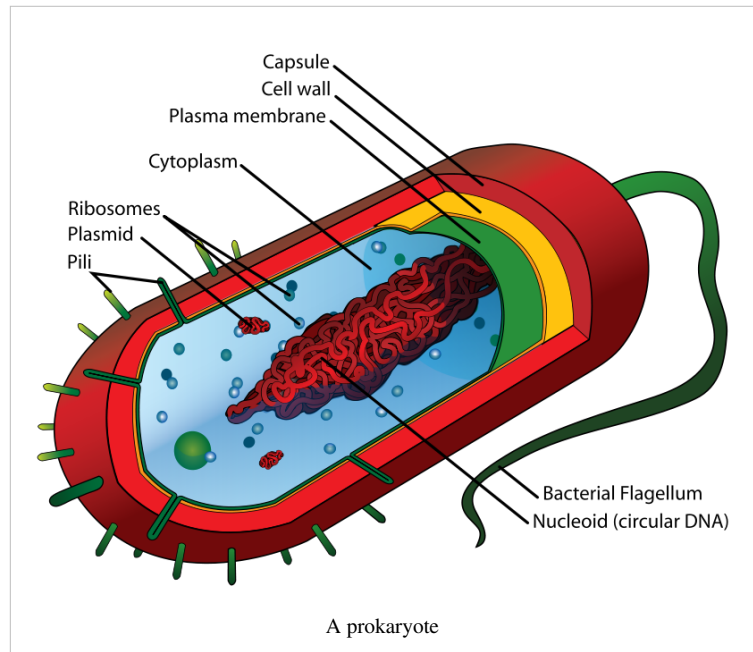


# Cell theory

**Cell theory** refers to the idea that cells are the basic unit of structure in every living thing. Development of this theory during the mid 17th century was made possible by advances in microscopy. This theory is one of the foundations of biology. The theory says that new cells are formed from other existing cells, and that the cell is a fundamental unit of structure, function and organization in all living organisms.



## History

The cell was discovered by Robert Hooke in 1665. He examined (under a coarse, compound microscope) very thin slices of cork and saw a multitude of tiny pores that he remarked looked like the walled compartments of a honeycomb. Because of this association, Hooke called them cells, the name they still bear. However, Hooke did not know their real structure or function.<sup>[1]</sup> Hooke's description of these cells (which were actually non-living cell walls) was published in *Micrographia*.<sup>[2]</sup> His cell observations gave no indication of the nucleus and other organelles found in most living cells.

The first man to witness a live cell under a microscope was Antony van Leeuwenhoek (although the first man to make a compound microscope was Zacharias Janssen), who in 1674 described the algae *Spirogyra* and named the moving organisms animalcules, meaning "little animals".<sup>[3]</sup> Leeuwenhoek probably also saw bacteria.<sup>[4]</sup> Cell theory was in contrast to the vitalism theories proposed before the discovery of cells.

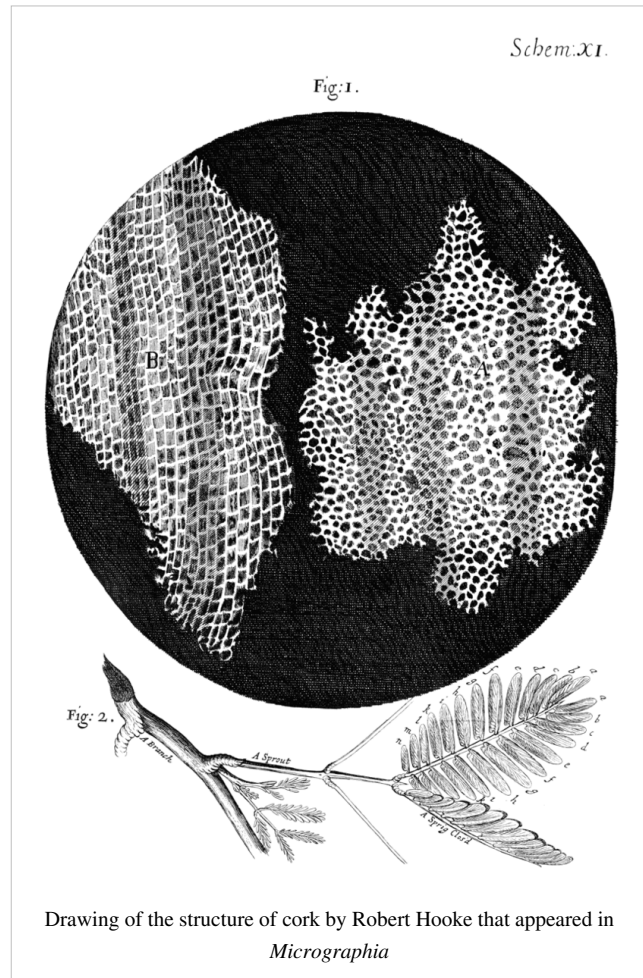
The idea that cells were separable into individual units was proposed by Ludolph Christian Treviranus<sup>[5]</sup> and Johann Jacob Paul Moldenhawer<sup>[6]</sup>. All of this finally led to Henri Dutrochet formulating one of the fundamental tenets of modern cell theory by declaring that "The cell is the fundamental element of organization"<sup>[7]</sup>

The observations of Hooke, Leeuwenhoek, Schleiden, Schwann, Virchow, and others led to the development of the cell theory. The cell theory is a widely accepted explanation of the relationship between cells and living things. The cell theory states:

- All living things or organisms are made of cells.
- New cells are created by old cells dividing into two.
- Cells are the basic building units of life.

The cell theory holds true for all living things, no matter how big or small, or how simple or complex. Since according to research, cells are common to all living things, they can provide information about all life. And because all cells come from other cells, scientists can study cells to learn about growth, reproduction, and all other functions that living things perform. By learning about cells and how they function, you can learn about all types of living things.

Credit for developing cell theory is usually given to three scientists: Theodor Schwann, Matthias Jakob Schleiden, and Rudolf Virchow. In 1839, Schwann and Schleiden suggested that cells were the basic unit of life. Their theory accepted the first two tenets of modern cell theory (see next section, below). However the cell theory of Schleiden differed from modern cell theory in that it proposed a method of spontaneous crystallization that he called "Free Cell Formation"<sup>[8]</sup>. In 1858, Rudolf Virchow concluded that all cells come from pre-existing cells, thus completing the classical cell theory.



## Classical interpretation

1. All living organisms are made up of one or more cells.
2. Cells are the basic unit of life.
3. All cells arise from pre-existing cells. (*omni cellulae e cellula*)
4. The cell is the unit of structure, physiology, and organization in living things.
5. The cell retains a dual existence as a distinct entity and a building block in the construction of organisms.

## Modern interpretation

The generally accepted parts of modern cell theory include:

1. The cell is the fundamental unit of structure and function in living organisms.
2. All cells arise from pre-existing cells by division.
3. Energy flow (metabolism and biochemistry) occurs within cells.
4. Cells contain hereditary information (DNA) which is passed from cell to cell during cell division.
5. All cells are basically the same in chemical composition in organisms of similar species.
6. All known living things are made up of one or more cells.
7. Some organisms are made up of only one cell and are known as unicellular organisms.
8. Others are multicellular, composed of a number of cells.
9. The activity of an organism depends on the total activity of independent cells.

## Exceptions

1. Viruses are considered alive by some, yet they are not made up of cells. Viruses have many features of life, but by definition of the cell theory, they are not alive.
2. The first cell did not originate from a pre-existing cell. There was no exact first cell since the definition of cell is imprecise.
3. Mitochondria and chloroplasts have their own genetic material, and reproduce independently from the rest of the cell.

## Types of cells

Cells can be subdivided into the following subcategories:

1. *Prokaryotes*: Prokaryotes lack a nucleus (though they do have circular DNA) and other membrane-bound organelles (though they do contain ribosomes). Bacteria and Archaea are two domains of prokaryotes.
2. *Eukaryotes*: Eukaryotes, on the other hand, have distinct nuclei bound by a nuclear membrane and membrane-bound organelles (mitochondria, chloroplasts, lysosomes, rough and smooth endoplasmic reticulum, vacuoles). In addition, they possess organized chromosomes which store genetic material.

## See also

- Cell biology
  - Cell division
  - Cell signaling
  - Cell adhesion
  - Cellular differentiation
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