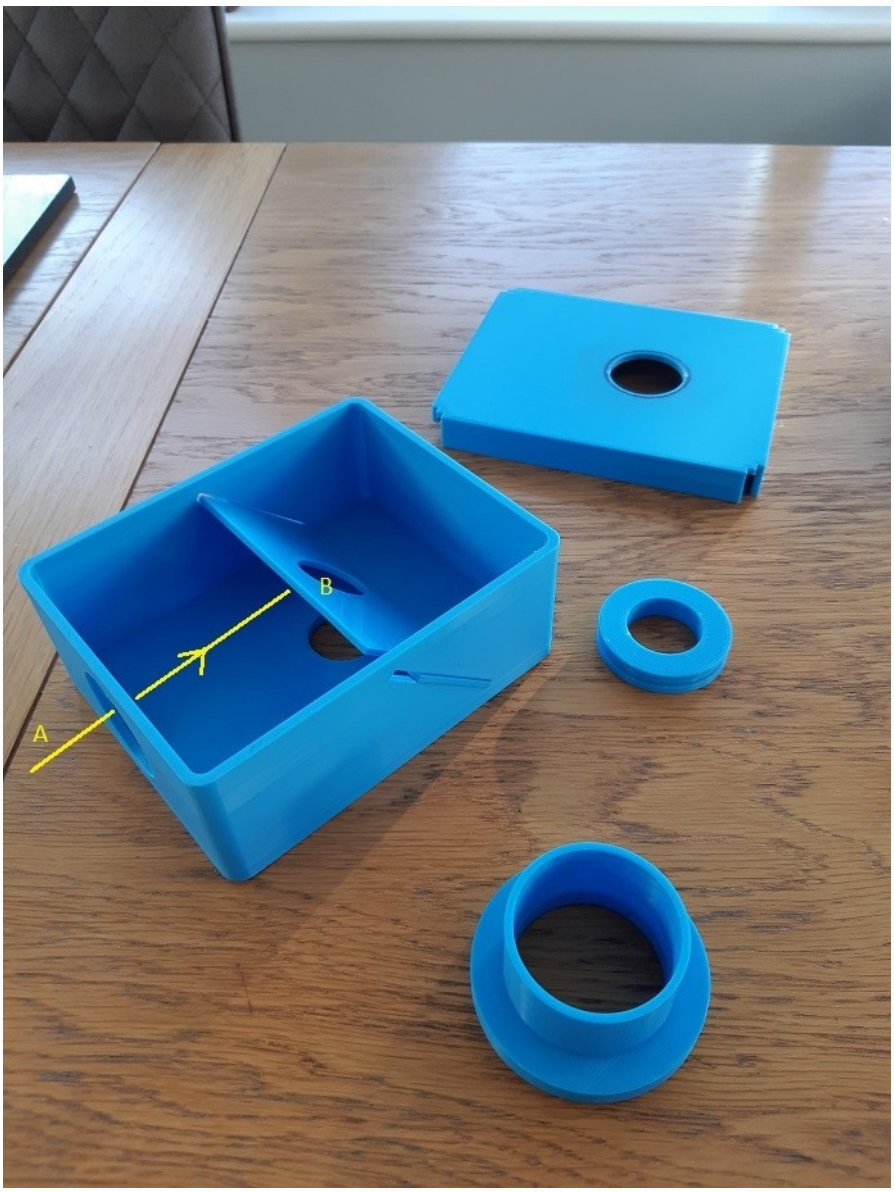
Further adventures with a 3D printer & Microscopy !

Part 1 An attempt at EPI illumination without a Dichroic mirror!

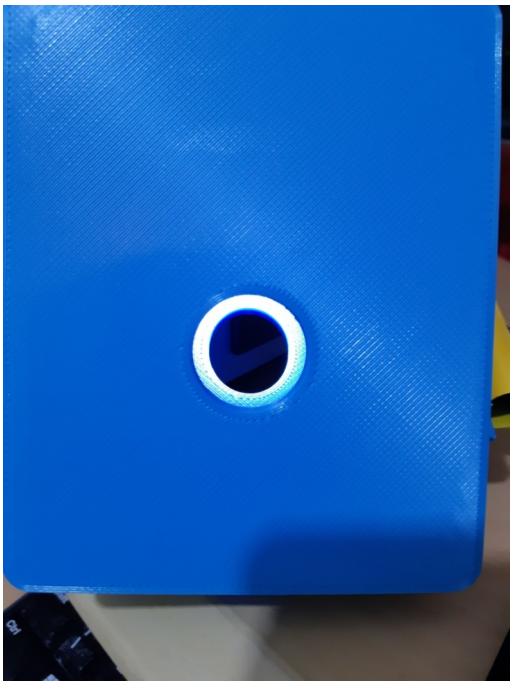
Following on from my last exploits with a 3D printer I began to explore other areas of Microscopy and came across Epi illumination and wondered how I might adapt my trusty old Leitz Laborlux compound scope to try this form of illumination. Reading many articles on Epi microscopy it was apparent that a Dichroic mirror was one required item to achieve this which is where I ran into a problem as I didn`t have one neither could I source one the size I wanted so had the rather off the cuff idea that all that was required was a means of reflecting light downwards at 45 degrees and at the same time allow light to be reflected back upwards unhindered to the detector.

Allow me to present the non Dichroic mirror epi project ;-)

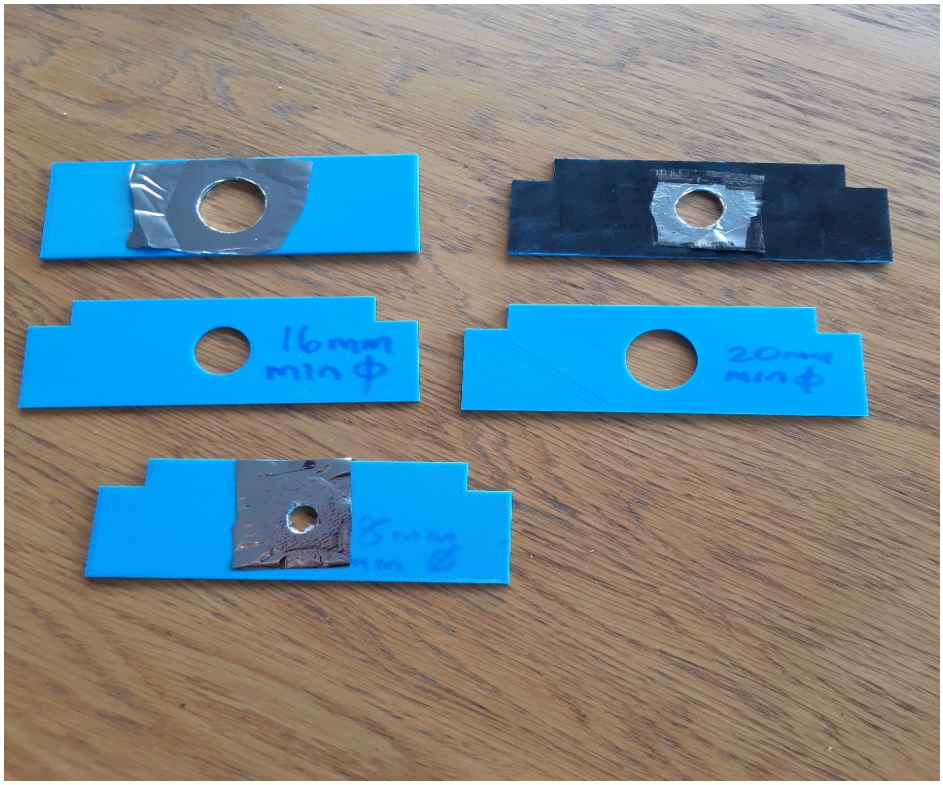


The idea is to use a bright white LED which shines in at `A` and hits an ellipse `B` at 45 degrees and reflects down to the sample through the objectives.
This is achieved by placing some foil at the ellipse and using just the outer 2mm to create a ring of light. Matt black paint was also added inside the unit.

Ring of light seen at the base here before attaching the scope mounting ring



I designed this project to be modular so I could use various size ellipse plates using simple geometry to calculate the ellipse minor axis to give the required exit diameter back to the detector.



Assembled unit onto microscope, 3D printed DSLR phototube containing x10 photo eyepiece

Bright 12V LED from side of unit before attaching DSLR tube.

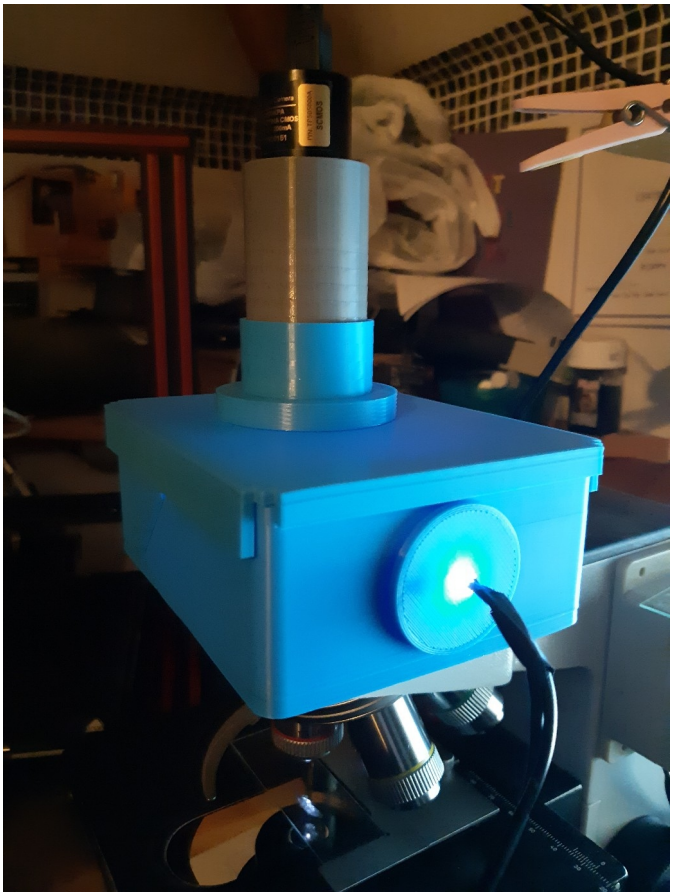
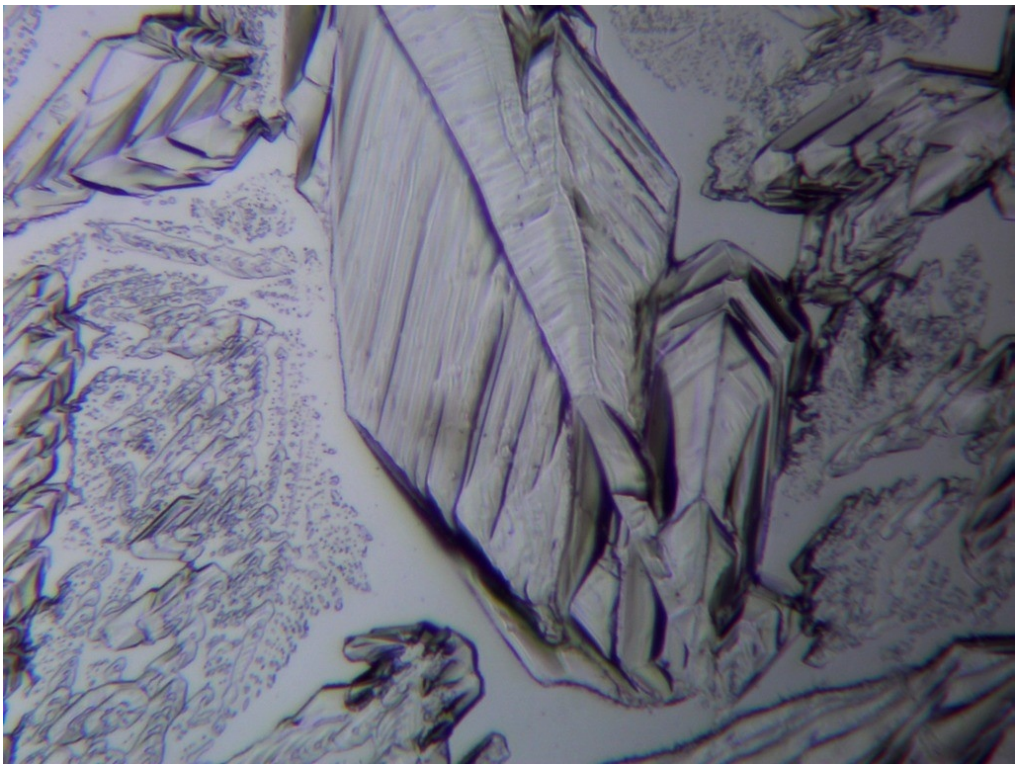
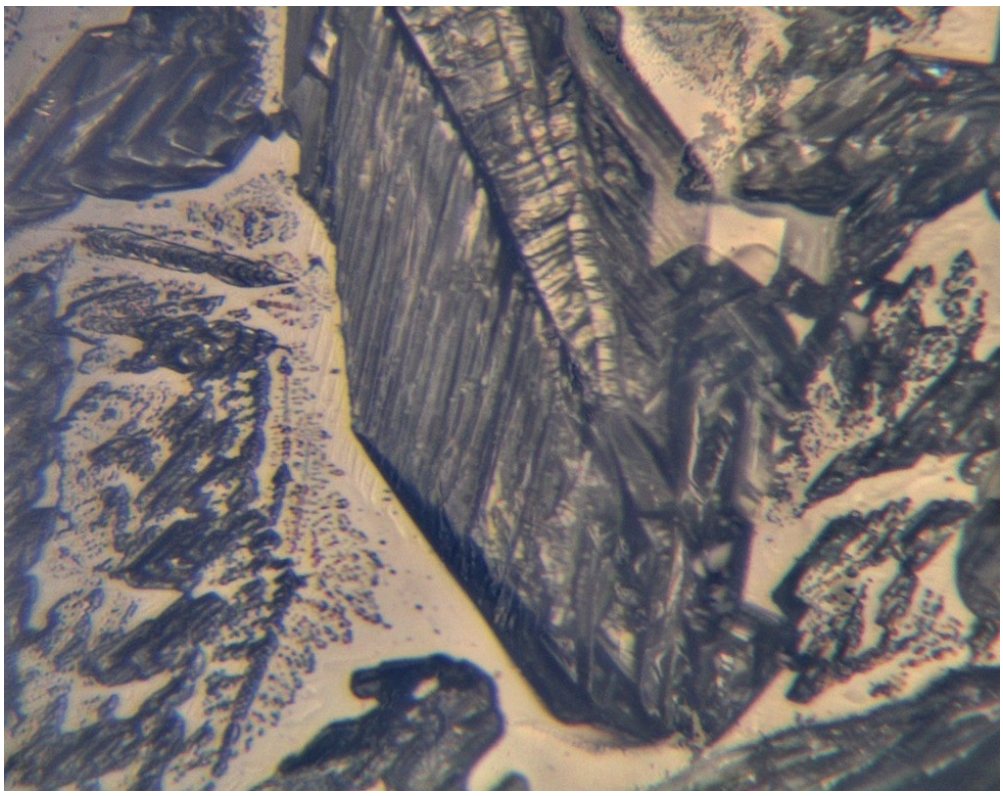


Image of some Erythritol using normal brightfield illumination lit from below.



Same image now using the LED lit from above via the 45 degree reflective plate



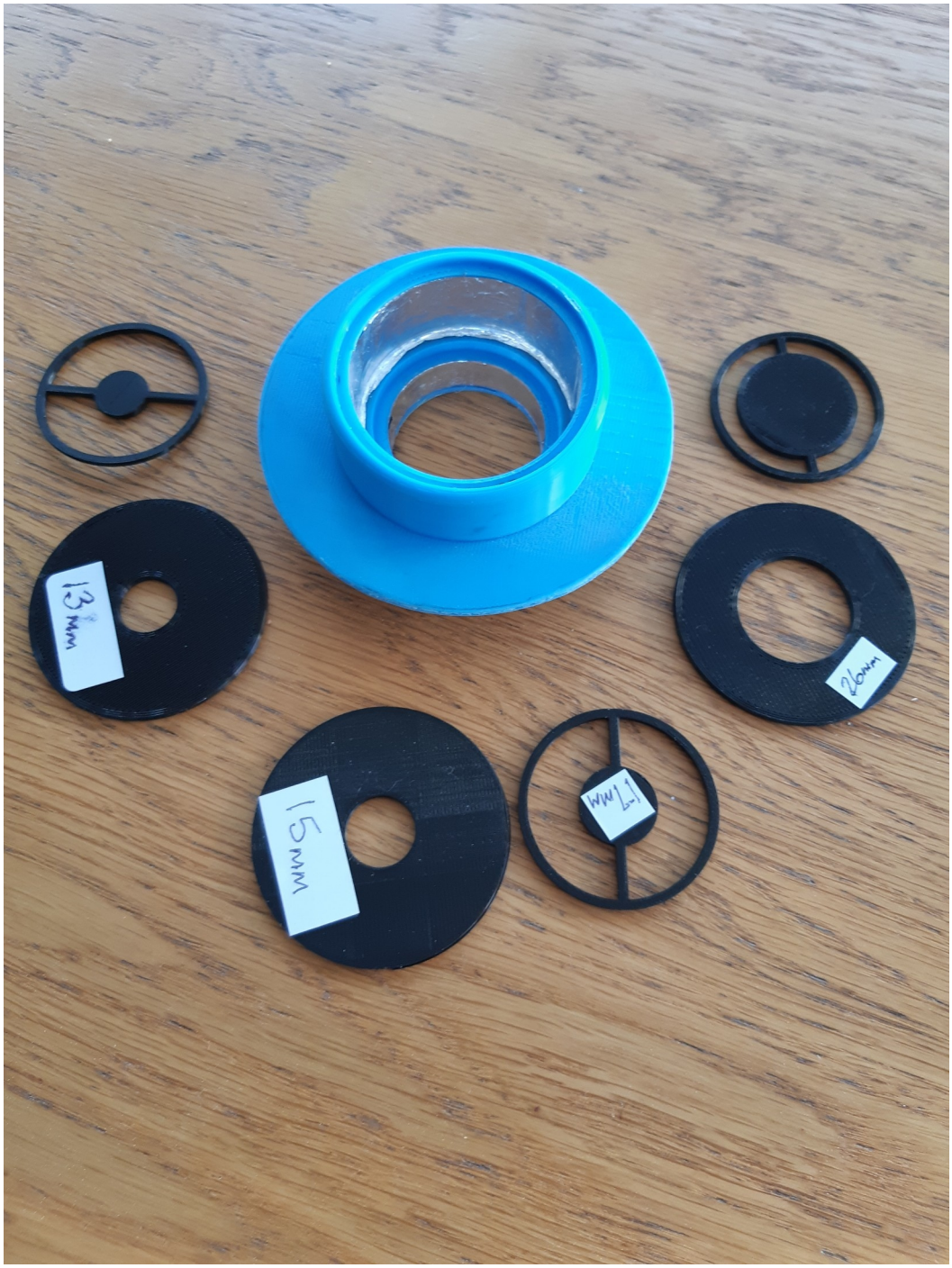
I did wonder at first why the LED lit image seemed to contain more detail until I realised it was showing all the opaque detail on the slide lighting it from above whereas the brightfield one was showing the transparent detail.

I don`t claim for one minute that this method would replace Epi illumination via a Dichroic mirror but I was pleased to get some (which I think I can claim as Epi illumination) via a reflected elliptical plate! Much room for experimentation and I plan to add emission and excitation filters at some point to try fluorescence.

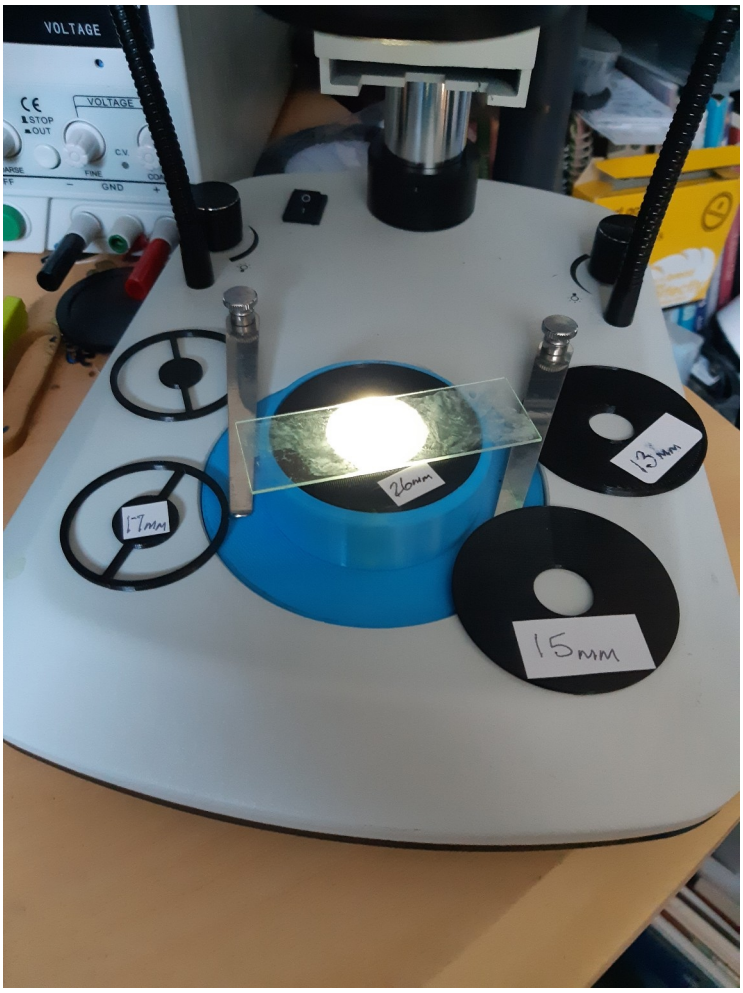
Part 2 Darkfield illumination adaptor for Stereo microscope

I was recently saw a friend's set of images using darkfield illumination with a stereo microscope a method I only thought possible using a compound scope prior to seeing these images so this gave me an idea and after seeing a youtube video on this very topic https://www.youtube.com/watch?v=TIXAr5cCDOc I wondered if yet again my trusty 3D printer could come to my aid.

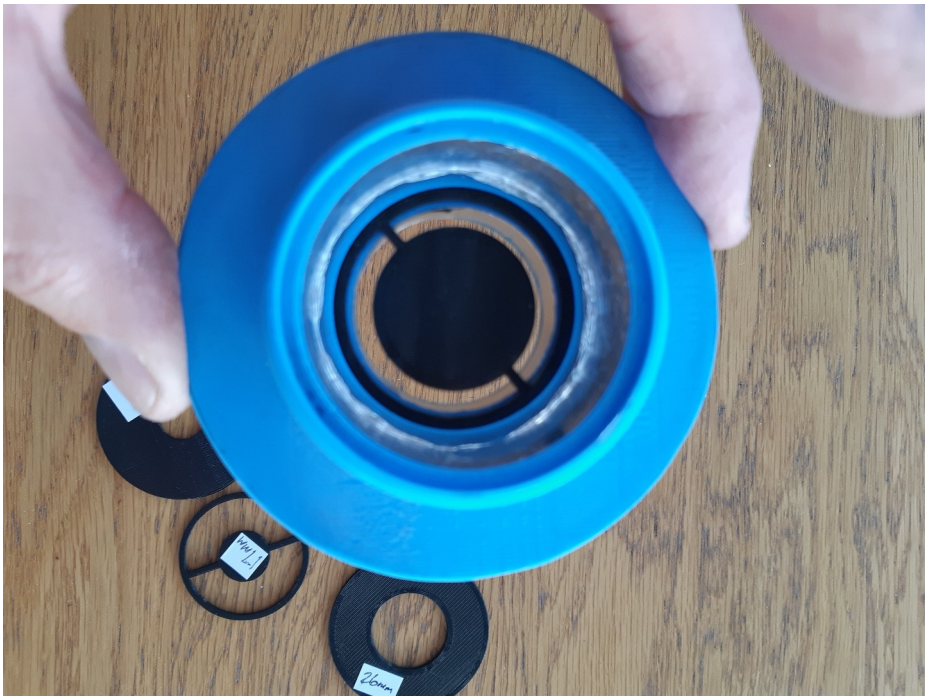
I wanted something that could be modular for my zoom stereo microscope so I could try different patch and orifice sizes and came up with this.



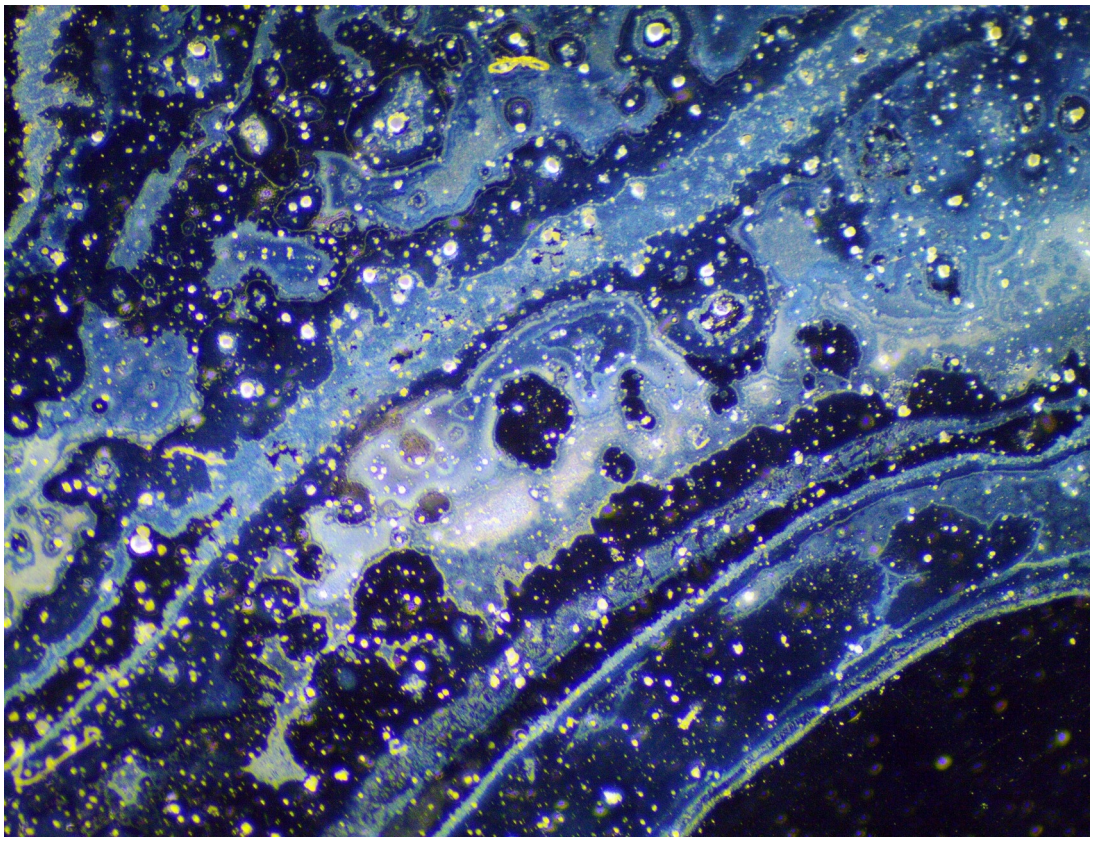
On the scope



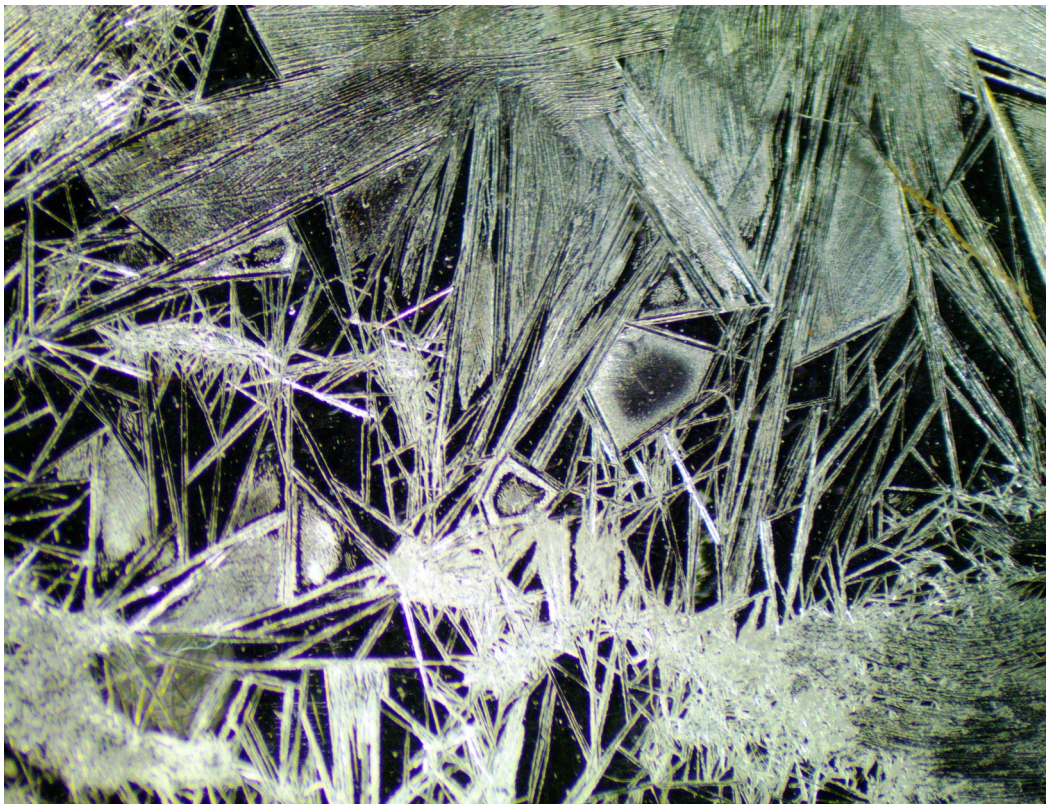
I found the 30mm patch with 26mm orifice seemed to give the best overall darkfield



Some Inositol



Some Betaine



My scope is a Swift S7-TGL 7x-45x zoom stereo microscope and camera is a Swift SC1003.

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