

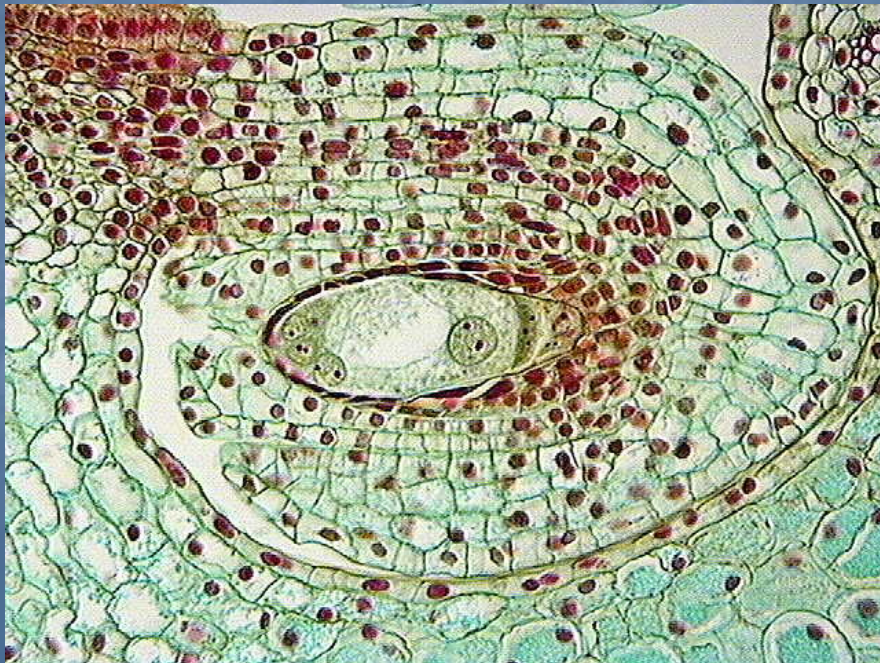
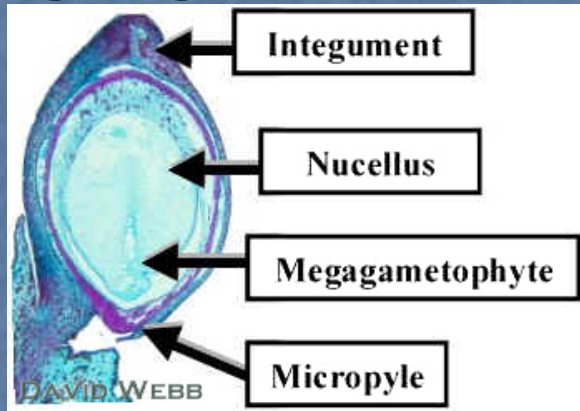
# Ovules and Seeds

Fertilization

Ovule Development

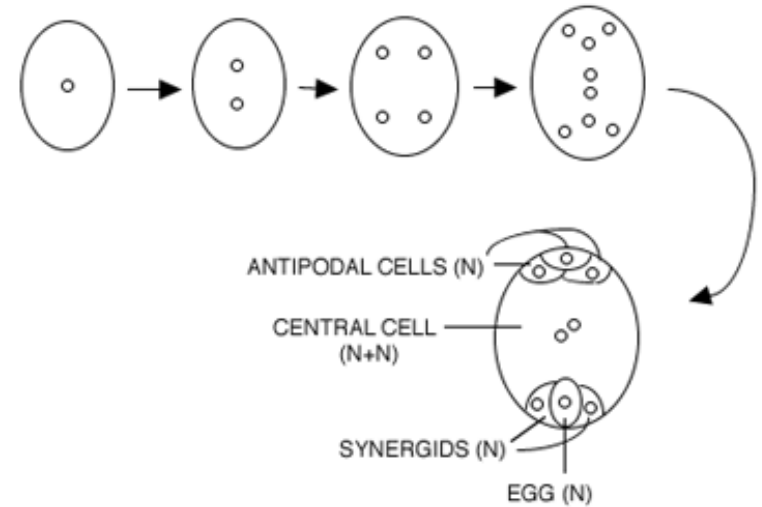
Seeds and Fruits

# Megagametophyte

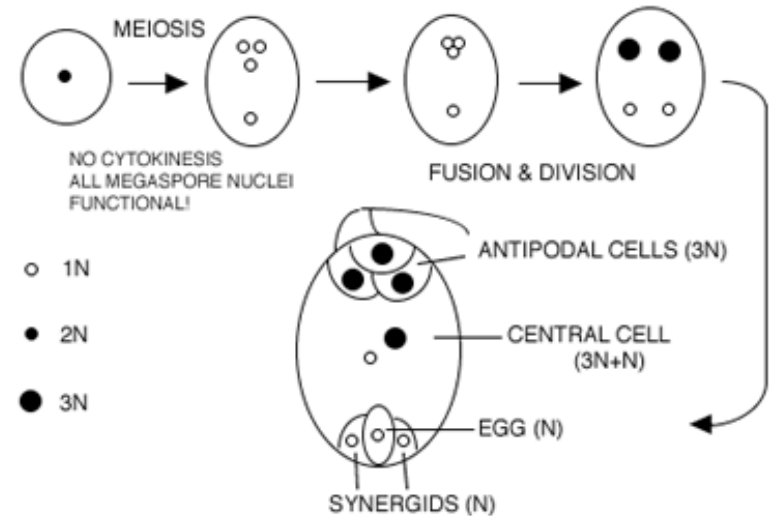


## MEGAGAMETOPHYTE DEVELOPMENT

MOST ANGIOSPERMS:

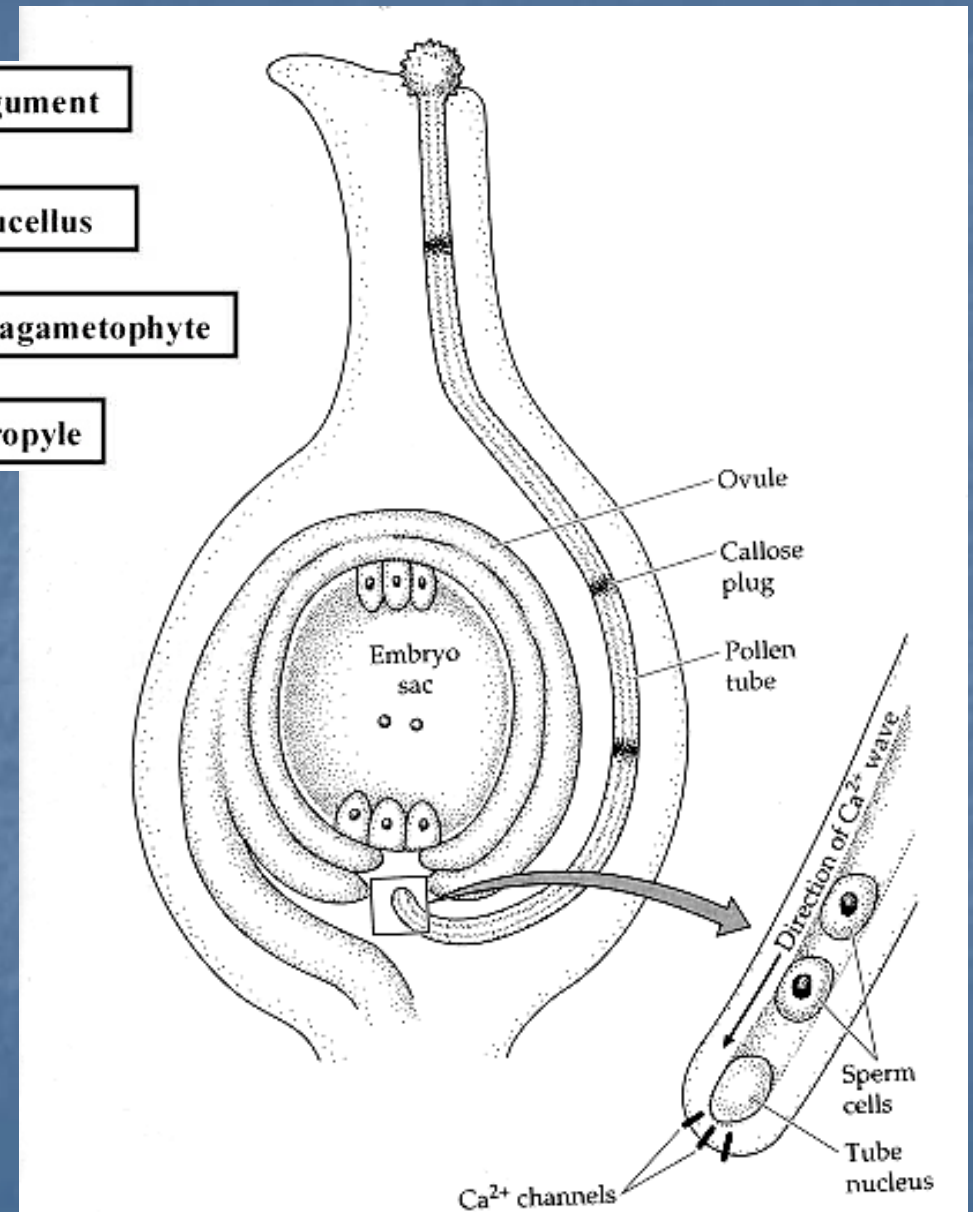
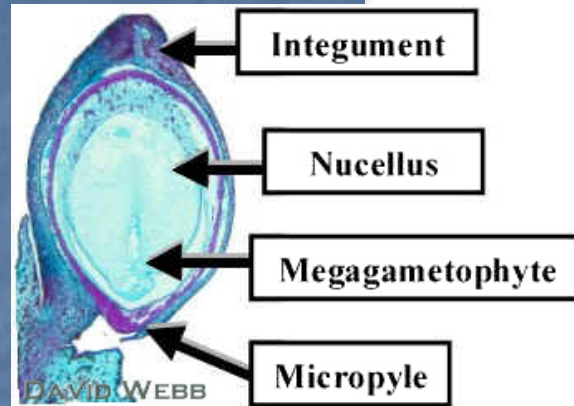


*Lilium* - an oddball



# Fertilization

- Micropyle.
- Double fertilization.
  - Embryo (2N)
  - Endosperm (3N)
- Developing embryo.
  - Chalaza.
  - Early abortion



# Embryo Development

- Relationships.
  - 2N Embryo
  - 3N endosperm
    - More closely related to the female sporophyte.
  - Does the endosperm mediate abortion?
    - Endosperm begins cell division first.
    - Early abortion may happen within a few days of fertilization.
  - Does the chalaza mediate abortion?
    - Build-up of callose in the chalaza is the first indication of abortion.
      - Cause or effect?
  - Source/sink relationships and auxins.
    - Is selective abortion dependent on competition among ovules?

# Fruit Development

- More likely to abort.
  - Few seeds.
    - Pollination may induce auxin production.
    - Weaker sink.
  - Selfed fruits.
    - Weaker sinks?
- Post-fertilization self-incompatibility.
  - Selfed ovules abort.
  - Common in the Rubiaceae.
  - Is it SI or early-acting inbreeding depression?



# Fruit Abortion

- Resource competition/brood reduction hypotheses.
  - The plant initiates more fruits than it has resources for.
    - “June drop” in apples.
  - Or, is it bet hedging?
    - Produce more fruits if resources are available.



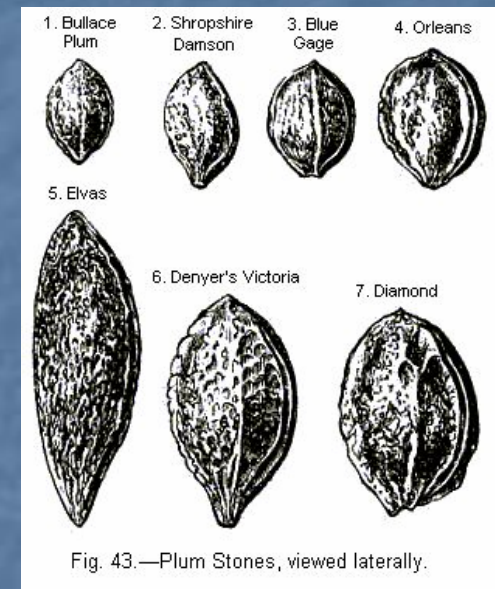
# Seeds- How Much and When?

- Annual plants.
  - Do the seeds starve the plant?
- Perennials.
  - Allocation to reproduction/vegetative growth.
  - Masting.
    - Predator satiation hypothesis.
  - Semelparous perennials.
    - Big-bang reproduction.



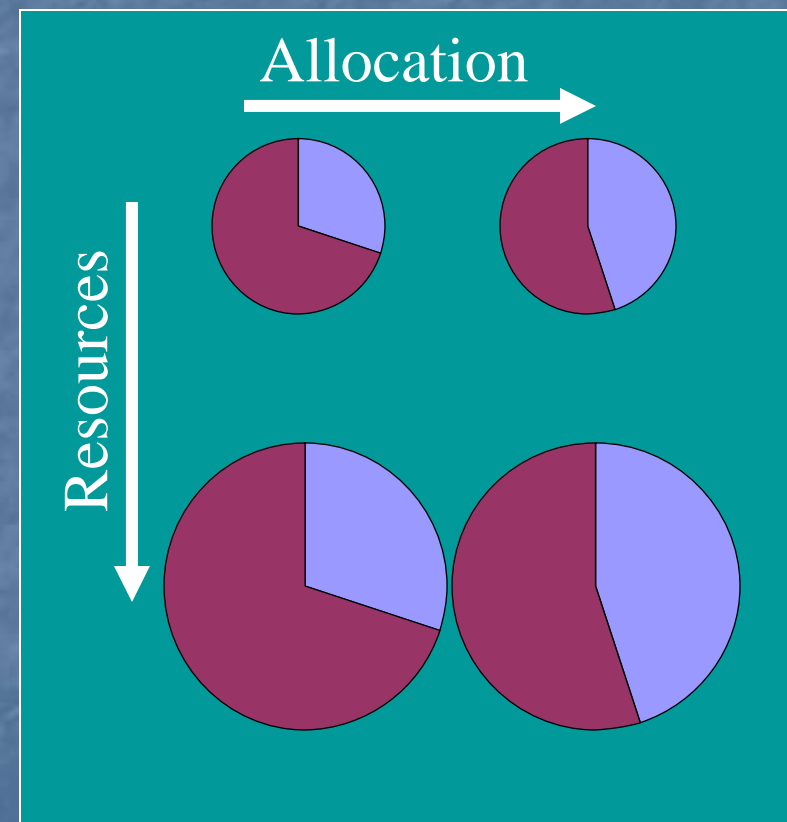
# Seeds – How Big?

- Resource allocation.
  - Size/number tradeoff.
- Maternal-offspring conflicts.
  - Fitness gain for the offspring.
  - Optimal maternal investment.



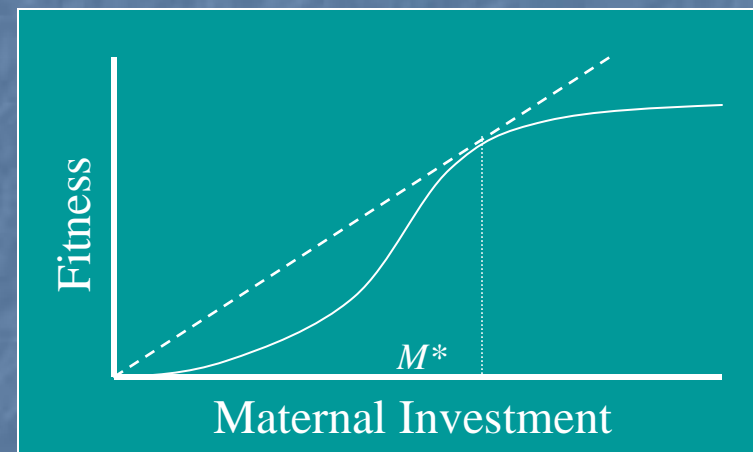
# Trade-Offs

- Limited resource pool.
  - Vegetative vs. reproductive growth.
  - Number vs. size.
- Increasing the pool size produces an apparent positive relationship between components.
  - The proportional allocation (ratio) will be negatively associated.
- What is the limiting resource?
  - What limits photosynthesis?



# Seed Size vs. Number

- Selection for seed size in different environments.
- Maternal-offspring conflicts.
  - Optimal seed size depends on your point of view.
  - Maternal control of seed size?
  - Competition for maternal resources.
  - Is inclusive fitness important?

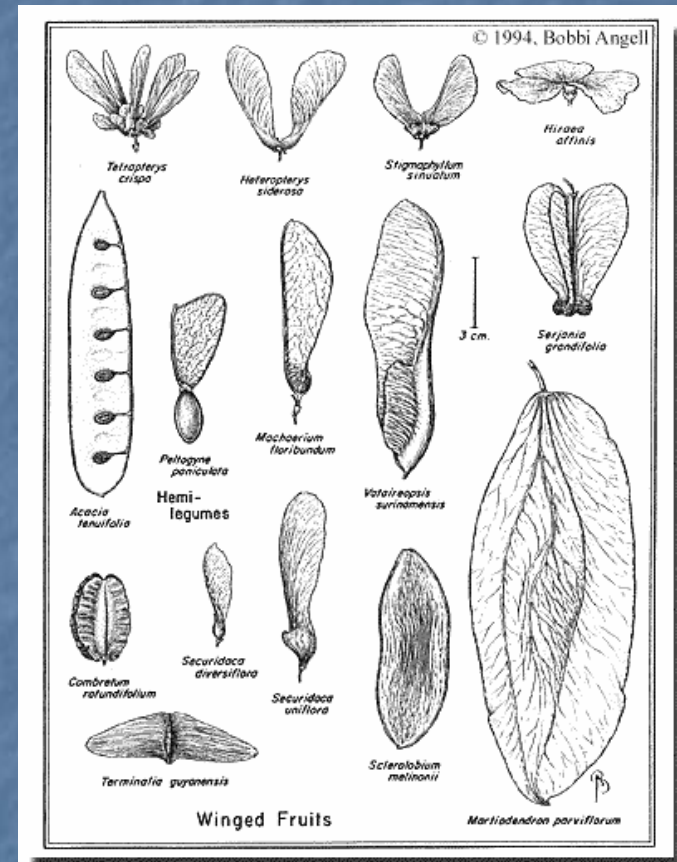


# Seed Size

- Who wins?
  - Are seeds consistently the same size?
    - If not, does that mean that embryos have more control?
    - Is there an advantage to mom to make seeds varying in size?

# Ecological Constraints on Seed Size

- Larger seed size selected in...
  - Shadier environments (Avocados).
  - Environments subject to drought.
    - Root development.
- Smaller seed size advantageous when....
  - Wind dispersal.
  - Large numbers of seeds are produced.



# Seed Dispersal

- Dispersal close to the parent.
  - Ensures adaptation to local conditions.
  - Advantageous in a fine-grained environment.
- Dispersal away from the plant.
  - Local predators.
    - Soil fungi in tropical trees.
  - Fugitive species.
    - Ephemeral environments.
    - Metapopulation dynamics.