

# **MICROSCOPICAL EXPLORATION**

## **THIRTY THREE**

### **A BRIEF COMPARISON OF OBJECTIVES OLD AND NEW**

Over the years, or should I say decades, that I have pursued my hobby of light microscopy as a very enthusiastic amateur, I have been fortunate enough to own and use a number of different microscopes dating from the nineteen forties up to the present day. By today's standards only my Swift SW380T microscope could possibly be classified as a 'research grade' instrument, but for my purposes they are all more than adequate. In Microscopical Exploration 33 objectives from the following microscopes are compared:

Leitz monocular dating from 1942/3 (ser. No. 364060)

MHR monocular dating from the 1980s

Vickers M10<sub>A</sub> monocular dating from 1985

Swift SW380T trinocular dating from 2021

Also included is a set of pre-owned Olympus short barrel objectives probably from the late 1980s, and a recent Prior x 2.7 objective

To make the comparison a fair test, each of the objectives was fitted to the Vickers M10<sub>A</sub> stand, which is the only one that I have with sufficient adjustment to accommodate all the different parfocal distances of the objectives under scrutiny. The stand was also fitted with a Brunel Eyecam Plus eyepiece camera, in order to facilitate image capture using Swift Imaging 3.0 software.

The parameters under consideration for each objective brand are listed below and are quantified in Table 1.

- Magnification (Mag.): as etched onto the objective barrel.
- Numerical Aperture (N.A):as etched onto the objective barrel.
- Optical Correction (OC): from available literature.
- Parfocal distance (PFD): from available literature.
- Working distance (WD): from available literature.
- Field of View (FoV): calculated from measurements made of the image on the computer screen captured by Eyecam Plus at 1600x1200pixels .

**TABLE 1**

Brand	Mag.	OC	N.A.	PFD (mm)	WD (mm)	FoV (mm)
Prior	x2.7	achr	0.59	66	59	5.0x3.75
MHR	x4	achr	0.10	37	20	2.48x1.86
Olympus	x4	achr	0.10	37	18	2.84x2.13
Vickers	x4	achr	0.10	45	18	2.80x2.10
Swift	x4	achr	0.10	45	18	2.95x2.21
MHR	x10	achr	0.25	37	7	1.17x0.88
Leitz	x10	achr	0.25	37	6.1	1.19x0.89
Vickers	x10	achr	0.25	45	6.1	1.16x0.87
Swift	x10	achr	0.25	45	6.1	0.58x0.44
Olympus	x20	Plan	0.40	37	1.2	0.54x0.40
Vickers	x20	achr	0.4	45	1.2	0.54x0.40

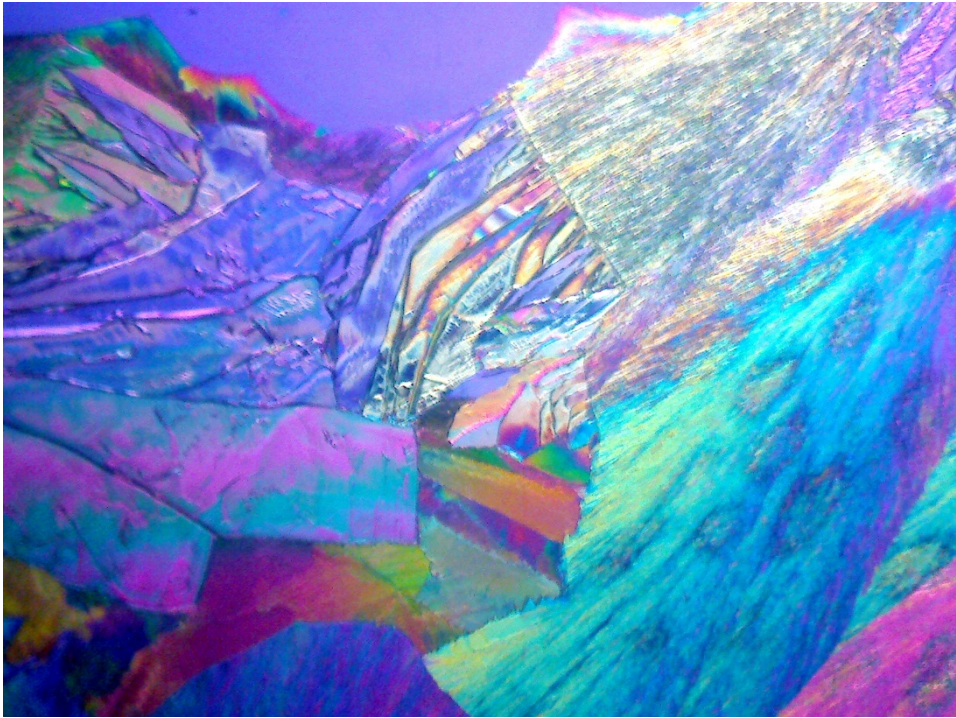
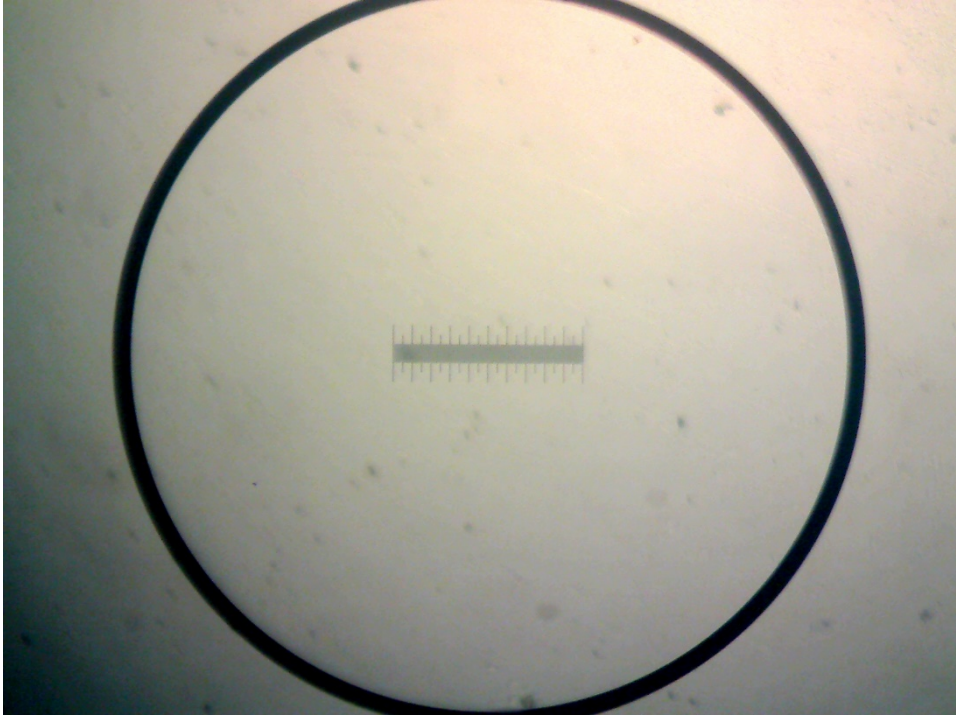
achr = achromatic

Plan = Flat field optical correction

Now that the numbers have been compared, it's time to invoke the adage regarding that sweet comestible, pudding: the proof of which is in the eating.

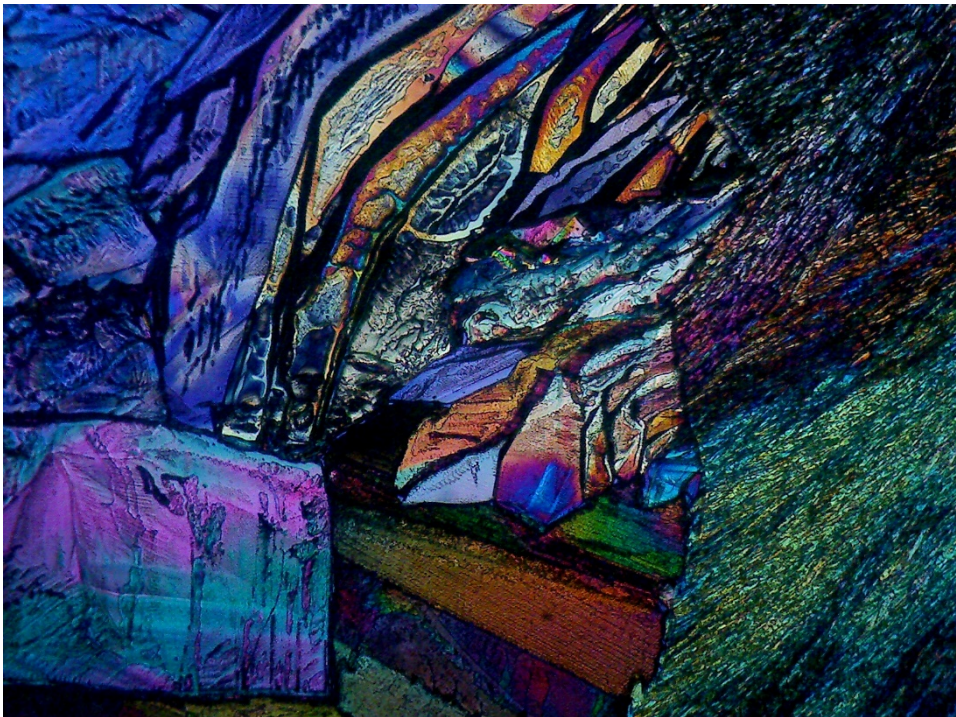
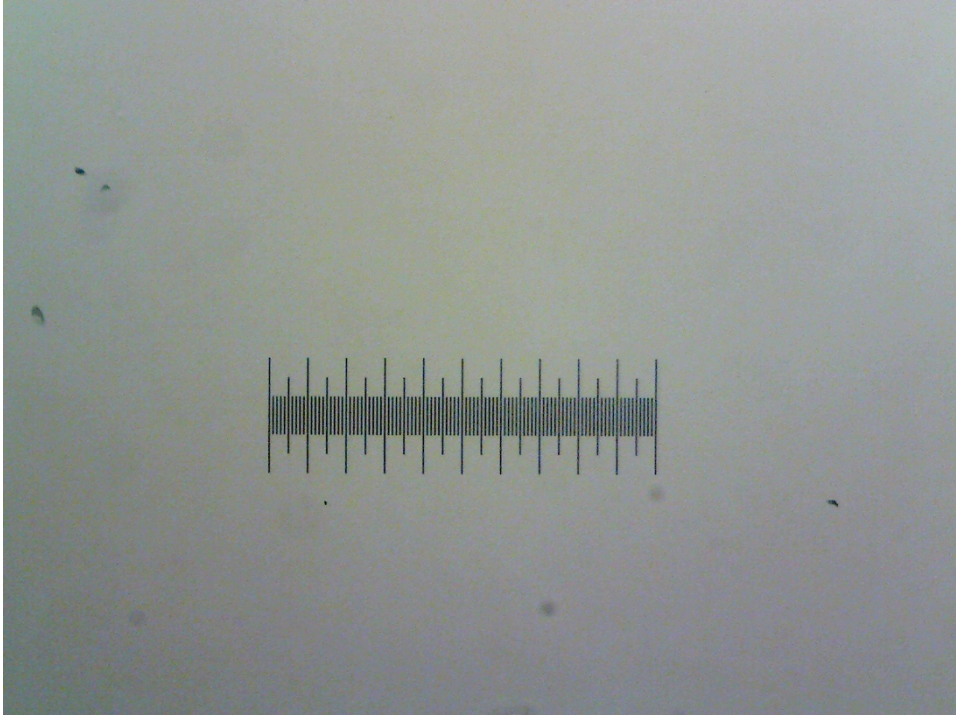
So, how good are the images captured using each of the objectives? Below are images of a 1mm stage micrometer, and of a slide of citric acid between crossed polars, for each objective.

Prior x2.7



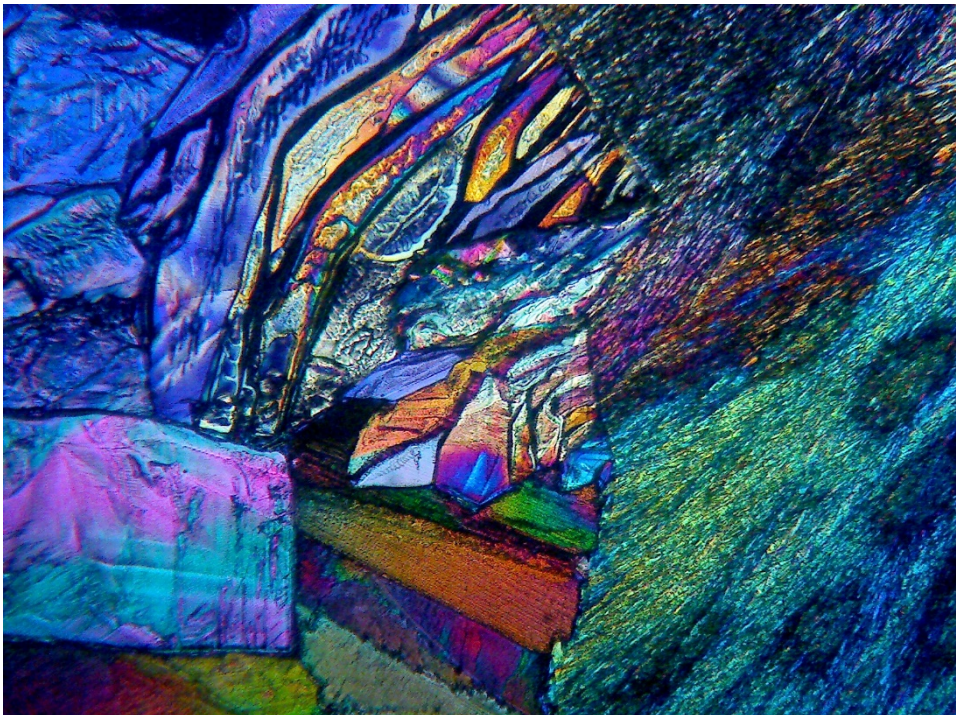
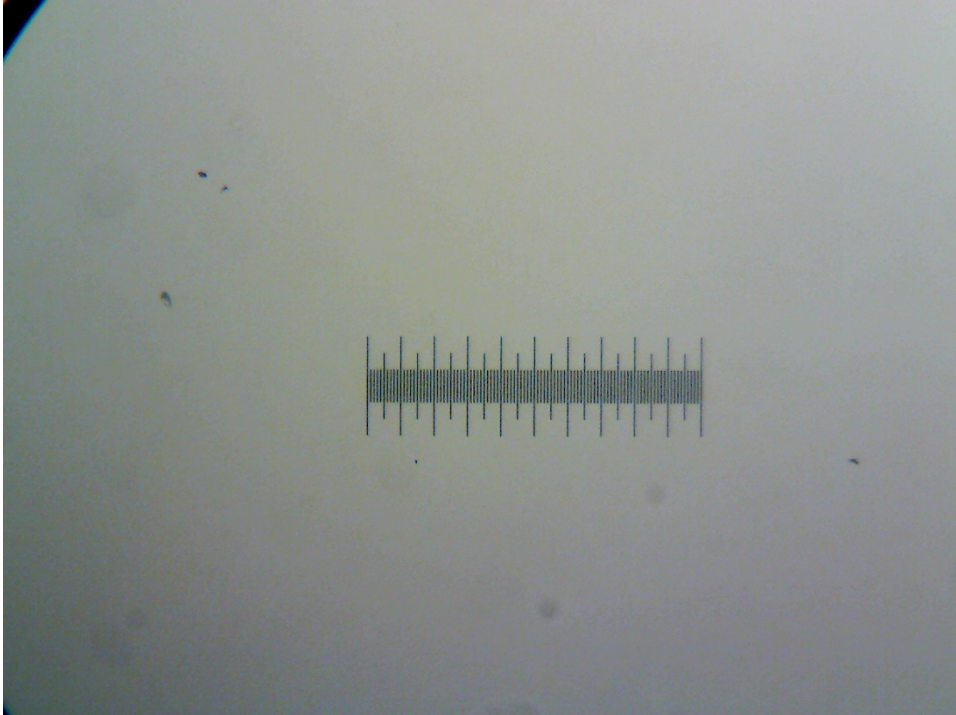


MHR x4



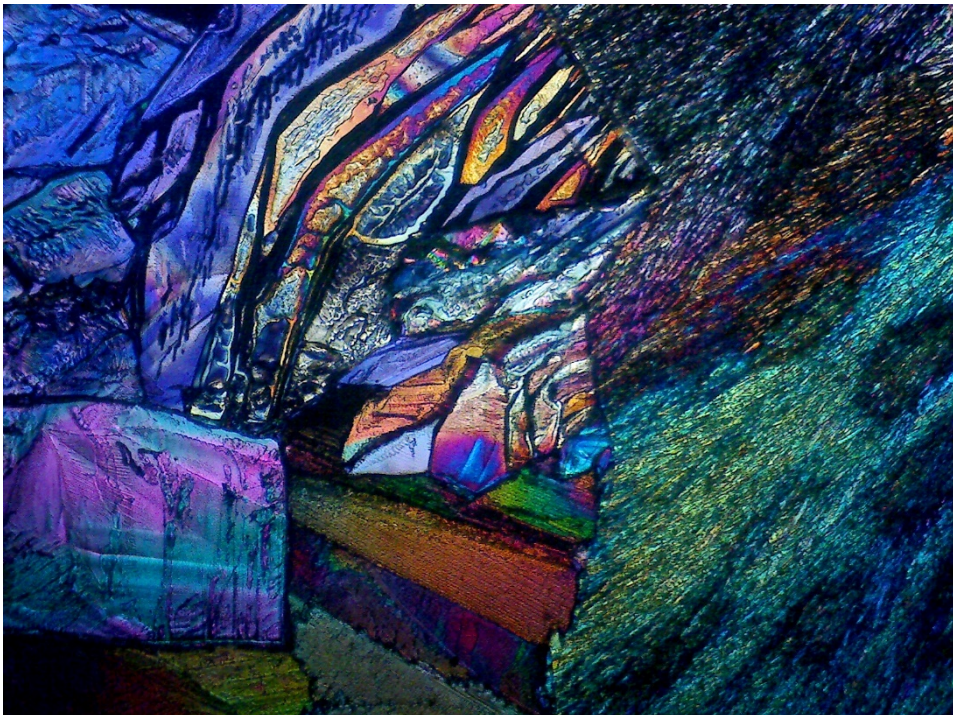


Olympus x4



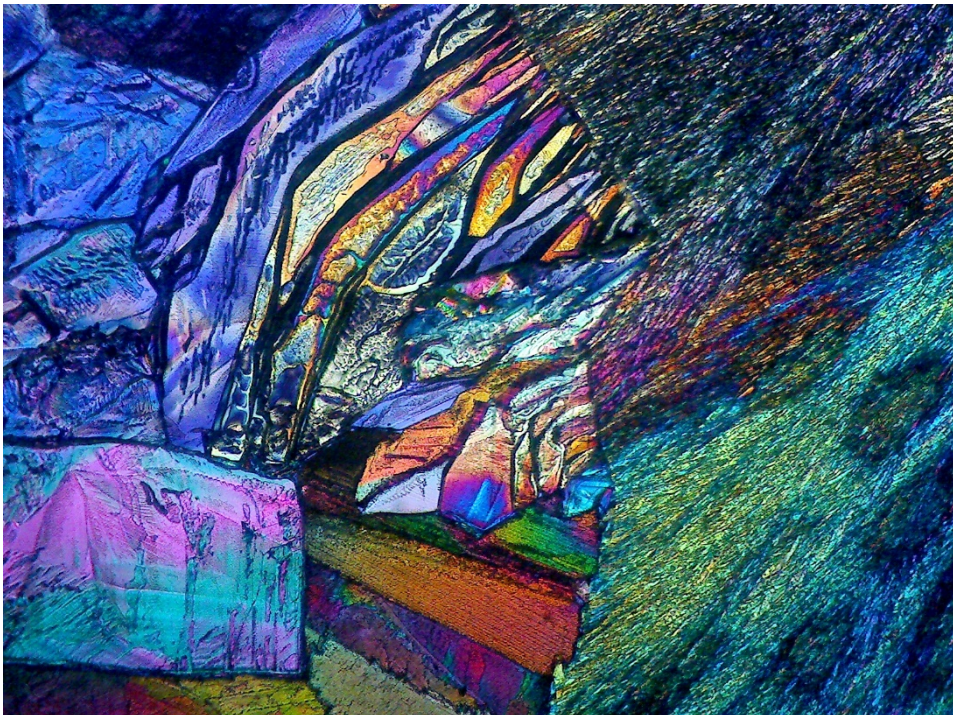
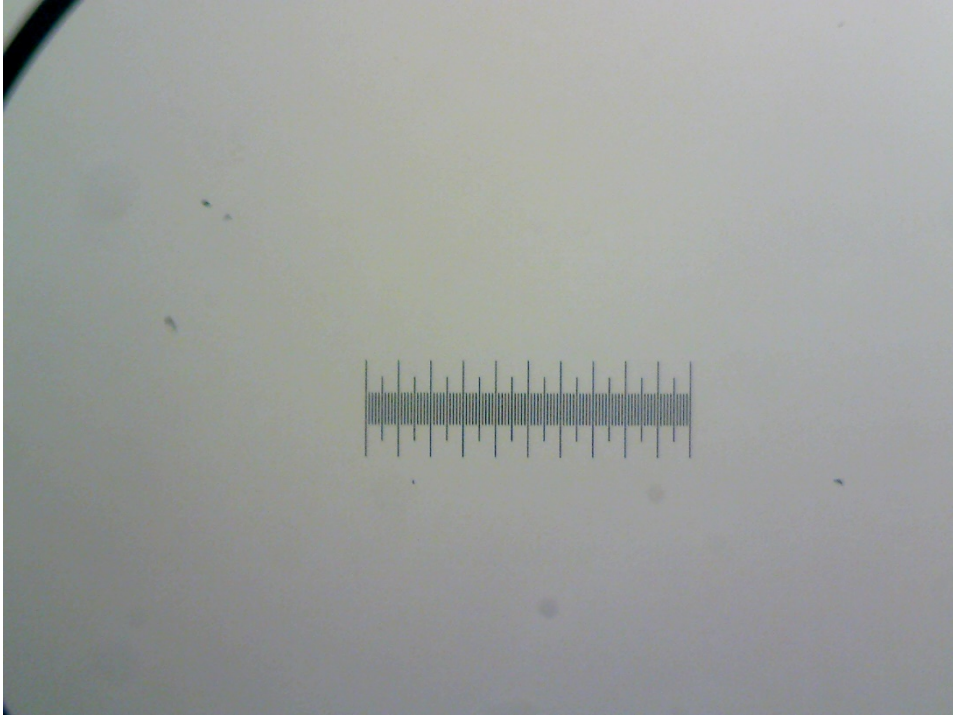


Vickers x4



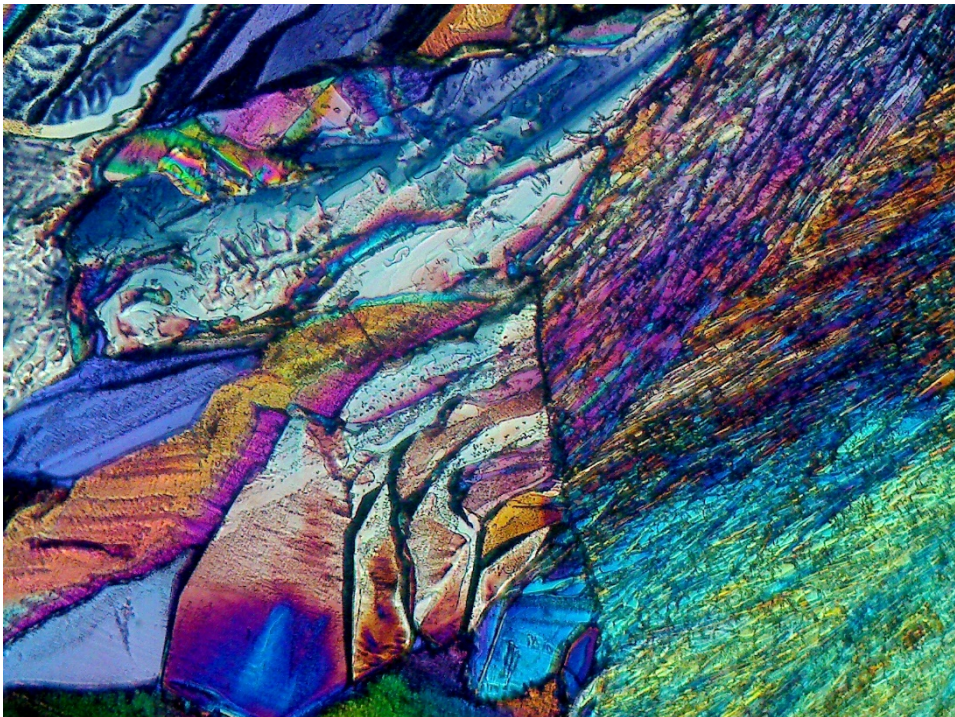
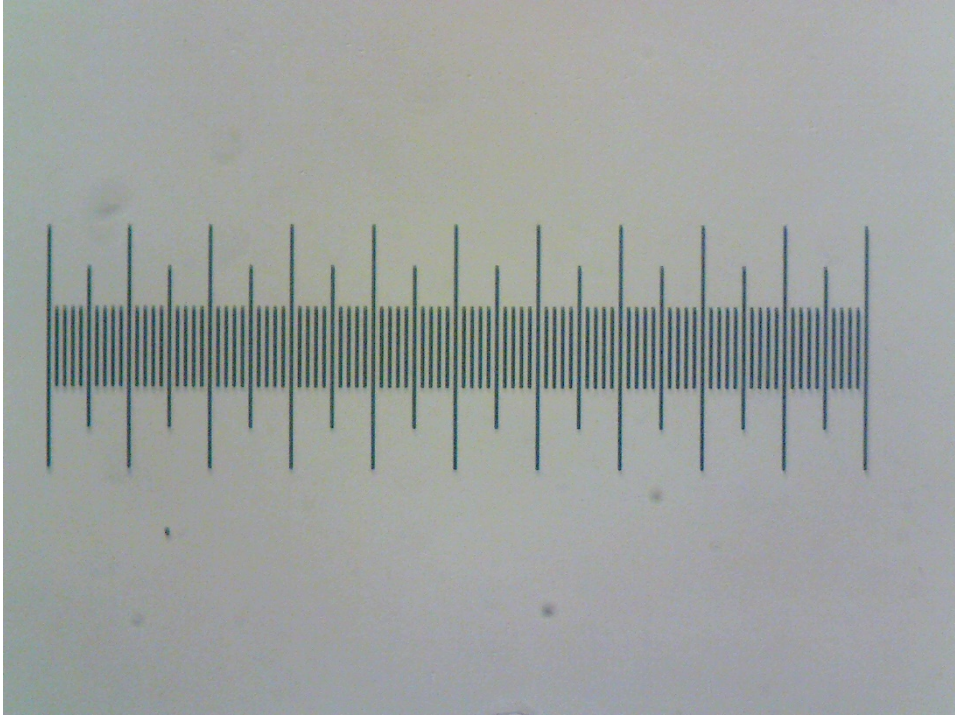


Swift x4



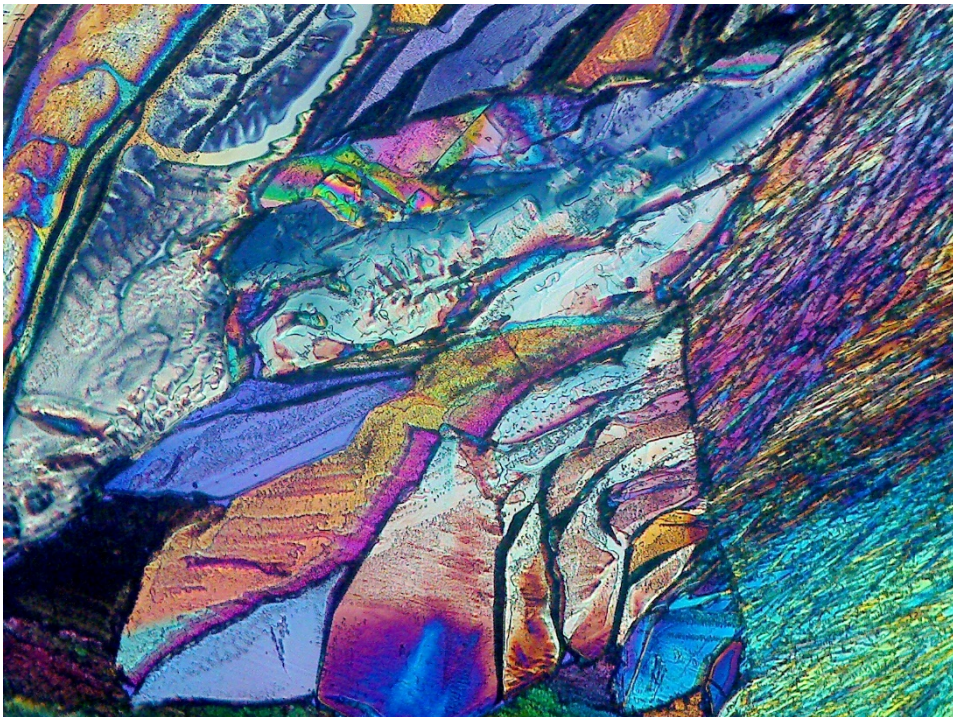
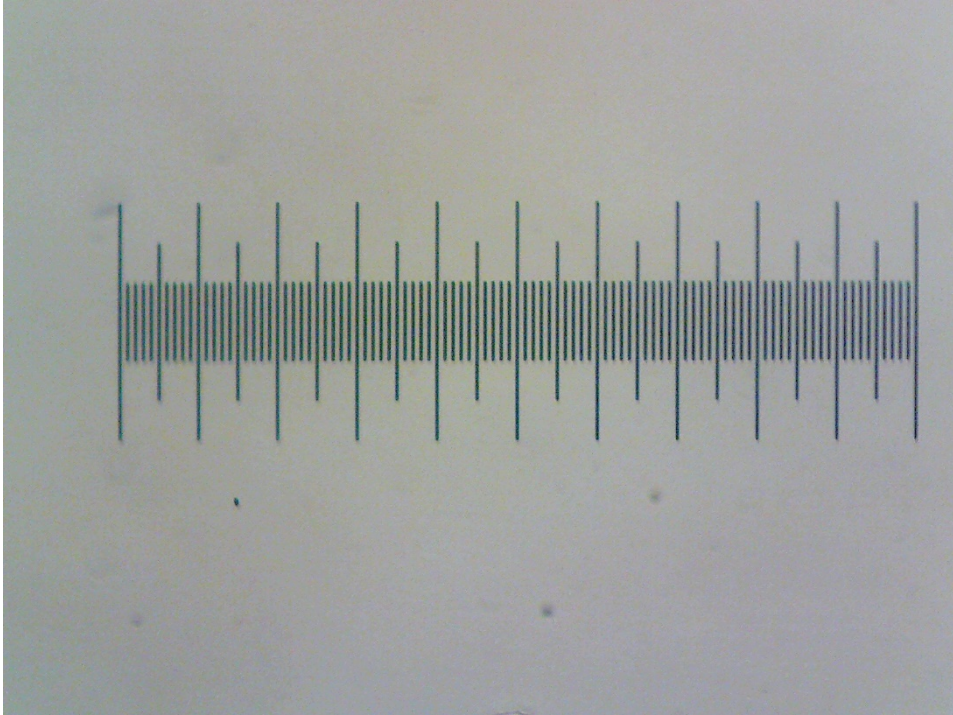


MHR x10



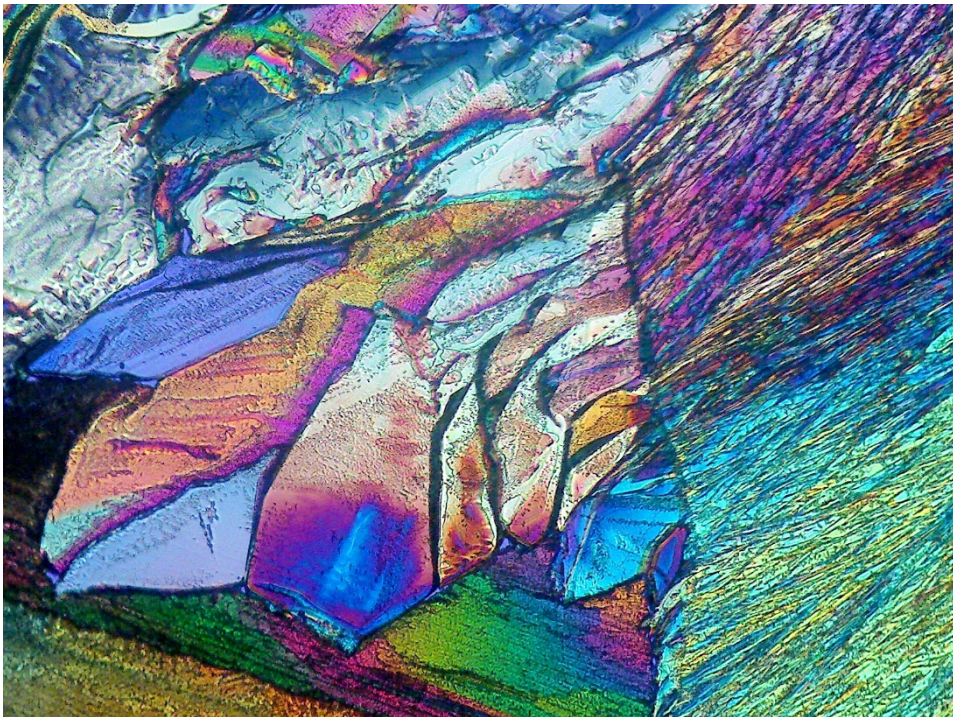
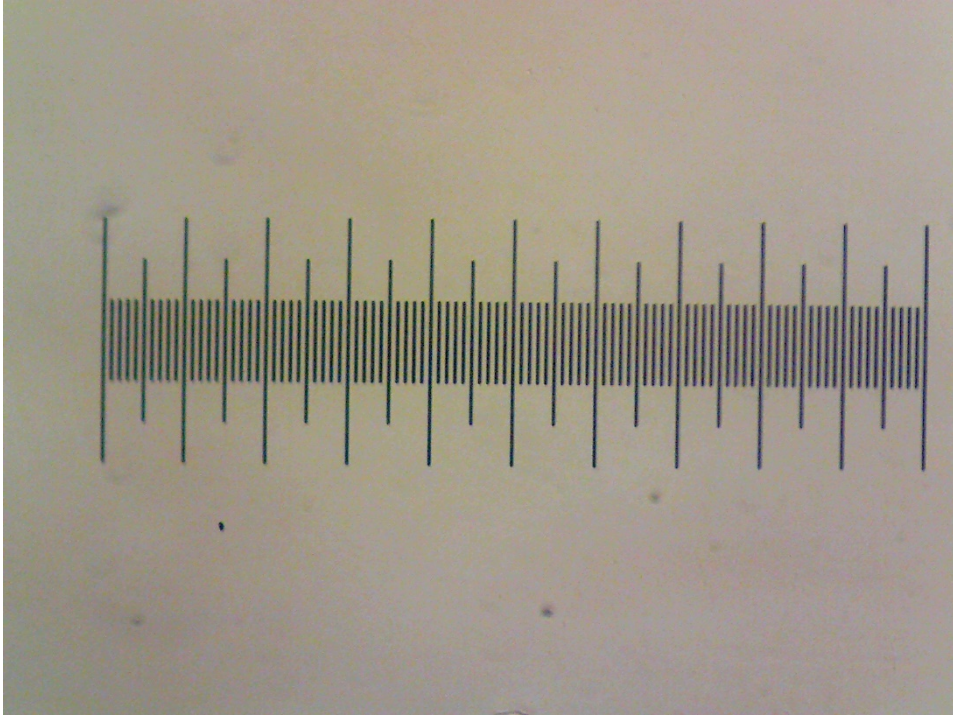


Leitz x10



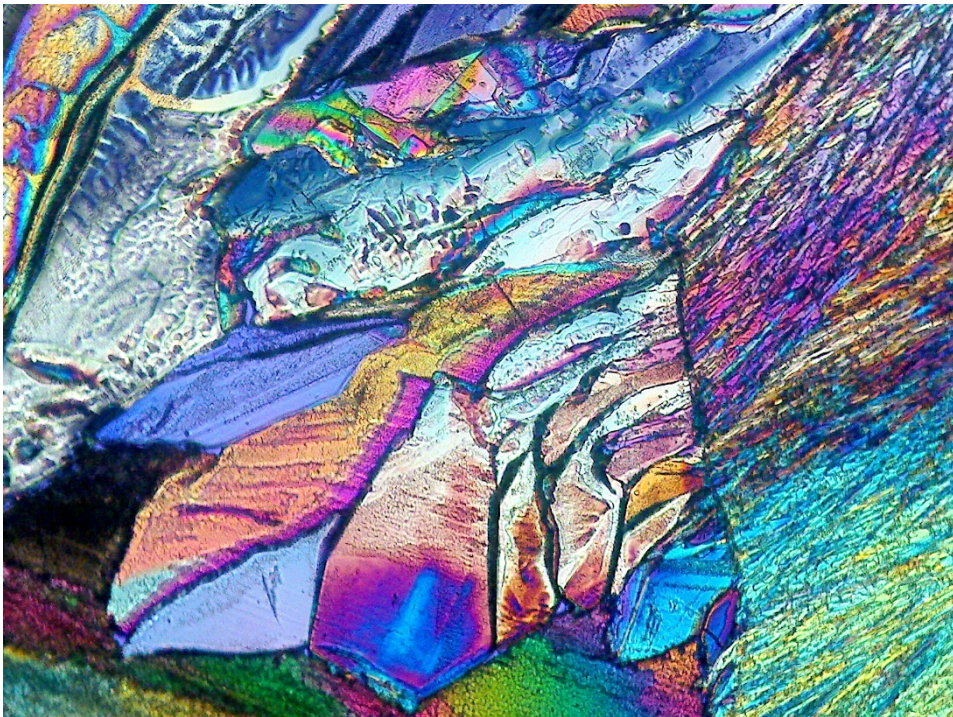
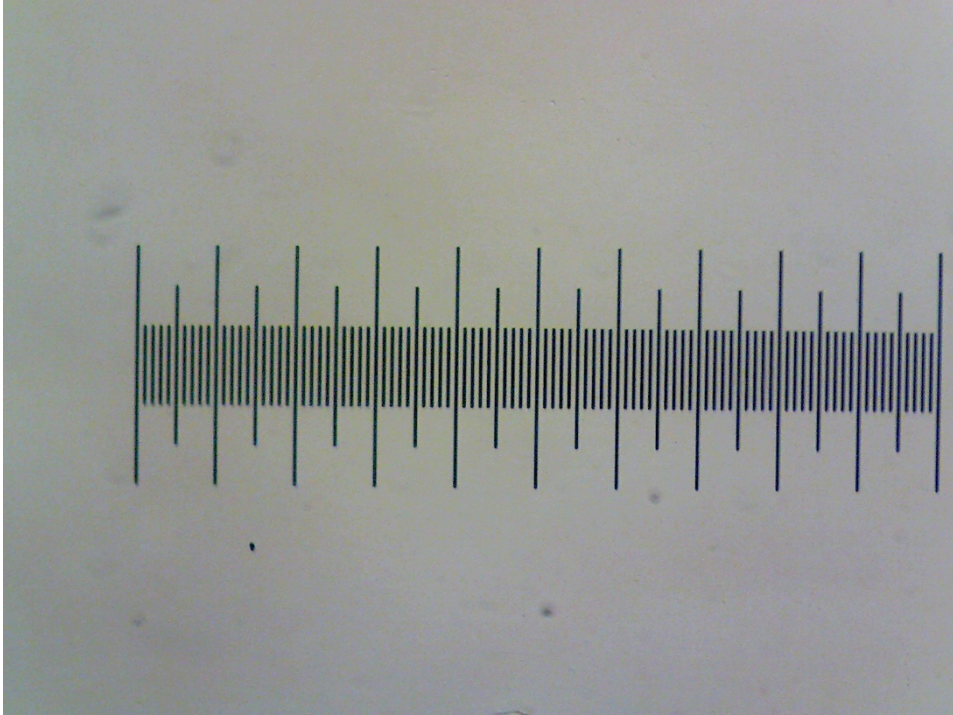


Vickers x10



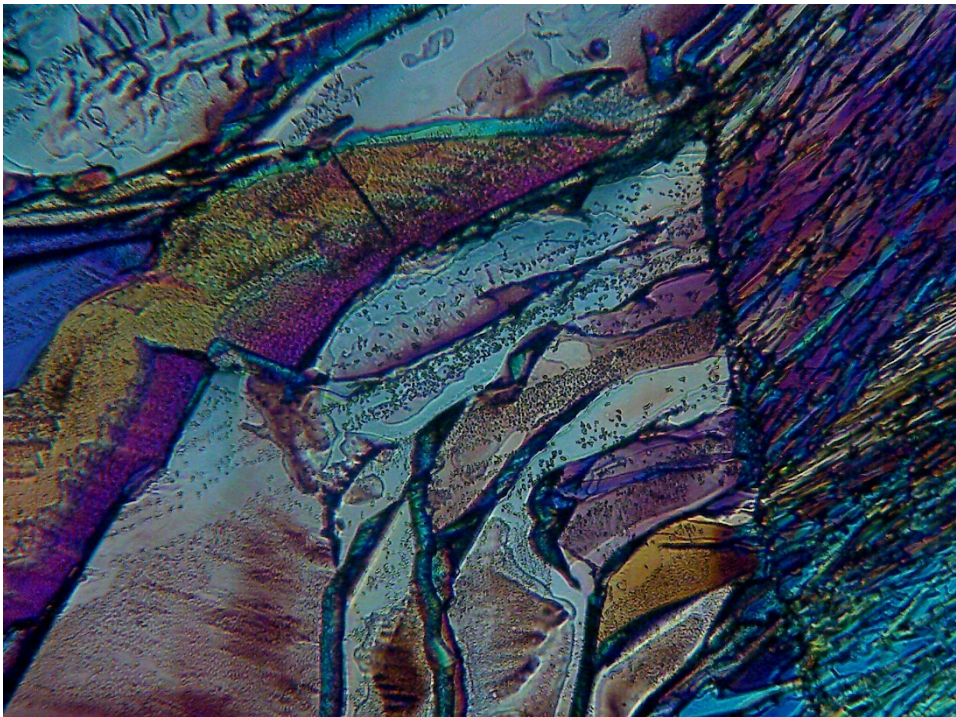
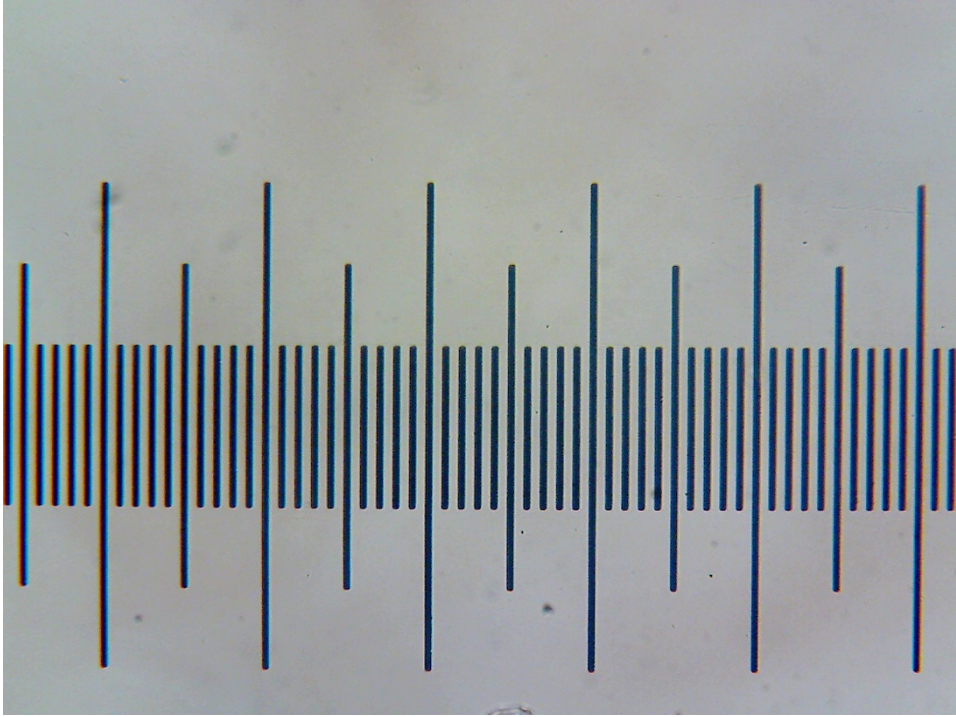


Swift x10



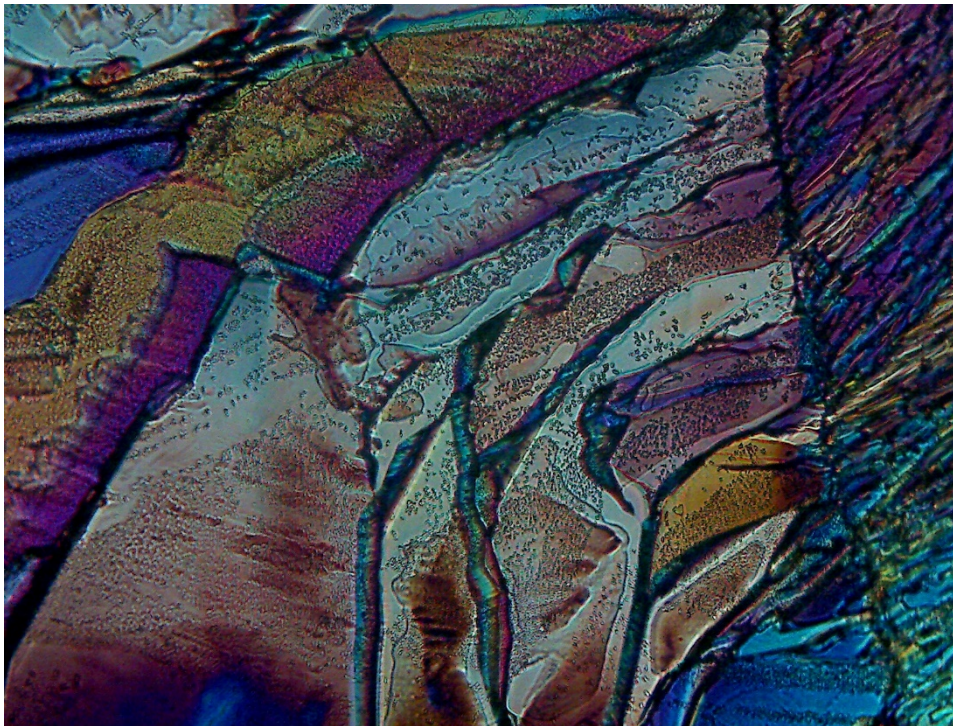
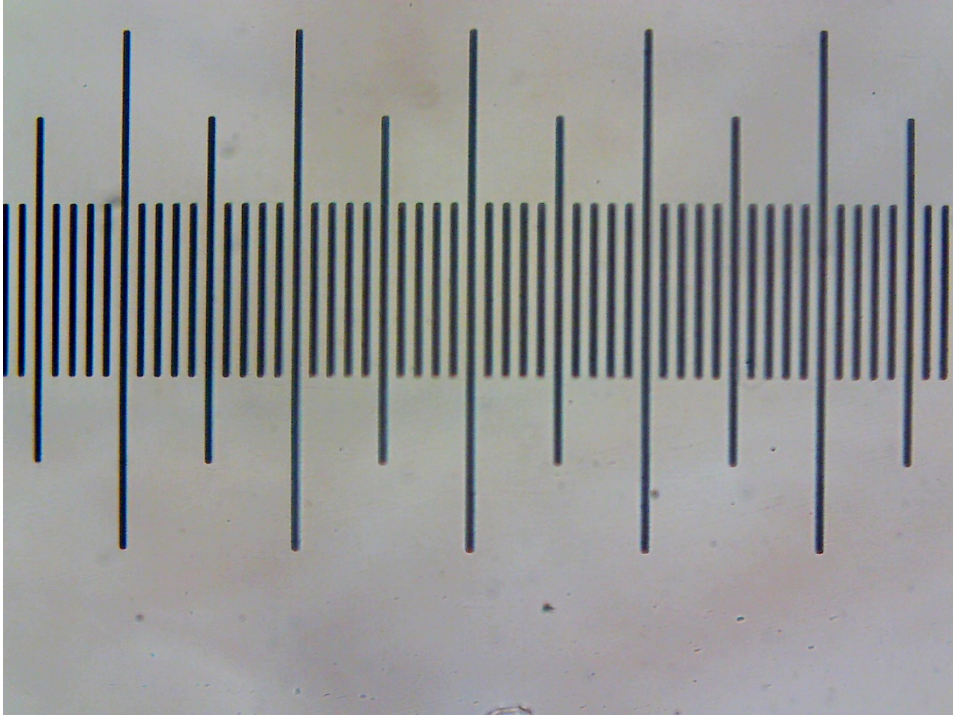


Olympus x20





Vickers x20



Given that all the above images were captured using the same sub-stage incandescent illumination provided by the Vickers M10A stand, there are discernible differences in the brightness of some of the images attributable to the inherent characteristics of each objective. That said, all the objectives in this Microscopical Exploration are eminently suitable for my purposes and will continue to be used regularly and often in the pursuit of my fascinating hobby.

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**As we say here in Cumbria:**

**‘Ave a go yersel’!**

**Comments, gratefully received, to:**

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