What are the primary types of cells?

5.3 Cells are of two types: prokaryotic and eukaryotic.

All cells can be grouped into two broad categories: **prokaryotic cells** (PRO-kare-ee-OT-ick) and **eukaryotic cells** (YOO-kare-ee-OT-ick). Cells are placed into one of these categories based on their type of structure. All prokaryotes are single-celled organisms—they consist of a single prokaryotic cell. Eukaryotes can be single-celled or multicellular organisms—they consist of one or multiple eukaryotic cells.

All prokaryotic cells share features not found in eukaryotic cells, and all eukaryotic cells share features not found in prokaryotic cells. But becuase both types are living cells, they have some features in common. Almost all cells have the following four characteristics:

- A surrounding membrane.
- A thick fluid enclosed by this membrane, which, along with the other cell contents, is called *protoplasm*.
- Organelles, or little organs, located within the protoplasm that carry out certain cellular functions.
- A control center that contains the hereditary material, DNA.

5.4 Prokaryotic cells have a simpler structure than eukaryotic cells.

Prokaryotic cells were the first type of cell to exist as life arose on Earth more that 3 billion years ago (see Chapter 18). Eukaryotic cells evolved from these simpler cells. Two of the three domains of life—bacteria and archaeans—are prokaryotes. The third domain, the eukaryotes, comprises protists, fungi, plants, and animals. (Section 1.13 discusses the characteristics that distunguish archaeans from bacteria; Figure 1.12 shows the evolutionary relationships among the three domains.)

The two main characteristics of prokaryotic cells that make them less complex that eukaryotic cells are:

- Prokaryotic cells have no membrane-bounded nucleus containing the DNA; rather, there is a region of DNA concentration within the cell called a *nucleoid*.
- The organelles in prokaryotic cells are not bounded by membranes and thus do not compartmentalize the cell.

Figure 5.4 (a bacterial cell), **Figure 5.5** (an animal cell), and **Figure 5.6** (a plant cell) will help you visualize prokaryotic and eukaryotic cell structures.

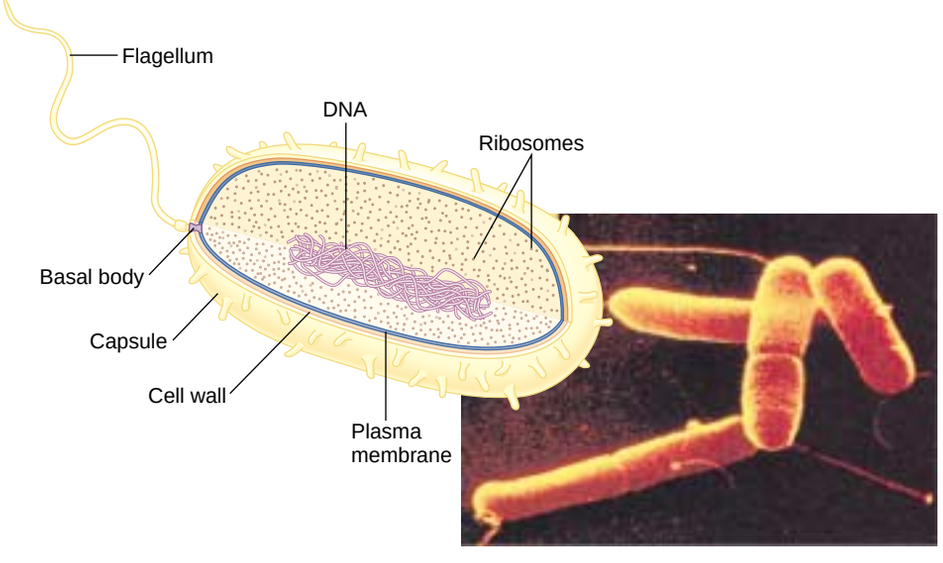

Figure 5.4 A bacterial cell. Bacterial cells are prokaryotic and have a simpler structure than eukaryotic cells.

Visual Thinking: Although bacteria (prokaryotes) have no membrane-bounded organelles, they do have organelles within their cytoplasm. What organelles are shown in this illustration? What is the function of these organelles?