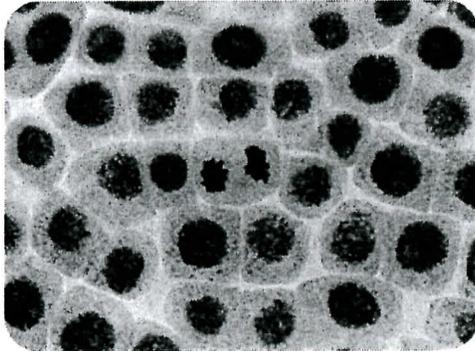


# CHAPTER 1

## Cell Theory

- Explain how cells are observed.
- Define the three main parts of the cell theory.
- Explain the levels of organization in an organism.



### What are you made of?

Cells make up all living things, including your own body. This picture shows a typical group of cells. But not all cells look alike. Cells can differ in shape and sizes. And the different shapes usually means different functions.

### Introduction to Cells

A **cell** is the smallest structural and functional unit of an organism. Some organisms, like bacteria, consist of only one cell. Big organisms, like humans, consist of trillions of cells. Compare a human to a banana. On the outside, they look very different, but if you look close enough you'll see that their cells are actually very similar.

### Cell Theory

In 1858, after using microscopes much better than Hooke's first microscope, Rudolf Virchow developed the hypothesis that cells only come from other cells. For example, bacteria, which are single-celled organisms, divide in half (after they grow some) to make new bacteria. In the same way, your body makes new cells by dividing the cells you already have. In all cases, cells only come from cells that have existed before. This idea led to the development of one of the most important theories in biology, the **cell theory**.

Cell theory states that:

1. All organisms are composed of cells.
2. Cells are alive and the basic living units of organization in all organisms.
3. All cells come from other cells.

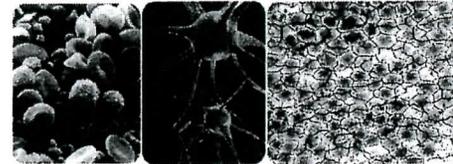
As with other scientific theories, many hundreds, if not thousands, of experiments support the cell theory. Since Virchow created the theory, no evidence has ever been identified to contradict it.

### Specialized Cells

Although cells share many of the same features and structures, they also can be very different ( **Figure 1.1**). Each cell in your body is designed for a specific task. In other words, the cell's function is partly based on the cell's structure. For example:

- Red blood cells are shaped with a pocket that traps oxygen and brings it to other body cells.
- Nerve cells are long and stringy in order to form a line of communication with other nerve cells, like a wire. Because of this shape, they can quickly send signals, such as the feeling of touching a hot stove, to your brain.
- Skin cells are flat and fit tightly together to protect your body.

As you can see, cells are shaped in ways that help them do their jobs. Multicellular (many-celled) organisms have many types of specialized cells in their bodies.



**FIGURE 1.1**

Red blood cells (*left*) are specialized to carry oxygen in the blood. Neurons (*center*) are shaped to conduct electrical impulses to many other nerve cells. These epidermal cells (*right*) make up the "skin" of plants. Note how the cells fit tightly together.

- **cell**: Basic unit of structure and function of a living organism; the basic unit of life.
- **cell theory**: Scientific theory that all living things are made up of cells, all life functions occur within cells, and all cells come from already existing cells.

### Summary

- Cell theory says that:
  - All organisms are composed of cells.
  - Cells are alive and the basic living units of organization in all organisms.
  - All cells come from other cells.

### Review

1. What are the three basic parts of the cell theory?
2. According to the cell theory, can you create a cell by combining molecules in a laboratory? Why or why not?

**Reading Questions: Cell Theory**

Name \_\_\_\_\_ Date \_\_\_\_\_ Core \_\_\_\_\_ Page \_\_\_\_\_

**1. True or False: "Most organisms are composed of cells," is part of the cell theory.**

**2. True or False: A cell's function is partly based on its structure.**

**3. Define a cell.**

**4. What was needed to observe cells for the first time?**

**5. Complete this sentence:**

\_\_\_\_\_ organisms have many types of \_\_\_\_\_ cells in their bodies.

**6. Which of the following is in the correct order?**

- a) organ system – organ – organelle - organism
- b) organism – organ – organelle - cell
- c) tissue – cell – organelle - compound
- d) tissue – organelle – cell - atom

**7. Which of the following is true?**

- a) Specialized cells are organized into tissues.
- b) Specialized tissues are organized into an organ system.
- c) Organs work with other organs to form an organism.
- d) All of the above are correct.

**Reading Questions: Cell Theory**

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**8. Which of the following are parts of the cell theory?**

- a) All cells come from other cells.
- b) All organisms are composed of cells.
- c) Cells are alive and the basic units of organization in all organisms.
- d) All of the above are parts of the cell theory.

**9. Who developed the idea that all cells come from other cells?**

- a) Robert Hooke
- b) Rudolf Virchow
- c) Rudolf Hooke
- d) Robert Virchow

**10. When were cells observed for the first time?**

- a) 1965
- b) 1865
- c) 1858
- d) 1665