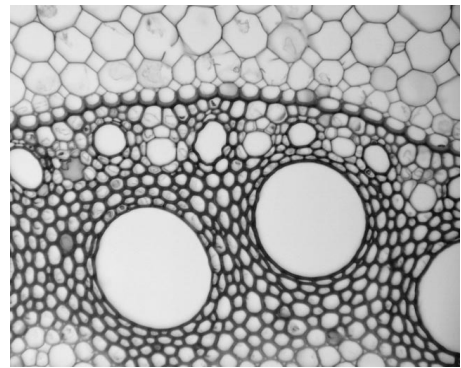
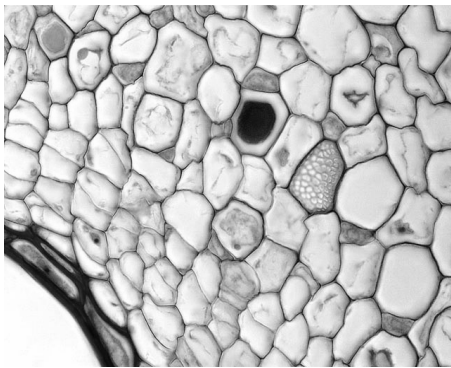
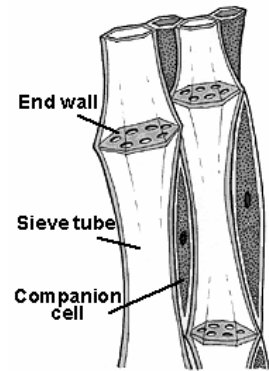


**Conductive Vessel Element in Mountain Mahogany Wood (SEM x750)**



**Phloem cells**

**Phloem structure**



# Plant Ground Tissues

- parenchyma: photosynthesis, storage
- collenchyma: flexible support
- sclerenchyma: rigid support

