

**FIGURE 1.4** In prokaryotic cells, such as this bacterium (top), DNA is suspended in the cytoplasm. In eukaryotic cells, such as this protozoan (bottom), the nuclear envelope separates DNA from the cytoplasm. (colored TEMs; magnifications: protozoan 3200×; bacterium 19,000×)

### CONNECT TO PROKARYOTES

You will learn more about prokaryotes in **Viruses and Prokaryotes**, which discusses their requirements to sustain life, their role in the ecosystem, and their role in human disease.

## MAIN IDEA

# Prokaryotic cells lack a nucleus and most internal structures of eukaryotic cells.

The variety of cell types found in living things is staggering. Your body alone is made of trillions of cells of many different shapes, sizes, and functions. They include long, thin nerve cells that transmit sensory information, as well as short, blocky skin cells that cover and protect the body. Despite this variety, the cells in your body share many characteristics with one another and with the cells that make up every other organism. In general, cells tend to be microscopic in size and have similar building blocks. They are also enclosed by a membrane that controls the movement of materials into and out of the cell.

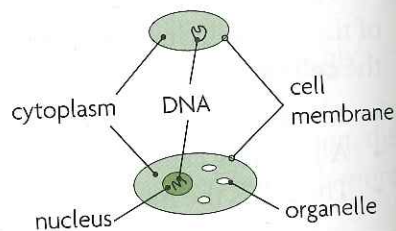
Within the membrane, a cell is filled with cytoplasm. **Cytoplasm** is a jellylike substance that contains dissolved molecular building blocks—such as proteins, nucleic acids, minerals, and ions. In some types of cells, the cytoplasm also contains **organelles**, which are structures specialized to perform distinct processes within a cell. Most organelles are surrounded by a membrane. In many cells, the largest and most visible organelle is the nucleus, which stores genetic information.

As shown in **FIGURE 1.4**, cells can be separated into two broad categories based on their internal structures: prokaryotic cells and eukaryotic cells.

- **Prokaryotic cells** (pro-KAR-ee-AHT-ihk) do not have a nucleus or other membrane-bound organelles. Instead, the cell's DNA is suspended in the cytoplasm. Most prokaryotes are microscopic single-celled organisms.
- **Eukaryotic cells** (yoo-KAR-ee-AHT-ihk) have a nucleus and other membrane-bound organelles. The nucleus, the largest organelle, encloses the genetic information. Eukaryotes may be multicellular or single-celled organisms.

### VISUAL VOCAB

**Prokaryotic cells** do not have a nucleus or other membrane-bound organelles.



**Eukaryotic cells** have a nucleus and other membrane-bound organelles.

**Summarize** What characteristics are shared by most cells?

## 3.1 Formative Assessment

### REVIEWING MAIN IDEAS

1. How did improvements in the microscope help scientists form the **cell theory**?
2. How do **prokaryotic** and **eukaryotic cells** differ?

### CRITICAL THINKING

3. **Analyze** Today, scientists can study human cells grown in petri dishes. Explain how this technique builds on the work of early scientists.
4. **Compare** In what way are cells similar to atoms?

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### CONNECT TO MEDICINE

5. Suppose a certain poison kills human cells by blocking pores in the nuclear membrane. Explain why it would or would not kill bacteria.