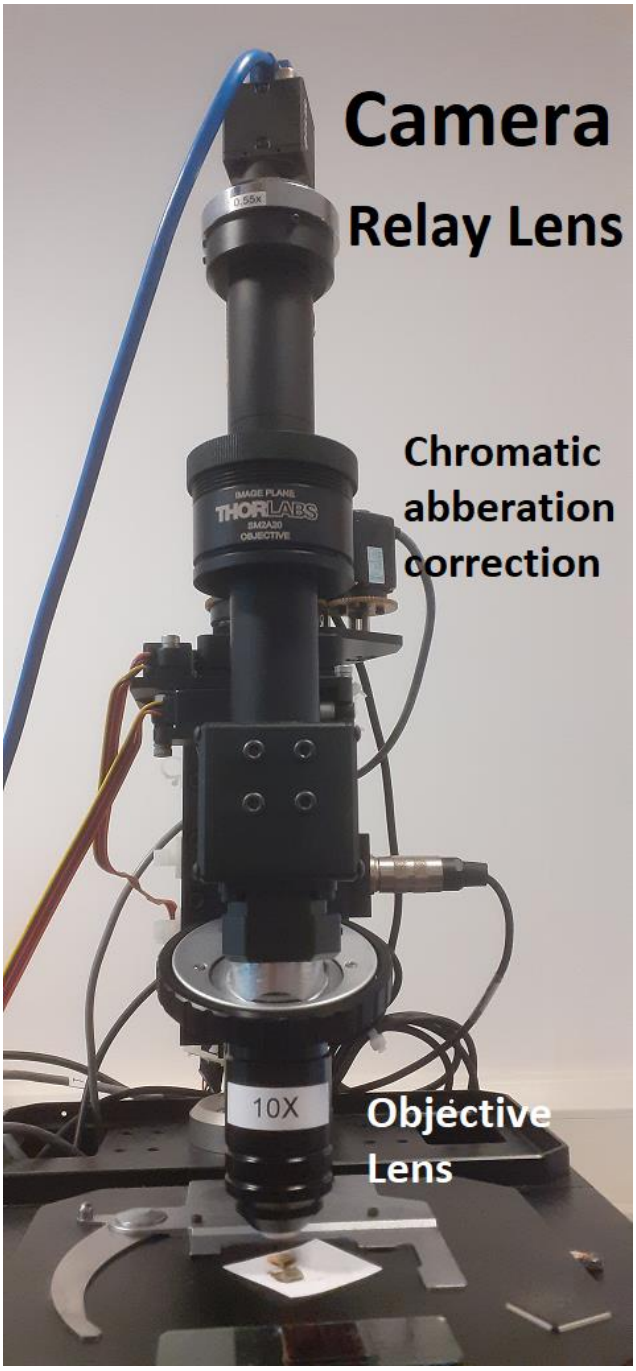
Magnification Overview



Questions are often asked about the magnification of our microscope. The magnification is not the important factor, the resolution is what enables us to see sub 100nm details which would be a blur with other hardware no matter how many times larger than life they are displayed.

The magnification of the SMAL lens is around 230x.

The chromatic aberration lens makes about a 5% difference (from memory).

The relay lens is a 0.55x lens.

230 x 0.95 x 0.55 ~= 120

I believe images are about 120x the size at the camera compared with the sample. E.g. 14,400 times the area.

The camera is a FLIR camera with a Sony ITX172 sensor. These have 1.55 µm pixels. So **each camera pixel represents 1.55 µm / ~120 = about 12 ½ nm of the sample.**

A common screen display standard is 96 dots per inch, i.e. per 25.4 mm. 25.4/96 = 0.26mm ~= ¼mm dots (screen pixels).

One way to look at this is the magnification from camera to screen may be of the order of 0.26mm / 1.55 µm ~= 170. The screen pixels are 170x the size of the camera pixels, making everything look much larger.

With 120x from sample to camera and 170x from camera to screen, we see things 120x170 = 20,400 times their real size when viewing one screen pixel per camera pixel.

Checking … 0.26mm screen pixels displaying 12.5 nm of sample … 0.26/12.5 x 1,000,000 = 20,800.

It is the clarity of images that matters though. Anyone can use an overhead projector to display images much larger than seen on a small screen. That's higher magnification but not clarity.