

An Unusual Old Microscope

John L. Hutchison

infocus readers may recall my recent article on the superb Science Heritage Collection of replica antique microscopes (issue 57, March 2020), kindly donated to the RMS by Dr and Mrs James McCormick.

These eight, fascinating and beautiful instruments provide a wealth of information and insight into the history of microscopy from the 17th to 19th Centuries.

There is, however, one model of particular interest to the Society, since it is a replica of a rare instrument in our own RMS Collection, currently housed in Oxford University's History of Science

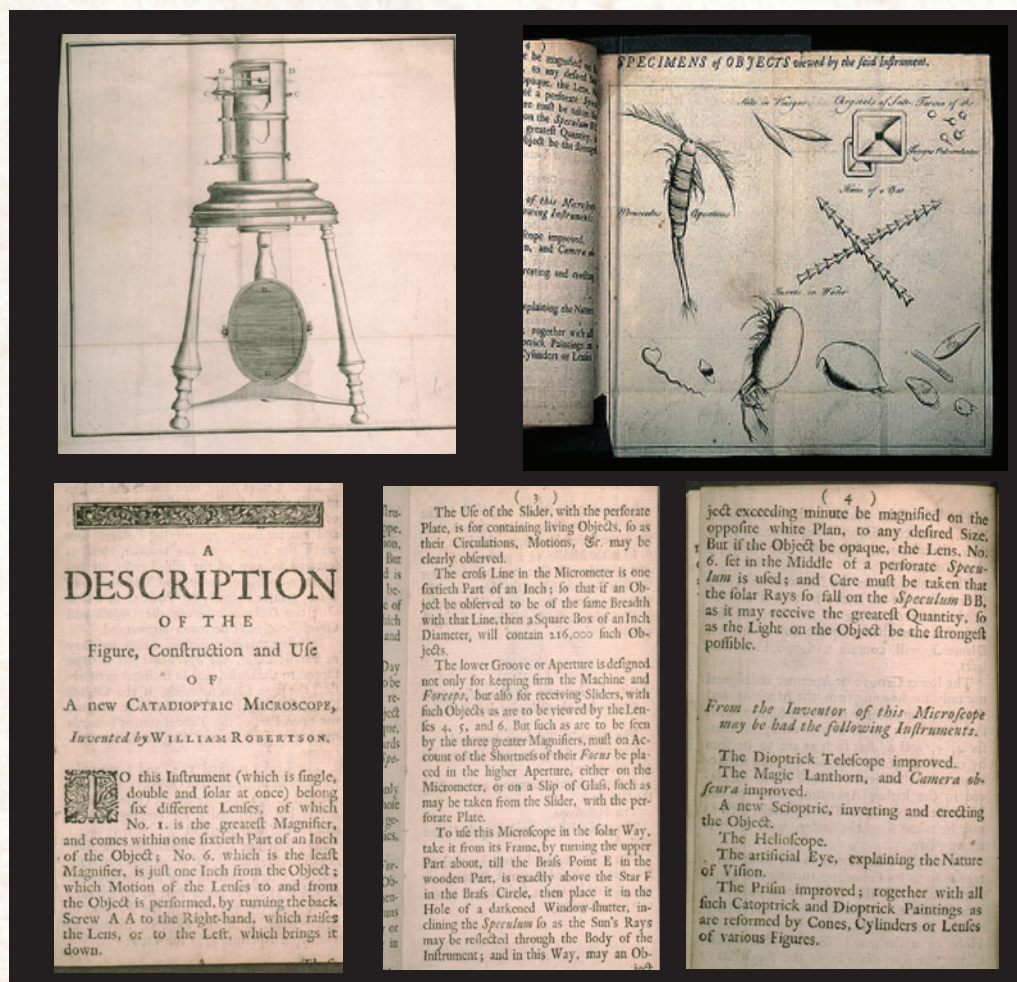


Figure 1. Pages from the original "Owner's Manual" for the microscope. Cambridge University Whipple Museum of the History of Science.



Figure 2. Complete microscope and accessories.

Museum.

This mid-18th Century microscope was made by a Scotsman, William Robertson, who was active in Edinburgh at the time, advertising his unique models in the city's newspaper *The Caledonian Mercury* in June 1749. The same year he issued a descriptive pamphlet on this particular instrument, which he dubbed the 'catadioptric microscope' on account of its unusually large, oval sub-stage mirror to reflect the light along the optic axis – an unusual feature for the time.

The idea behind this arrangement was that the body could be detached from its brass and hardwood base and if mounted in a suitable hole in a window shutter, it could project images of the sun, or of a transparent specimen (depending on its setting) onto the wall of a darkened room - a function which led to the instrument becoming known as the 'solar microscope'.



Figure 3. Objective lenses. Note the highly polished Lieberkühn (far right). Johannes Lieberkühn was an 18th century German physician and physicist who devised the use of a highly polished reflector to enhance the illumination of opaque specimens.

A fascinating instruction manual still survives in remarkably good condition, and can be found at the Cambridge University Whipple Museum of the History of Science. Figure 1 is used here with its kind permission.

The original microscope was given to the Society by a Fellow, James More in 1897, as recorded in the *Journal of Microscopy*: 1897 p.89.

"Mr Jas. More, jun. stated in the letter that accompanied the old Microscope presented by him that he had met with it at a dealer's in Edinburgh, and thinking it might be of interest, he had forwarded it for the acceptance of the Society if they found it to be so".

Thankfully, the Society indeed "found it to be so", and it was added to our Collection.

The replica instrument and its accessories in our Science Heritage Collection are shown in Figure 2. The complete kit includes five objective lenses of varying powers and one low-power objective for observing opaque specimens (Figure 3).

In its simplest form the microscope consists of a brass tripod base which supports the microscope body through a wooden collar. The brass body holds a condenser lens and an eyepiece lens, one of the six accompanying the microscope. Two concentric, brass tubes with cutout sides, are then used to hold specimens. Opaque specimens are mounted in a special holder (Figure 4) which in turn is held firmly in a modified, spring-loaded 'Bonanni Stage', as shown in Figure 5. Another accessory was a small ring across which was stretched a copper wire exactly 1/60th inch in diameter, acting as a micrometer for magnification calibration.

The lowest-power eyepiece is then mounted on top of the body as shown in Figure 5. This lens

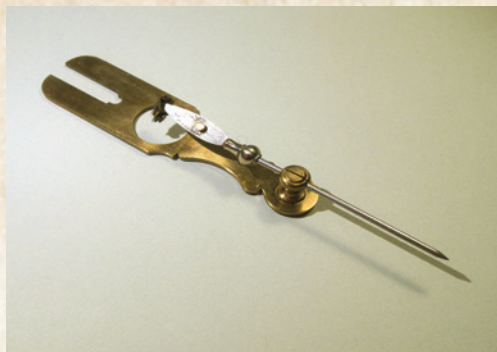


Figure 4. Special holder for opaque specimens.

includes a “Lieberkühn” – a highly polished concave silver mirror set around the lens to reflect and focus light impinging on an opaque specimen back onto it, providing excellent illumination that can enhance contrast in a micrograph. Examples of the impressive results achieved with this setup can be seen in Figures 6 and 7.



Figure 5. Opaque specimen in position, with Lieberkühn and lens above. The specimen holder is held securely in place by a spring-loaded ‘Bonanni stage’ - named after Filippo Bonanni, a 17th Century Italian microscope designer.



Figure 6. The exquisite detail of a house fly's compound eye recorded with this setup.

Transparent specimens are prepared by mounting between thin mica discs, held in bone or ivory sliders (Figure 8). A cheap and simple slider can be made from two strips of card with punched holes. Self-supporting objects can then be held firm when the strips are glued together, as shown on the right-hand side.

A slider is then held between spring-loaded, brass discs – the modified Bonanni Stage – in the microscope body, in one of two positions depending on the power of the objective used. With the addition of an eyepiece above the objective, the instrument is now a compound microscope, as in Figure 9, with a selection of five magnifications.

Fine structures of transparent specimen are thus revealed. Figure 10 shows details of a fly's wing, at different magnifications.

The recognisable wing structure can be seen at a relatively low magnification in Figure 10 (a), while (b) shows that the wing is actually covered with fine hairs, which are thought to improve its aerodynamic properties! Figure 10 (c) reveals the hairs along the trailing edge of the wing.



Figure 7. This is no alien invader! – it shows (a) the head and (b) the tail of a common woodlouse.

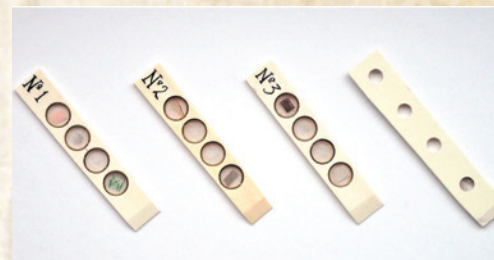


Figure 8. Bone specimen sliders, and one made from card (far right).

The microscope is unusual in several respects: its large, flat mirror, elliptical in shape, was designed for when the instrument was to be used as a solar microscope, although exactly how it could be attached to a round hole in a window blind is not obvious. The possible positioning of the specimen



Figure 9. Instrument set up as a compound microscope.

at different stage positions was unusual, enabling the use of a wide range of objective lenses and also, with the Lieberkühn and low power lens, excellent frontal illumination of opaque objects, as shown in Figures 6 and 7.

Very few of these original “Edinburgh” microscopes are known to have survived. As indicated above, the

RMS owns one in its Collection; a similar instrument is in Cambridge University's Whipple Museum; a London-based firm that hires film set props may have an original one for hire, but the only others we have traced so far appear to be replicas, or even a 3D render - check out <https://micro.magnet.fsu.edu/primer/museum/index.html> for a very convincing ‘virtual’ microscope.

The Society is very fortunate in having received this interesting microscope as part of the Science Heritage Collection, and we are tremendously grateful to Dr and Mrs McCormick for supporting our historical activities with their generous gift.

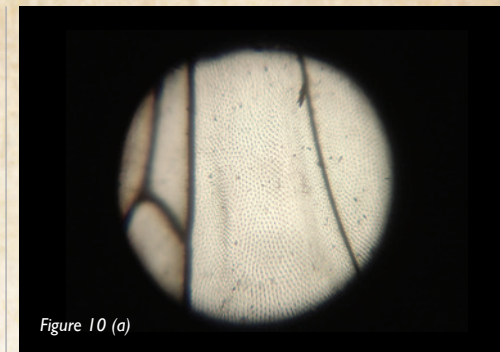


Figure 10 (a)

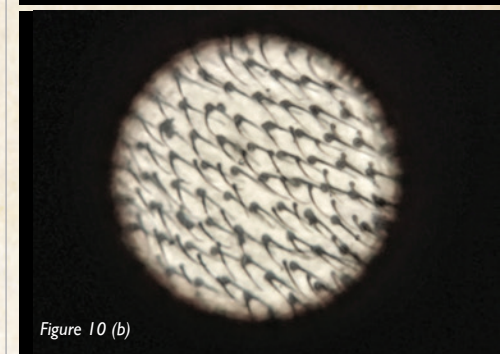


Figure 10 (b)

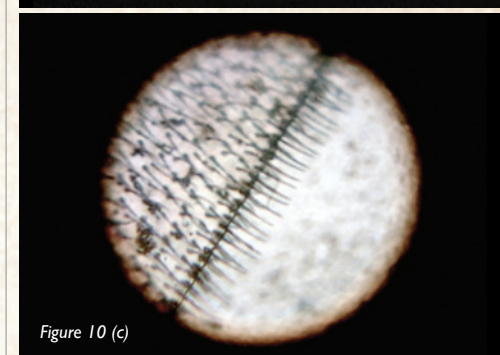


Figure 10 (c)

John L Hutchison Hon FRMS, History Committee Chair

