# Leeuwenhoek: Discoverer of the Microbial World

Great discoveries in science are often made by those who are well-trained in the scientific method. This is to be expected, as much of science is extensions of our present knowledge of the world by building on the foundations that already exist. Even the great Sir Isaac Newton admitted that he could see farther because he stood "on the shoulders of giants". There are rare exceptions to this axiom when outstanding discoveries are made by individuals with no formal scientific training and do not belong to the scientific community. The discovery of the existence of an entire world of microorganisms, invisible to the naked eye, by Antony van Leeuwenhoek, a modest Dutch trader of fabrics, belongs to this rare class. Leeuwenhoek was not the first one to make a microscope. In fact, microscopes with more complex designs were already available in his time. It is his skill and craftsmanship in designing lenses with better magnification power as well as an undying passion to see farther that set Leeuwenhoek apart from others. While his contemporaries including luminaries such as Robert Hooke were content to observe the observables through a microscope in a magnified form, Leeuwenhoek chose to explore the unobserved. Though limited by the knowledge of only his native Dutch language, Leeuwenhoek made meticulous observations and recorded them with the help of an artist. He was the first to observe and report the existence of bacteria, protists, spermatozoa, and blood cells. He was a pioneer in the true sense of the word and the flame that he lighted was later carried by greats like Louis Pasteur and Robert Koch.

Born in the town of Delft in the Netherlands on October 24, 1632, in a middle class family of traders, Leeuwenhoek spent his early years in the towns of Warmond and Benthuizen where he had his early education and apprenticeship. He returned to Delft when he was 22 years old and started his own business as a fabric merchant. Though he was not a scholar and knew only his native language of Dutch, he was a respected member of his community. In his spare time that was apparently plentiful, Leeuwenhoek indulged in his passion – the grinding of magnifying lenses. He used these superior quality lenses that he fabricated to design simple microscopes. It is believed that he was inspired by the book *Micrographia* by Robert Hooke, which had illustrations of the objects that Hooke had observed under a compound microscope. Though Leeuwenhoek's microscopes had only a single lens, they were superior in terms of the magnification they produced and the quality of the images. Leeuwenhoek is known to have fabricated about 500 such microscopes, each about 3 inches long. Many of them had samples permanently mounted for those who wanted to verify his observations.

Leeuwenhoek's discoveries were brought to the attention of the Royal Society, London, by the famous Dutch doctor de Graaf. The then secretary of the Society, Henry Oldenburg, invited Leeuwenhoek to submit his findings so that they could be published in the proceedings of the Society, *Philosophical Transactions*. Encouraged by this invitation, Leeuwenhoek submitted his first letter to the Royal Society in 1673. The contents of his first letter written in Dutch, in which he described observations like the sting of a bee, were not very dramatic. During the next fifty years, Leeuwenhoek continued his correspondence with the Royal Society, describing his wonderful discoveries with the microscope. He could communicate the observation of ciliates in rain water, algae in lake water, bacteria in dental plaques, and fast moving spermatozoa in semen. He was the first to observe the presence of cells in blood. His fame grew as his letters, translated into English or Latin, were published in the *Philosophical Transactions* of the Royal Society. He had many visitors who came to verify his observations. The Royal Society honoured him by electing him a fellow in 1680 for his lifetime achievements. He was in the company of great minds such as Robert Hooke and Isaac Newton though he is not known to have traveled to London to attend any of the meetings of the Society.

Under the loving care of his devoted daughter Maria, Leeuwenhoek continued his observations till his death on August 30, 1723. Other than the fellowship of the Royal Society, he did not receive any honours. But the greatest honour he could receive is the reverence of others who followed in his footsteps and expanded the horizons of our knowledge. Leeuwenhoek's discoveries that inspired great minds like Pasteur and Koch will always remain as important milestones in history.

## Suggested Reading

**[1]** **M Friedman and G W Friedland, Antony Leeuwenhoek and Bacteria; in *Medicine's 10 Greatest Discoveries*. Universities Press, Hyderabad, 1999.**

**[2]** **www.ucmp.berkeley.edu/history/leeuwenhoek.html**

*S Mahadevan*
*Molecular Reproduction, Development and Genetics Department*
*Indian Institute of Science*
*Bangalore 560012, India*
*Email:mahi@mrdg.iisc.ernet.in*