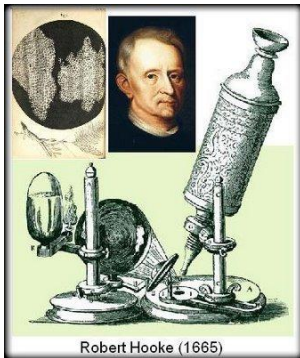


# Discovery of the Cell and Mitosis

While some scientists argued over spontaneous generation, others were using the first microscopes to examine and describe cells. The discovery of cells was only possible after the compound microscope was invented by a Dutch lens maker, **Zacharias Janssen**, in **1590**.



The First Compound Microscope (circa 1595)



Robert Hooke (1665)

English physicist **Robert Hooke** first described cells in **1665**. He made thin slices of cork (a type of tree) and observed many small boxes that reminded him of cells (small rooms) in a monastery. So, he called what he saw under the microscope “cells”. Because the cork was already dead and dried, the cells were empty. At the time Hooke thought they had only contained water when the cork was alive.

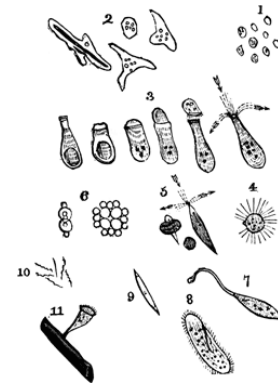
In **1670**, **Antony van Leeuwenhoek**, built a simple microscope that would magnify at 250x. He was the first person to observe bacteria and protozoa. He studied Protists, plant cells, various types of algae, and was the first person to view bacteria, which he termed "*animalcules*". Leeuwenhoek discovered these bacteria while viewing scrapings from his teeth and the teeth of others. He also discovered blood cells and was the first to see living sperm cells in animals.



Antonie van Leeuwenhoek (1632-1723)



Leeuwenhoek Microscope (circa late 1600s)



For the next 150 years, numerous scientists used both the simple and compound microscopes to look at many types of living and non-living materials.



**Barthelemy Dumortier** was a botanist who was the first scientist to observe reproduction by cell division in plants. In **1832**, he published his findings and called the process he saw “binary fission”.



In **1838**, **Matthias Schleiden**, a German botanist, concluded that all plant tissues are composed of cells and that an embryonic plant arose from a single cell. He declared that the cell is the *basic building block* of all plant matter. This statement of Schleiden was the first generalizations concerning cells.

Schlieden investigated plants microscopically and conceived that plants were made up of recognizable units, or cells. He thought plant growth came about through the production of new cells, which, he speculated, came from the nuclei of old cells. Although later discoveries proved him wrong about the role of the nucleus in mitosis, his conception of the cell as the common structural unit of plants shifted study from to processes going on in a living cell.



In **1839**, **Theodor Schwann**, a German biologist, reached the same conclusion as Schleiden about animal tissue being composed of cells, ending speculations that plants and animals were different in structure. Schwann described cellular structures in animal cartilage. He pulled existing observations together into theory that stated: 1. Cells are organisms and all organisms consist of one or more cells. 2. The cell is

the basic unit of structure for all organisms and that plants and animals consist of combinations of these structures. In other words, **the cell is the basic unit of life**. This statement was the second generalization concerning cells and is the most important in the development of biology. It became known as the **cell theory**.

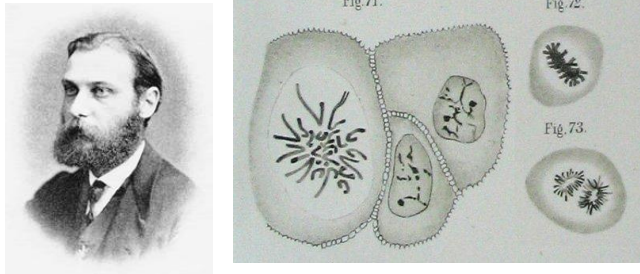


**Robert Remak** was able to confirm Dumortier’s findings in animal cells. He was able to see cell division in animal cells as early as **1844**. However, many scientists at the time did not agree with him. Rudolf Virchow finally published Remak’s findings as his own in 1855.

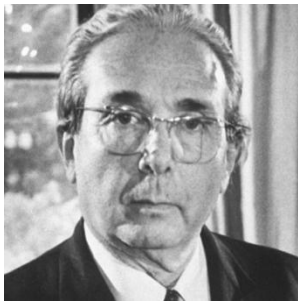


In **1855**, the German physiologist, physician, pathologist, and anthropologist **Rudolf Virchow** was able to add a third part to the cell theory. He stated that all cells develop only from existing cells. Virchow was the first to demonstrate that the cell theory applies to diseased tissue as well as to healthy tissue. Diseased cells derive from the healthy cells of normal tissue. He did not, however, accept Louis Pasteur's germ theory of disease.

**Walter Flemming** was a German biologist, studied chromosomes inside cells. He is given credit as the first scientist to study mitosis (cell division). In **1878**, he published his findings and concluded that cells divide in a process he called mitosis. He is also the first scientist to describe chromosomes.



Around **1930**, a Hungarian physicist named **Leo Szilard** designed the electron microscope. However, Szilard did not build the microscope. In **1931**, **Ernst Ruska** and **Max Knoll** built the first electron microscope that could magnify at 400x. In **1933**, **Ruska** built another electron microscope that was more powerful than any other compound microscope at that time. These powerful electron microscopes allowed scientists to study pieces and processes inside cells that they could not see before.



Leo Szilard



Ruska and Knoll with the first electron microscope



Ernst Ruska and Max Knoll

In **1953**, **Francis Crick** and **James Watson** working at one university, and **Maurice Wilkins** and **Rosalind Franklin** working at another university were the first two teams of scientists to properly describe DNA.



Francis Crick James Watson Maurice Wilkins Rosalind Franklin



Biological discoveries and new technology are still being described and created today. There is no limit to what can be discovered in the future.