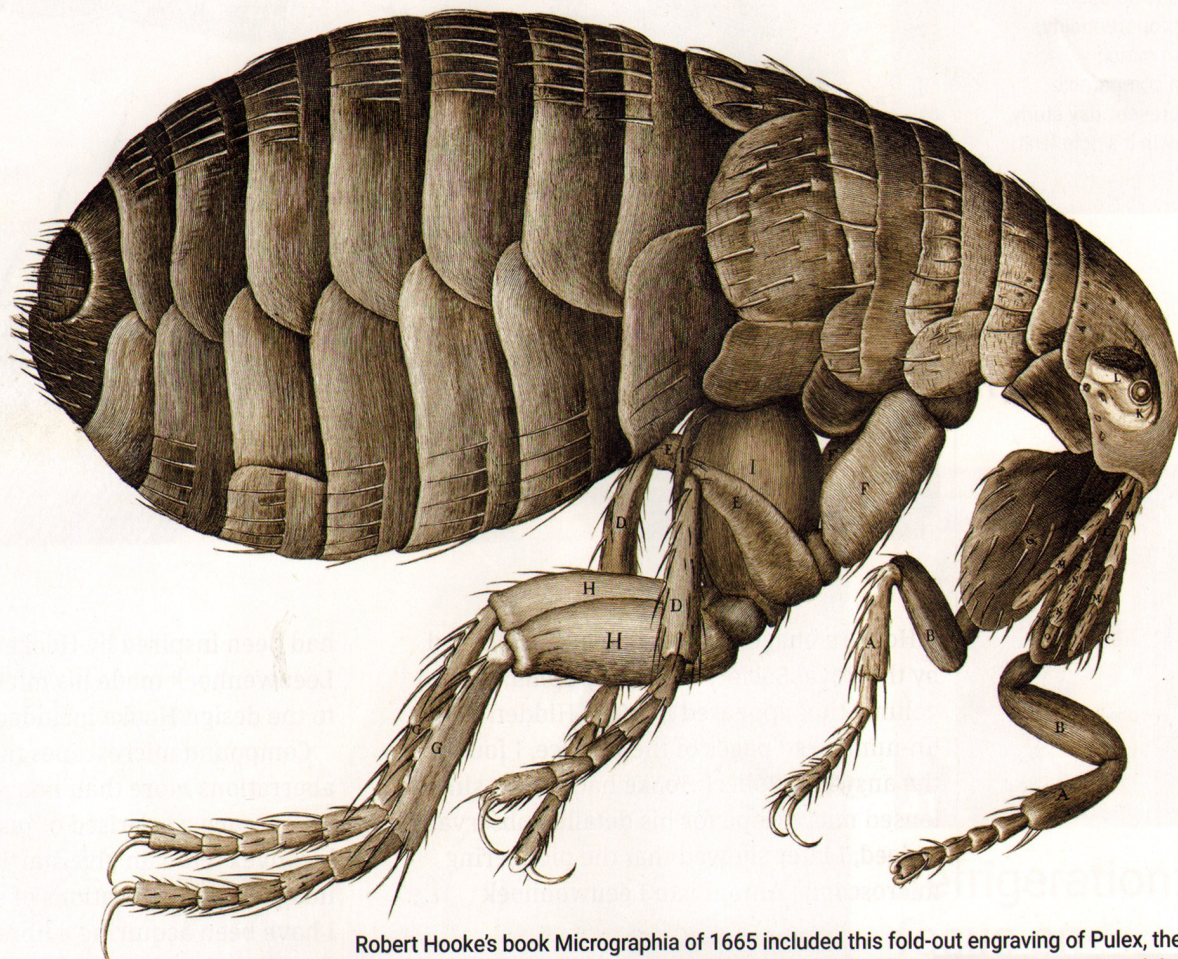


Focus through time

How had Robert Hooke's engravings attained detail beyond the apparent powers of his microscope?

Professor Brian J Ford investigated to solve the mystery...



Robert Hooke's book *Micrographia* of 1665 included this fold-out engraving of *Pulex*, the flea, portrayed in intimate detail. Scholars have concluded that Hooke supervised the process personally, and may have engraved some of these images himself.

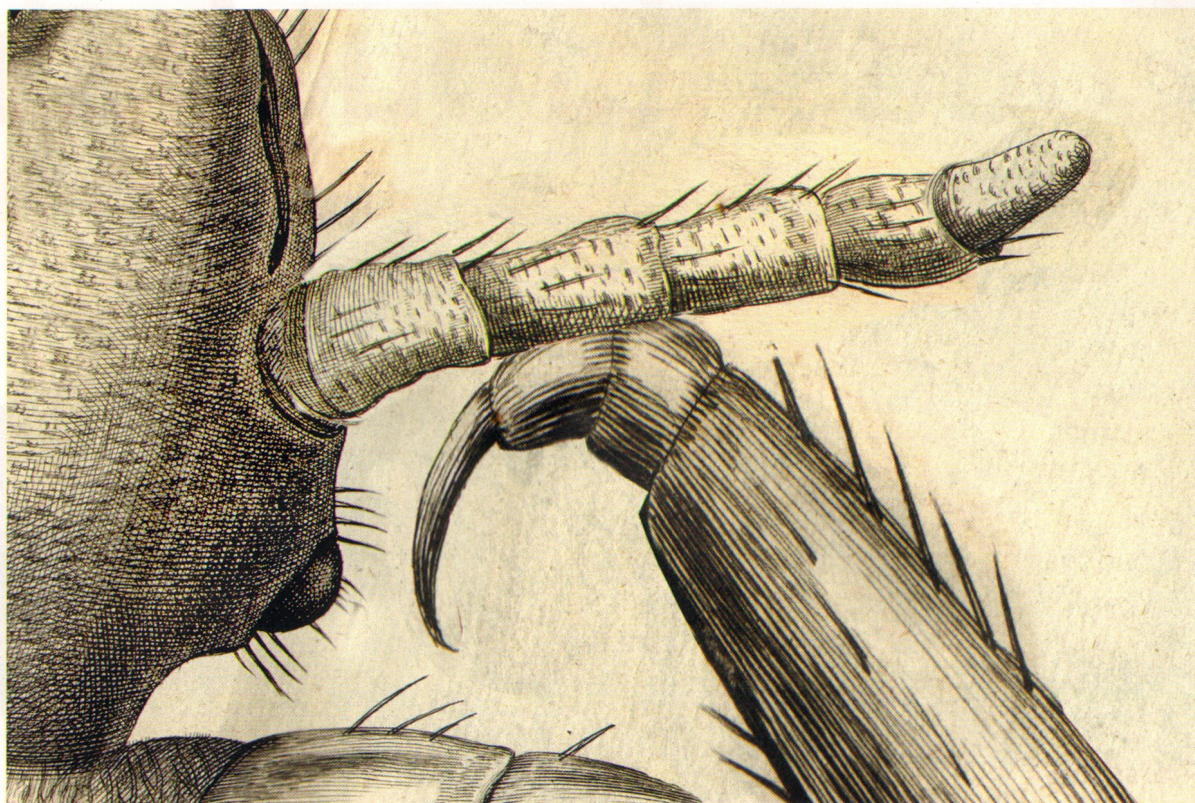
The flea, seen here under the kind of microscope that Hooke used in his investigations, is compromised by aberrations, and the fine details shown in the engravings cannot be resolved. He admitted using single lenses to study fine detail.



Half a century ago I took some historic micrographs that nobody had ever done before: the view of specimens as seen through Robert Hooke's microscope in the 1600s.

I included a micrograph of cork, matching Hooke's own drawing from 1663, in my book *The Revealing Lens*, published in 1973. A problem soon arose – you couldn't see what Hooke had portrayed by looking through his compound microscope. The published engravings were rich with intricate details that his instrument could never reveal. ►

Hooke's engraving of the head of the louse *Pediculus humanus* is richly imbued with fine detail. Here I have utilised Photoshop to reposition the insect's claw, and adjust its proportionality, to match a comparable present-day study with a single lens.

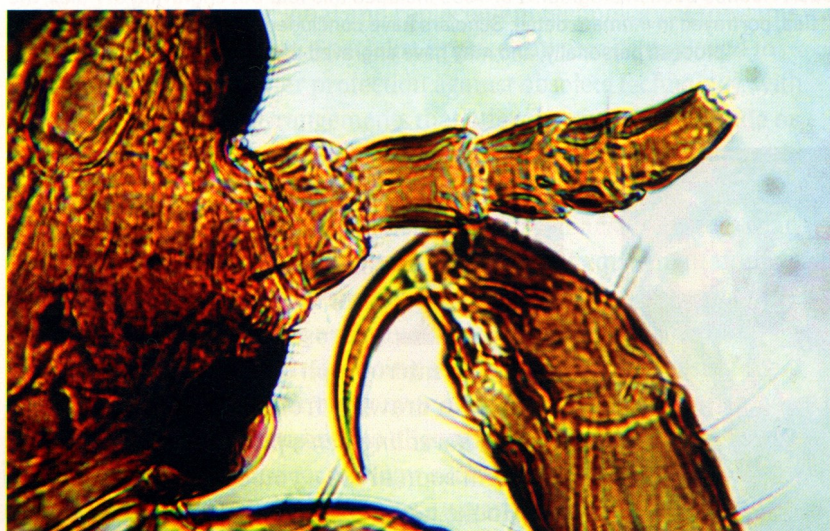


Hooke's images were originally published by the Royal Society in *Micrographia*, a large volume that appeared in 1665. Hidden in the un-numbered pages of the Preface, I found the answer – Robert Hooke had used a single lensed microscope for his detailed observations. Indeed, I later showed that the pioneering microscopist Antoni van Leeuwenhoek

had been inspired by Hooke's book, and Leeuwenhoek made his microscopes according to the design Hooke included in *Micrographia*.

Compound microscopes tend to magnify aberrations more than images, and a simple microscope comprised of just one tiny biconvex lens can give startlingly clear images at magnifications of several hundred. I have been acquiring a library of images that directly relate Hooke's engravings to identical specimens imaged with single lenses, or modern microscopes, in order to demonstrate just how accurate were his observations.

It is a complex and delicate operation. Single lenses (as Hooke warned his readers) are hard to use and many other microscopists have failed to obtain useful results. And of course, specimens rarely match the precise appearance of those Hooke had studied. Photoshop allows us to reposition appendages, or adjust the positions of specimens, to match what Hooke had observed. The results re-create the view that the world's first microscopist could have seen. They open a new window on the history of science, and reveal for the first time just how diligent, how precise, and how meticulous were the first pioneers of modern science. ■



The single-lens image of *Pediculus* provides the kind of detail Hooke described. This microscope was made by the late Horace Dall with a spinel lens and the image defies conventional views that such lenses produced distortions and severe aberration.