

### Making a Patch-stop for Dark Ground Illumination

Nb. Each objective lens in a set needs its own custom-made stop. I recommend that you start by making a stop for the x10 lens.

1. Measure the diameter of the filter carrier immediately below the microscope's sub-stage condenser.
2. Draw a circle of this diameter with a pair of compasses on a piece of card and cut out the disc.
3. Use the disc as a template to cut a disc from a piece of **clear** acetate sheet.

Next, we need to work out the required diameter of a stop (opaque disc) to be fixed in the centre of the clear disc.:

4. Make a note of the **numerical aperture** of your x10 objective lens. This is one of the figures engraved on the lens barrel and will be in the region of 0.25.
5. Add 10% to this value and then double what you get.

$$\begin{aligned} \text{Example: N.A.} &= 0.25 \\ + 10\% &= 0.025 = 0.275, \text{ say } 0.28 \\ \times 2 &= \underline{0.56} \end{aligned}$$

6. We now need to multiply this figure by the focal length of our condenser - - - say, 20mm:

$$0.56 \times 20\text{mm} = \underline{11.20\text{mm}}$$

7. Mark and cut out a disc of this diameter from a piece of opaque card.
8. Attach this small, opaque disc to the centre of the disc that you cut from clear acetate sheet. This is best done with a very small blob of "Blutac"; once you have tested your dark-ground stop and made any necessary adjustments to the size of the small, opaque disc, it can be glued in place if you wish.

### Using the Dark-ground Stop

1. Set up your microscope in the usual way.
2. Put the stop in the filter tray just underneath the condenser. If you do not have a filter tray, it is usually possible to fix the stop in position temporarily with two or three pieces of "Blutac" around the perimeter.
3. Open the sub-stage iris diaphragm a bit and try adjusting the height of the condenser until you get a satisfactory result.
4. [if necessary] Replace the opaque disk with slightly smaller or larger ones; a millimeter or two to the diameter, either way, could make a world of difference!