

02- Microorganisms & History, Microscopy (Instructor: Şeref Tağı)

Microorganisms, or microbes, are very small organisms; many types of microbes are too small to see without a microscope, although some parasites and fungi are visible to the naked eye. Therefore, the science of microbiology is dependent on technology that can artificially enhance the capacity of our natural senses of perception.

While the ancients may have suspected the existence of invisible “minute creatures,” it wasn’t until the invention of the microscope that their existence was definitively confirmed. It is unclear who exactly invented the microscope.

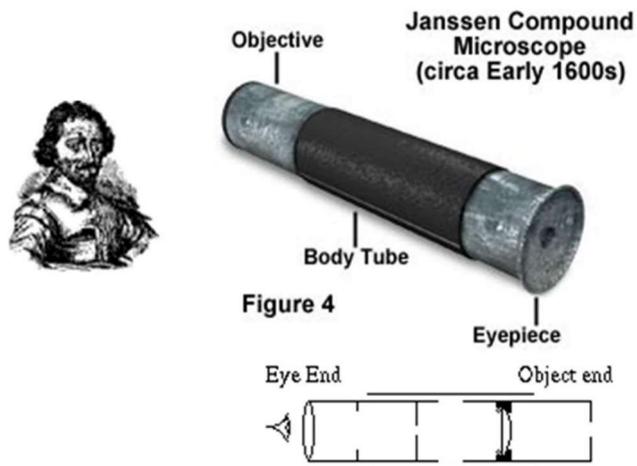


So the crucial question still remain to ask **“Who invented the microscope?”**

- The invention of the microscope, is clouded in mystery in who can lay claim to been the inventor of the microscope; the only thing known for sure is that the microscope was invented in the 1590s.
- Some historians believe that “Hans Lipperhey” should be given the honour of the inventor of the microscope. Lipperhey settled in Middleberg, where he produced spectacles, binoculars, and some early microscopes and telescopes. Hans became famous for filing the first patent for a telescope.
- At the same time and in the same town, Hans and Zacharias Janssen (father and son Team), were spectacle makers. The microscope illustrated in the next page was built by Zacharias Janssen, probably with the help of his father Hans in 1595 in Netherlands. They were spectacle maker.
- In the 1650s, The Dutch diplomat William Boreel was a longtime friend of Zacharias Janssen, who had written to him about the microscope in letters. wrote a letter to the Doctor of the French King, where he describes a microscope. Boreel stated that Zacharias Janssen, had started to write to him about his new invention.

First Microscope by Zacharias Janssen (1595)

Janssen microscope was one of the first



The microscope consisted of three draw tubes with lenses inserted into the ends of the flanking tubes. The eyepiece lens was bi-convex and the objective lens was plano-convex, a very advanced compound design for this time period.

Focusing of this hand-held microscope was achieved by sliding the draw tube in or out while observing the sample. The Janssen microscope was capable of magnifying images approximately three times when fully closed and up to ten times when extended to the maximum.

Who was the first to observe microorganisms?

No one is sure who made the first observations of microorganisms, but the microscope was available by the mid-1600s, and an English scientist named Robert Hooke made observations of cells in slices of cork. He noted the various shapes, sizes, and forms of the organisms. He also observed strands of fungi among the specimens he viewed.

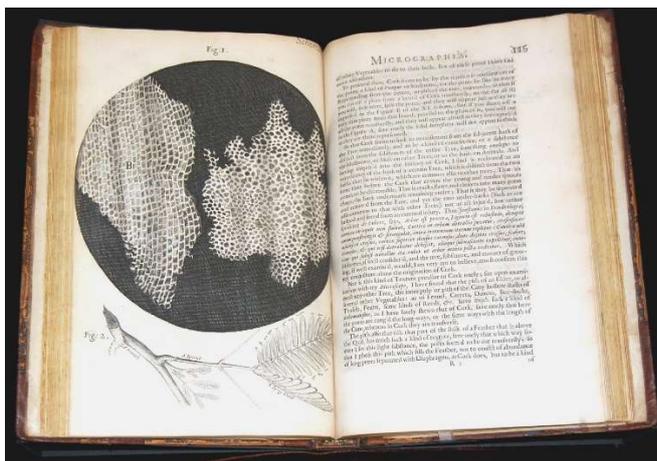
Beginning in the 1670s, a Dutch merchant named Anton van Leeuwenhoek made careful observations of microscopic organisms which he called animalcules. Among his descriptions were those of protozoa, fungi, and various kinds of bacteria. Leeuwenhoek is regarded as one of the first to provide accurate descriptions of the world of microorganisms.

The English mathematician and natural historian Robert Hooke (1635–1703) was an excellent microscopist. In his famous book *Micrographia* (1665), the first book devoted to microscopic observations, Hooke illustrated many microscopic images including the fruiting structures of molds .

He was not only a scientist, he was a mapmaking pioneer, architect, astronomer, biologist and ingenious experimenter. He was a founding member and ‘curator of experiments’ at the Royal Society, an academy at the cutting edge of scientific discovery in Britain.

This book, *Micrographia*, was the first important work on microscopy, the study of minute objects through a microscope. First published in 1665, it contains large-scale, finely detailed illustrations of some of the specimens Hooke viewed under the microscopes he designed. At the end of the book, there are observations of the stars and moon as seen through a telescope.

Hooke described the structures he observed as resembling “Honey-comb,” and as “small Boxes or Bladders of Air,” noting that each “Cavern, Bubble, or Cell” is distinct from the others (in Latin, “cell” literally means “small room”). They likely appeared to Hooke to be filled with air because the cork cells were dead, with only the rigid cell walls providing the structure.

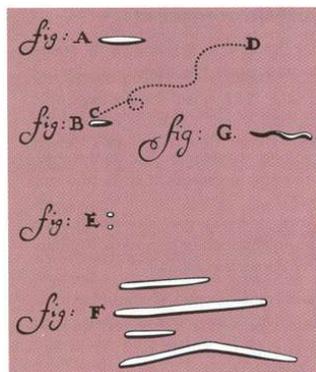
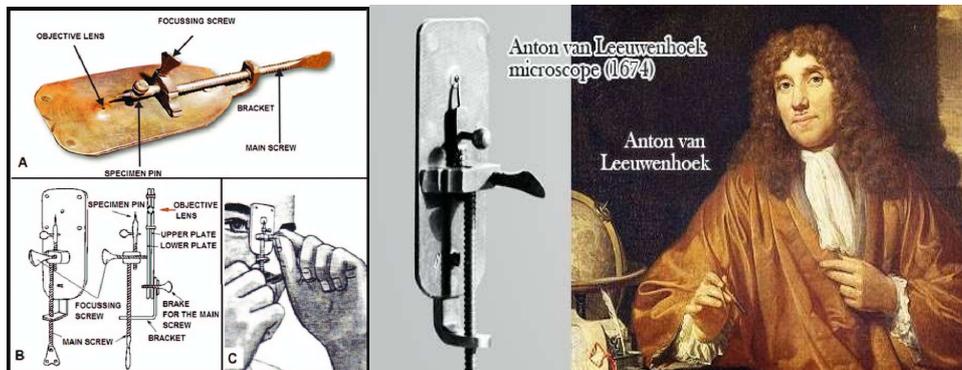


Robert Hooke (1665): first “cells” from cork; and mold cells (*Micrographia*, 1665)

About Antony Van Leeuwenhoek and his Microscopes

A Dutch cloth merchant named Antonie van Leeuwenhoek (1632–1723) was the first to develop a lens powerful enough to view microbes. His first experience with microscopy was examining threads and cloth under a magnifying glass. He gained skill in making his own lenses and then building the microscope frame to hold them. He was the first to observe microorganisms

Some people refer to him as the father of the microscope, although compound microscopes had been in existence for 50 years prior to van Leeuwenhoek's birth. In 1675, using a simple but powerful microscope, Leeuwenhoek was able to observe single-celled organisms, which he described as "animalcules" or "wee little beasties," swimming in a drop

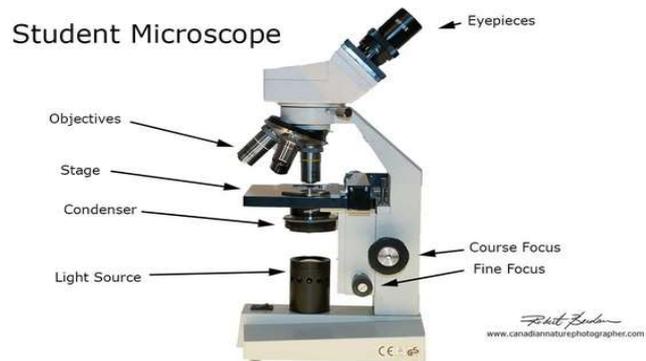
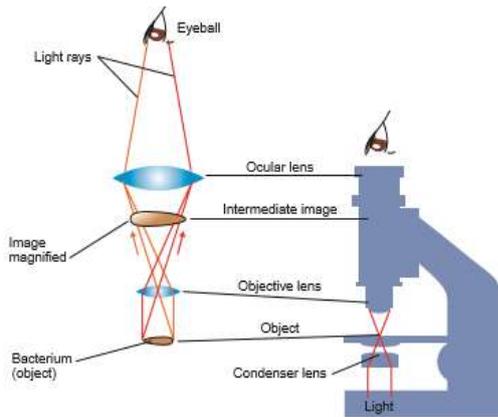


Antony Van Leeuwenhoek and his Microscopes, and his drawing of bacteria

Today's Microscopy

Many types of microscopes fall under the category of light microscopes, which use light to visualize images. Examples of light microscopes include brightfield microscopes, darkfield

microscopes, phase-contrast microscopes, differential interference contrast microscopes, fluorescence microscopes, confocal scanning laser microscopes, and two-photon microscopes. The brightfield microscope, perhaps the most commonly used type of microscope, is a compound microscope with two or more lenses that produce a dark image on a bright background.



Today's microscope , main parts and working principles

References:

- 1- Alcamo's Fundamentals of Microbiology, 2011, Ninth Edition (9 ed.) by Jeffrey C. Pommerville, Jones & Bartlett Publishers, Canada
- 2- <https://www.bl.uk/collection-items/micrographia-by-robert-hooke-1665>
- 3- "Download for free at <https://openstax.org/details/books/microbiology>."