

# Microscopes and cell theory



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Use available evidence to assess the impact of technology, including the development of the microscope on the development of cell theory. Over a period of nearly 400 years, technology has impacted so significantly on humanities understanding of life. This is due to the development of the microscope, examining the invisible, discovering the building blocks of life, and the creation of the cell theory. This theory is so fundamental to our current knowledge of the functioning of living organisms.

The development of cell theory is closely linked to the improvements of the microscope and other technologies. Initially the cell was observed as a unit of structure, but continuous experiments demonstrated their functional importance. Over time, the theory has been modified, introducing ideas of spontaneous generation or free formation. It was believed that living cells could be derived from non-living matter, but was disproved upon the invention of magnification.

The use of lenses for magnification arose from Galileo's observations of astronomy and distant objects. Malpighi was the first scientist to use lenses to magnify living organisms in the 1600s, but was not as significant in the development of cell theory as Leeuwenhoek, constructing simple microscopes. He discovered a variety of microbes in rainwater, including yeast cells, bacteria and protozoa, using a single lens microscope. Hooke was the first to design a compound microscope, and the multiple lenses allowed him to develop the word "cell" in 1655.

In 1805, German microscopist Oken claimed that all living things consisted of cells, and Brown in 1831 discovered the nucleus as a regular feature of plant cells. Schleiden and Schwann were the first to propose the cell theory in

1838, including the theory of the spontaneous generation of cells. In 1858, Virchow proposed a modification of the cell theory, concerning the idea that cells could derive from existing cells, and Pasteur confirmed that spontaneous generation did not occur in 1862.

In the 1930s, the electron microscope was developed, allowing greater magnification, and a more detailed understanding of cellular structure and function. The progress of cell theory closely relates to the history of technology developments. In the 1800s, the stains and dyes used for sectioning slides and fixatives were enhanced to provide better specimen mounting, leading to the discovery of cholera bacteria, and Golgi apparatus in cells. In 1938, the invention of the centrifuge enabled the separation of cell nuclei, facilitating a more detailed study of specific organelle.

The ability to view viruses was a result of the development of the electron microscope in the 1920s and 1930s, also providing superior magnification and resolution. The construction of freeze-fracture in the 1960s allowed the closer dissection at the structure of cell membranes, contributing to a greater understanding of their multiple functions. The development of cell theory would not have occurred if it were not for the advances in microscopic technologies. Both enable a deeper understanding of cell composition and function, reproduction, the production of proteins and inheritance.