Mader/*Biology*, 11/e – Chapter Outline

Chapter 10

10.1 Halving the Chromosome Number

1. **Meiosis** is nuclear division, reducing the chromosome number from the **diploid** (**2n**) to the **haploid** (**n**) number.
2. The **haploid (n) number** is half of the diploid number of chromosomes.
3. Sexual reproduction requires **gamete** formation and then fusion of gametes to form a zygote.
4. A zygote always has the full or diploid (2n) number of chromosomes.
5. If gametes contained same number of chromosomes as body cells, doubling would soon fill cells.

A. Homologous Pairs of Chromosomes
   1. In diploid body cells, chromosomes occur as pairs.
      a. Each set of chromosomes is a homologous pair; each member is a **homologous chromosome** or **homologue.**
      b. Homologues look alike, have the same length and centromere position, and have a similar banding pattern when stained.
      c. A location on one homologue contains gene for the same trait that occurs at this locus on the other homologue, although the genes may code for different variations of that trait; alternate forms of a gene are called **alleles**.
   2. Chromosomes duplicate immediately prior to nuclear division.
      a. Duplication produces two identical parts called *sister chromatids*; they are held together at the *centromere*.
   3. One member of each homologous pair is inherited from the male parent, the other member from the female parent.
   4. One member of each homologous pair will be placed in each sperm or egg.

B. Overview of Meiosis
   1. Meiosis involves two nuclear divisions and produces four haploid daughter cells.
   2. Each daughter cell has half the number of chromosomes found in the diploid parent nucleus.
   3. Meiosis I is the nuclear division at the first meiotic division.
      a. Prior to meiosis I, DNA replication occurs, each chromosome thus has two sister chromatids.
      b. During meiosis I, homologous chromosomes pair forming a **synaptonemal complex**; this process is called **synapsis.**
      c. During synapsis, the two sets of paired chromosomes lay alongside each other as a **bivalent** (sometimes called a tetrad).
   4. In meiosis II, the centromeres divide and daughter chromosomes (derived as sister chromatids) separate.
      a. No replication of DNA is needed between meiosis I and II because chromosomes are already doubled (DNA replication occurred prior to meiosis I).
      b. Chromosomes in the four daughter cells have only one chromatid.
      c. Counting the number of centromeres verifies that parent cells were diploid; each daughter cell is haploid.
      d. In the animal life cycle, daughter cells become gametes that fuse during fertilization.
      e. Fertilization restores the diploid number in cells.

C. Fate of Daughter Cells

   1. In plant life cycle, daughter cells become haploid spores that germinate to become a haploid generation.

   2. In the animal life cycle, the daughter cells become the gametes, either sperm or egg.