C h a p t e r 4: A Tour of the Cell

**Chapter Objectives**

**4.1** Define cell theory and briefly describe the discoveries that led to its development.

**4.2** Explain why there are upper and lower limits to cell size.

**4.3** Distinguish between the structures of prokaryotic and eukaryotic cells.

**4.4** Explain why compartmentalization is important in eukaryotic cells.

**4.4** Compare the structures of plant and animal cells. Note the function of each cell part.

**4.4** Describe the structures and functions of the four compartments of eukaryotic cells.

**4.5** Describe the hydrophobic and hydrophilic components of a plasma membrane.

**Cell Structures Involved in Manufacturing and Breakdown**

**4.6–4.13** Describe the structure and functions of the nucleus, endomembrane system, smooth and rough endoplasmic reticulum, Golgi apparatus, lysosomes, and vacuoles.

**Energy-Converting Organelles**

**4.14–4.15** Compare the structures and functions of chloroplasts and mitochondria.

**4.16** Describe the evidence that suggests that mitochondria and chloroplasts evolved by endosymbiosis.

**Internal and External Support: The Cytoskeleton and Cell Surfaces**

**4.17** Compare the structures and functions of microfilaments, intermediate filaments, and microtubules.

**4.18** Relate the structure of cilia and flagella to their functions.

**4.20** Relate the structure of the extracellular matrix to its functions.

**4.22** Relate the structure of plant cell walls to its functions.

**Word Roots**

**centro-** \_ **center** (*centriole:* an animal cell structure composed of cylinders of microtubule triplets; within the cell’s centrosome, a pair of centrioles function in cell division)

**chloro-** \_ green; **-plast** \_ molded (*chloroplast:* the site of photosynthesis in plants and algae)

**cili-** \_ hair (*cilium:* a short hair-like cellular appendage with a microtubule core, specialized for locomotion)

**cyto-** \_ cell; **-plasm** \_ fluid (*cytoplasm:* everything inside a cell between the plasma membrane and the nucleus, consisting of a semifluid medium and organelles)

**-ell** \_ small (*organelle:* a membrane-enclosed structure with a specialized function within a cell)

**endo-** \_ inner (*endomembrane system:* the system of membranes within a cell that includes the nuclear envelope, endoplasmic reticulum, Golgi apparatus, lysosomes, vacuoles, and the plasma membrane)

**endo-** \_ inner; **sym-** \_ together; **bios-** \_ living (*endosymbiosis:* when one organism lives inside another organism; the process by which the mitochondria and chloroplasts of eukaryotic cells probably evolved)

**eu-** \_ true; **karyo-** \_ nucleus (*eukaryotic cell:* a cell with a membrane-enclosed nucleus and other membrane-enclosed organelles)

**extra-** \_ outside (*extracellular matrix:* the substance in which animal tissue cells are embedded)

**flagell-** \_ whip (*flagellum:* a long whiplike cellular appendage specialized for locomotion)

**glyco-** \_ sweet (*glycoprotein:* a macromolecule consisting of one or more polypeptides linked to short chains of sugars)

**lyso-** \_ loosen (*lysosome:* a digestive organelle containing hydrolytic enzymes used by eukaryotic cells to digest food and wastes)

**micro-** \_ small; -**tubul** \_ a little pipe (*microtubule:* a straight, hollow tube of globular proteins in the cytoskeleton of eukaryotic cells that support the structure and movement of cilia and flagella)

**nucle-** \_ nucleus; **-oid** \_ like (*nucleoid:* a dense region of DNA in a prokaryotic cell) \_ a band or bond (*plasmodesmata:* an open channel in a plant cell wall)

**pro-** \_ before; (*prokaryotic cell:* a cell that has no nucleus)

**-soma** \_ a body (*chromosome:* the structure carrying the genetic material found in the nucleus of a eukaryotic cell; also, the main gene-carrying structure of a prokaryotic cell; *ribosome*: a cell structure consisting of RNA and protein organized into two subunits and functioning as the site of protein synthesis in the cytoplasm; *peroxisome:* an organelle containing enzymes that transfer hydrogen from various substrates to oxygen, producing and then degrading hydrogen peroxide)

**thylaco-** \_ sac or pouch (*thylakoid:* a flattened membranous sac inside the chloroplast that serves as the site of the light reactions of photosynthesis)

**trans-** \_ across; **-port** \_ a harbor; **vesic-** \_ sac or bladder (*transport vesicle:* a membranous compartment used to enclose and transport materials from one part of a cell to another)

**vacu-** \_ empty (*vacuole:* a membrane-enclosed sac that is part of the endomembrane system of a