

Cell Structure and Function

Section I: The Discovery of Cells



Cells are fascinating. They are the smallest and most fundamental unit of all living things and are the foundation of life itself. Cells can exist in simple forms, as found in bacteria, or complex structures, as seen in plants and animals. However, without the invention of the microscope, cells would have remained invisible throughout much of human history.

The development of microscopes allowed scientists to see that cells were composed of many parts with many functions. One type of microscope, the compound microscope, uses two or more lenses to magnify an object like those commonly found in a biology lab. In 1665, a scientist named Robert Hook used an early compound microscope to look at a cork slice and coined the term “cell” to describe the tissue. The development of an **electron microscope**, which uses electromagnetic fields, allows objects to be magnified up to 500,000 times using beams of electrons instead of light. The transmission electron microscope (TEM) lets scientists see cell structures. Additionally, the scanning electron microscope (SEM) enables scientists to see a cell’s three-dimensional shape, allowing them to study its surface. Further innovations include the **scanning probe microscope**, which generates images by tracing the surface of a cell or structure with a probe.

With the development of microscopes, scientists could observe and learn more about cells, creating a fundamental concept of biology. **Cell theory** was developed out of their conclusions. Cell theory has three main components. First, all living things are made of one or more cells. Secondly, cells are the basic unit of structure and function in all living things. Finally, all cells come from other cells.



Cell Theory

- 1. All living things are made of one or more cells.**
- 2. Cells are the basic unit of structure and function in all living things.**
- 3. All cells come from other cells.**

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Section I: The Discovery of Cells Continued

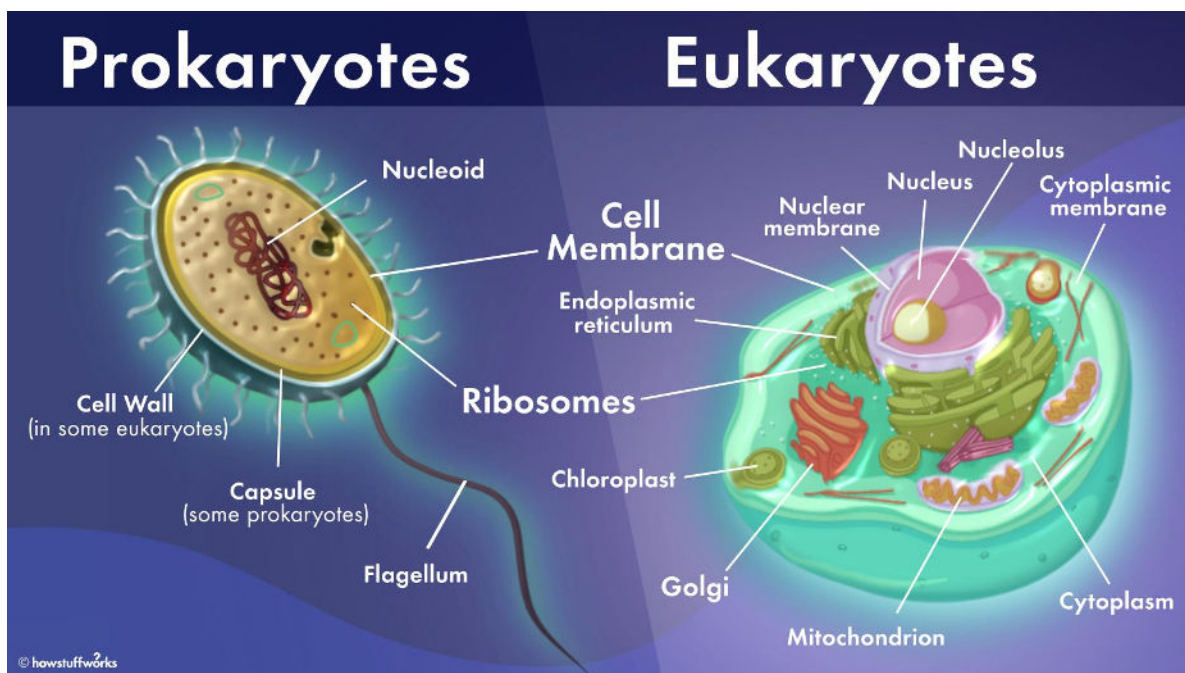
Throughout the history of scientific exploration, a diverse array of researchers and thinkers have played pivotal roles in deepening our understanding of cells.

Scientist	Contribution to Cell History
Hans & Zacharias Jansen – 1590	Invented the compound microscope, which allowed for the first observations of cells and their structures.
Rudolph Virchow – 1850	Proposed that cells arise only from pre-existing cells, introducing the concept of cell division and laying the groundwork for modern cell theory.
Rosalind Franklin – 1952	A chemist who used X-ray crystallography to capture the first image of DNA's structure, which was crucial to understanding DNA's double helix shape.
Walter Fleming – 1882	Discovered and described chromosomes during cell division, leading to the understanding of their role in heredity and cell reproduction.
Robert Brown – 1833	Discovered the cell nucleus in plant cells, which led to the understanding that cells contain various structures with specific functions.
Matthias Schleiden – 1838	Proposed that all plants are composed of cells, contributing to the development of the cell theory.
Anton von Leeuwenhoek – 1670	Developed powerful microscopes and was the first to observe and describe microorganisms, including bacteria and protists, as well as human blood cells.
Barbara McClintock – 1940	Discovered "jumping genes" in corn, demonstrating that genes can change position within the genome. Her work challenged the static view of the genome and contributed to understanding gene regulation and cell variability.
Theodore Schwann – 1839	Alongside Matthias Schleiden, proposed that all animals are composed of cells, contributing to the development of the cell theory.
Ernest Everett Just – 1939	Pioneered research on fertilization and cell behavior, particularly in marine invertebrates, contributing to the understanding of cellular processes and development.
Robert Hooke – 1665	Coined the term "cell" after observing cork under a microscope. His observations and drawings laid the foundation for the study of cells as basic units of life.

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All cells contain small structures called **organelles**. Each organelle has a specific function in the cell. There are two distinct types of cells called **prokaryotic** and **eukaryotic**. Prokaryotic cells were the first to evolve. They lack a true nucleus and other membrane-bound organelles. They tend to be smaller and simpler. Bacteria and archaea are examples of prokaryotic cells. Eukaryotic cells are similar; all have a nucleus surrounded by a membrane and other membrane-bound organelles. Protists, fungi, plants, and animals are all eukaryotic cells.



Review:

1. How did the invention of the microscope contribute to our understanding of cells?
2. What is cell theory?
3. Explain how prokaryotic and eukaryotic cells are different.