Fig 1: The 300th anniversary of the death of Antony van Leeuwenhoek was marked by a commemorative lecture by Professor Brian J Ford for an audience aboard the Seabourn Voyager. He demonstrated several videos showing the comparison between the views generated by single lensed microscopes, and those that are obtained with present-day instrumentation.

Prof. Brian J Ford recreates seventeenth-century Microscopy

In Cambridge, England, Prof. Brian J Ford is reviving the microscopy of the 1600s in a remarkable series of experiments. He has selected specimens identical to those portrayed by the pioneers, including Robert Hooke and Antony van Leeuwenhoek, and imaged them through a range of microscopes ancient and modern. The oldest he used is a microscope attributed to van Leeuwenhoek and dating from around 1690, the newest being the Hitachi scanning electron microscopes at the Cavendish Laboratory, University of Cambridge.

In order to ensure the images were precisely correlated, Photoshop was used where necessary to ensure that the orientation of features in the modern micrographs matched the original published illustrations.

Prof. Ford, who was made an Honorary Fellow of the Royal Microscopical Society in recognition of his research, has demonstrated the views obtained by pioneering microscopists in his lectures at Cambridge University, the Royal Society, and in public presentations ***(Fig 1)***. He points out that historians of science are rarely microscopists, and his latest programme of research is intended to answer the enduring question in the history of microscopy, namely, what exactly did the pioneers observe, and are their published portrayals truly representative of reality?

His first correlated historical micrographs were published in the *British Journal of Photography* in 1972, when he imaged living, unstained squamous epithelial cells with a modern Leitz instrument and also captured exactly the same specimens through a single lensed Wilson screw-barrel microscope manufactured around 1720 and thus contemporaneous with van Leeuwenhoek. This was the first time such correlated images had been obtained with microscopes old and new, and Prof. Ford's research attracted much interest.

His investigations in 2024 address how the earliest microscopical studies were rendered for publication. It

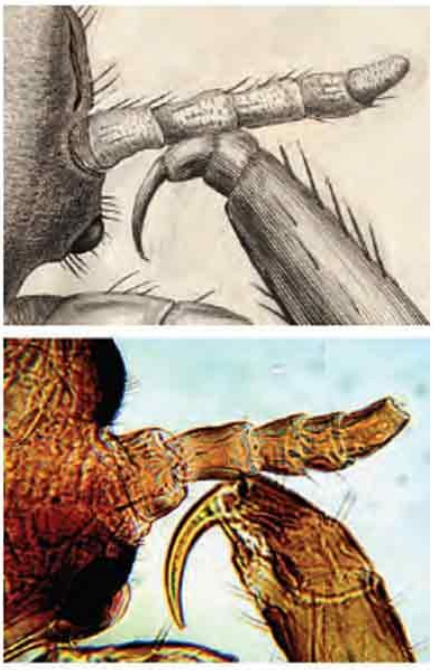

Fig 2: Robert Hooke relied on a single lensed microscope for his detailed studies. The human head-louse *Pediculus capitis* was illustrated in his book *Micrographia* of 1665 (top). Using Photoshop we can adjust the orientation of the front claw to match that of a permanent preparation imaged with a single lens of spinel made by Horace Dall of Luton, England, magnifying 400x.

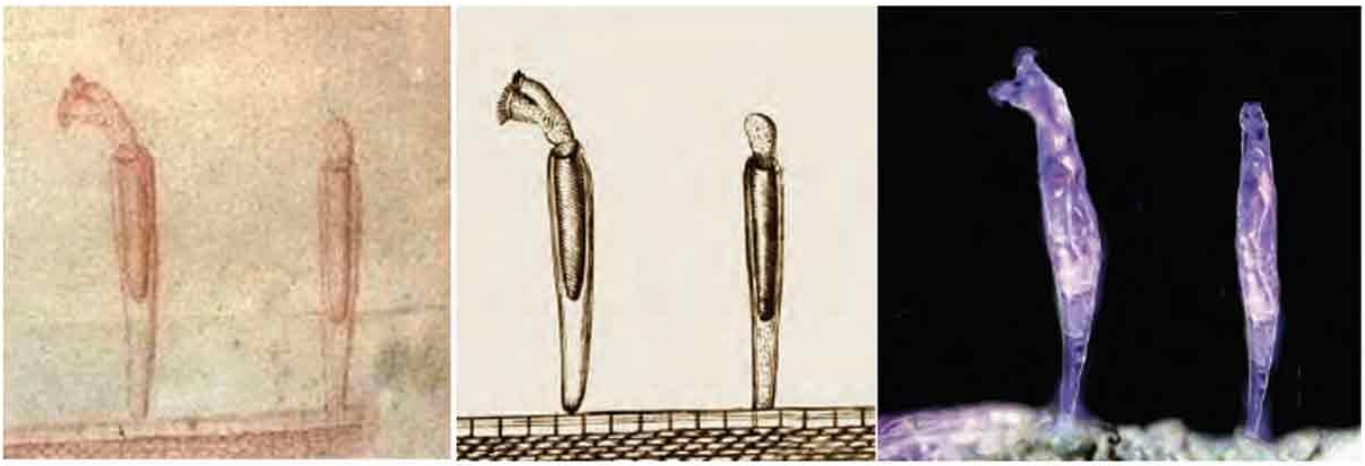

Fig 3: Red crayon was used to illustrate rotifers, likely of the genus Otostephanos, in a letter written by Antony van Leeuwenhoek in 1702 (left). Skilled engravers created a remarkable rendition for publication in Proceedings of the Royal Society, and we can compare this with the living organism under phase-contrast in a micrograph by Canadian microscopist Robert Berdan (right).

has often been stated by scholars that the process of engraving (with a steel needle on copper plates) must surely have prevented microscopical images from being rendered accurately, and the early microscopists have been thought to have consistently exaggerated their illustrations prior to publication.

In previous investigations, Prof. Ford had already shown that Hooke's well-known compound microscope was incapable of the high resolution shown in the original illustrations published in Robert Hooke's *Micrographia* of 1665. In the Preface to his great book, Ford showed that Hooke reveals that he utilised a single lensed microscope for detailed microscopy, and the results now being obtained prove the point ***(Fig 2)***.

The results show that the published images are faithful renditions of microscopical reality. Prof. Ford compared the hand-drawn images of aquatic microorganisms sent to London by van Leeuwenhoek in the 1600s with the engraved versions formally published in *Proceedings of the Royal Society*. Alongside these images he has now placed correlated photomicrographs taken with contemporary light microscopes ***(Fig 3)***.

Similarly, Prof. Ford imaged seventeenth-century hand-cut sections prepared by van Leeuwenhoek alongside contemporary scanning electron micrographs. In October 2024 he took Robert Hooke's celebrated study of the nettle *Urtica dioica*, and correlated those with modern micrographs of identical specimens ***(Fig 4)***.

There are no prior publications that compare the precise appearance of identically oriented specimens viewed by the pioneers, with the result we can now see through antique instruments. These have now been correlated with the appearance that present-day microscopists would obtain. Several papers are currently appearing in print, and for the first time in the history of microscopy they will enable scholars to comprehend how accurate were those pioneering studies, and how faithfully they were reproduced through the skill of the seventeenth century craftsman engraver.

The lesson is that the earliest observations were made with exemplary attention to detail, and the results were interpreted for publication with extraordinary precision. For all the limitations of engraving in the 1600s, the essence of the microscopical world was conveyed with remarkable realism. We owe those first microscopists a debt of gratitude, and also of admiration. ■

Fig 4: Scheme XV of Hooke's Micrographia shows the microscopical appearance of the nettle Urtica dioica (left) shown here without annotations. Scholars ascribe the dramatic appearance of Hooke's illustrations to exaggeration. Ford's 2024 micrographs reveal the nature of the living leaf (right) and we can finally substantiate the accuracy of the published illustration.