

Inquiry into Life

Eleventh Edition

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Chapter 29 Lecture Outline

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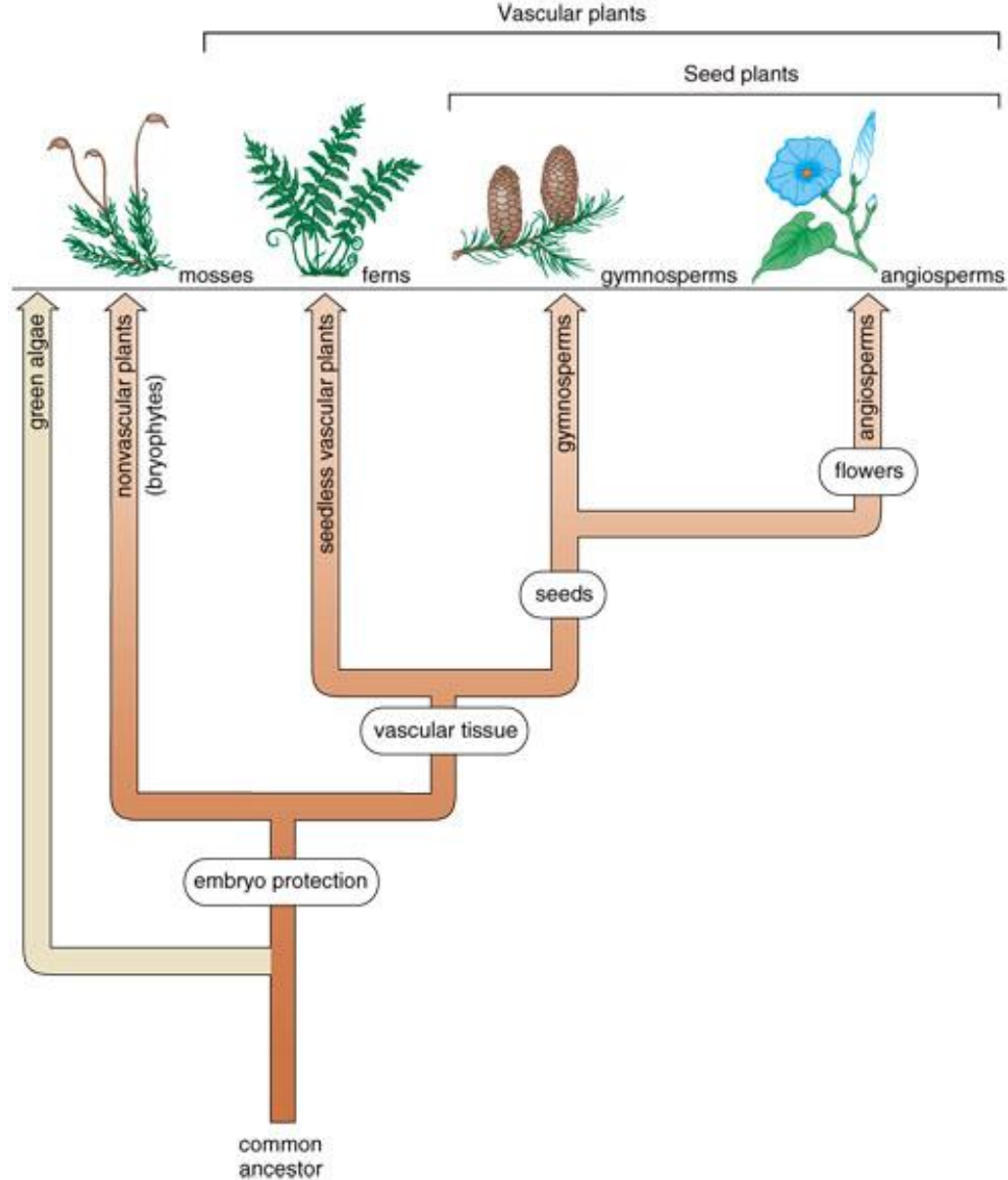


29.1 Evolutionary history of plants

- Overview
 - Multicellular, photosynthetic eukaryotes
 - Believed to have evolved from a freshwater green alga
 - Plants and green algae contain chlorophyll a and b
 - Both store carbohydrates as starch
 - Both have cell walls of cellulose
 - 4 evolutionary events in evolution of plants
 - Development of embryo protection
 - Development of vascular tissue
 - Development of seeds
 - Development of flowers

Evolution of plants

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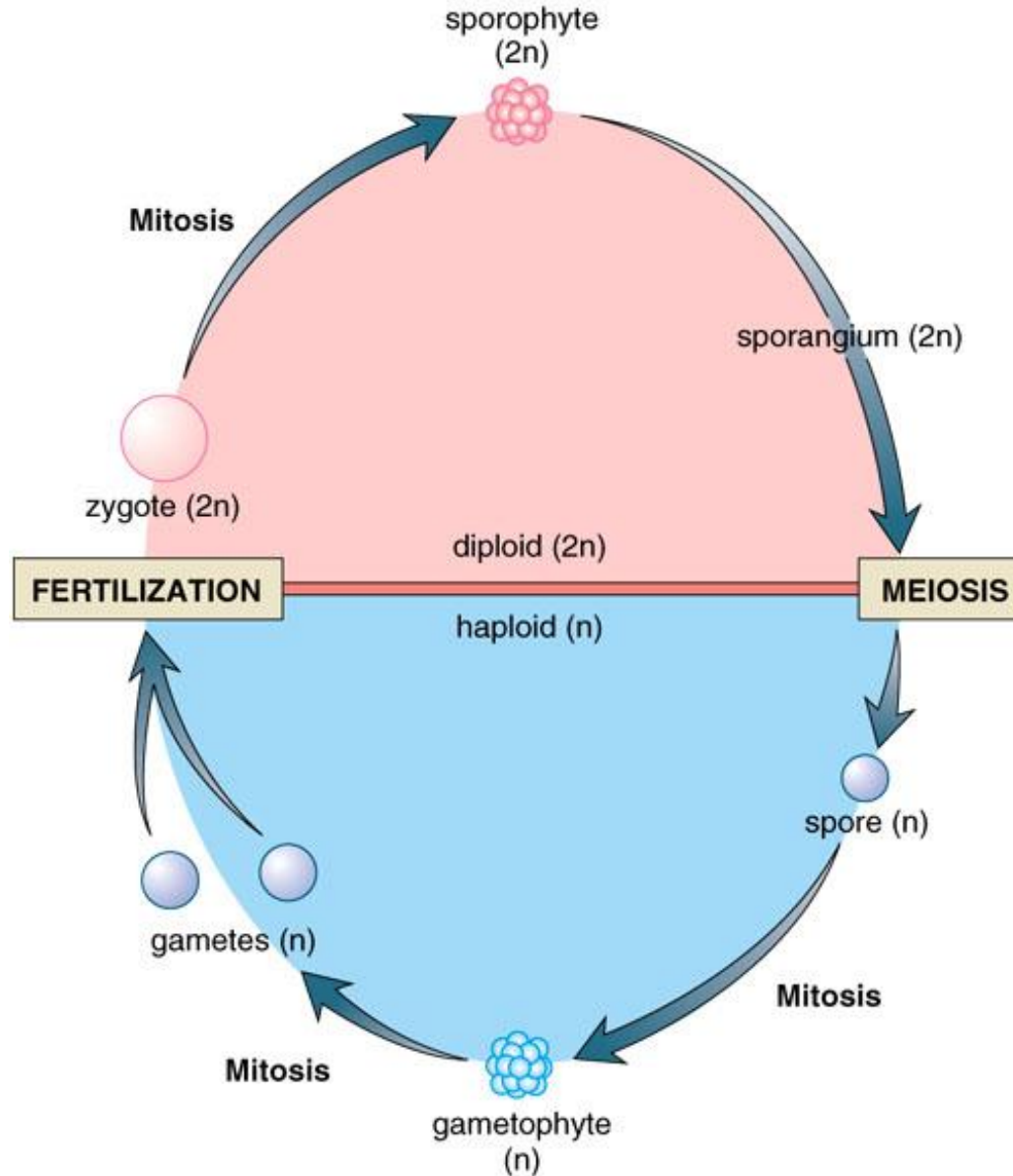
• Fig. 29.1

Evolutionary history of plants cont'd.

- **Alternation of generations**
 - Characteristic life cycle of plants
 - Two multicellular stages, each producing the other
 - One is haploid- **gametophyte**
 - The other is diploid- **sporophyte**
 - **Sporophyte produces haploid spores by meiosis**
 - Each spore develops into a gametophyte
 - **Gametophyte produces gametes by mitosis**
 - After fertilization, the embryo develops into a new sporophyte
 - In primitive plants the gametophyte is dominant, while in more advanced plants the sporophyte is dominant
 - **Only the sporophyte develops vascular tissue**

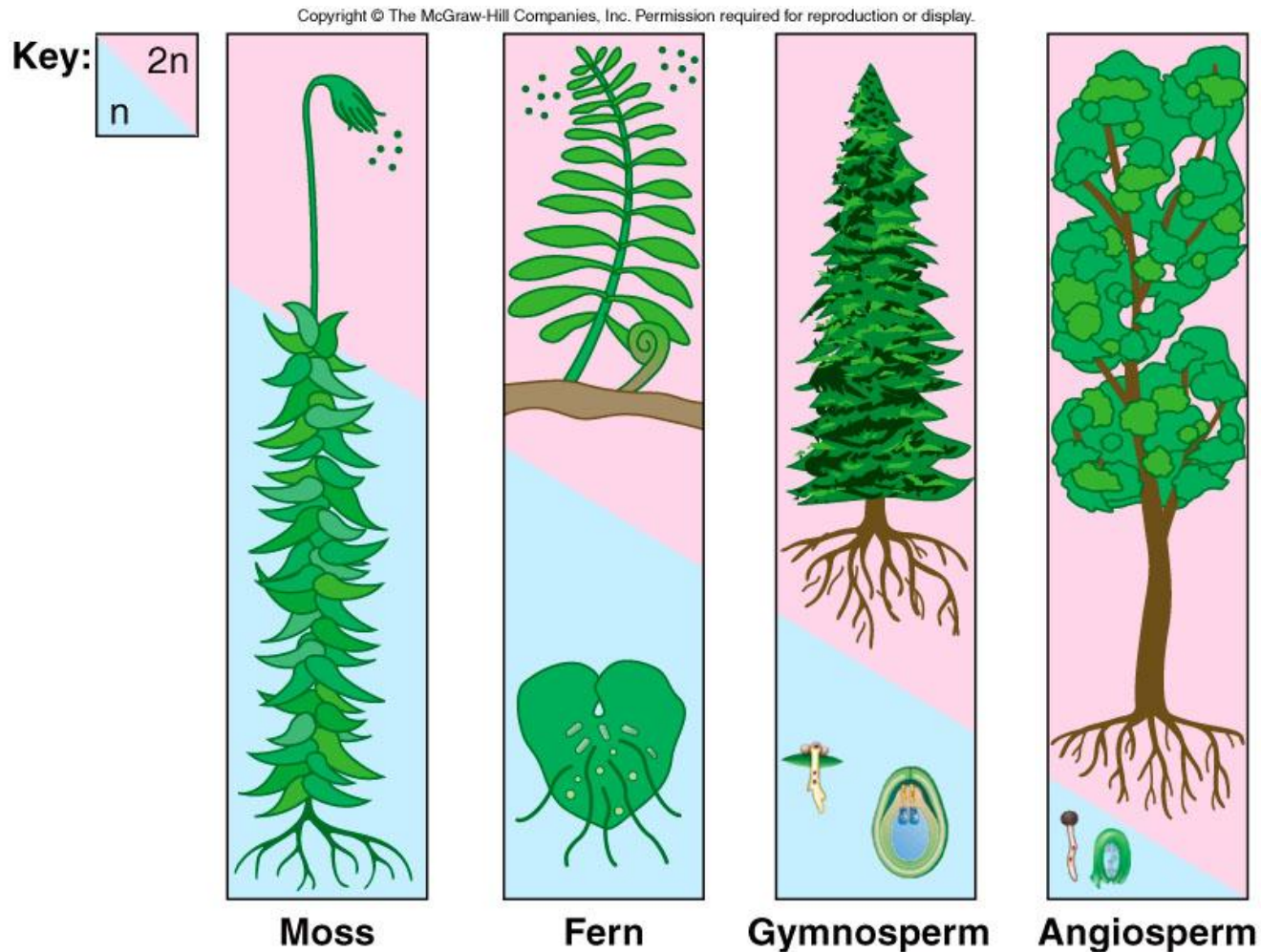
Alternation of generations

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• Fig. 29.2

Size of the gametophyte versus the sporophyte



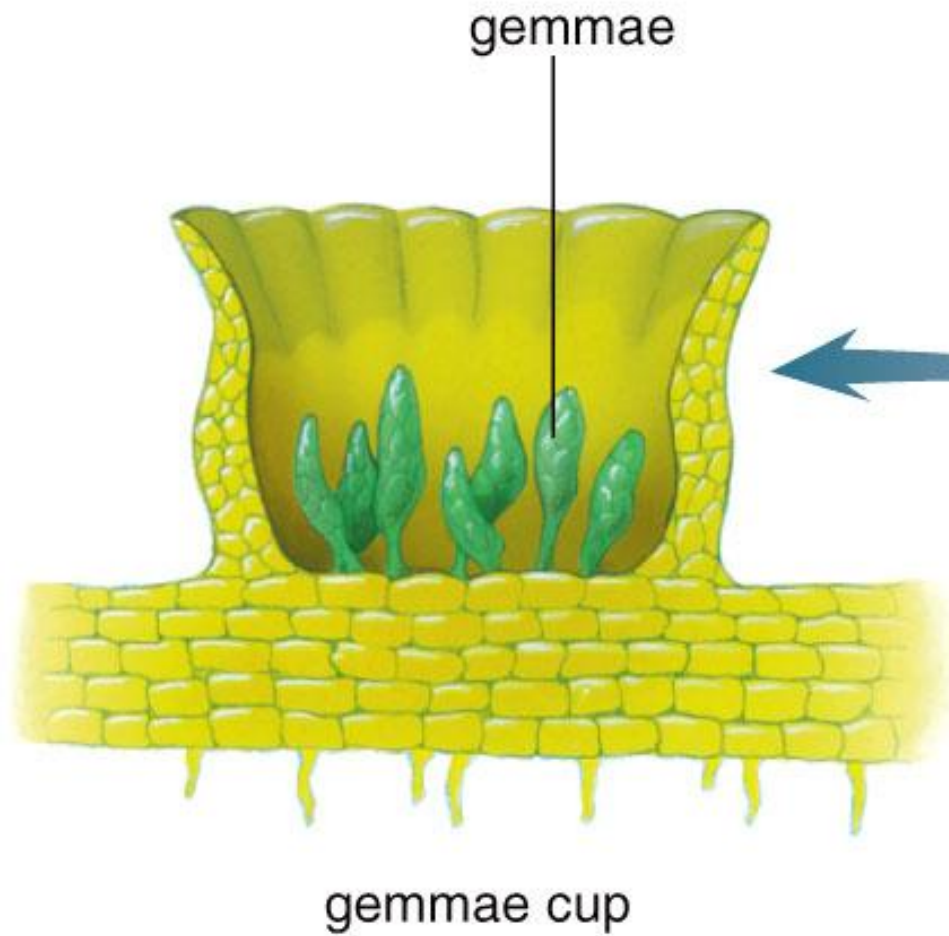
- Fig. 29.3

29.2 Nonvascular plants

- Overview
 - Lack vascular tissue-limits size and habitat
 - Do not have true roots, stems, or leaves
 - Gametophyte is the dominant generation
 - Sperm must swim to egg for fertilization
 - Sporophyte is attached to the gametophyte and derives nourishment from it
 - 3 separate divisions on nonvascular plants
 - Mosses, liverworts, hornworts

Liverwort, *Marchantia*

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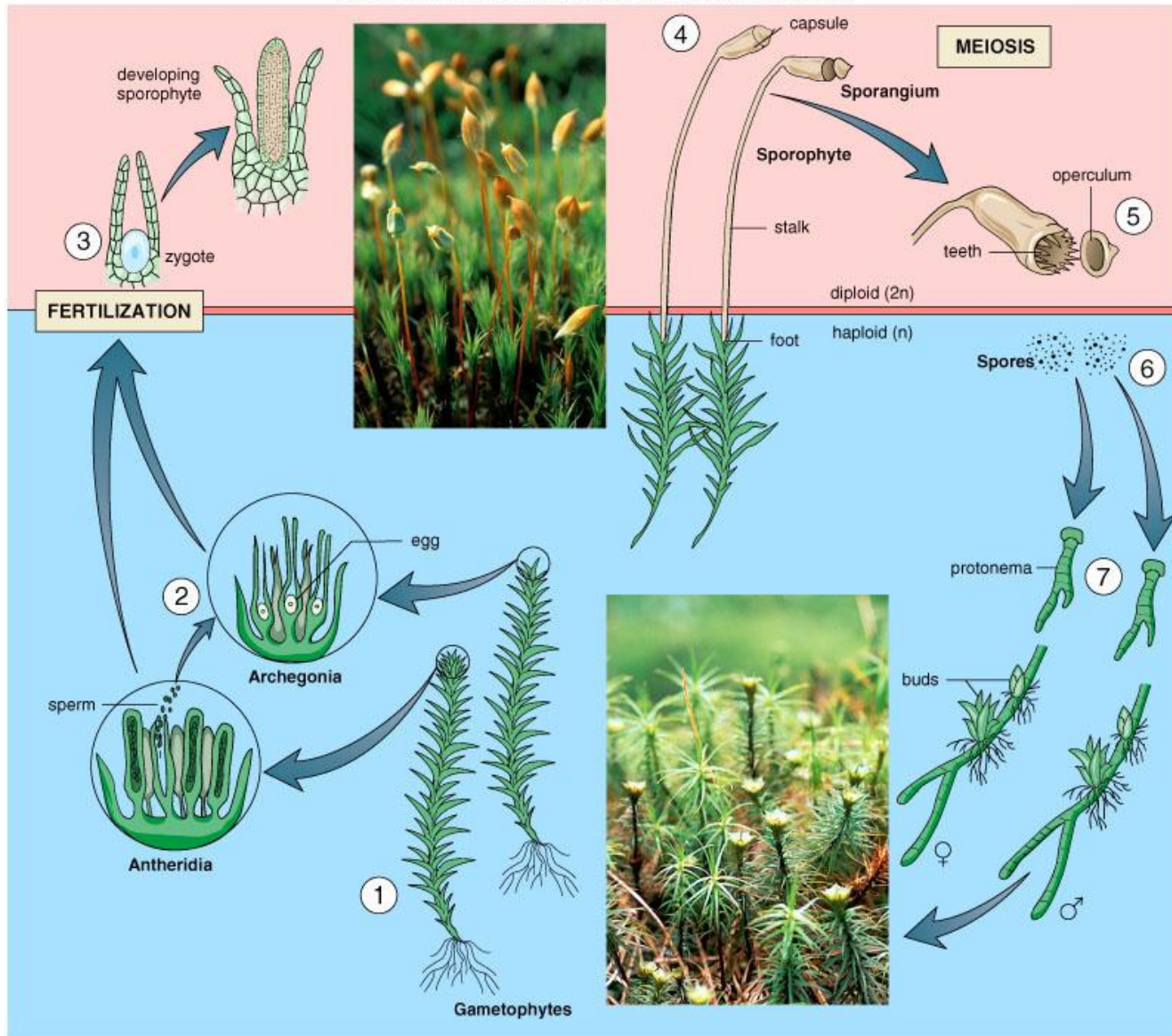


thallus with gemmae cups

- Fig. 29.4

Moss life cycle

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• Fig. 29.5

Nonvascular plants cont'd.

- Adaptations and uses of nonvascular plants
 - Can live on bare rock, fences, cracks of sidewalks
 - Selective advantage to being small and simple
 - Help convert rocks to soil
 - Peat moss
 - Used as fuel
 - Holds water-used in gardens to improve soil

29.3 Seedless vascular plants

- Overview
 - Ferns and fern allies
 - Have vascular tissue- **xylem** and **phloem**
 - True roots, stems, and leaves in most
 - Sporophyte is the predominant life cycle stage
 - Stage with vascular tissue so can exploit more habitats
 - Advantage to being diploid- 2 copies of each allele

The Carboniferous period

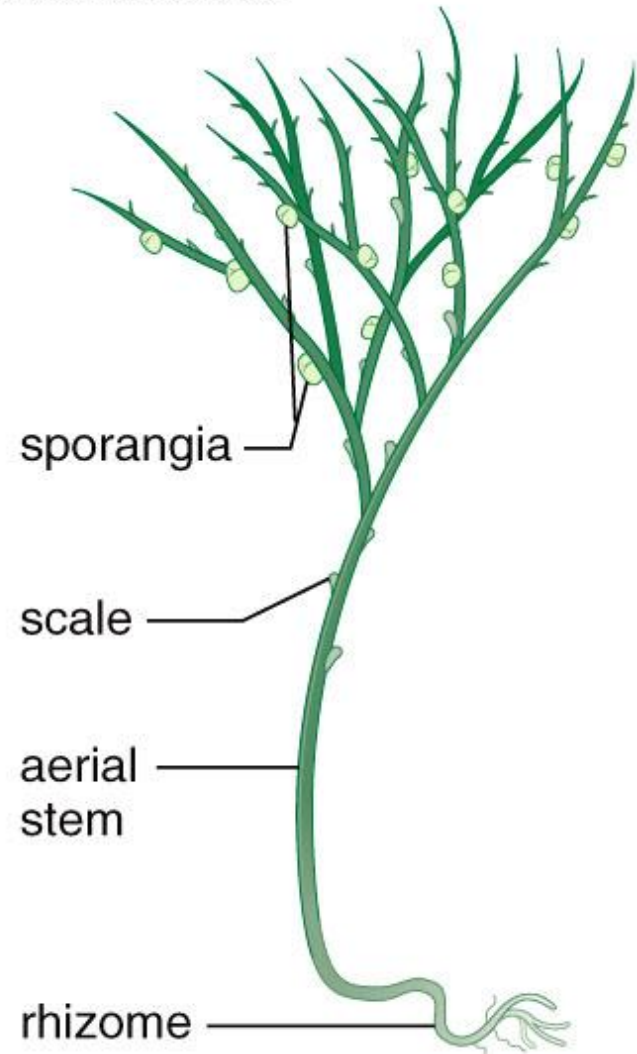
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- Fig. 29.6

Whisk ferns

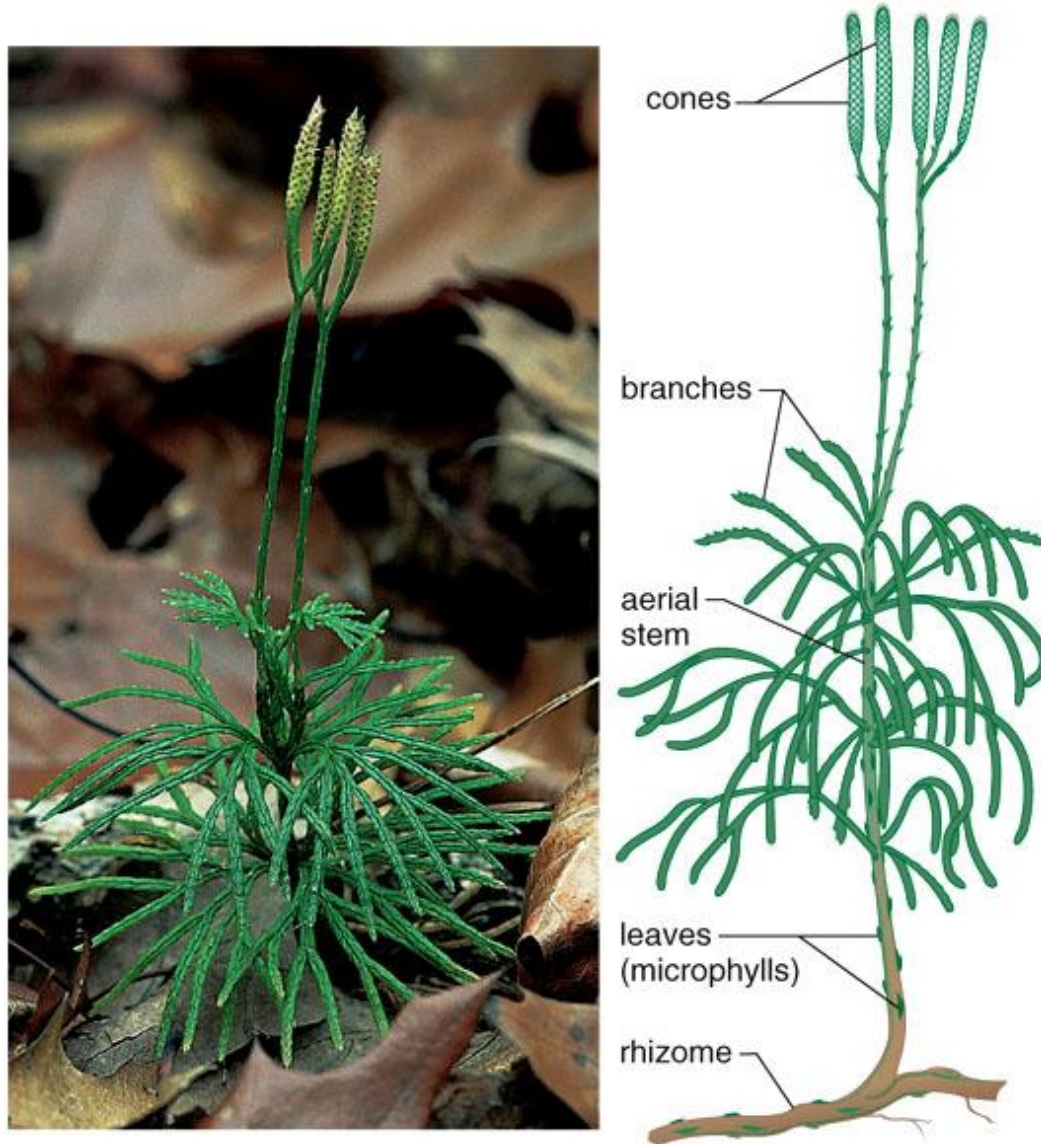
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• Fig. 29.7

Club moss, *Lycopodium*

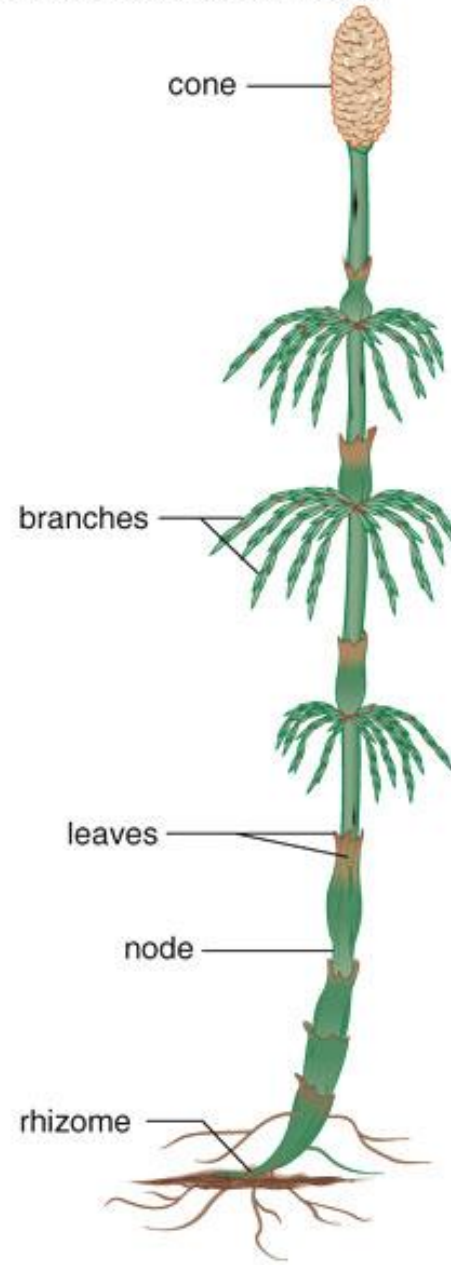
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- Fig. 29.8

Horsetail, Equisetum

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• Fig. 29.9

Seedless vascular plants cont'd.

- Ferns

- Adaptations

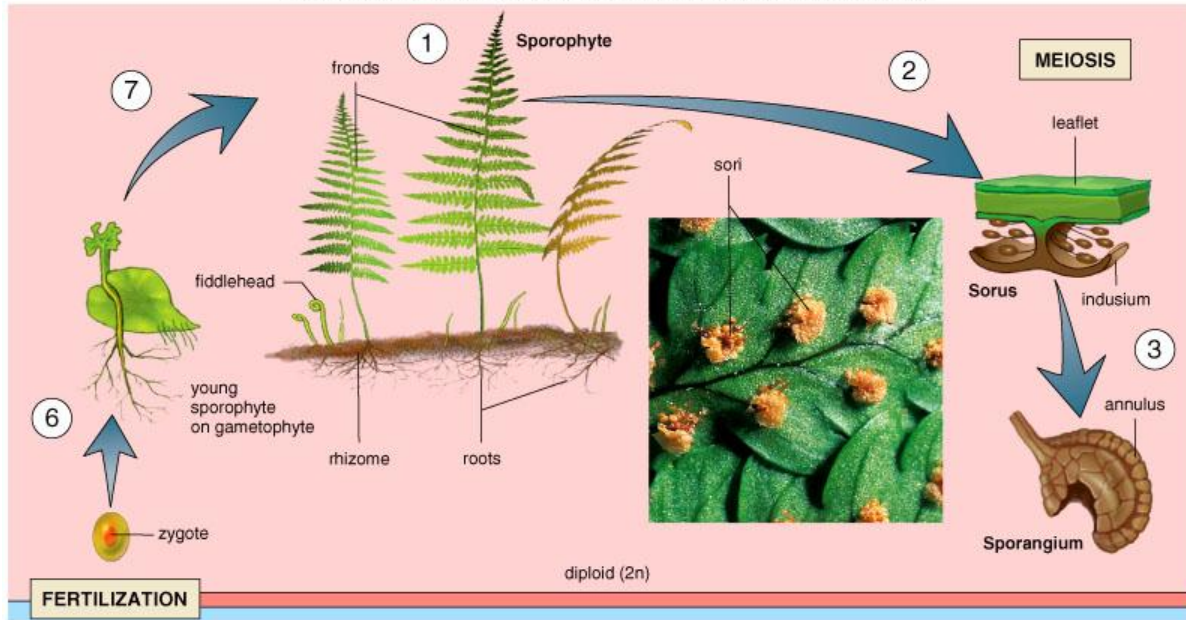
- True roots, stems, leaves
 - Gametophyte lacks vascular tissue so is water dependent
 - Sperm also need water film to swim
 - Sporophytes can spread to drier areas by vegetative reproduction
 - Rhizomes

- Uses of ferns

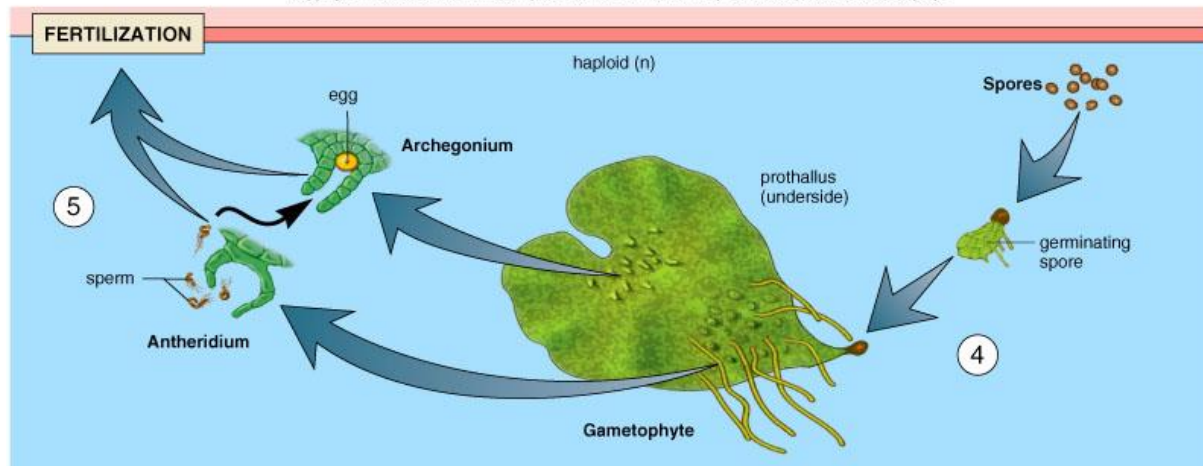
- Floral decorations
 - Ornamental landscape plants
 - Some species used as food

Fern life cycle

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• Fig. 29.11

29.4 Seed plants

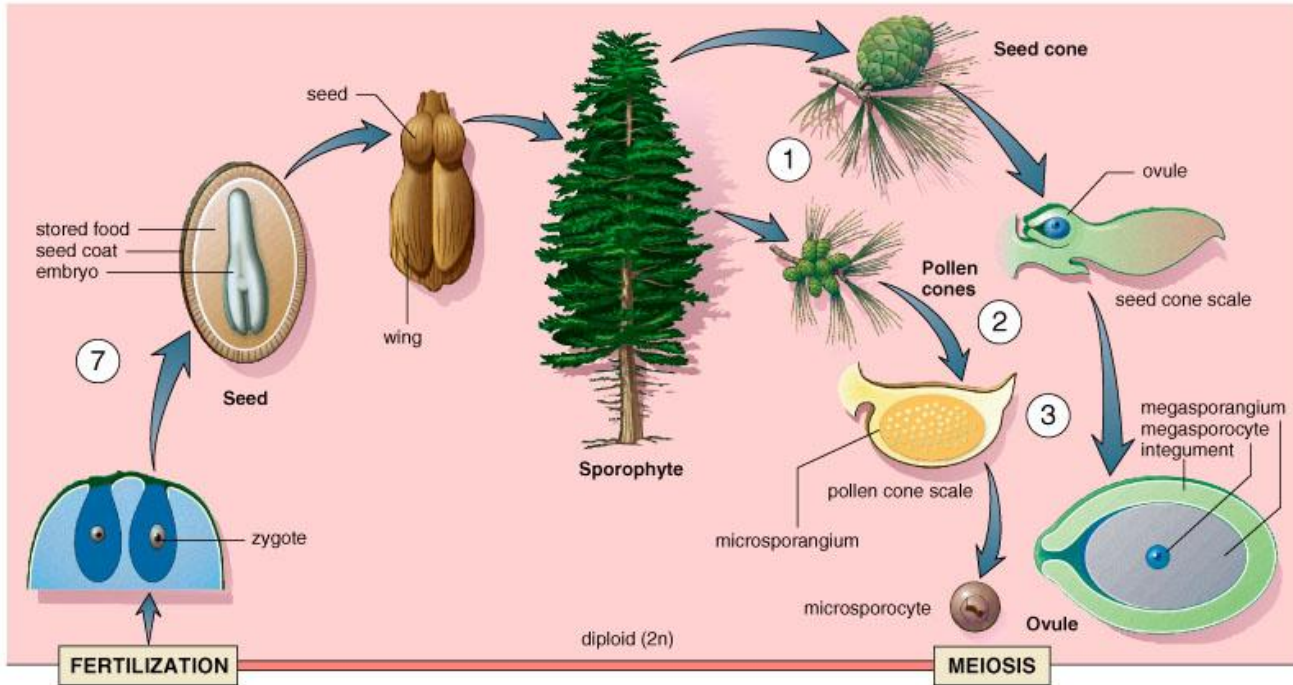
- Overview
 - **Gymnosperms** and **angiosperms** are seed plants
 - Seed contains a sporophyte embryo and stored food
 - Allows survival until conditions are favorable for germination
 - Gymnosperms-ovule not completely enclosed by diploid tissue
 - Angiosperms-ovule completely enclosed within diploid sporophyte tissue (ovary) which becomes a fruit

Seed plants cont'd.

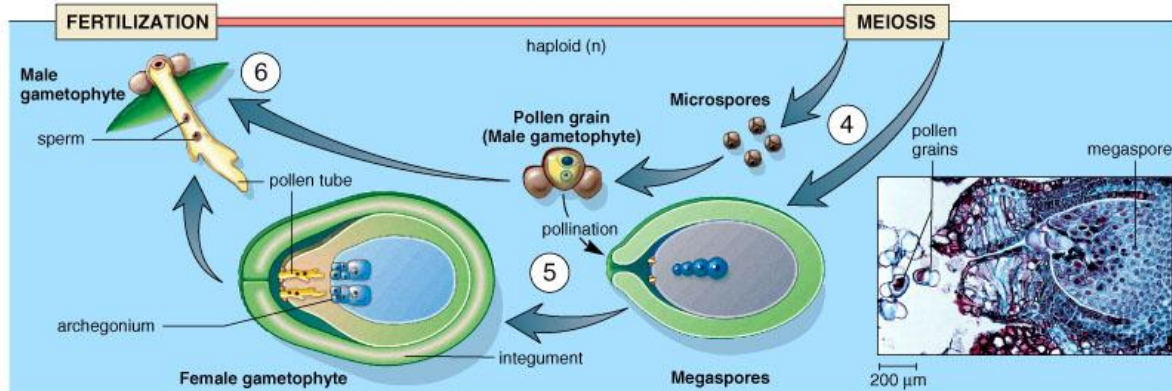
- Gymnosperms- conifers, gnetophytes, ginkgophytes, and cycads
 - We will use the conifers as our example
 - Pines, spruces, firs, cedars, hemlocks, redwoods, cypresses
 - Cone-bearers
 - Exhibit **heterospory**
 - Two types of spores- produce two types of gametophytes, male and female
 - **Pollen grains**- male gametophyte
 - **Pollination**-deposition of pollen on a female gametophyte
 - **Pollen tube**-sperm pass through pollen tube to reach ovule
 - No water required as it is in previous groups
 - Female gametophyte develops within ovule
 - Follow the pine life cycle on the following slide

Pine life cycle

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• Fig. 29.12

Seed plants cont'd.

- Adaptations and uses of conifers
 - Adapted to cold, dry weather
 - Pollen cones and seed cones are adaptations to land
 - Needle-shaped leaves have small surface area-decreases water loss
 - Also have a thick cuticle and recessed stomata
 - Wood is used in construction and for making paper
 - Resins are used for production of chemicals

Conifers

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a. A northern coniferous forest



b. Cones of lodgepole pine



c. Juniper, seed cones are fleshy

- Fig. 29.13

Seed plants cont'd.

- Other gymnosperms
 - Cycads
 - Resemble palms or ferns
 - Pollen or seed cones grow on top of long vertical stem
 - Plentiful in Mesozoic era at the time of dinosaurs
 - Gingkoes
 - Only one surviving species-*Ginkgo biloba*, the maidenhair tree
 - Fleshy seeds give off foul odor
 - Resistant to pollution-often used in ornamental plantings
 - Used in herbal remedies
 - Gnetophytes
 - *Ephedra* is only species in N. America
 - Adapted to hot temperatures

Other gymnosperms

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male



female

a.



b.



c.

• Fig. 29.14

Seed plants cont'd.

- Angiosperms-flowering plants
 - Wide range of habitats
 - Two classes
 - **Monocotyledones**- monocots
 - **Eucotyledones**-eudicots
 - Classes are distinguished by
 - Number of cotyledons
 - Number of flower parts
 - Pattern of leaf venation
 - Arrangement of vascular bundles
 - Type of root system
 - These characteristics are summarized on the following slide

Monocots and eudicots

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TABLE 29.1 MONOCOTS AND EUDICOTS

Monocots

One cotyledon

Flower parts in threes or multiples of three

Usually herbaceous

Usually parallel venation

Scattered bundles in stem

Fibrous root system

Eudicots

Two cotyledons

Flower parts in fours or fives or multiples of four or five

Woody or herbaceous

Usually net venation

Vascular bundles in a ring

Taproot system

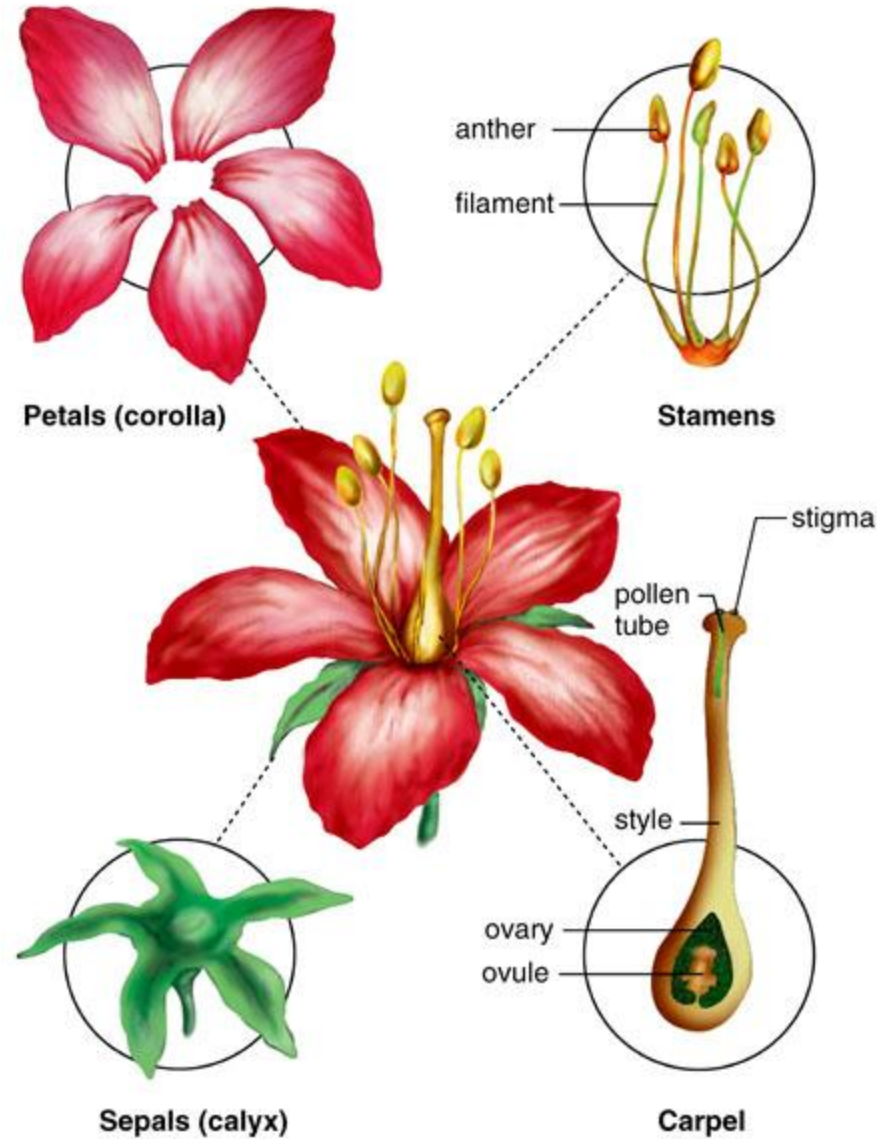
- Table 29.1

Seed plants cont'd.

- Angiosperms cont'd.
 - The flower
 - Flower parts
 - **Receptacle**-tip of stalk that bears flowers
 - **Sepals**-modified leaves that protect bud
 - **Petals**-modified leaves, may be colorful, collectively called the corolla
 - **Stamens**-male reproductive structures
 - » **Anther**-pollen production
 - » **Filament**
 - **Carpels**-female reproductive structures
 - » **Stigma**-for reception of pollen
 - » **Style**
 - » **Ovary**-ovule production

Generalized flower

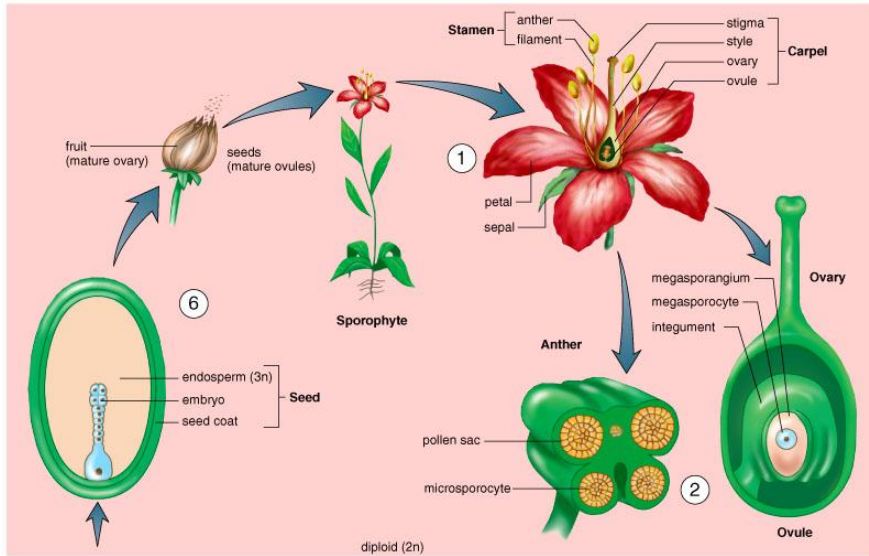
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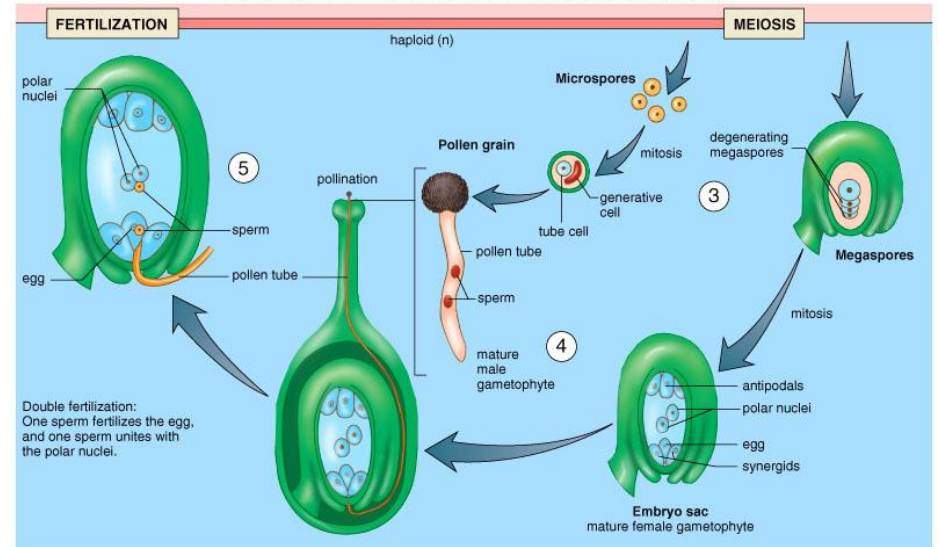
• Fig. 29.16

Flowering plant life cycle

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- Fig. 29.17

Seed plants cont'd.

- Adaptations of flowering plants
 - Flower structure, color, and scent co-evolves with pollinators
 - Insect, bird, and bat-pollinated plants have evolved showy flowers to attract pollinating species
 - Provides pollinator with nectar, fruit, etc.
 - » Ex: hummingbirds are attracted to red, trumpet-shaped flowers
 - Wind-pollinated plants do not produce showy flowers
 - Generally have no petals or scent
 - Seeds are sent up on stalks into the path of the wind
 - Fruit-aids in seed dispersal