

Early Microscopes

Early scientists found out exactly what you discovered in the Find Out Activity about the best shape for good magnification. One of the greatest explorers of all time discovered a whole new world without leaving his room. He was a Dutch linen merchant named Anton van Leeuwenhoek. His hobby was making magnifying lenses. With his great skill at grinding very small lenses, Leeuwenhoek made instruments called **microscopes**, which magnified objects up to 300 times (300 \times). Microscopes magnify objects by bending light through a lens. (You will learn more about lenses and magnification in Unit 3, Light and Optical Instruments.) Using his simple microscopes, Leeuwenhoek studied substances such as blood, pond water, and matter scraped from his teeth. He became the first person to observe organisms made of only one cell. He called these single-celled organisms “animalcules.”

When Leeuwenhoek began writing about his discoveries in 1674, he created a sensation. Nobody before had suspected we are surrounded by a parallel world of living things so small they cannot be seen by the unaided eye. Leeuwenhoek’s discoveries excited people’s imaginations. Some people wondered if single-celled organisms might help answer the age-old question: What is life?

DidYouKnow?

Leeuwenhoek discovered micro-organisms by making lenses that could magnify objects as much as 300 times. By comparison, the palm of your hand magnified 300 times would be about the size of an average door.

Figure 1.1 Anton van Leeuwenhoek (1632–1723) used a simple homemade microscope to observe single-celled organisms and other objects.

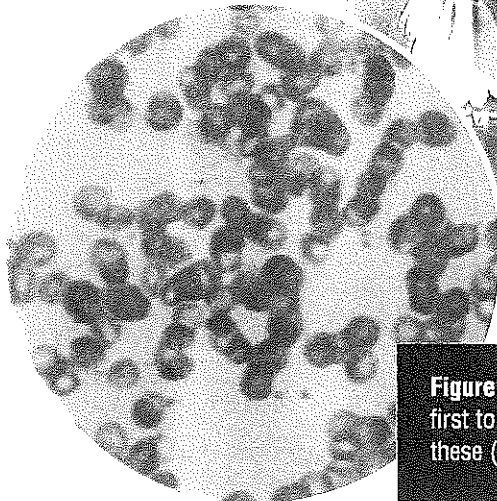


Figure 1.2 Leeuwenhoek was the first to see red blood cells such as these (160 \times).

Pause & Reflect

Imagine yourself in the place of Anton van Leeuwenhoek. What was life like at the time he lived? Use your library or a computer to research van Leeuwenhoek's life and times. Create a comic book, a play, a video, a talk, or some other means to present your ideas about this scientist and his experiences to your class.

Without microscopes, scientists could not have learned anything about the structure of cells. Our eyes cannot see such small objects unless the objects are magnified. Leeuwenhoek's microscopes had only one lens, similar to a magnifying glass. The sample (object) being studied with the microscope was held steady on a platform. A light placed behind the platform produced a bright image.

Microscopes Today

Improvements in technology and design gradually led to the development of modern compound light microscopes, such as the ones in your school. Compound light microscopes have two lenses, which give a greater power of magnification.

The best light microscopes can magnify objects as much as 2000 \times . This still is not enough, though, to see some of the smaller structures inside cells. For this, scientists use electron microscopes, which use beams of electrons instead of light. The electrons are bounced off the sample, then enlarged to form an image on a television screen or photographic plate. The first electron microscope was built in Germany in 1932. It could magnify up to 4000 \times . In 1938, the first practical electron microscope was developed by two Canadians at the University of Toronto: James Hillier of Brampton, Ontario, and Albert Prebus of Edmonton, Alberta. To test their valuable new laboratory tool, they first looked at the edge of a razor blade. Under a light microscope, the magnified blade edge appeared relatively smooth. Under their electron microscope, however, the same edge looked like a mountain range of rugged peaks and valleys! This electron microscope could magnify up to 7000 \times .

Both light and electron microscopes are used extensively today by scientists, engineers, and medical practitioners. Can you think of different microscopic objects each might want to observe?

Your investigations in this unit begin with an introduction to effective microscope use. With these skills, you, too, will be able to explore the microscopic world around you.

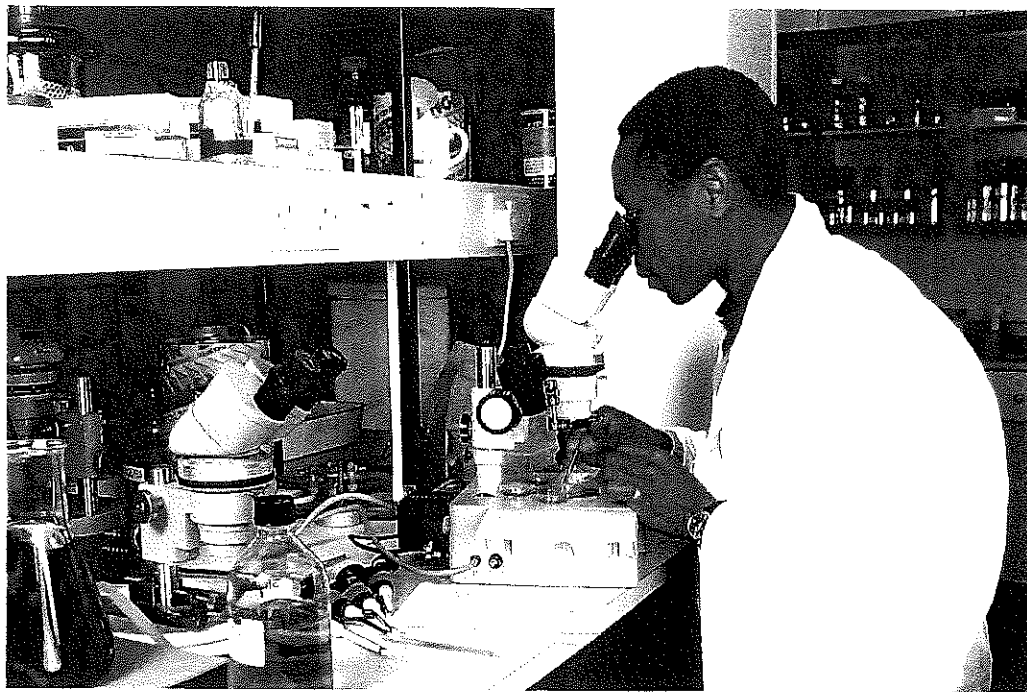


Figure 1.3A A compound light microscope