

“How has the development of the microscope aided the advancement of medicine?”

What is a microscope? By definition, a microscope is an instrument for viewing objects that are too small to be seen easily by the naked eye. The smallest size that we can see with the naked eye is about 20 micrometer. A strand of human hair is about 50-100 micrometer thick. So, the smallest size that we can see with the naked eye would probably be about 2/5 the thickness of a strand of hair.

There are many different kinds of microscopes. Examples of the different kinds of microscopes include the light microscope and electron microscopes. The light microscope, also known as the optical microscope, employs visible light to detect small objects, and is probably the most well-known and well-used research tool in biology. With the advancement of technology and the invention of the light microscope, it allows us to see about 1 micrometer. An electron microscope is a type of microscope that uses electrons to illuminate a specimen and create an enlarged image. Electron microscopes have much greater resolving power than light microscopes and can obtain much higher magnifications due to the small size of electrons. Electron microscopes let us see objects as small as 10 nanometers. Present day instruments give magnifications up to 1250X with ordinary light and up to 5000 with blue light.

Being able to see microorganisms gave us a new tool to use. It has certainly affected how we consider the world around us. For example, we now know that surrounding us is a lot of germs and bacteria and before eating, we should always wash our hands. Also, after the microscope has been invented, diseases could be diagnosed. This is because we now can see what disease we're fighting, and we can identify the organism that causes diseases. This allows us to also think of a cure for different illnesses, for example, to cure certain illnesses by the consumption of antibiotics.

TIMELINE

1st Century AD- Glass was invented by Romans

-Romans discovered that “lenses” (named lenses because they were shaped like the seeds of a lentil) could magnify objects if it was placed over it when experimenting with the different types and shapes of clear glass and found one of their samples to be thick in the middle and thin on the edges.

-An anonymous person discovered that you could direct the rays of a sun into one of these special “lenses” and start a fire. These lenses were then called “magnifying glasses” or “burning glasses”, as mentioned in the writings of Roman philosophers.

13th Century AD- Lenses put into use to invent spectacles.

- 1500s - The invention of the earliest simple "microscopes" was only a tube with a plate for the object at one end and, at the other, a magnifying glass with only one power, which was about 10X. At that point of time, people found it very interesting to look at fleas, and other tiny insects, and hence was named "flea glasses".
- 1590- Two Dutch spectacle makers, Zaccharias Janssen and his son, Hans, started experimenting with several lenses in a tube, and discovered that the objects near the end of the tube then appeared greatly enlarged.
- 1609- Galileo, a father of modern physics and astronomy, heard of these early experiments and started experimenting on his own. He worked out the principles of lenses and light rays, and improved the microscope with a focusing device.
- 1665- Robert Hooke, an Englishman (who is sometimes called the "English Father of Microscopy") published a book called *Micrographia*, which contained drawings of over 100 specimens, and described the use and benefits of the microscope.
- 1674- Anton Van Leeuwenhoek, also known as "the father of microscopy" invented a simple microscope, with one lens of a magnification up to 270X, to examine bacteria, yeast, blood cells in a mere drop of water.
- 1830 – Joseph Jackson Lister reduces spherical aberration or the "chromatic effect" by showing that several weak lenses used together at certain distances gave good magnification without blurring the image. This was the prototype for the compound microscope.
- 1863– Henry Clifton Sorby develops a metallurgical microscope to observe structure of meteorites.
- 1872– Ernst Abbe, then research director of the Zeiss Optical Works, wrote a mathematical formula called the "Abbe Sine Condition". His formula provided calculations that allowed for the maximum resolution in microscopes possible.
- 1903– Richard Zsigmondy developed the ultra microscope that could study objects below the wavelength of light.
- 1931– Ernst Ruska co-invented the first electron microscope. (TEM)
- 1936- Erwin Muller invents a field emission microscope.
- 1938- James Hiller invents another Transmission electron microscope.
- 1951- Erwin Muller invents the field ion microscope and is the first to see atoms.

1955- Frits Zernike, professor of theoretical physics, receives the Nobel Prize in Physics for his invention of phase contrast microscope.

1967- Erwin Muller adds time-of-flight spectroscopy to the field ion microscope, making the first atom probe and allowing the chemical identification of each individual atom.

1981-Gerd Binnig and Heinrich Rohrer invented the scanning tunneling microscope that gives three-dimensional images of objects down to the atomic level.

1986– Gerd Binnig, Quate, and Gerber invents the Atomic force microscope.

1988- Alfred Cerezo, Terence Godfrey, and George D.W. Smith applied a position-sensitive detector to the atom probe, making it able to resolve atoms in 3-D.

1988- Kingo Itaya invents the Electrochemical scanning tunneling microscope.

1991- Kelvin probe force microscope invented.

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