MICROSCOPICAL EXPLORATION

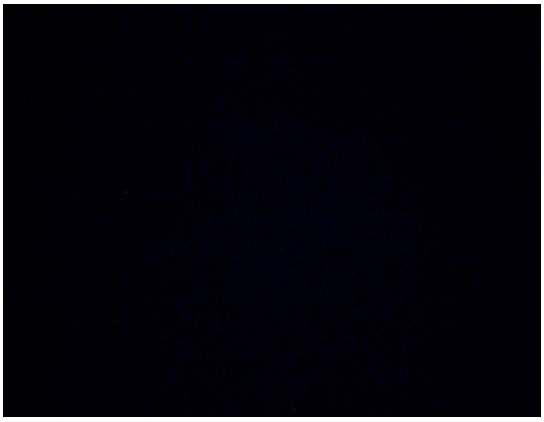
TWENTY EIGHT

COLOUR CHANGES BY DEGREES

For this Microscopical Exploration the word degrees measures angle of rotation, and is represented by the ° symbol.

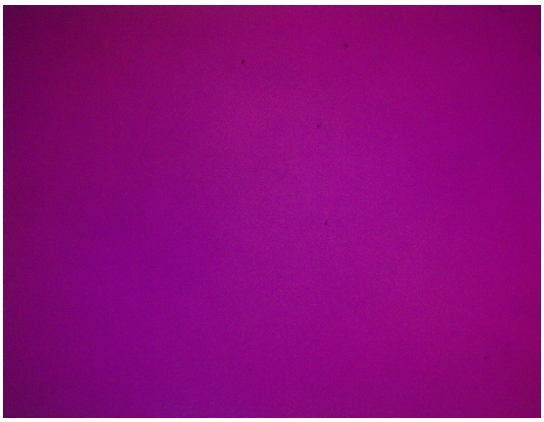
To start the Exploration which is described here I fitted my microscope with a polarising filter and analysing filter positioned with their planes of polarisation at right angles leading to maximum extinction and a dark field as shown in image1.

Image 1.



A sticky tape waveplate was then interposed in the light path between polariser and analyser and the polariser was arbitrarily assigned as being at 0° rotation with respect to the waveplate, giving rise to the coloured field of view as shown below.

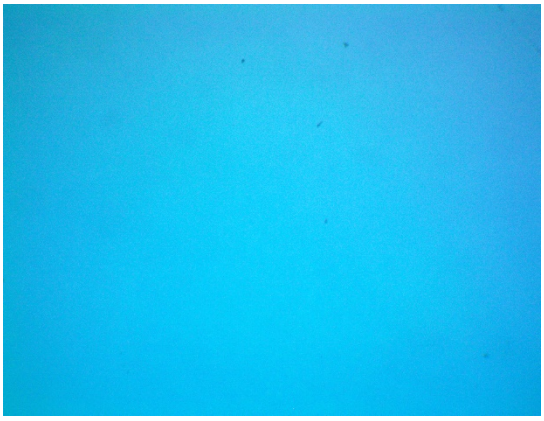
0°



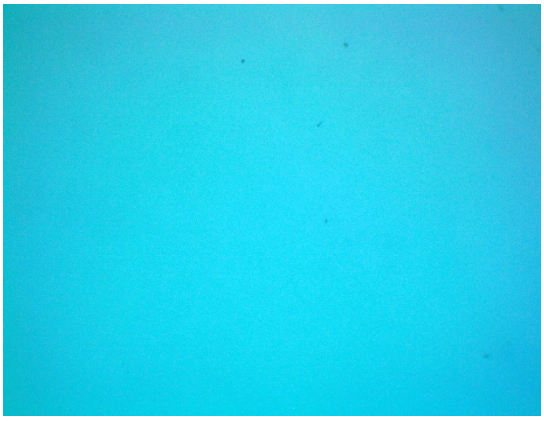
The polariser was then rotated clockwise in the light path by increments of 30° with respect to the wave plate, giving rise to the colour changes in the field of view as seen in the following images.

30°

60°



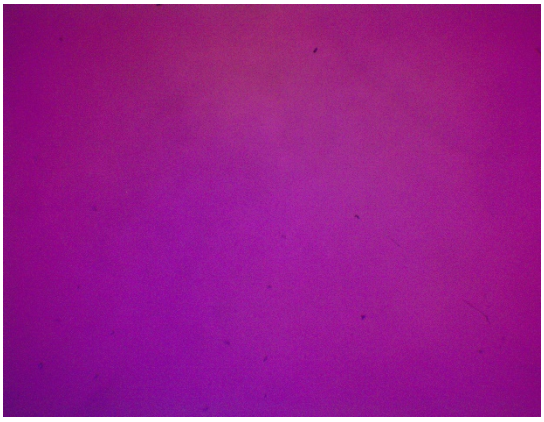
90°



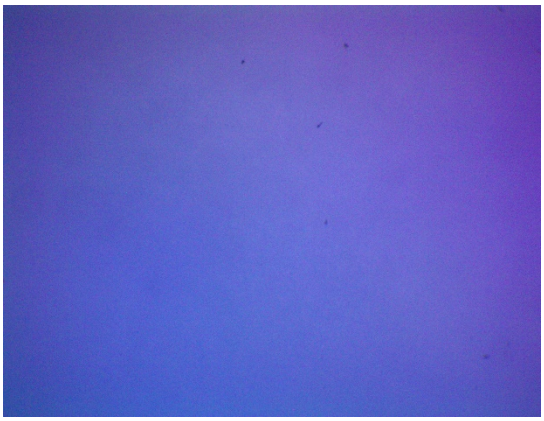
120°

150°

180°

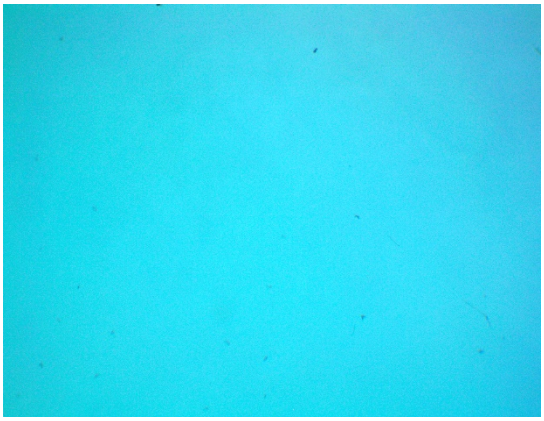


210°

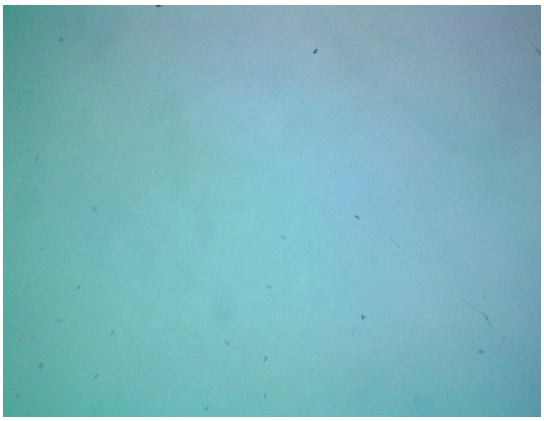


240°

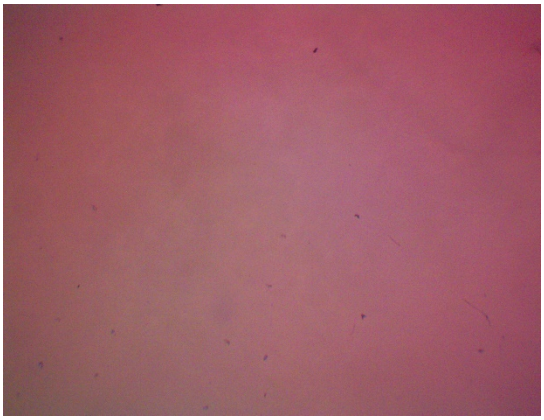
270°



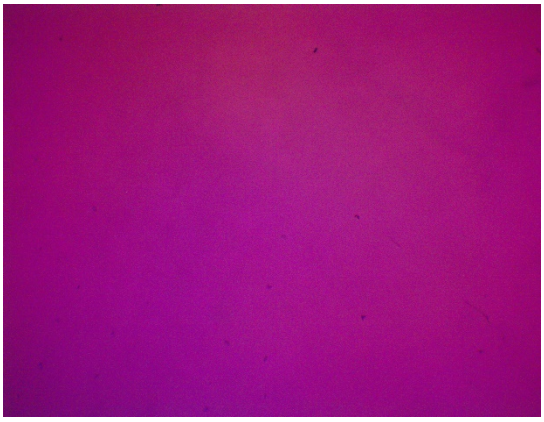
300°



330°



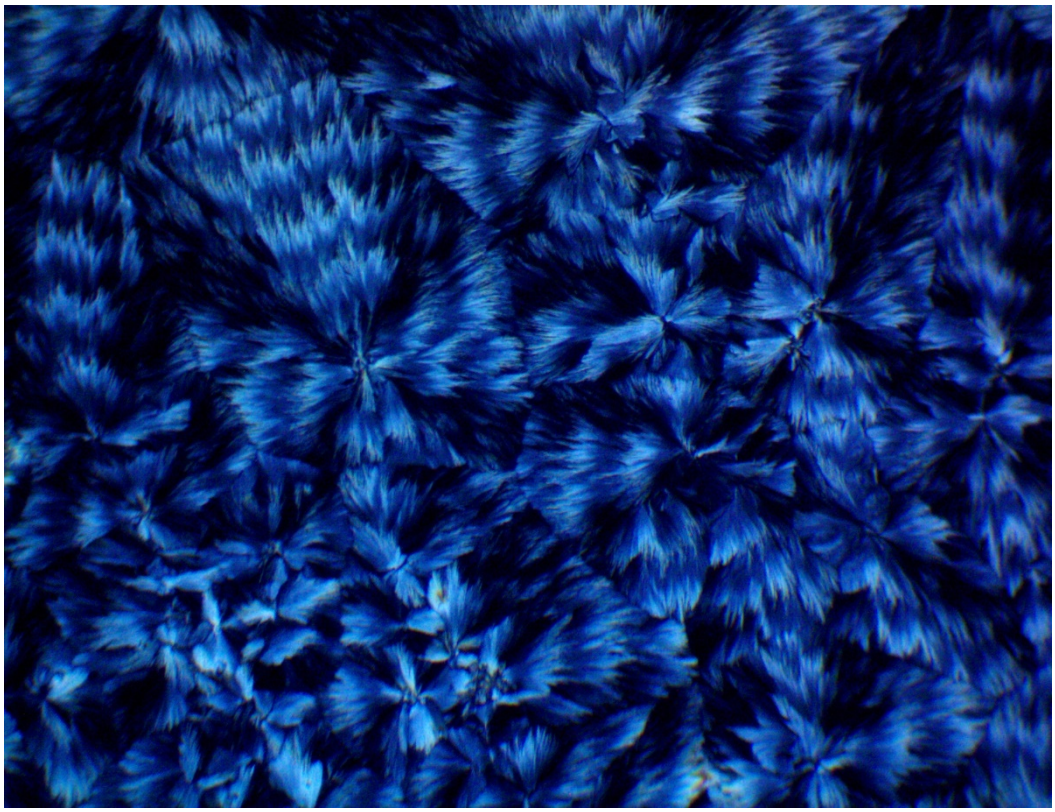
360°



As can reasonably be expected, the colours generated at rotations of the analyser separated by 180° are the same, due to the relative positions of the planes of polarisation of the two filters being the same.

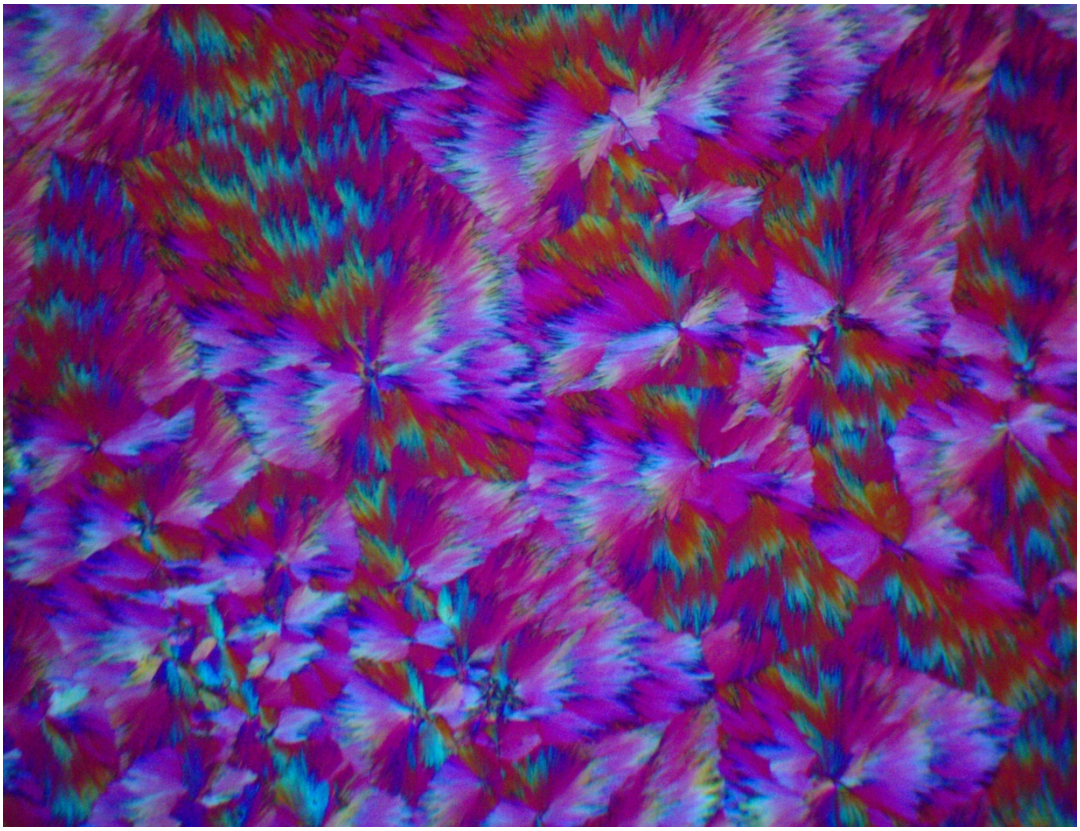
Next a specimen slide of Tartaric acid was prepared by evaporative crystallization from solution in industrial methylated spirit. The slide was placed between the polariser and analyser with no waveplate in position, and produced an image thus:

Tartaric acid between crossed polars, no waveplate

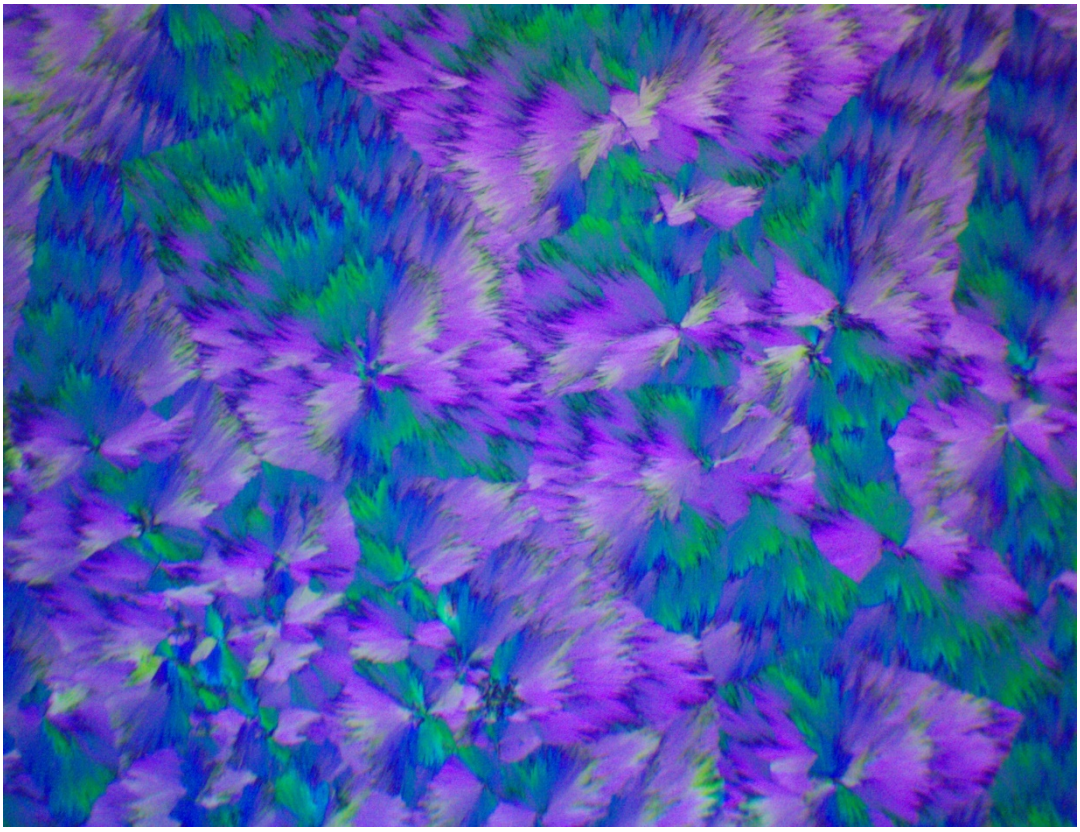


The sticky tape waveplate was then interposed between polariser and specimen and the rotation of the polariser repeated as before. The resulting colour changes are illustrated in the following images:

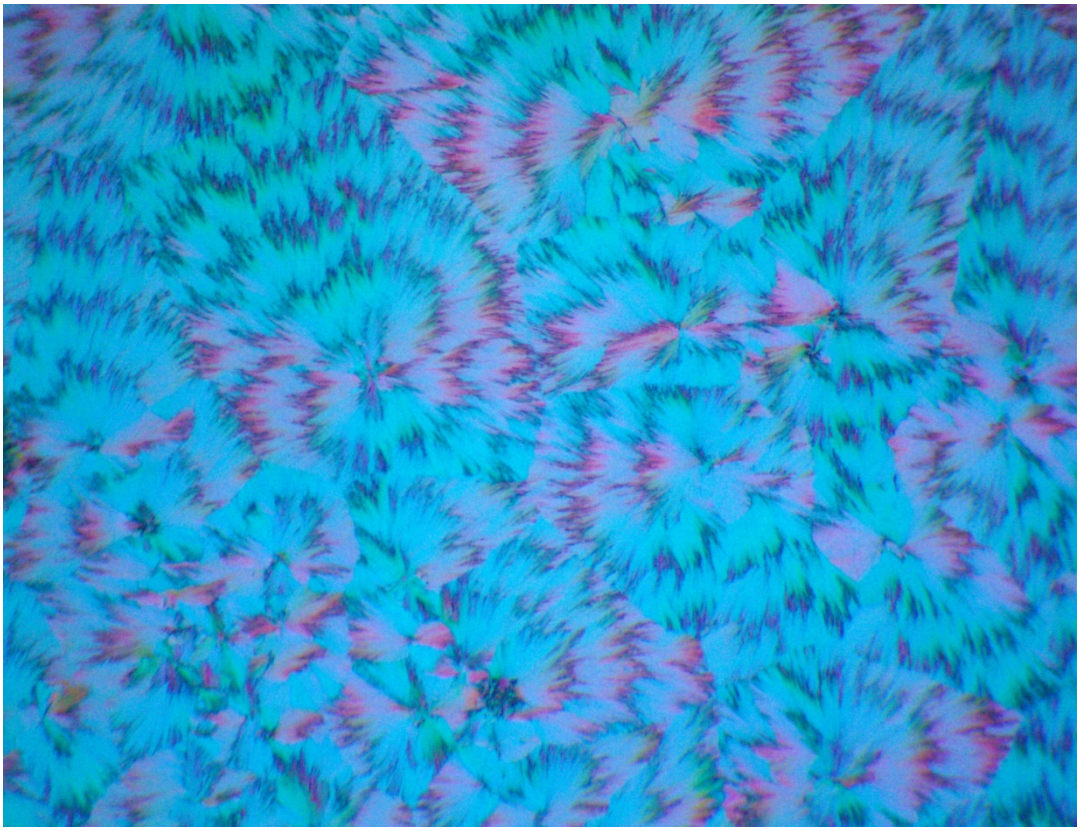
Tartaric acid 0°



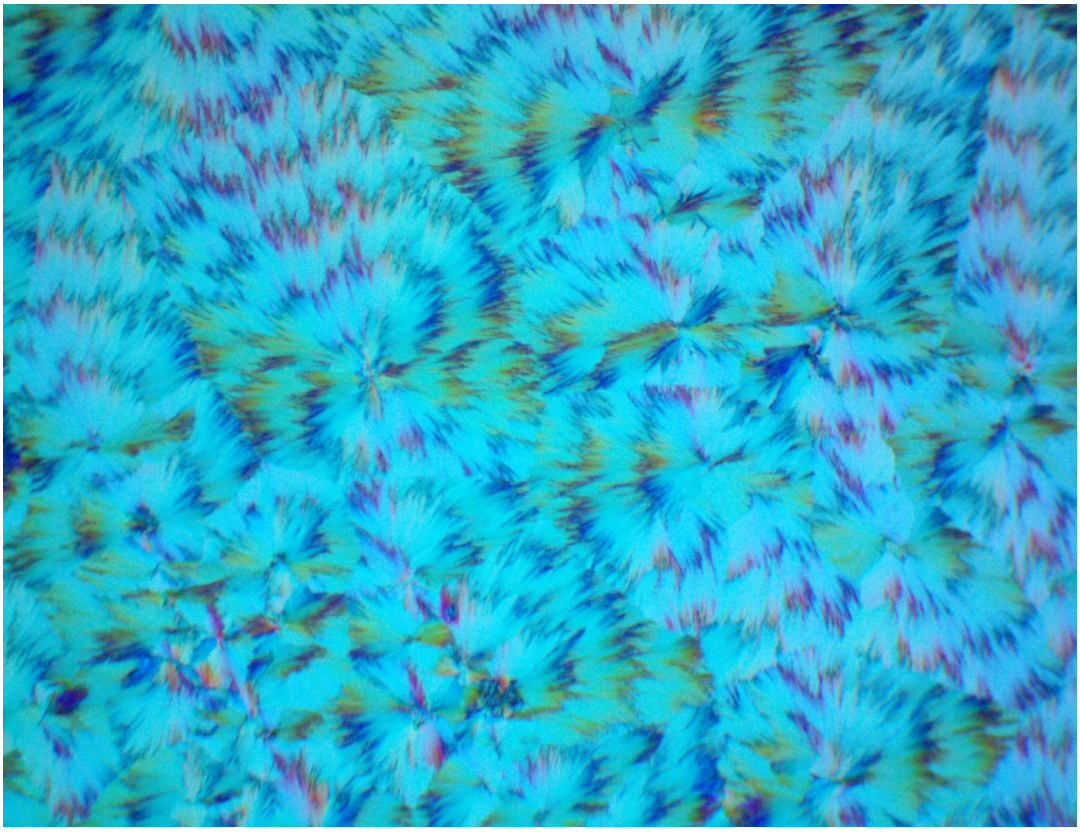
Tartaric acid 30°



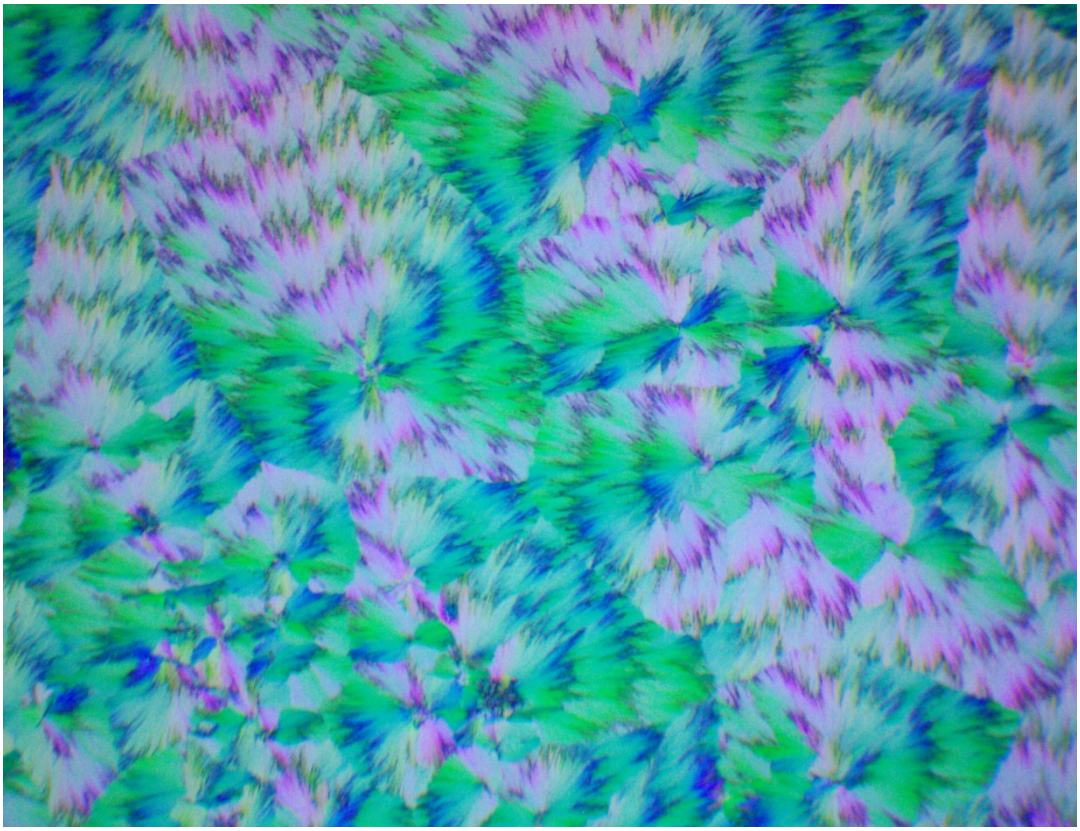
Tartaric acid 60°



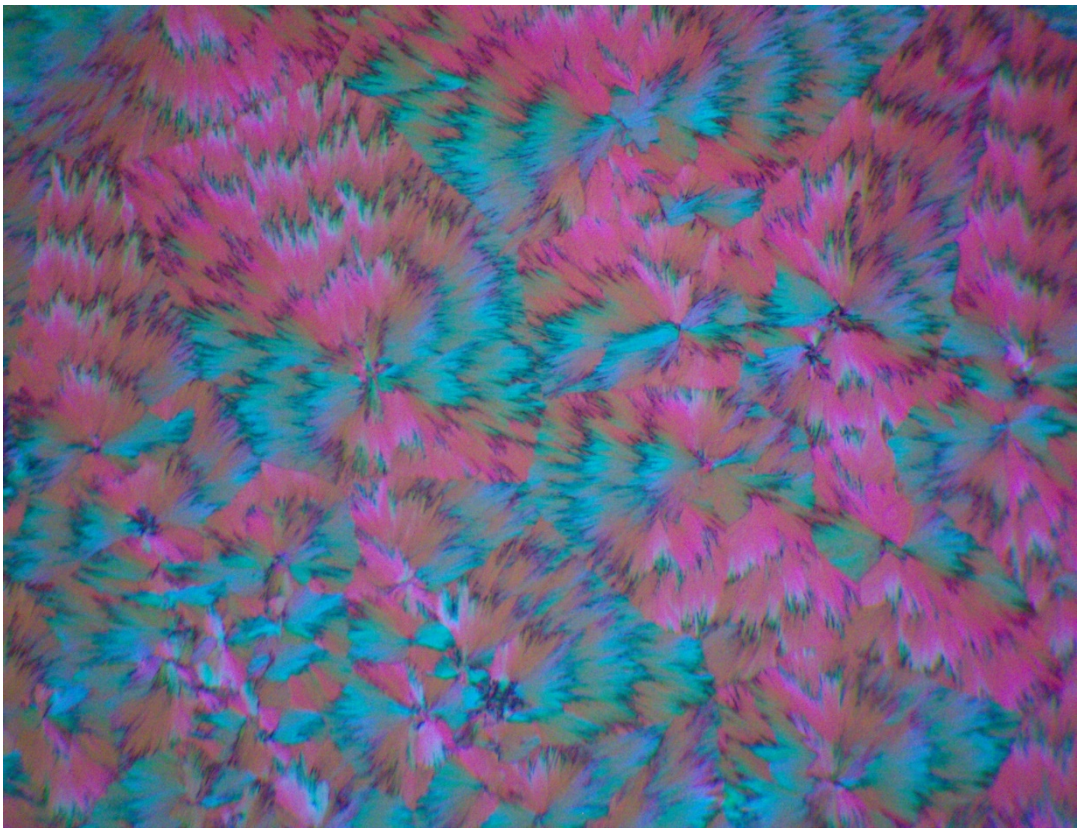
Tartaric acid 90°



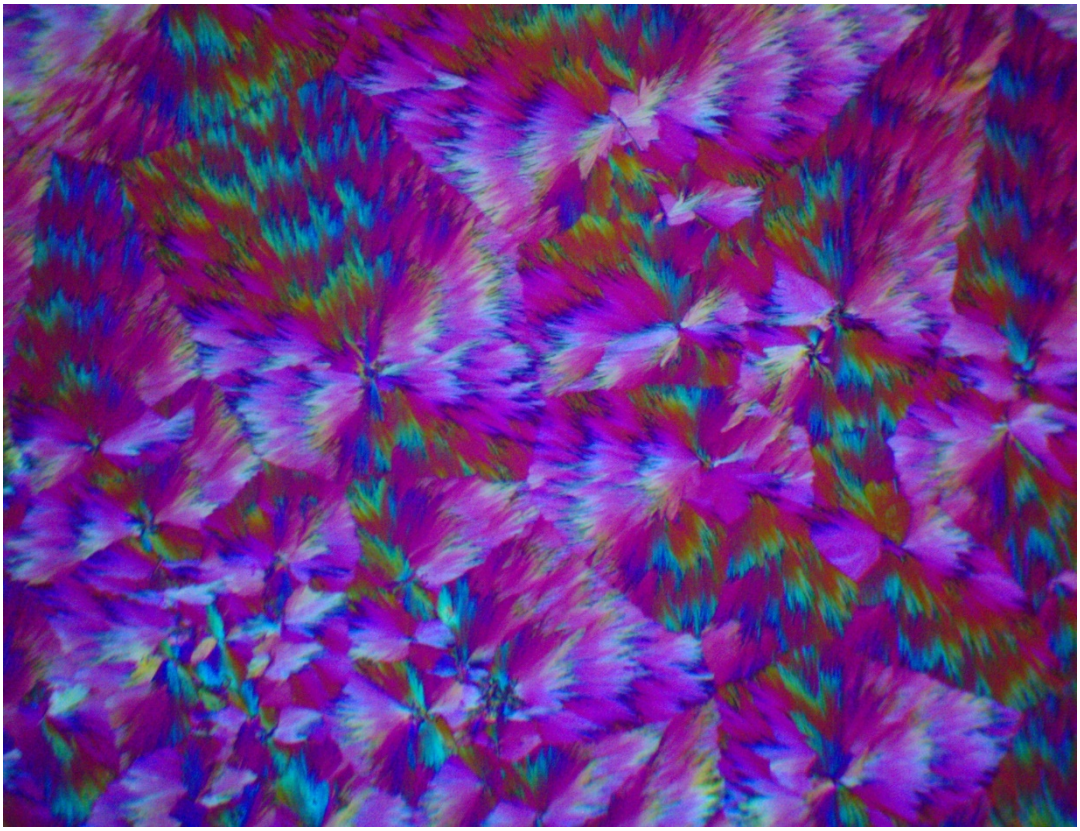
Tartaric acid 120°



Tartaric acid 150°



Tartaric acid 180°



Although I make no attempt to explain these changes in colour by polarised light/waveplate theory or by reference to any of the commonly recognised cylindrical co-ordinate colour models, eg. HSL or HSV, by reducing the magnitude of the increments of rotation of the polariser more subtle differences could become visible…Who Knows????

As we say here in Cumbria:

‘Ave a go yersel’!

Comments, gratefully received, to:

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