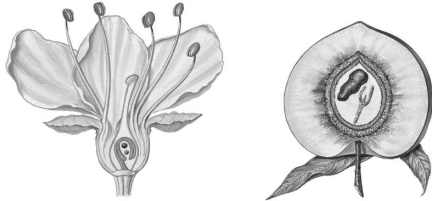


Chapter 24:
Plant Reproduction and Development



The Sex Life of Plants...

- Plants can reproduce either sexually or asexually
 - Asexual: Single plant → new plant (genetically identical)
 - Daffodil bulbs; Strawberry runners
 - Sexual: Parental plants → new plant (genetic mix)
 - Most plants

Asexual reproduction

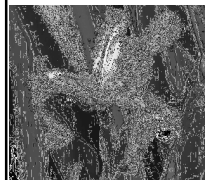


Seedless navel oranges



Strawberry runners

Sexual reproduction



flowers



seed pods

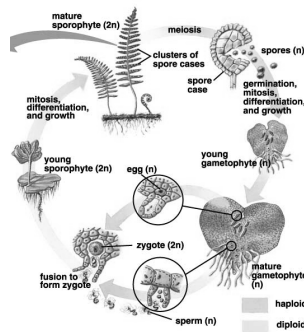


fruits

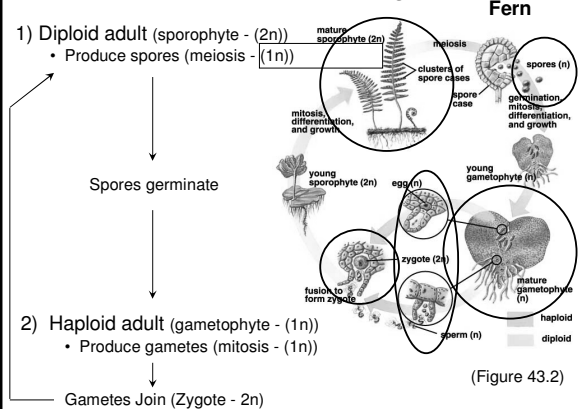
The Sex Life of Plants...

- Plant sexual life history is complex:

- ❖ Alternation of Generations:
 - Diploid (2n) plants alternate with haploid (1n) plants



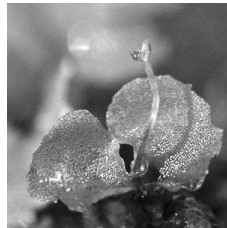
Alternation of Generations: Non-flowering



Ferns: sporophyte & gametophyte



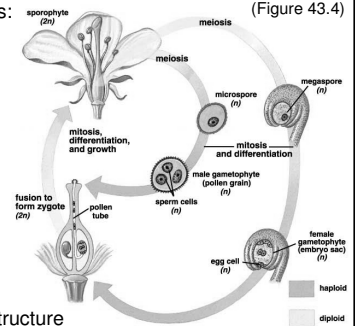
Sporophyte



Gametophyte

Alternation of Generations: Flowering Plants (Figure 43.4)

Gametophytes do not live independently of the sporophytes



Flower = Reproductive Structure

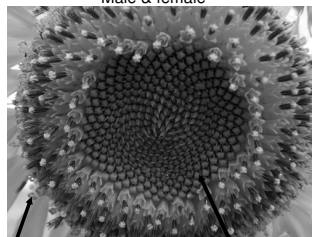
- Megaspore (1n) → Embryo sac (female gametophyte)
- Microspore (1n) → Pollen grain (male gametophyte)
- Seed = Zygote (2n)

Angiosperms: sporophyte & gametophyte

Gametophytes:
Male & female



Sporophyte

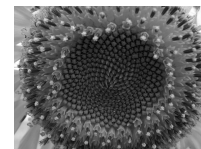
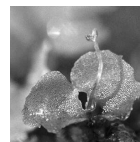


Male pollen

Female ovules

Non-flowering vs. flowering plants

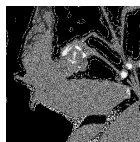
Non-flowering Ferns, moss, horsetails	Flowering All angiosperms
Gametophyte lives independent of the sporophyte	Gametophyte are dependent on the sporophyte Pollen & ovules



The Flower:

Flowers are modified leaves

- A sexual display that enhances reproductive success
 - ❖ Entices animals to carry pollen to distant plants
 - Efficient (unlike wind...)
- Evolutionary events:
 - 1) Nectar: attractant (sugary secretions)
 - 2) Advertisement = Flashy flowers
- Pollinators = Insects (bees, flies), hummingbirds, mammals (bats)

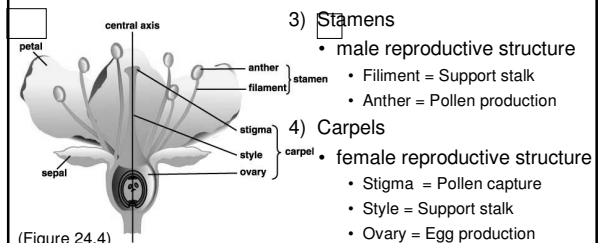


Parts of a Complete Flower:

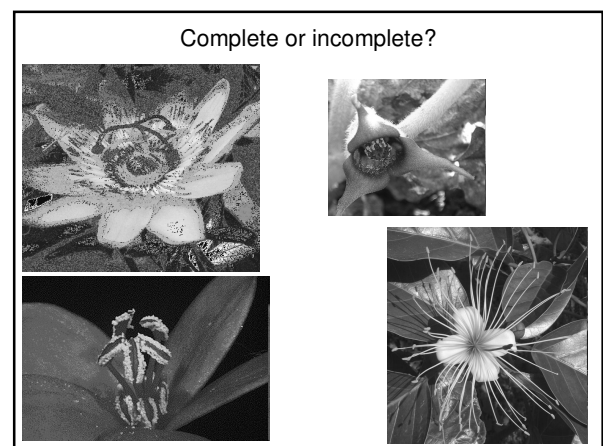
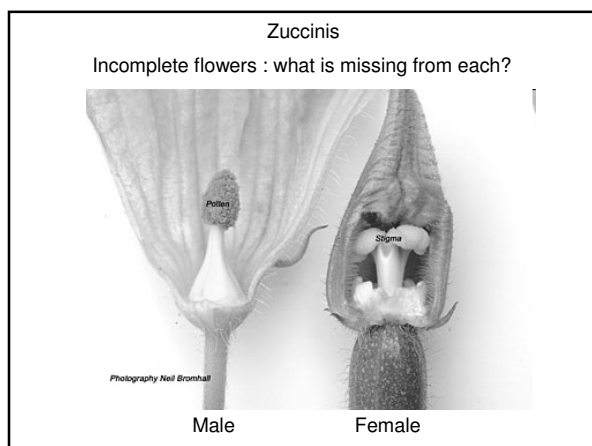
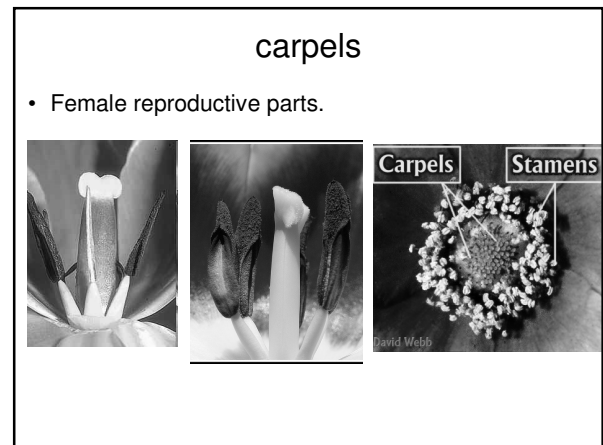
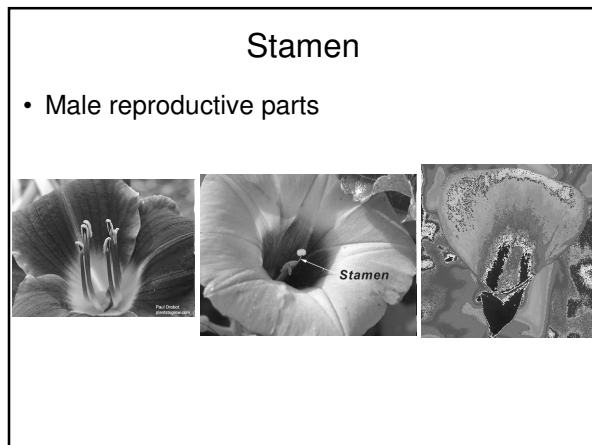
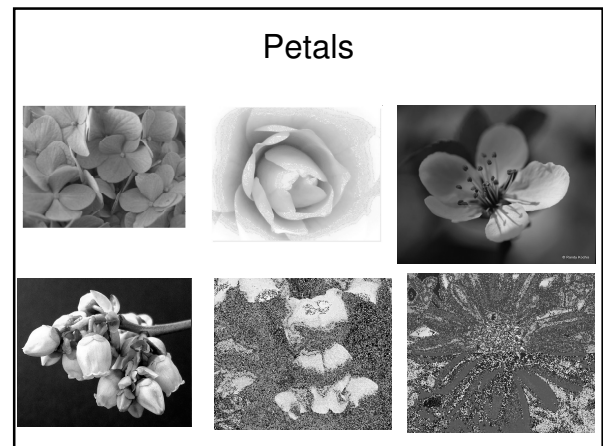
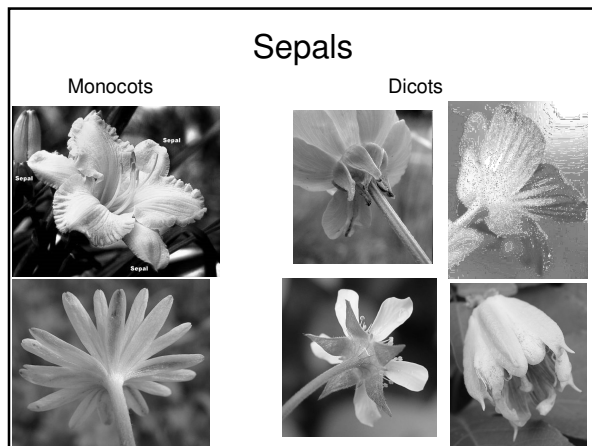
- 1) Sepals
 - Base of flower; usually green
 - Protect flower bud during development
- 2) Petals
 - Advertise flower location (bright / fragrant)

Incomplete Flower:

Lack 1 or more flower parts



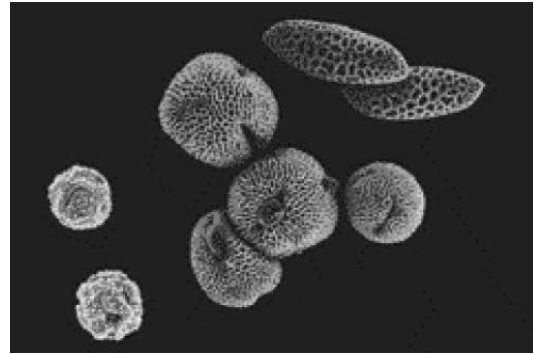
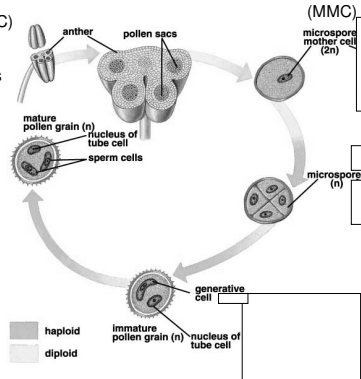
(Figure 24.4)



Gametophyte Development:

Pollen:

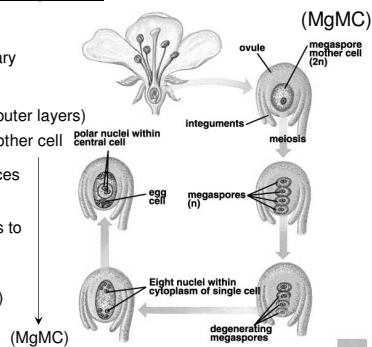
- 1) Pollen sac contains microspore mother cells
- 2) MMCs (2n) produce microspores (1n)
- 3) Microspores (1n) form pollen grains:
 - Tube cell
 - Sperm cells (1n)
 - Tough shell



Gametophyte Development:

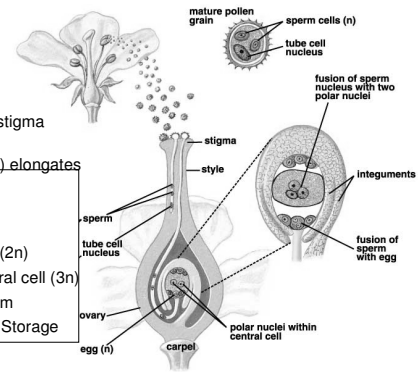
Embryo Sac:

- 1) Ovules form in ovary
- 2) Ovule contains
 - A) Integuments (outer layers)
 - B) Megaspore mother cell
- 3) MgMC (2n) produces megaspores (1n)
- 4) Megaspore divides to form embryo sac
 - egg (1n)
 - central cell (2n)



Pollination & Fertilization:

- 1) Pollen lands on stigma
- 2) Tube cell (pollen) elongates to ovule (ovary)
- 3) Sperm (via tube):
 - A) fertilize egg (2n)
 - B) fertilize central cell (3n)
 - Endosperm
 - Food Storage

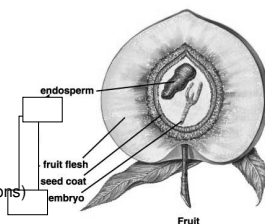


Pollination = Pollen grain lands on stigma
Fertilization = Fusion of sperm and egg

(Figure 24.9)

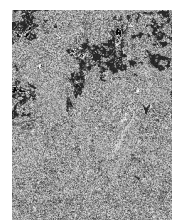
Seed / Fruit Development:

- 1) Petals / stamen shrivel & fall away
- 2) Fruit enlarges:
 - Ovule integuments → seed coat
 - Endosperm absorbs nutrients from parent
- 3) Zygote develops into embryo (cotyledons)
 - Dicots: Completely absorb endosperm
 - Monocots: Partially absorb endosperm
 - Fruit body = Ovary wall
 - Aid in seed dispersal



Fruit or vegetable?

- Fruits are the maturing ovary of a plant.
- ❖ Many vegetables are also fruits!



Germination:

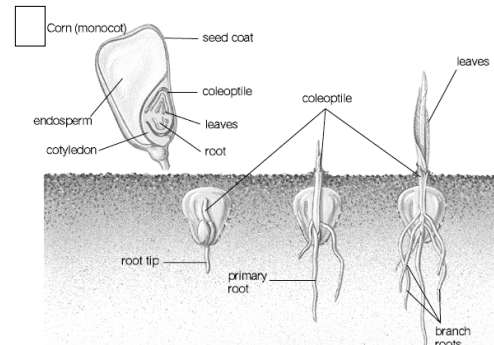
Seeds stay dormant until germination signaled:

- 1) Drying: Seed must dry out
 - Seed doesn't germinate in fruit
- 2) Cold: Seed must be exposed to prolong cold period
 - Seed doesn't germinate in winter
- 3) Seed Coat Disruption: Seed must have coat broken
 - Seed doesn't germinate off periods (e.g. dry)

Germination Events:

- 1) Roots emerge (gather water / minerals)
- 2) Shoots push through to surface
 - Monocots: Coleoptile protects apical meristem

Monocot Germination:



(Figure 24.12a)

Germination:

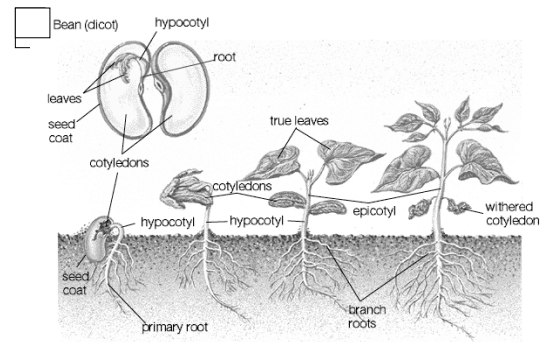
Seeds stay dormant until germination signaled:

- 1) Drying: Seed must dry out
 - Seed doesn't germinate in fruit
- 2) Cold: Seed must be exposed to prolong cold period
 - Seed doesn't germinate in winter
- 3) Seed Coat Disruption: Seed must have coat broken
 - Seed doesn't germinate off periods (e.g. dry)

Germination Events:

- 1) Roots emerge (gather water / minerals)
- 2) Shoots push through to surface
 - Monocots: Coleoptile protects apical meristem
 - Dicots: Stem bends into hook

Dicot Germination:



(Figure 24.12b)

Germination:

Seeds stay dormant until germination signaled:

- 1) Drying: Seed must dry out
 - Seed doesn't germinate in fruit
- 2) Cold: Seed must be exposed to prolong cold period
 - Seed doesn't germinate in winter
- 3) Seed Coat Disruption: Seed must have coat broken
 - Seed doesn't germinate off periods (e.g. dry)

Germination Events:

- 1) Roots emerge (gather water / minerals)
- 2) Shoots push through to surface
 - Monocots: Coleoptile protects apical meristem
 - Dicots: Stem bends into hook
- 3) Cotyledons nourish sprouting seed

Adaptations for Pollination:

Coevolution matches Plants and Pollinators:

Coevolution = One species acts as major force driving the evolution of another species

Flowers: Attract pollinators / detract unwanted visitors

Pollinators: Identify / locate useful flowers & extract nectar

Sometimes coevolution is so specialized that a single flower species will attract only one pollinator.

If one goes extinct, the other follows.

Especially true with orchids



Types of Benefits:

1) Flowers Offer Food for Pollinators:

Nectar - Insects

Nectar - Birds

Nectar - Mammals

Pollinators locate flowers via:

Vision

(Ultraviolet)

Odor

Types of Benefits:

2) Flowers Offer 'Sex':

Fly Orchid

'Confused' Wasp

The Birds and the Bees?

Types of Benefits:

3) Flowers Offer Nurseries:

Yucca

Yucca Moth

Seed Dispersal:

- Important so young don't compete w/ adult
- Seed dispersal is function of fruit

Approaches for Seed Dispersal:

1) Shotgun Dispersal:

- Seeds explosively ejected from fruit (e.g. mistletoe)

2) Wind Dispersal:

- Lightweight fruits carried by wind

Dandelion

Maple Seeds

Approaches for Seed Dispersal:

3) Water Dispersal:

- Seeds float on water

4) Animal Dispersal:

- Cling to fur
- Eaten and passed

Cocklebur

Bat

Coconuts