



HISTORY OF MICROSCOPY



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WHY MICROSCOPES? WHY NOT TELESCOPES? DSLRS? GOPROS?

Well, the answer is obvious: **Microscopes are clearly the superior piece of machinery.** They are one of the most powerful tools used to gather data about the world around us – they allow us to see objects that are too small to be viewed by the human eyes.

Microscopes are used in a vast amount of fields including:

- Medicine
- Science
- R&D



HOW IT ALL
BEGAN...

SOME THINGS TO KNOW BEFOREHAND

The microscope is a tool made possible only by the discovery of the power of glass lenses. In first century A.D. (year 100), glass had been invented by Egypt. Romans experimented with different shapes of glass and found an interesting characteristic: when the glass was wide at the center and thin at the edges, if it was held over an object, that object would be magnified (appear larger than reality as seen by human eyes)!

From then, many scientists have studied the properties of these lenses, and that's why we have Snell's law, Book of Optics, etc. The application of this phenomenon (outside of spectacles and magnifying glasses) was never really used until the 13th century, when spectacle makers began to use lenses to make glasses.



Biconvex



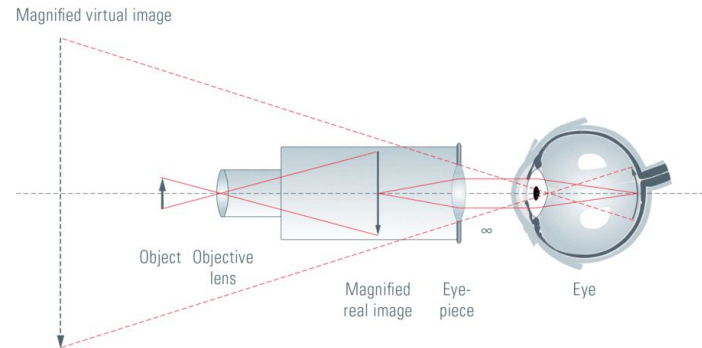
Biconcave



Plano Convex



Plano Concave



Other things to know...

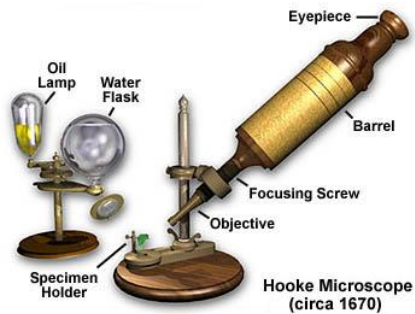
BUT AS WITH MOST BRILLIANT THINGS, THE INVENTOR OF THE MICROSCOPE IS DISPUTABLE...

It is widely believed that Dutch spectacle makers, Zacharias Jansen and his father Hans were responsible for making the first **compound** microscope in the late 16th century (1500s). The microscope consisted of three draw tubes. The eyepiece lens was bi-convex and the objective lens was plano-convex, a very advanced compound design for this time period (during this time, most people still primarily used monocles!). Focusing of this handheld microscope was achieved by sliding the draw tube in or out while observing the sample. The microscope was capable of magnifying images approximately 3x when fully closed and up to 10x when extended to the maximum.

There has been some dispute however, as to whether German born, Hans Lippershey, was another possible inventor, who actually invented the first telescope! The funny thing is, Zacharias Jansen was also reported to have claimed the invention of the first telescope at that time, too.

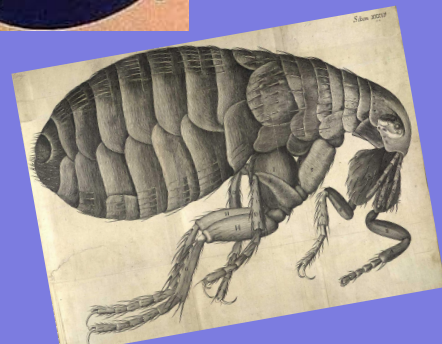
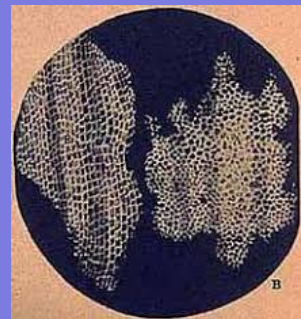
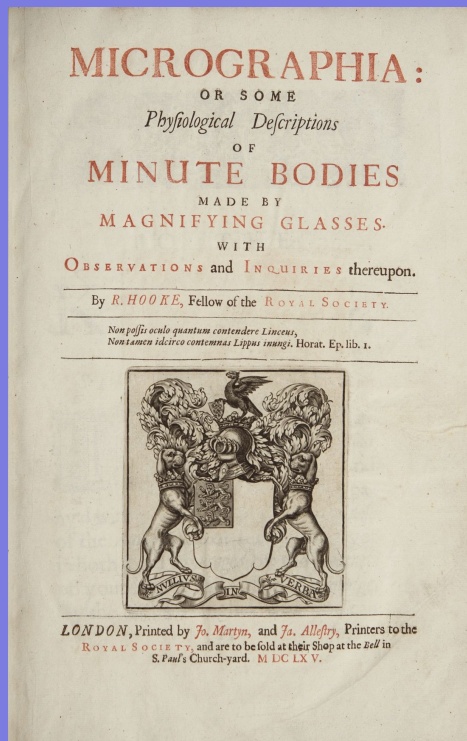
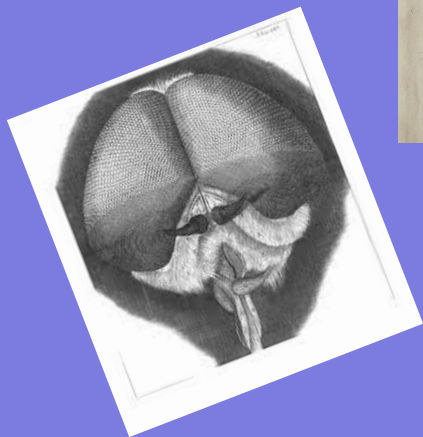
COMPOUND MICROSCOPE

Popularized by Robert Hooke (but
designed by Christopher Cock)



MICROPHAGIA

BY
ROBERT
HOOKE



OVER THE NEXT 200
YEARS....

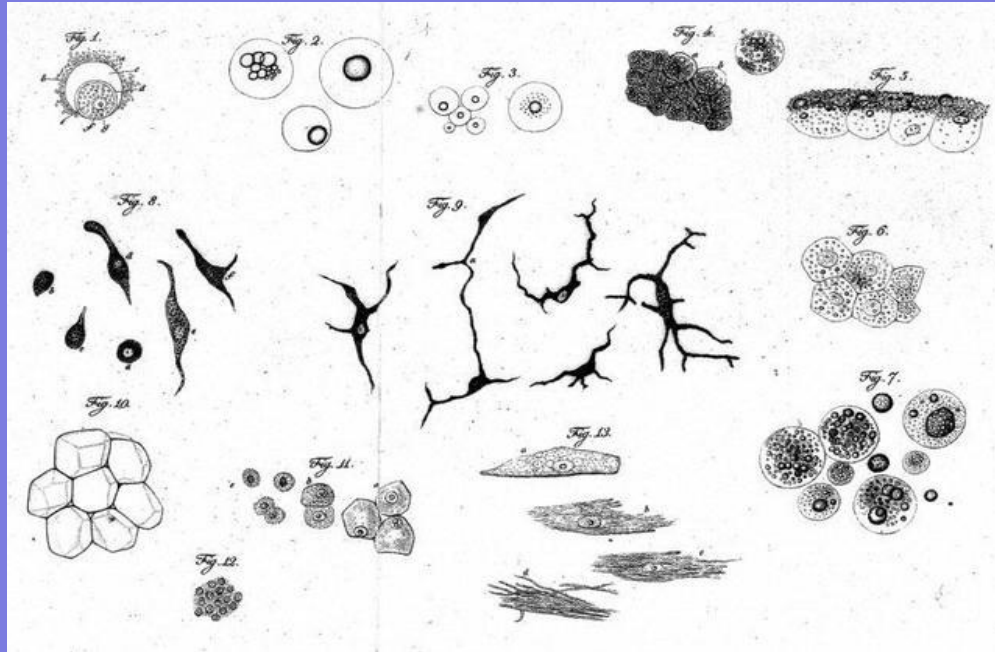
THE WORLD OF MICROSCOPY WAS STAGNANT!

The quality of optical lenses was greatly improved by Anton van Leeuwenhoek, a Dutch scientist, in the mid-17th century. Anton is considered to be the father of microbiology due to the tremendous discoveries he made thanks to his improvements of the microscope.

He was able to get the magnification on the order of 200x because he was able to produce the smallest spherical lenses possible that his predecessors weren't able to via lens grinding - a form of molding glass by heat. This allowed him to study cells, muscle fibres, and the flow of blood in capillaries.

However, for the next 200 years, the improvements in microscopy were marginal; scientists used the Leeuwenhoek technology to make amazing discoveries.

BACTERIA IN POND WATER BY ANTON LEEUWENHOEK



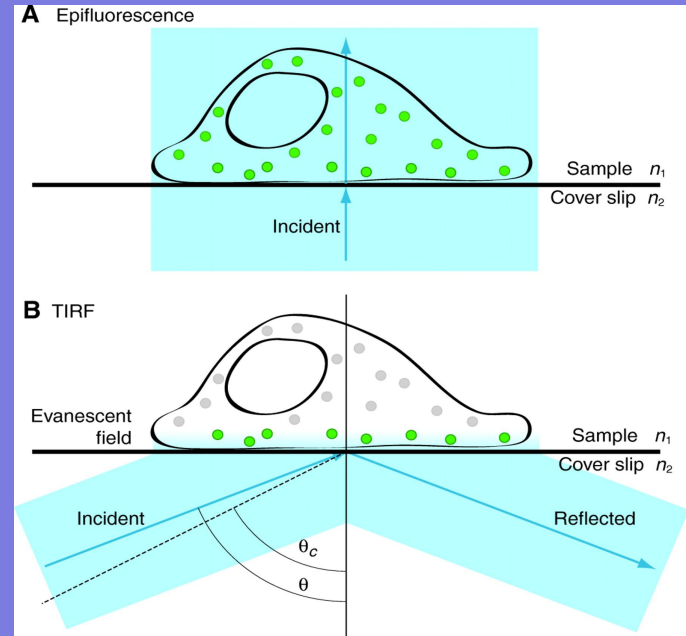
THEN IN THE
1900s...

THE INTRODUCTION OF THE ELECTRON MICROSCOPE

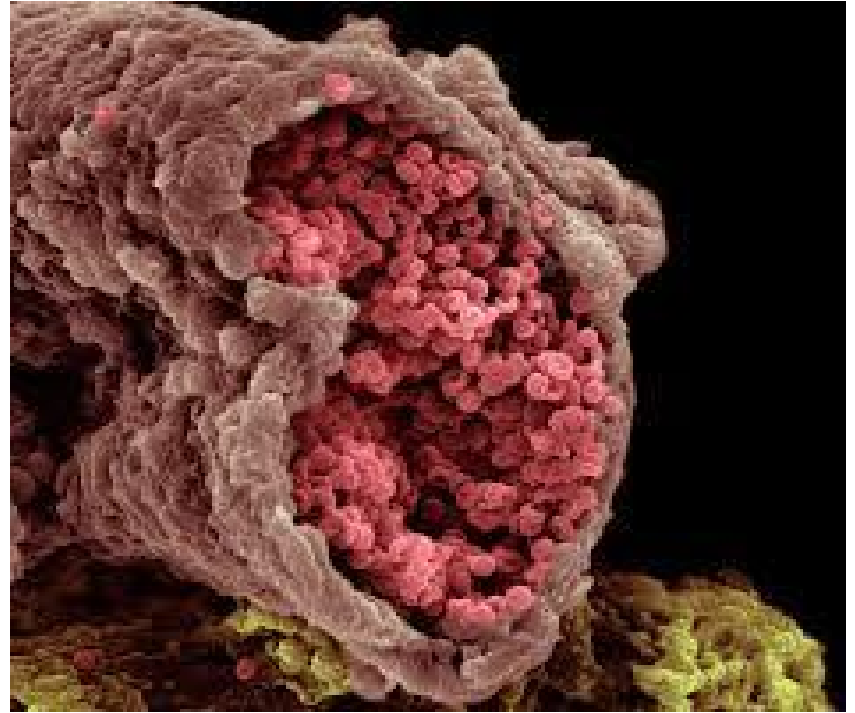
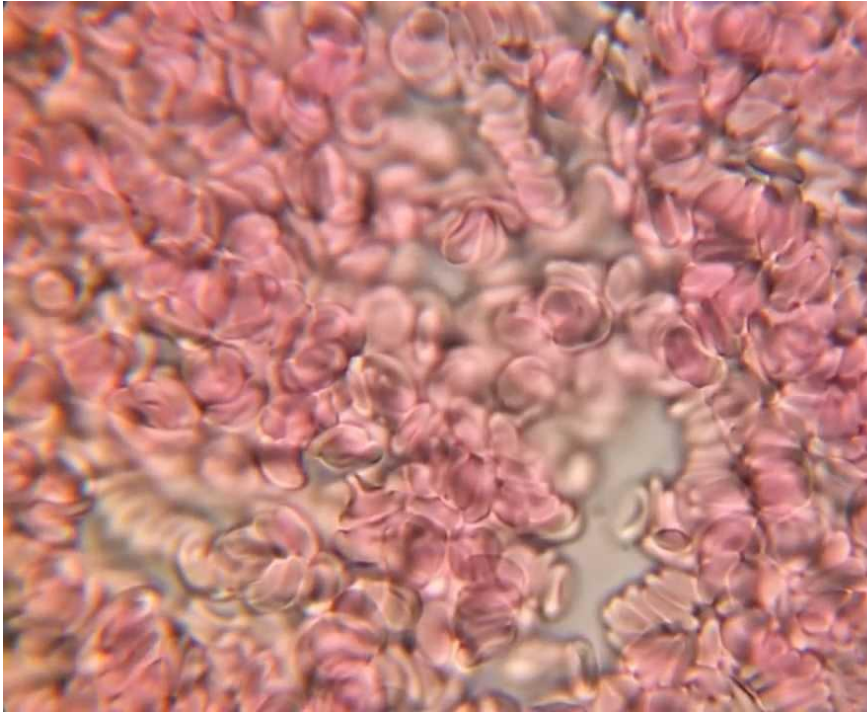
In 1981, two IBM researchers, Gerd Binnig and Heinrich Rohrer, broke new ground in the science of the very, very small with their invention of the scanning tunneling microscope (STM). In the mid-17th century. The STM won the Nobel prize in 1986 and is regarded as the instrument that opened the door to nanotechnology and a wide range of explorations in fields as diverse as electrochemistry, semiconductor science, and molecular biology. To do that, they began experimenting with tunneling, a quantum phenomenon in which atoms escape the surface of a solid to form a kind of cloud that hovers above the surface; when another surface approaches, its atomic cloud overlaps and an atomic exchange occurs.

By maneuvering a sharp metal conducting tip over the surface of a sample at an extremely small distance, the amount of electrical current flowing between the tip and the surface could be measured. Variations in this current could provide information about the inner structure and the height of the surface of the sample. And from this information, one could build a 3-D atomic-scale map of the sample's surface!

STEREO MICROSCOPY ALLOW 3D IMAGING!



BLOOD UNDER LIGHT MICROSCOPE VS ELECTRON MICROSCOPE



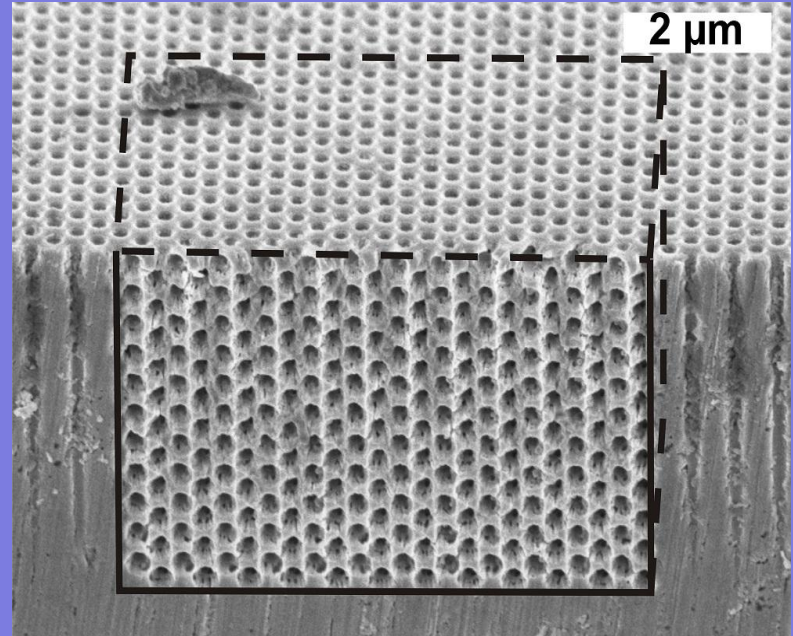
MICROSCOPY TODAY

MICROSCOPES HELP OUR EVERYDAY LIVES

Microscopes are foremostly used to analyze blood samples while performing a blood test. Any signs of cancer cells, infection, etc. can be seen through a microscope.

The more powerful microscopes like electron microscopes are used to study many things ranging from detailed structures of bacteria & viruses (which in turn helps to design medicines against the disorders they might cause) to the study of crystal structures of different surfaces (this has helped to design many things like the wristwatch) and semiconductor technology (computer chip).

PHOTOS OF MODERN IMAGING





THE FUTURE OF MICROSCOPY?

THANK YOU!

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SOURCES

- <http://www.history-of-the-microscope.org/anton-van-leeuwenhoek-microscope-history.php>
- https://en.wikipedia.org/wiki/Scanning_tunneling_microscope
- <https://www.online-sciences.com/technology/what-are-uses-and-importance-of-microscopes>