Darwin's Other Microscope

By Les May, UK

When Charles Darwin boarded the Beagle at the end of 1831 he carried with him a single lens, or simple, microscope of a type recommended to him by the botanist Robert Brown and made by Bancks. Four microscopes from this period, all of a similar type, are illustrated by Ford[1, 2]. All were owned by botanists, Brown, William Hooker and George Bentham. Ford[1, 3] also illustrates a less refined microscope of this type used by Linnaeus some sixty years earlier.

Dissection practised by botanists for the purpose of plant identification is largely confined to producing transverse and longitudinal sections of plant ovaries[4, 5] and longitudinal sections of whole flowers. In the field these are examined using a x10 or x20 hand lens. Simple microscopes such as those referred to above would be a great convenience for examining the sections but they are not essential for producing them. Ford[2] points to evidence that Bentham used the metal parts of the microscope in producing his, i.e. not the glass stage. They were less suitable for is the dissection of invertebrates under water.

Darwin had been dissecting barnacles since 1846 when he wrote to Richard Owen in March 1848 expressing in a postscript his liking for his new microscope and his 'hatred' of his old one.

P.S.—If I do not hear, I shall understand that my letter is superfluous. Smith and Beck were so pleased with the simple microscope they made for me, that they have made another as a model. If you are consulted by any young naturalists, do recommend them to look at this. I really feel quite a personal gratitude to this form of microscope, and quite a hatred to my old one.[6]

A description of Darwin's new microscope appears in a contribution to a larger volume written by Owen[7]

The facility in examining the smaller invertebrate animals, either alive or dead, depends much more on the form of the microscope used than would be at first expected. The chief requisite of a simple microscope for this purpose is strength, firmness, and especially a large stage; the instruments generally sold in this country are much too small and weak. The stage ought to be firmly soldered to the upright column and have no movement; besides the strength thus gained, the stage is always at exactly the same height, which aids practice in the delicate movements of the hand. The stage should be able to receive saucers, three inches in internal diameter. A disc of blackened wood, with a piece of cork inlaid in the centre, made to drop into the same rim which receives the saucers, is useful for opaque and dry objects: there should also be a disc of metal of the same size, with a hole and rim in the centre to receive plates of glass, both flat and concave, in diameter one inch and a half, for dissecting minute objects; a plate of glass of three inches diameter lets in too much light and is otherwise inconvenient. Close under the stage there should be a blackened diaphragm, to slip easily in and out, in order to shut off the

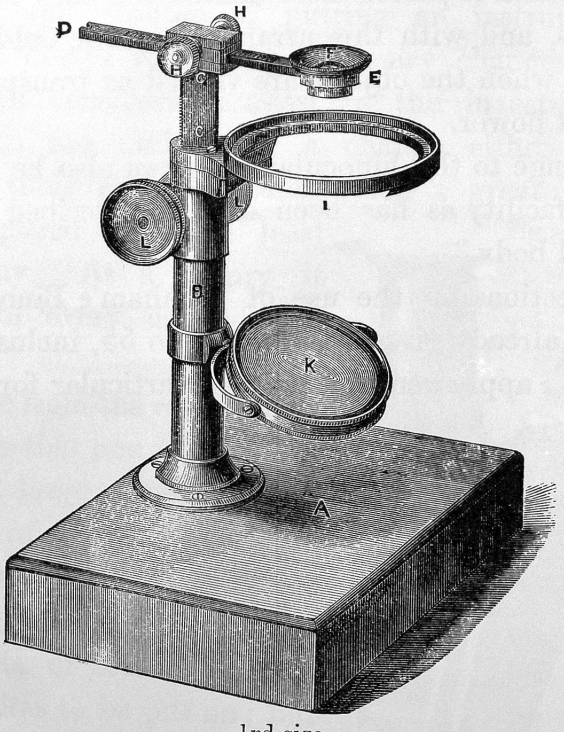
light completely; in this diaphragm there may be a small orifice with a slide, to let in a pencil of light for small objects. The whole microscope should be screwed into a solid block of oak, and not into the lid of the box as is usual.

The mirror should be capable of movement in every direction, and of sliding up and down the column; on one side there must be a large concave mirror, and on the other a small flat one; these mirrors ought to be fitted water tight in caps, made to screw off and on; and two or three spare mirrors ought undoubtedly to be taken on a long voyage, as salt water spilt on the mirror easily deadens the quicksilver. A small cap is very convenient to cover the mirror when not in use, and often saves it from being wet. The vertical shaft by which the lenses are moved up and down should be triangular (as these work much better than those of a cylindrical form), and there should be on both sides large milled heads; with such, there is no occasion for fine movements of adjustment, which always tend to weaken the instrument. The horizontal shaft should be capable of revolving, and should be moved to and fro by two milled heads (for the right and left hands), but the left milled head must be quite small, to allow of the cheek and eye approaching close to the lenses of high power. The horizontal shaft must come down to the stage.

The most useful lenses are doublets of 1 inch and 6-10ths of an inch (measured from the lower glass of the doublet) in focal distance; a simple lens of 4 or 5-10ths of an inch is a very valuable power; and, lastly, Coddington lenses (of the kind sold by Adie of Edinburgh), of 1-10th, 1-15th, and 1-20th focal distances, have been found most useful by two of the most eminent naturalists in England. With a little practice it is not difficult to dissect under the 1-10th lens, and some succeed under the 1-20th. A person not having a compound microscope might procure a 1-30th of an inch Coddington lens. All the lenses (except the largest doublet) should be made to drop, not screw, into the same ring; the large doublet may slip off and on the opposite end of the horizontal shaft.

A simple microscope to this specification was made for Darwin by Smith and Beck, and later offered for sale.[8]

Fig. 46.



$\frac{1}{3}$rd size.

Darwin's 'new' microscope was a much more stable and robust instrument than the botanical microscope he took with him on the Beagle almost twenty years earlier and can properly be described as a 'dissecting microscope'. At this time other makers such as Chevalier[9, 10] in France were making similar more robust instruments. Darwin's botanist friend Joseph Hooker (son of William) owned one of these and it appears that this instrument influenced Darwin's thinking when he specified his 'new' microscope.[11]

1. Single Lens.* Ford 1985.

2. Charles Darwin and Robert Brown – their microscopes and the microscopic image. Ford 2009

3. The Microscope of Linnaeus and His Blind Spot. Ford. 2009.

4. In Flora of Mauritius and the Seychelles. (Sect. 244. xxxiii, p62 of the PDF)

5. The Identification of Flowering Plant Families.* Davis and Cullen. 1965.

6. Darwin's letter to Owen 26 March 1848

7. A manual of Scientific Enquiry (p402). The Admiralty. 1849 and later

8. A Treatise On The Construction, Proper Use, And Capabilities Of Smith, Beck, And Beck's Achromatic Microscopes

9. https://www.microscope-antiques.com/chevsimple.html

10. http://microscopist.net/ChevallierJGA.html (Figure 18)

11. https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-1174.xml;query=10%20may%201848;brand=default

Apart from the two books marked * all the above can be found on WWW.

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Published in the February 2019 issue of *Micscape* magazine.
www.micscape.org