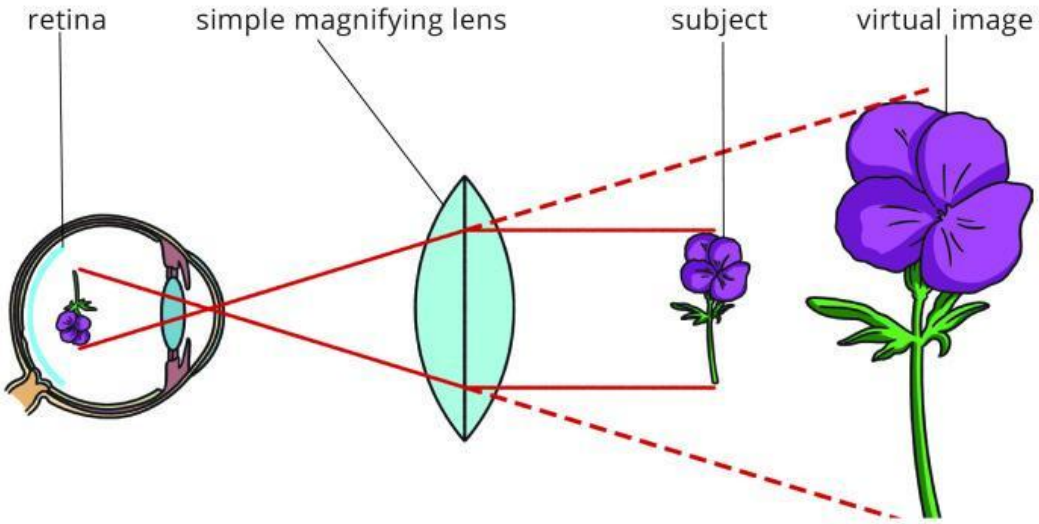
History of the Light Microscope

A microscope is a scientific instrument that makes small objects appear larger so they can be seen in more detail than they can with the naked eye. A light microscope uses lenses to bend light toward the eye so that it seems as if the light came from a much bigger object. This means that it produces a **magnified** image of the object – making smaller details appear larger than they actually are. The illustration below shows how this works:



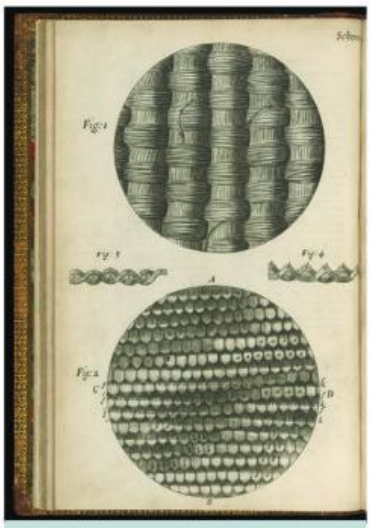
Lenses were first used in glasses in the 14th century. In the late 15th-century, some makers of glasses used the lenses to make an early version of the microscope. The microscope consisted of a sliding tube with different-sized lenses on opposite ends. By sliding the tube in and out, you could focus on an object.

An early version of the microscope

In 1609, Galileo Galilei made his own version of the microscope that could make objects appear 20 to 30 times larger. He called the instrument an Occhiolino, meaning 'little eye'. Giovanni Faber later renamed it a microscope from the Greek words micro meaning 'small' and scope meaning 'to look at'.

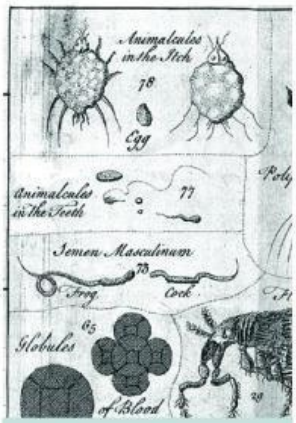
In 1665, Robert Hooke published a book, Micrographia, of observations he had made using a simple microscope illuminated by an oil lamp. He observed pores in some cork and called them 'cells' because they reminded him of the rooms in monasteries, which were also called cells.

By the late 17th-century, improvements to lenses had increased the magnification of microscopes. Antonie van Leeuwenhoek, used these microscopes to view tiny organisms suspended in water, which he called animalcules, meaning 'little animals'. He viewed sperm and blood cells and was the first person to observe bacteria and protozoa.



Engraving from 'Micrographia' by Robert Hooke

The glass used to make the lenses in early microscopes was not pure glass and this made images blurry. Many researchers refused to use these microscopes because they caused errors in the observations that were made.



Observations of animalcules

Microscope technology was improved by:

- using purer glass for the lenses to reduce blurriness;
- adding mirrors to increase the light through the object;
- using microtomes, which cut very thin slices of tissue This helped the light to pass through the tissue.
- using stains to highlight parts of cells or tissues.

As the technology improved, so did the quality of the images so microscopy became more popular among scientists.

The use of microscopes allowed doctors to better understand the causes of disease. Arthur Hill Hassall was a British doctor whose use of the microscope to look at the organisms in London's water supply led to water reforms that improved public health. By the 1880s, microscopes had become an essential tool for doctors in identifying pathogens. Now that they understood what caused diseases, they began to prevent the spread of them through disinfection, quarantine and vaccination.

In the early 19th-century, further developments allowed transparent objects and objects smaller than the wavelength of light to be observed.

A 19th-century microscope featuring an achromatic lens

Glossary

lens	A curved piece of transparent material that forms an image by refracting (bending) light.
magnification	The degree to which an object is made to appear bigger.
observation	Looking carefully and in detail at an object.
organism	A single living thing. Can be multicellular or single-celled.
pathogen	A microorganism that causes infectious disease.
technology	The use of scientific knowledge for a practical purpose.

History of the Light Microscope

1. A microscope is used to make smaller objects appear larger than they actually are.

   Which word describes this process?
   Tick **one** box.

   ☐ magnification

   ☐ observation

   ☐ refraction

2. Name the scientists who came up with the following terms:

   microscope _____

   cell _____

   animalcule _____

3. Briefly describe how a light microscope works.

   _____

   _____

   _____

4. Give **two** developments in technology that increased the use of the microscope.

   1. _____

      _____

   2. _____

      _____

5. People used to believe that diseases were caused by evil spirits and miasma (bad air).

   Give **two** ways that the development of the microscope has contributed to an improvement in public health.

   1. _____

      _____

   2. _____

      _____

Parts of a Microscope

Label the parts of the microscope. Use the words in the box to help you.

arm
base
coarse adjustment knob
diaphragm
eyepiece lens
fine adjustment knob
light source
objective lenses
stage
stage clips

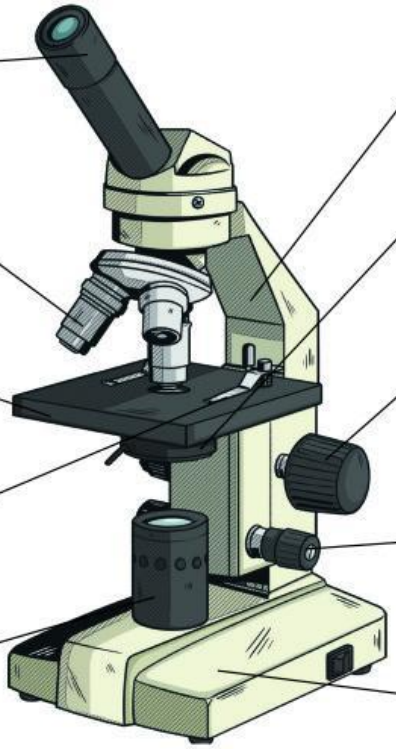
_____
The lens at the top that you look through, typically 10× magnification.

_____
There are 3 or 4 of these lenses that can be rotated between to change the magnification.

_____
A flat platform where the slides are placed.

_____
Hold the slide in place.

_____
A lamp or a mirror that directs light through the bottom of the stage.



_____
Connects the different parts of the microscope together.

_____
Used to vary the amount of light that passes through the stage.

_____
This moves the stage up and down by large amounts so that the object moves closer or further from the objective lens.

_____
This moves the stage up and down by much smaller distances to refine the resolution.

_____
The bottom of the microscope that is used for support.