EPI-ILLUMINATION IN BRIGHTFIELD

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INTRODUCTION:

When observing through the objectives of a compound microscope, sometimes we notice objects are too thick for light to illuminate them. In addition, we are taught that the specimens on the stage must be transparent or translucent for observing them. This is true regarding the use of transmitted illumination with the source of light beneath the stage as it is traditionally done.

Regularly we are taught that for epi-illumination we need a stereo microscope or a microscope with those epi features and this is true too. Nevertheless, we can improve the capabilities of our compound microscope with an epi-illumination system created by ourselves and that expands the limits of our observation because now we can place upon the slide “almost” whatever we want. See below.

DEVELOPMENT:

Inspired by two works that I found on *Micscape* the first one: Simple 'top lighting' with a compound microscope... or how to study subjects you can't get light through! by Dave Walker and Darkfield illumination with a desk LED lamp by Rolf Vossen, Netherlands, I decided to create my own epi-illumination system and make it part of the microscope for having it available any time I need it, this way expanding my scope of observation exponentially.

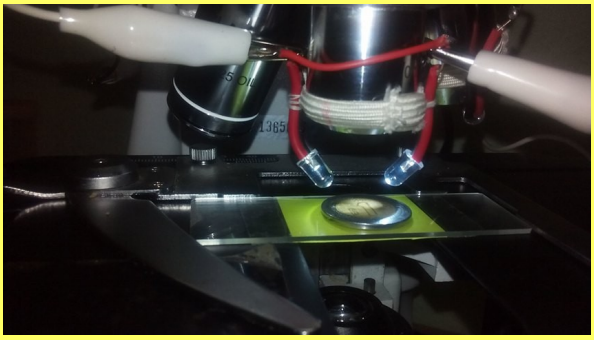
This is how I did it:

I took some elastic and made a pair of circles 1.7 cm in diameter, one for the 4x objective and another for the 10x objective. (For the moment they are the usable objectives, although I have been trying the 40x with some promising results, but this is out of the scope of the present article.) I insulated four white LEDs with wire insulation, I sewed the LEDs to the elastic and joined the poles of the LEDs' positive with positive and negative with negative to make the LEDs work together. At the same time I set an angle to the LEDs so that they illuminated the object but without interfering with the field of the objective as shown in the pictures:

This form of lighting is very useful because:

- first it may be a kind of “permanent” illumination system,
- it can be adjusted by either lifting or lowering manually the elastic upon the objective without causing any scratches or damage, either to the lens or to the metallic part of the objective,
- it can be removed whenever it is needed,
- it is very cheap and easy to produce,

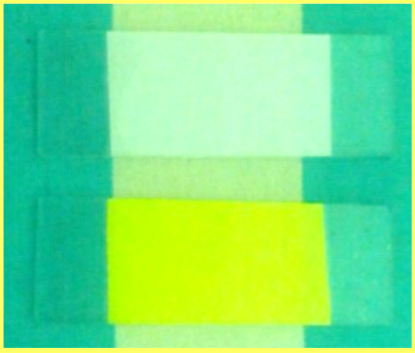
- when the transmitted light system is used they can remain there because they do not interfere with each objective's field of view.



With the help of a battery box and two Cayman wires and I turn on the LEDs with a switch. Shown below is the system for only one for the two objectives.

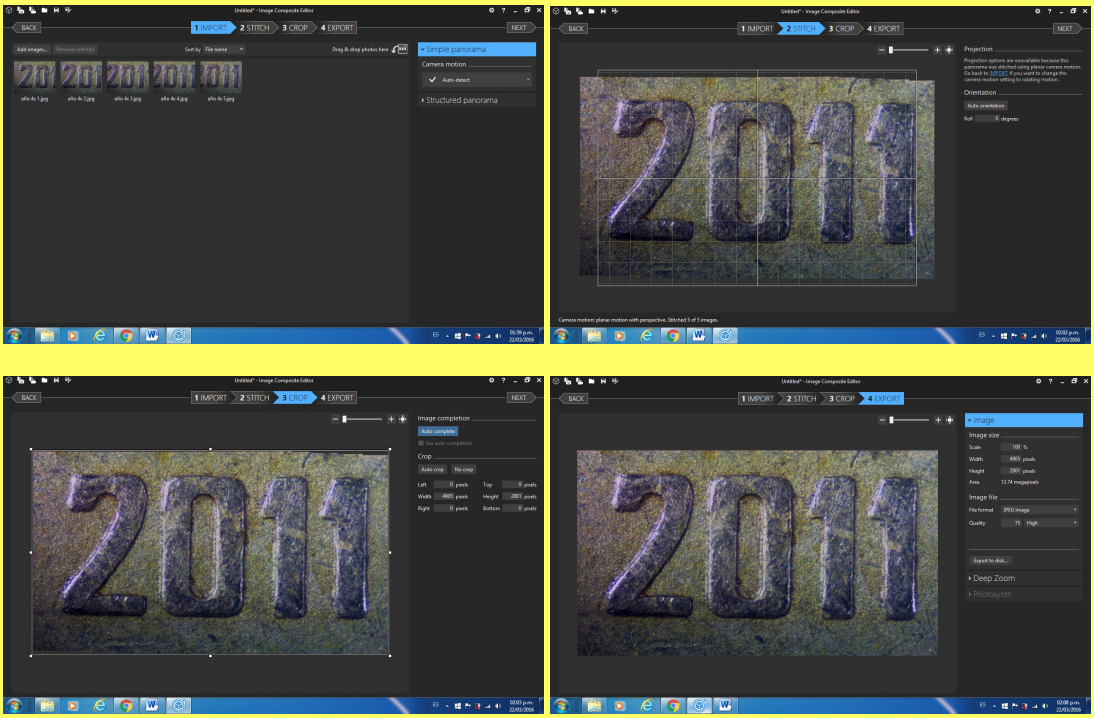
I just exchange the clips in the circuit whenever I need one or the other.

For using the brightfield of this form of epi-illumination I cover some slides with two kinds of paper, one yellow and one white as shown below.



So the sample is illuminated by the LEDs and it is surrounded by a yellow or white background which enhances the contrast of the sample giving a better resolution. This is what I call epi-brightfield. I use the yellow one most because it gives more color to the brightfield background of the sample.

Sometimes the subjects are going to be too large for the field of the lens as in the case of a coin, but if you wish to take a create an image of it whole, it is possible to use the program IMAGE COMPOSITE EDITOR which is free software. Michael Reese Much from Bethlehem, Pennsylvania, USA in his article Panoramic Stitching in Photomicrography taught us how to use this software in the April 2015 issue of *Micscape*.



In four simple steps, once loading the individual images, you can have an image of the whole subject.

RESULTS:

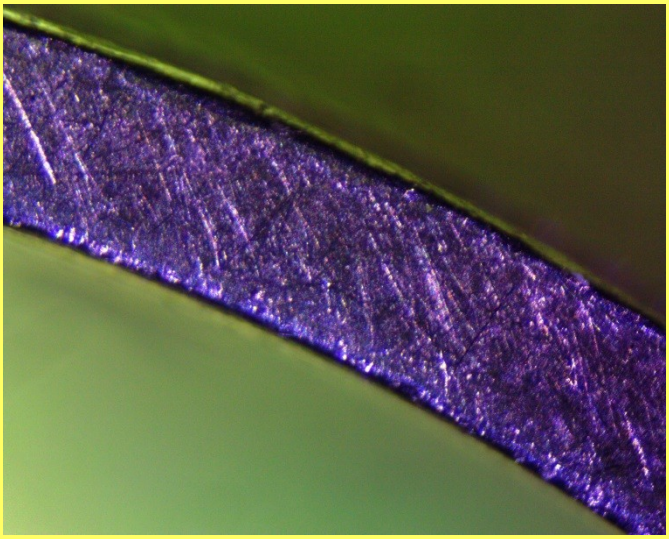
Note: It is necessary to take into account that the colors and the level of depth shown in the images below corresponds to the interpretation of the camera and that a photo is a flat image. The best views of these type of subjects are seen by viewing them directly in the eyepieces.

The symbol of money on a one peso Mexican coin 4x

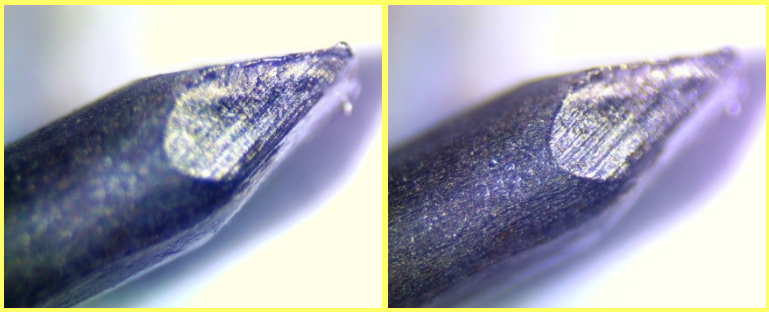
The year of coining of the same Mexican peso 4x

A bit of a copper wire 10x

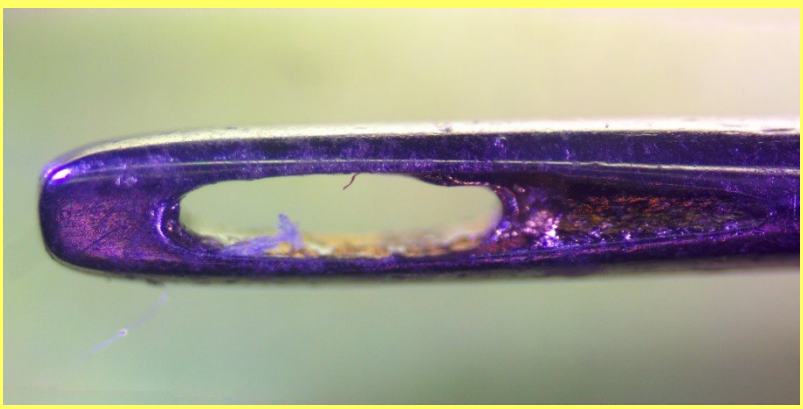
The tip of one end of a staple 4x



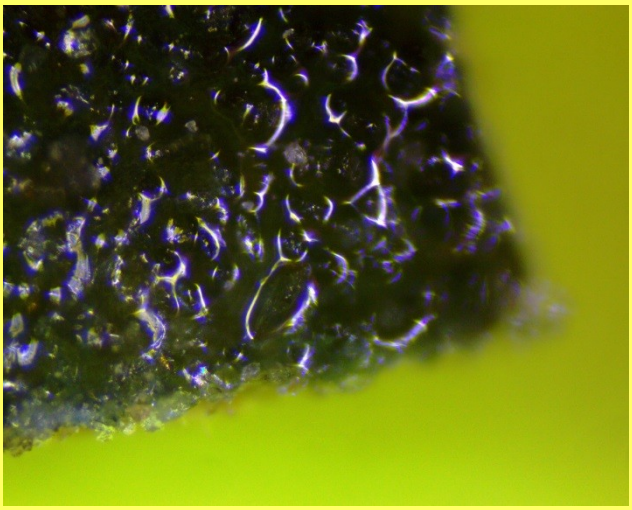
Part of my wedding ring 4x



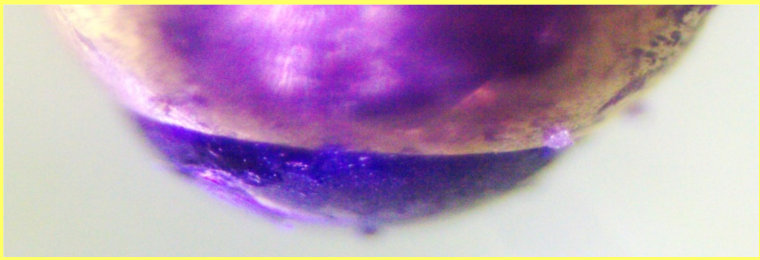
The tip of a nail - two views



The eye of a needle 4x

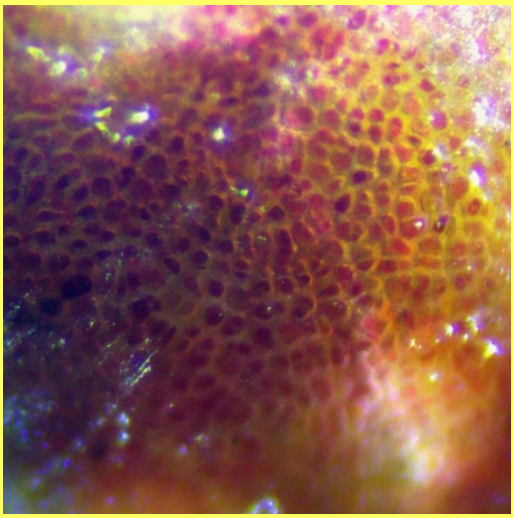


A bit of a waterproof sandpaper 4x

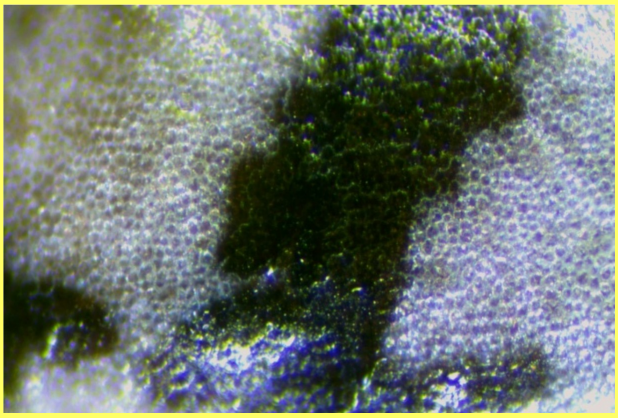


The tip of a pen 4x

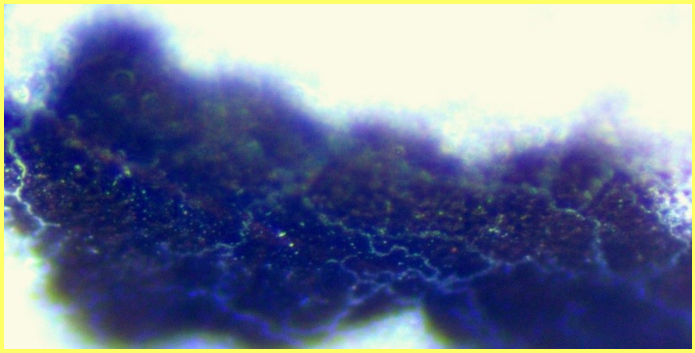
A bit of gray fabric 4x



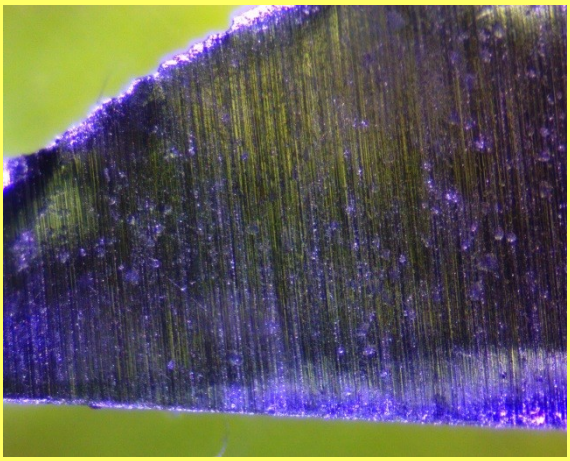
Cells of the external part of the skin of an avocado 10x



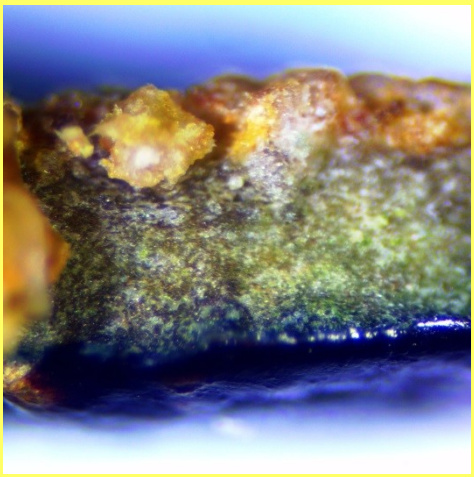
Part of a chia seed also called S*alvia hispanica* 10x



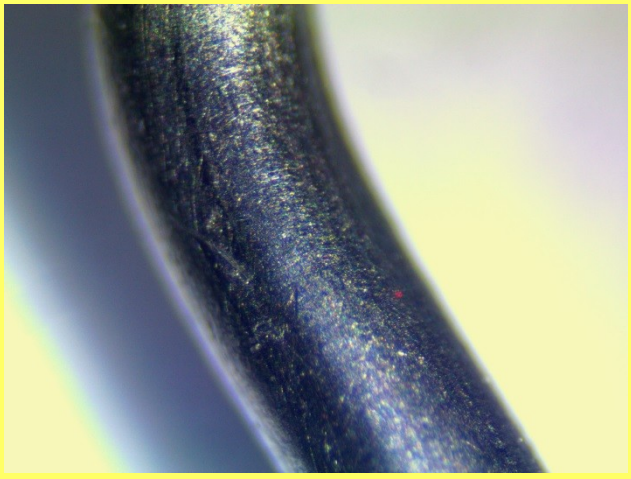
The black part of a chia seed also called S*alvia hispanica* 10x



A bit of aluminum foil 4x



The layers of the avocado skin 4x



A bit of circuit tin weld 4x

CONCLUSION:

One of the objectives of this project is to create by oneself something that improves the way we see through our microscopes. I like it to be a kind of permanent modification but without damaging the microscope and to have it available whenever it may be needed. So I can conclude that everybody can have

an epi-illumination microscope and that observing the miniature world that we like so much, now has expanded and limitless opportunities.

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(Above in anti-spam format. Copy string to email software, remove spaces and manually insert the capitalised characters.)

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