

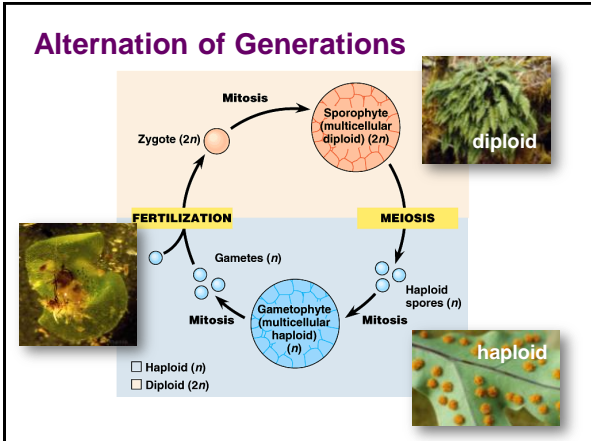
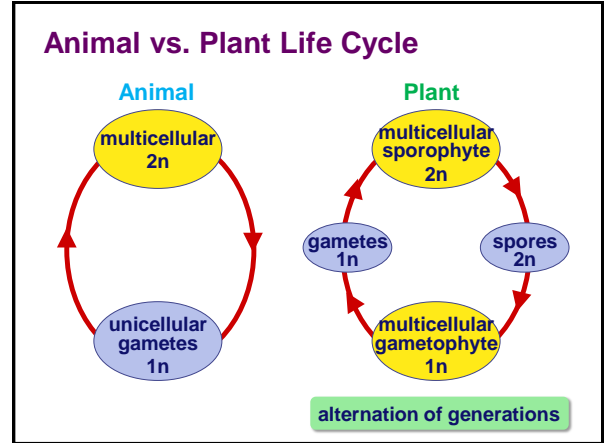


Chapter 38

Plant Reproduction

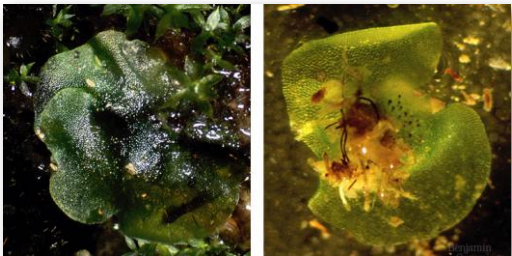
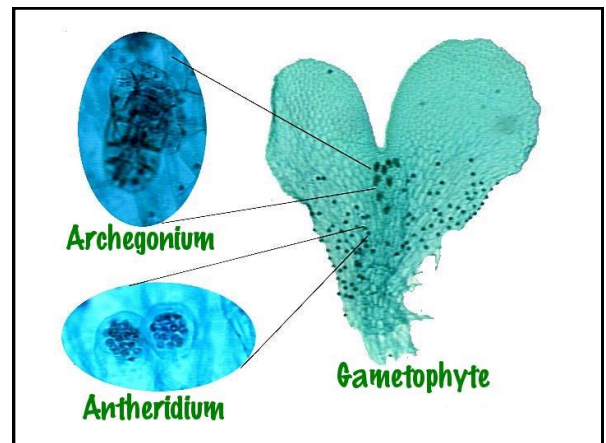
Alternation of Generations

- Fern sporophyte
 - ◆ leafy plant you are familiar with
- Fern spores
 - ◆ haploid cells that will sprout into gametophyte



Alternation of Generations

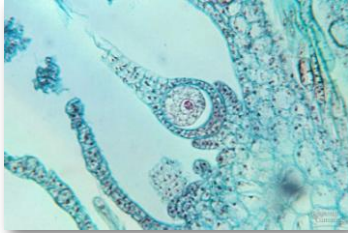
- Fern gametophyte
 - ◆ small diploid plant which produces gametes

Alternation of Generations

▪ Archegonium

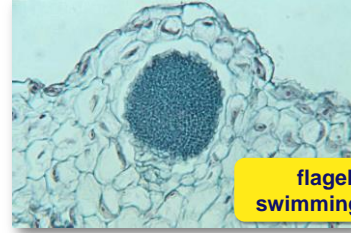
- ◆ female gamete-producing structure
- ◆ produces a single egg cell in a vase-shaped organ



Alternation of Generations

▪ Antheridia

- ◆ male gamete-producing structure
- ◆ produces many sperm cells that are released to the environment



flagella = swimming sperm

Evolutionary Trends

▪ Alternation of generations

- ◆ dominant haploid plant
 - bryophytes - mosses
- ◆ dominant diploid plant
 - pteridophytes - ferns
 - gymnosperm - conifers
 - angiosperm - flowering plants



▪ Evolutionary advantage?

- ◆ reduction of gametophyte protects delicate egg & embryo in protective sporophyte

Gametophytes of Seed Plants

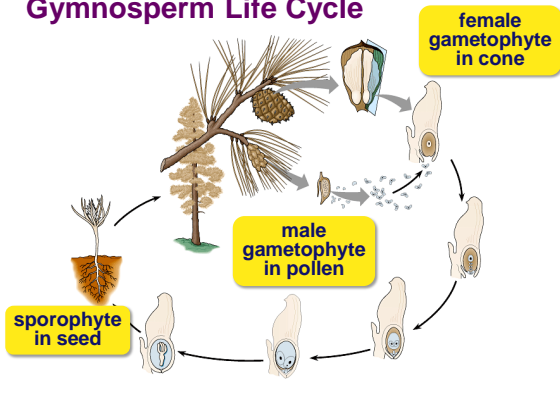
Gymnosperm

- male gametophyte
 - ◆ pollen in male cone
- female gametophyte
 - ◆ develops in female cone
- seed
 - ◆ naked in cone

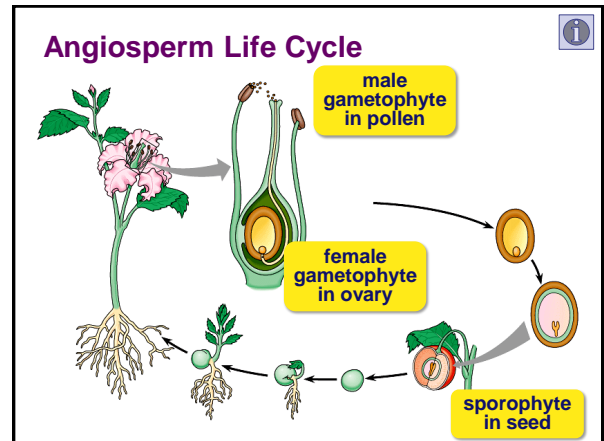
Angiosperm

- male gametophyte
 - ◆ pollen in anthers of flower
- female gametophyte
 - ◆ develops in ovaries of flower
- seed
 - ◆ protected in ovary
 - ◆ ovary wall can develop into fruit

Gymnosperm Life Cycle



Angiosperm Life Cycle

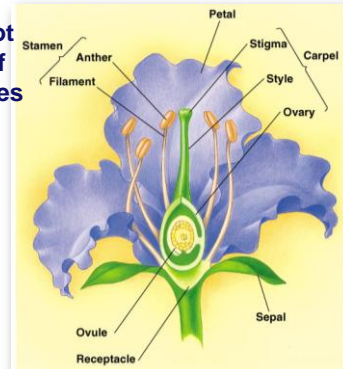


Reproduction in Angiosperms

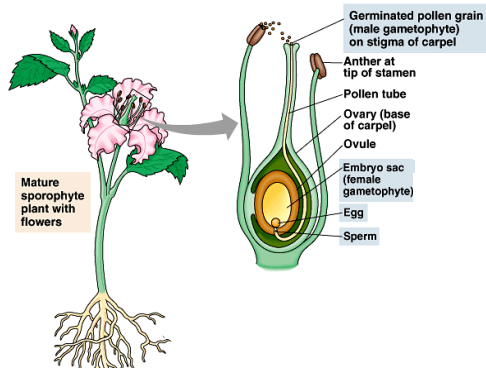
- Sporophyte plant produces unique reproductive structure = the flower
 - ◆ male gametophyte = pollen grain
 - develop within anthers of flower
 - ◆ female gametophyte = embryo sac
 - develop within ovaries of flower
 - ◆ pollination by wind or animals brings pollen grain to female gametophyte
 - ◆ fertilization takes place within ovary
 - **double fertilization** = embryo & endosperm
 - ◆ seeds contain sporophyte embryo
 - development of seeds in ovary
 - ovary develops into fruit around the seed

Flower

- Modified shoot with 4 rings of modified leaves
 - ◆ sepals
 - ◆ petals
 - ◆ stamens
 - male
 - ◆ carpals
 - female



Male & Female Parts of Flower



Parts of a Flower

- Male
 - ◆ stamens = male reproductive organs
 - ◆ stamens have stalks (filament) & terminal anthers which carry pollen sacs
 - ◆ pollen sacs produce pollen
 - ◆ pollen grain = gametophyte
 - sperm-producing structure

Parts of a Flower

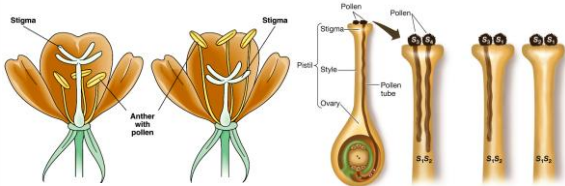
- Female
 - ◆ carpels = female reproductive organs
 - ◆ ovary at the base
 - ◆ slender neck = style
 - ◆ within the ovary are 1 or more ovules
 - ◆ within ovules are embryo sacs
 - ◆ female gametophyte = embryo sac
 - egg-producing structure

Fertilization

- Pollination
 - ◆ pollen released from anthers is carried by wind or animals to land on stigma
 - ◆ pollen grain produces a pollen tube
 - pollen tube grows down style into ovary & discharges 2 sperm into the embryo sac
 - 1 sperm fertilizes egg = zygote
 - zygote develops into embryo
 - ◆ ovule develops into a seed
 - ◆ ovary develops into a fruit containing 1 or more seeds

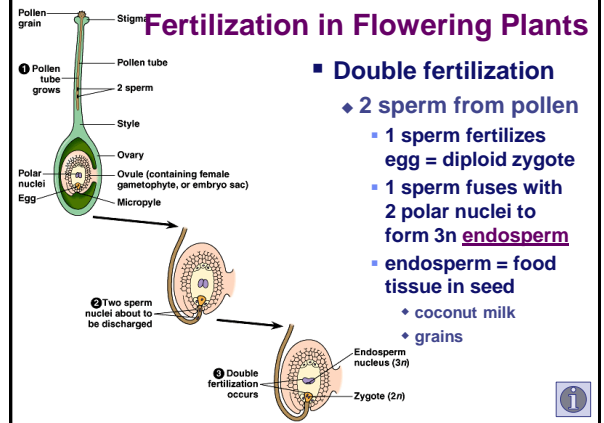
Preventing Self-Pollination

- Various mechanisms
 - ♦ stamens & carpels may mature at different times
 - ♦ arranged so that animal pollinator won't transfer pollen from anthers to stigma of same flower
 - ♦ biochemical self-incompatibility = block pollen tube growth



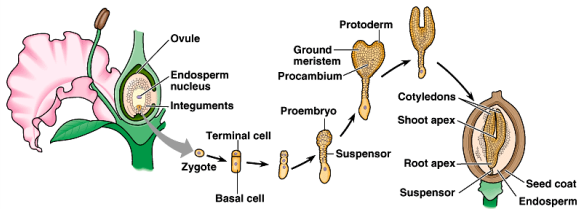
Fertilization in Flowering Plants

- Double fertilization
 - ♦ 2 sperm from pollen
 - 1 sperm fertilizes egg = diploid zygote
 - 1 sperm fuses with 2 polar nuclei to form 3n **endosperm**
 - endosperm = food tissue in seed
 - ♦ coconut milk
 - ♦ grains

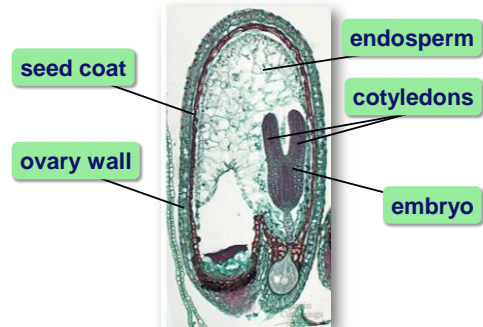


Fertilization in Flowering Plants

- Development of the new sporophyte



Plant Embryo



Fruit

- Fruit is a mature ovary
 - ♦ seeds develop from ovules
 - ♦ wall of ovary thickens to form fruit
 - ♦ fruits protect dormant seeds & aid in their dispersal




Seed Dispersal

- Plants produce enormous numbers of seeds to compensate for low survival rate
 - ♦ a lot of genetic variation for natural selection to screen




Fruit Development

- peach
 - 1 flower : 1 carpel : 1 ovary : 1 seed




Fruit Development

- apple
 - 1 flower : 5 carpels : many ovaries : many seeds




Fruit Development

- Citrus fruit
 - 1 flower : many carpels : many ovaries : many seeds




Fruit Development

- Raspberry
 - 1 flower : many ovaries : many seeds



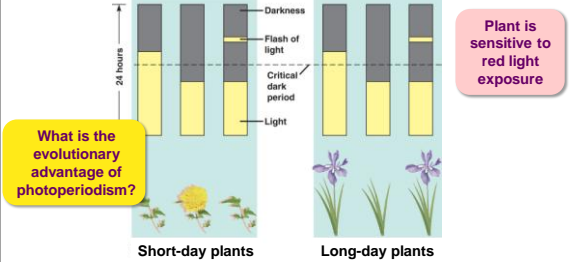
Coevolution of Plants & Animals

- Angiosperms & animals have shaped one another's evolution
- Natural selection reinforced the interactions because they improved the reproductive success of both partners



Flowering Response

- Triggered by photoperiod
 - relative lengths of day & night
 - night length—"critical period"—is trigger



What is the evolutionary advantage of photoperiodism?

Plant is sensitive to red light exposure

Short-day plants Long-day plants