

Photomicrography with a digital SLR camera

You have probably seen the exhibition of photomicrographs upstairs in the foyer of the Flett Theatre and you may have wondered how the photographers achieved such good results. Well, it is a combination of skill, experience and the right equipment, and for many of us that means a digital SLR camera.

Lots of Quekett members can recall using 35 mm film for photomicrography, with large and expensive systems from microscope manufacturers, or a Leica rangefinder camera, or a single-lens reflex with an adapter that clamped onto the vertical tube of a trinocular microscope.

Most of us have switched to a digital SLR camera, but nobody seems to make reasonably-priced adapters any more, so we have to search eBay and wander around microscope club sales meetings.

Whichever microscope you use, you need to choose a digital SLR that avoids vibration from raising the mirror and opening the shutter. Canon were the first to manage this and most EOS models from 2007 onwards are suitable. Other manufacturers are catching up.

It is also very convenient to have a camera that can be controlled from your computer, so that you can focus and compose on the computer screen, adjust exposure and white balance, and save images direct to your hard disk. Again, Canon did this first with the free EOS Utility software, but other manufacturers are catching up and there is suitable software from independent providers too.

These days, you do not need to be satisfied with the image that your camera provides. Photo editing software lets you crop your photos, remove blemishes and adjust brightness, contrast, saturation, colour balance and sharpness. Image stacking software lets you take a series of images focused at different planes in the subject, and then selects the sharpest bits from each image and creates a new composite image with good depth of field.



Eyepiece projection: Microscope manufacturer adapters

With eyepiece projection, the photo eyepiece projects an image onto the sensor in your camera. The eyepiece should be of the same make and vintage as your objectives.

If you can find an adapter for an SLR camera made by the manufacturer of your microscope, that is likely to be the best route because it will be designed to be parfocal, i.e. the image through the eyepieces will be in focus at the same time as the image seen by the camera. It will also be designed to accommodate a photo eyepiece.

Olympus seem to have made more adapters and photo eyepieces than other manufacturers, for their E/F, BH, BH-2 and early BX microscopes, but they are in short supply on eBay now and prices are becoming silly.

At home I use an Olympus BH-2 and a desktop computer with a large IPS monitor, but that equipment is not portable. Today I am using the Club's BHC with a BH-2 trinocular head and my laptop. Inside the head there is an Olympus 2.5× NFK photo eyepiece. Above the head there is an Olympus Photomicro Adapter L. This was designed to fit an Olympus OM 35 mm SLR, so I use a cheap Chinese OM-EOS adapter from eBay to connect my full-frame Canon EOS 5D Mark II camera.

I have also brought the separate components.



Left to right: Olympus PM-ADF Eyepiece Adapter, Olympus NFK 2.5x photo eyepiece, Olympus Photomicro Adapter L, adapter for using Olympus OM lenses on Canon EOS SLR bodies

Eyepiece projection: Simple microscope adapters

With eyepiece projection, the photo eyepiece projects an image onto the sensor in your camera. You can also use a normal eyepiece; you may need to raise it slightly.

Most camera manufacturers used to make simple microscope adapters, and so did independent manufacturers such as Hama, Panagor, Soligor and Vivitar. The ones from independents usually came with a T-2 mount, so you can still find a mount for almost any SLR camera. Nobody seems to make the adapters any more, so you have to search eBay and microscope club sales meetings such as Microscopium in St Albans on 19th October.

The adapters are usually in 2 parts. The lower part clamps onto the vertical tube of a trinocular head and accepts a microscope eyepiece; try to use one of the same make and vintage as your objectives. The upper part attaches to your camera and then bayonets or screws onto the lower part.

Be careful if you try this on an inclined eyepiece tube – my T-2 mounts fell apart because of the weight of my camera.

This arrangement will probably not be parfocal, i.e. the image through the eyepieces will not be in focus at the same time as the image seen by the camera. You may be able to improve this by raising the eyepiece a little, or by using extension tubes between the adapter and the camera body.

I have brought an example of an adapter from an independent so that you have some idea of what to look for on eBay.



Left to right: Lower part of adapter, microscope eyepiece, upper part of adapter, T2 adapter for camera

Afocal coupling

Afocal coupling uses a camera fitted with a standard lens, supported with the front of the lens just above the top of the microscope eyepiece. The principle is that the camera lens sees the same image as the human eye.

I have seen lots of photos of people using a tripod or a copying stand to support the camera, but this does not look convenient or easy to adjust.

If you come on Quekett excursions, or read the meeting reports, you will see all sorts of arrangement made by people with lathes or workshops, but there is a way to achieve the same results without tools or equipment.

A few microscope eyepieces were made with screw-on eyecups, often 28 mm diameter. A bit of searching on eBay will lead you to cheap Chinese step-down filter adapters that fit the filter mount on the front of your camera lens, such as 55–28, 52–28 or 49–28 mm. The eyepiece screws into the step-down adapter, which then screws into the filter mount, giving a nice firm connection with no d.i.y. skills required.

Leitz made some suitable Periplan compensating eyepieces, and Carl Zeiss Jena made some suitable eyepieces too, both compensating and non-compensating. As usual, eBay and microscope club sales meetings are the most likely sources.

The microscope eyepiece needs to be mounted as close as possible to the front of the camera lens, but be careful that they do not touch.

This arrangement seems to reveal every speck of dust on the eyepiece and the camera lens, so try to keep them clean.

I am a beginner at this technique, which I hope will allow me to take photographs at meetings though other people's microscopes. I am still working out the best focal lengths for different sensor sizes. For full-frame, a camera lens around 50 mm seems o.k., or 35–40 mm for APS-C, or 25–30 mm for Four-Thirds.

I have brought an example of a Periplan eyepiece and a step-down adapter attached to a Zuiko 50 mm f/1.8 standard lens from an Olympus OM 35 mm camera; standard lenses from many other manufacturers are suitable too.



Left to right: Leitz Periplan eyepiece with male 28 mm thread, step-down adapter from camera filter size to 28 mm, standard lens from a 35 mm SLR camera, adapter for using Olympus OM lenses on Canon EOS SLR bodies