Plant Developmental Biology

Plant development envisages

1. formation of a complete embryo from a **zygote**
2. seed germination
3. the elaboration of a mature vegetative plant from the embryo
4. The development of roots
5. Initiation and development of flowers
6. Development of fruits and seeds
7. plant's responses to its environment.

Plant development also encompasses the growth and differentiation of cells, tissues, organs, and organ systems.

Plant development shares many similarities with developmental processes in animals.
However, plants are no-nmotile, photosynthetic organisms that require certain novel developmental processes in addition to the common ones.

The fundamental questions in developmental biology are similar for plants and animals. Their developmental strategies, which have evolved over millions of years, have many commonalities; however, they have certain differences.

*Land plants have their origins from the green algae, and the transition to land correlates with the evolution of an increasingly protected embryo. Mosses, ferns, gymnosperms (conifers, cycads, and ginkgos), and angiosperms (flowering plants) all develop from protected embryos.

*Two examples of embryo protection are the seed coat that first appeared in the gymnosperms and the fruit that characterizes the angiosperms. As we have seen, embryo protection is also a theme in animal development.

What are the differences?

Plants do not gastrulate. Plant cells are trapped within rigid cellulose walls that generally prevent cell and tissue migration. Plants, like animals, develop three basic tissue systems (dermal, ground, and vascular), but do not rely on gastrulation to establish this layered system of tissues. Plant development is highly regulated by the environment, a strategy that is adaptive for a stationary organism.

GASTRULA FORMATION DURING ANIMAL DEVELOPMENT

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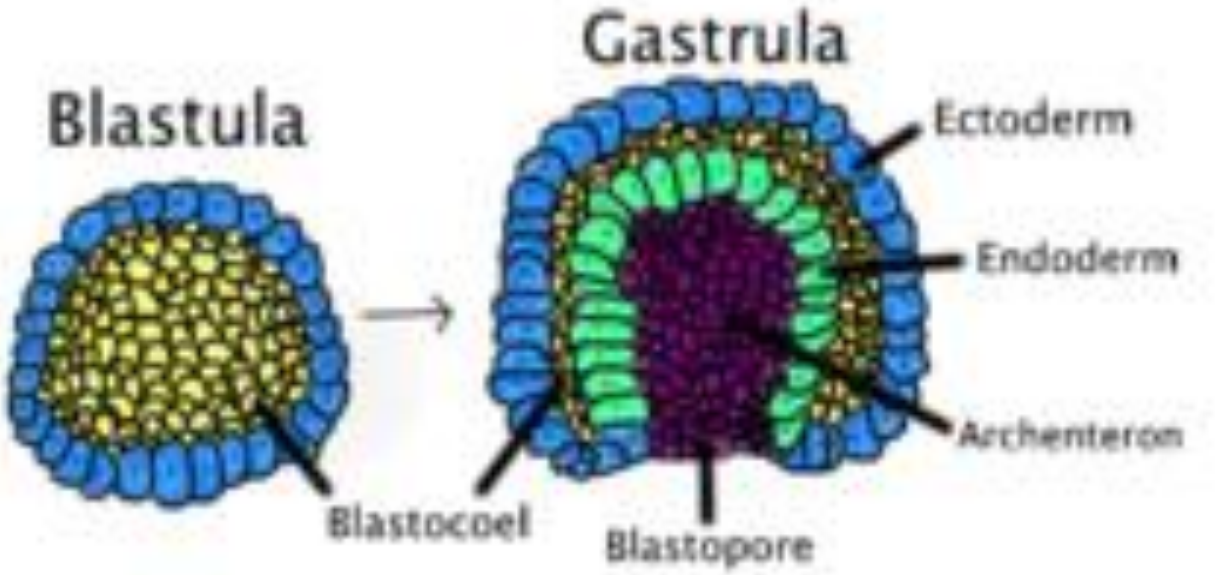
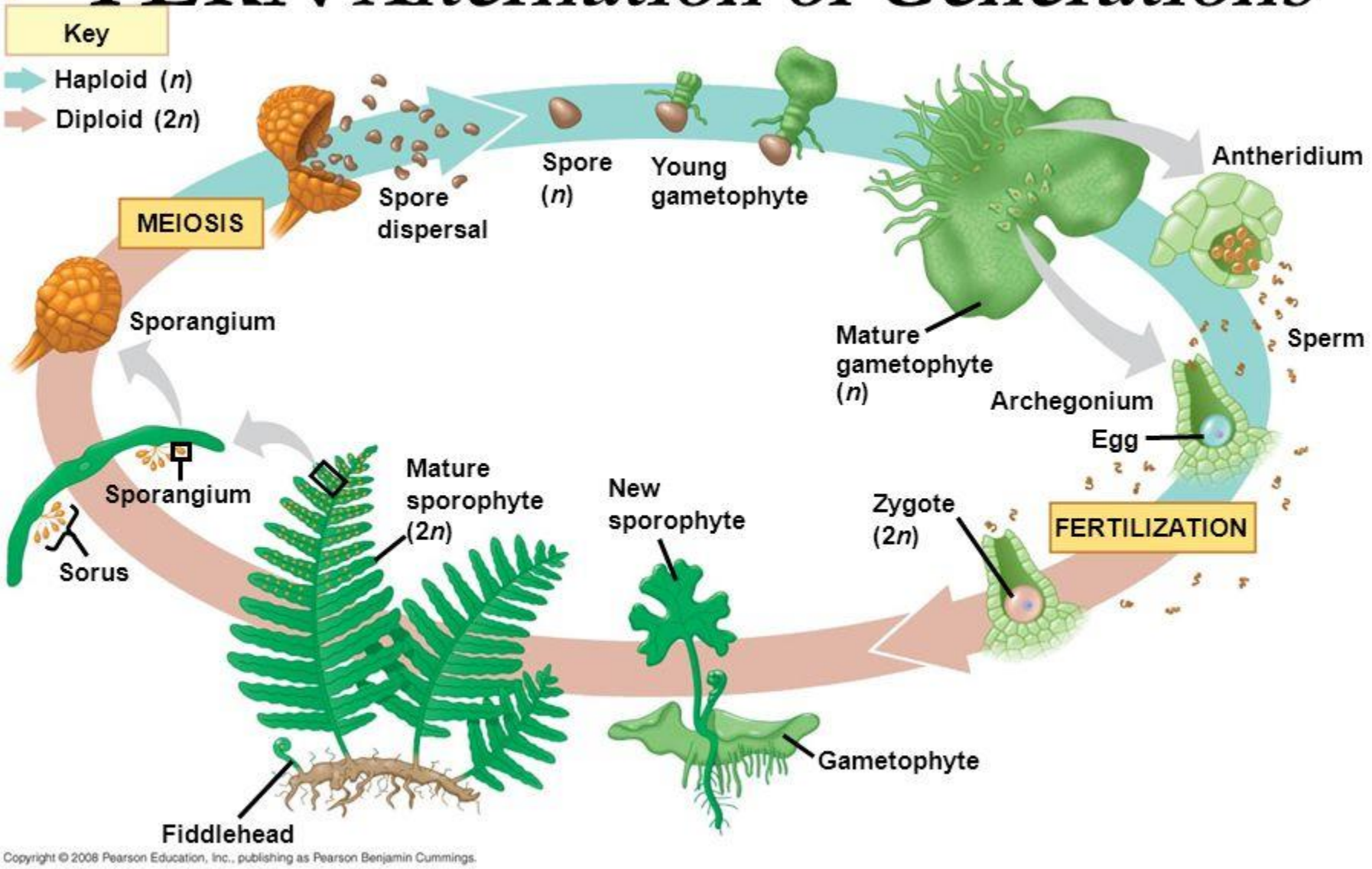


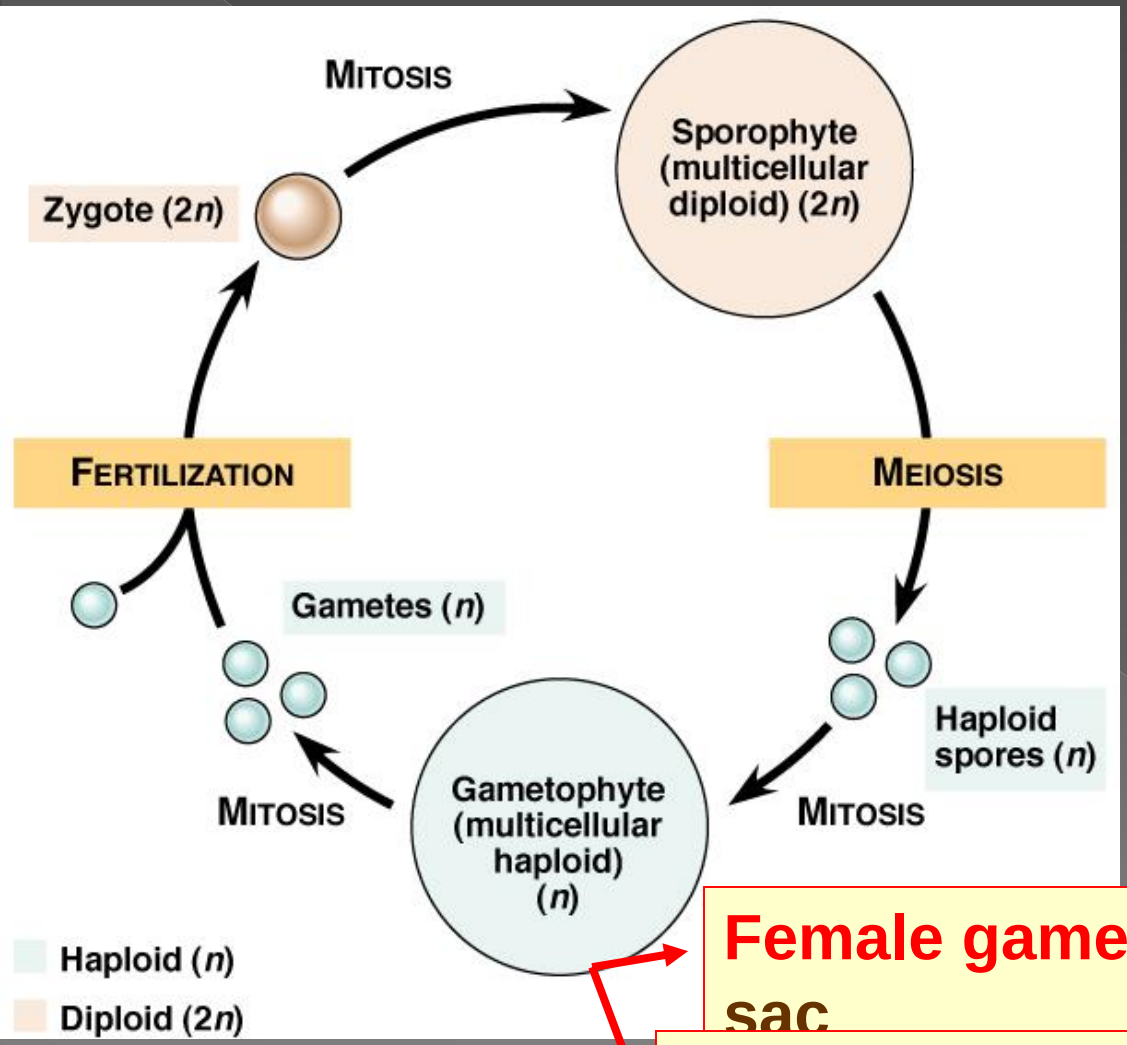
Plants have sporic meiosis rather than gametic meiosis. That is, spores, not gametes, are produced by meiosis. Gametes are produced by mitotic divisions following meiosis.

The life cycle of land plants includes both diploid and haploid multicellular stages. This type of life cycle is referred to as alternation of generations. The evolutionary trend has been toward a reduction in the size of the haploid generation.

FERN Alternation of Generations



Alternation of Generations: Angiosperms



To complete the life cycle, the gametes produced by the male and female gametophyte must unite, restoring the diploid sporophyte.

Female gametophyte = embryo sac

Immature male gametophyte = pollen grain