

Intro to cells

An introduction to cells, including the history of their discovery and the development of cell theory.

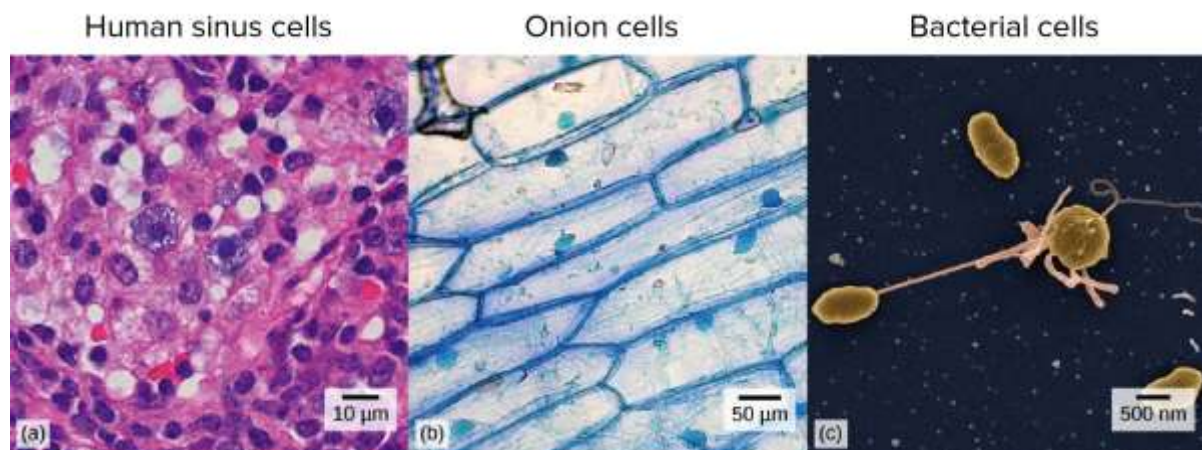
Introduction

Close your eyes and picture a brick wall. What is the basic building block of that wall? A single brick, of course. Like a brick wall, your body is composed of basic building blocks, and the building blocks of your body are cells.

Fortunately, your cells are way more interesting than bricks. (Just as you, undoubtedly, are much more interesting than a brick wall!) Bricks are generally square-shaped, like all other bricks, while cells can have many shapes—round, square, spindle-shaped, and star-like. Bricks generally stay put, while many types of cells will happily migrate from one place to another. And if you slice a brick in half, you just find more brick, while if you slice a cell in half—which is a good trick, given how tiny they are—you'll find an intricate and beautiful array of specialized structures that help the cell perform its function. Yes, cells are building blocks, but they're the most amazing building blocks in the world!

Cells perform a huge number of different roles within your body. For example, epithelial cells protect the outside surface of the body as part of the skin and cover the organs and body cavities within. Bone cells build up bones to provide support for the body. Cells of the immune system fight invading bacteria. Blood and blood cells carry nutrients and oxygen throughout the body while removing carbon dioxide. Each of these cell types plays a vital role in the growth, development, and day-to-day maintenance of the body.

In spite of their enormous variety, however, cells from all organisms—even ones as diverse as humans, onions, and bacteria, shown from left to right in the pictures below—share certain fundamental characteristics. We'll explore these more in the articles to come. Here, we'll take a quick peek at cell theory and at how cells were first discovered.



Micrographs of human, onion, and bacterial cells.

Image credit: modified from "[Introduction: Figure 1](#)" by OpenStax College, Biology, [CC BY 3.0](#); a: modification of work by Ed Uthman, MD; b: modification of work by Umberto Salvagnin; c: modification of work by Anthony D'Onofrio, William H. Fowle, Eric J. Stewart, and Kim Lewis of the Lewis Lab at Northeastern University; scale-bar data from Matt Russell

Cell theory

It may seem obvious now that we, and other living things, are made up of cells. Prior to the 1600s, however, it wasn't obvious at all, for the simple reason that no one had ever seen a cell up close and personal. To distinguish individual cells in a piece of tissue or individual bacteria in a sample of liquid required the development of relatively high-powered **microscopes**, instruments used for magnifying objects otherwise too small to be seen. For more on how microscopes are used in biology today, check out the article on [microscopy](#).

The first person to observe cells as microscopic structures was the British scientist Robert Hooke. In fact, he was the person who gave cells their name. In his book *Micrographia*, he used the term cell to refer to the box-like structures he saw when he looked at dead cork tissue through a simple microscope¹. He chose cell as the name because these boxes reminded him of the cells of a monastery, the simple rooms in which monks slept².

The cells that Hooke observed, however, were in dead tissue, and were in fact cell walls left behind after the death of the real cells. The first person to observe living, moving cells was Anton van Leeuwenhoek, a Dutch shopkeeper and crafter of lenses. In the 1670s, inspired by Hooke's book, he began to build his own, more powerful microscopes³. With these, he was able to observe living single-celled organisms—such as bacteria—and sperm cells, which he collectively called animalcules.

Despite the discovery that cells existed, it took quite some time for scientists to realize that they weren't just an odd fringe case, but rather, the essential building blocks of all plants, animals, and other living things. In fact, it wasn't until the 1830s that botanist Matthias Schleiden and zoologist Theodor Schwann put forth a revolutionary idea: all the different parts of plants and animals are made up of cells, and that cells can be produced from other cells⁴.

German scientist Rudolf Virchow later added to this theory by stating that all cells must come from other cells—not just that some cells could, under the right circumstances, be formed this way⁵. However, he appears to have actually stolen this idea from Polish scientist Robert Remak⁶.

The ideas of all these early thinkers are summarized in modern **cell theory**, which states:

1. All living things are composed of one or more cells.
2. The cell is the basic unit of life.
3. New cells arise from pre-existing cells.

That's all fine and dandy, but it may leave you wondering: if all cells come from cells, where did that first cell come from? We'll return to that head-scratcher in later articles, when we look at the origins of life.