

Nature magnified

Peter Evennett

Single Lens: The Story of the Simple Microscope.

By Brian J. Ford.

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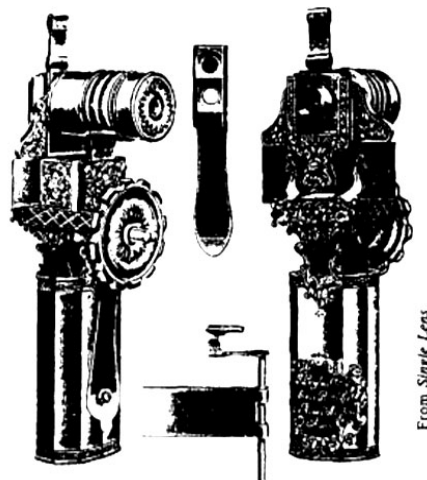
THE simple microscope, one whose optical system consists of a single lens, operating in the manner of a magnifying glass, has a distinguished place in history and quite remarkable capabilities, little known to the general scientist. The origins of its use are obscure, but by far the best known early work is that of Antony van Leeuwenhoek of Delft, communicated in the form of a series of letters to the Royal Society from 1673 until shortly before his death in 1723. One third of Brian Ford's book is devoted to Leeuwenhoek, his microscopes and specimens.

Using single-lens microscopes, Leeuwenhoek was the first to observe Protozoa, bacteria and spermatozoa: truly microscopic objects. In contrast Robert Hooke, Leeuwenhoek's contemporary working in London who published *Micrographia* in 1665, used a compound microscope (consisting of two lenses, objective and eyepiece). Both men's observations were excellent within their own limits, but while Hooke's work — on relatively large objects such as the flea or the sting of the nettle, for example — extended existing knowledge only slightly (though illustrating it most beautifully), Leeuwenhoek broke entirely new ground. The reason for this was principally his choice of microscope: lens design was then in its infancy and, to put it crudely, one poor lens gave better results than two poor lenses.

In addition to his letters, Leeuwenhoek also sent specimens, in small paper packets pasted to the letters; many of these survive in the archives of the Royal Society. In researching this book, Ford took some of the specimens to Utrecht and photographed them with an original microscope, demonstrating to those of us unlikely ever to lay hands on one the nature and quality of the image of a Leeuwenhoek microscope. A study of the surviving instruments shows that they were capable of resolving features as small as one micrometre, with a magnification of several hundred times — a performance as good as that of many school microscopes of today; indeed, for 300 years single-lens microscopes have been

capable of revealing most of the significant structures that can be resolved by a modern light microscope.

After Hooke and Leeuwenhoek, the compound microscope increased in popularity as a "drawing-room" instrument, presumably because of its impressive appearance and greater ease of use; Ford describes the progress of the simple microscope in the form of the cheap flea-glass, the more versatile compass microscope, and the screw-barrel and later designs. A simple microscope is little more



From *Single Lens*

Art of the instrument-maker — an elaborately decorated simple microscope produced in Paris, c. 1720.

than a device to hold a specimen and a lens in suitable relationship one to the other, its design naturally influenced by the nature of the specimen to be examined. Around the middle of the eighteenth century the "aquatic" microscope was designed, arranged to stand on a table, with a movable lens to enable it to scan sensitive creatures such as *Hydra* without disturbance. Linnaeus owned one of these, and a similar though superior example was used by the Scottish botanist Robert Brown in 1827 when he discovered "active molecules" (now known as Brownian movement), and a few years later when he described the nucleus and cytoplasmic streaming in the plant cell. Darwin took a microscope of this kind on the *Beagle* expedition in 1831, on Brown's advice, and wrote of his purchase of another in 1848. An essentially similar instrument is still available as a "dissecting microscope".

The simple microscope has not been well documented previously. Brian Ford's book is a clearly written non-technical account of the instruments, the lenses, their performance and use, illustrated with historical anecdotes, quotations and drawings, and with a useful bibliography. It will interest anyone who uses a microscope and many others besides. □

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