



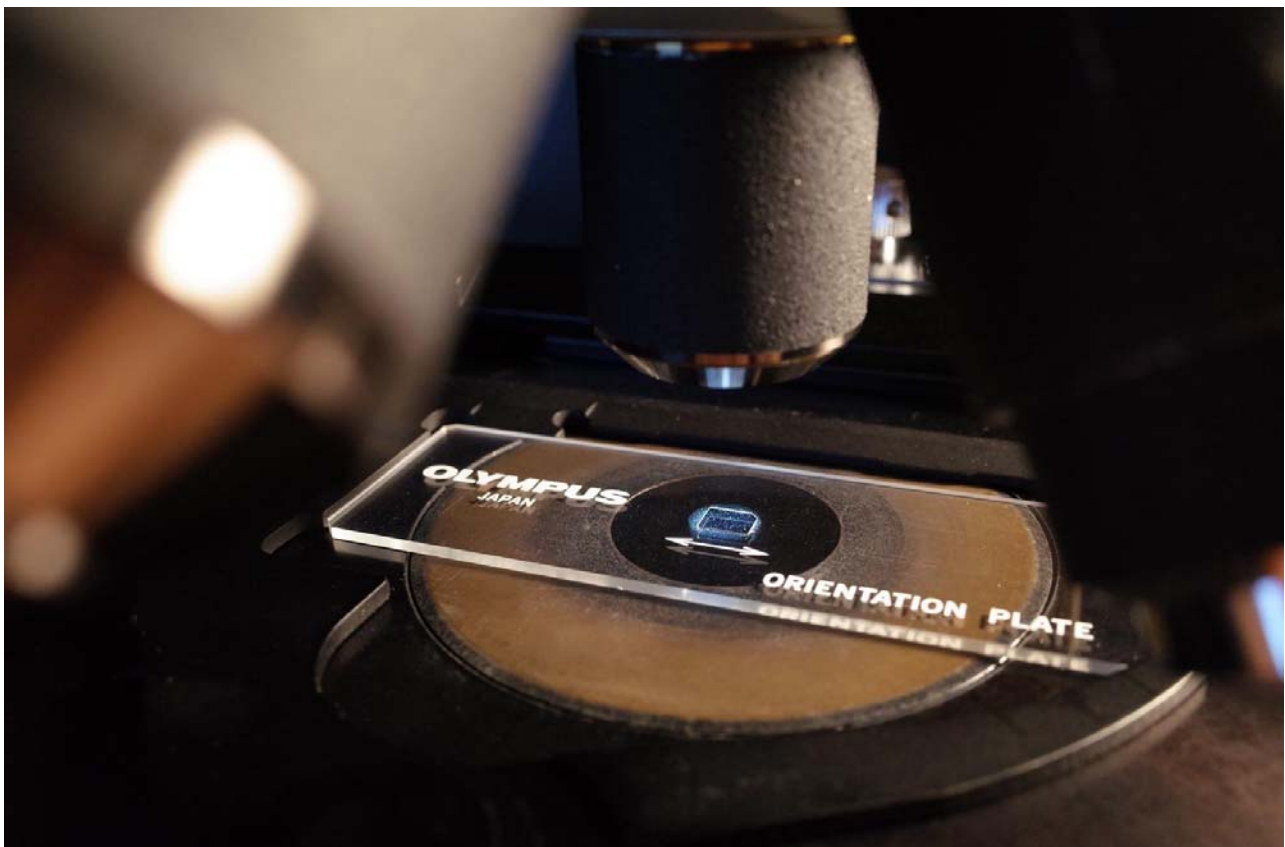
where photons meet black holes

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## ♣ > PETROGRAPHIC MICROSCOPE POLARIZER ORIENTATION PLATE

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To make accurate measurements in optical mineralogy and forensic analysis, the polarizers and eyepiece graticule crosshairs on a petrographic microscope have to be rotationally aligned to one another to a precision of a fraction of a degree. Most manufacturers presumably do this in the factory and don't give users any guidance on checking or realigning the instrument themselves. If at all, they instruct users to estimate alignment by viewing the indistinct polarization cross on the back focal plane of the objective through the Bertrand lens, a procedure completely inadequate for quantitative purposes.

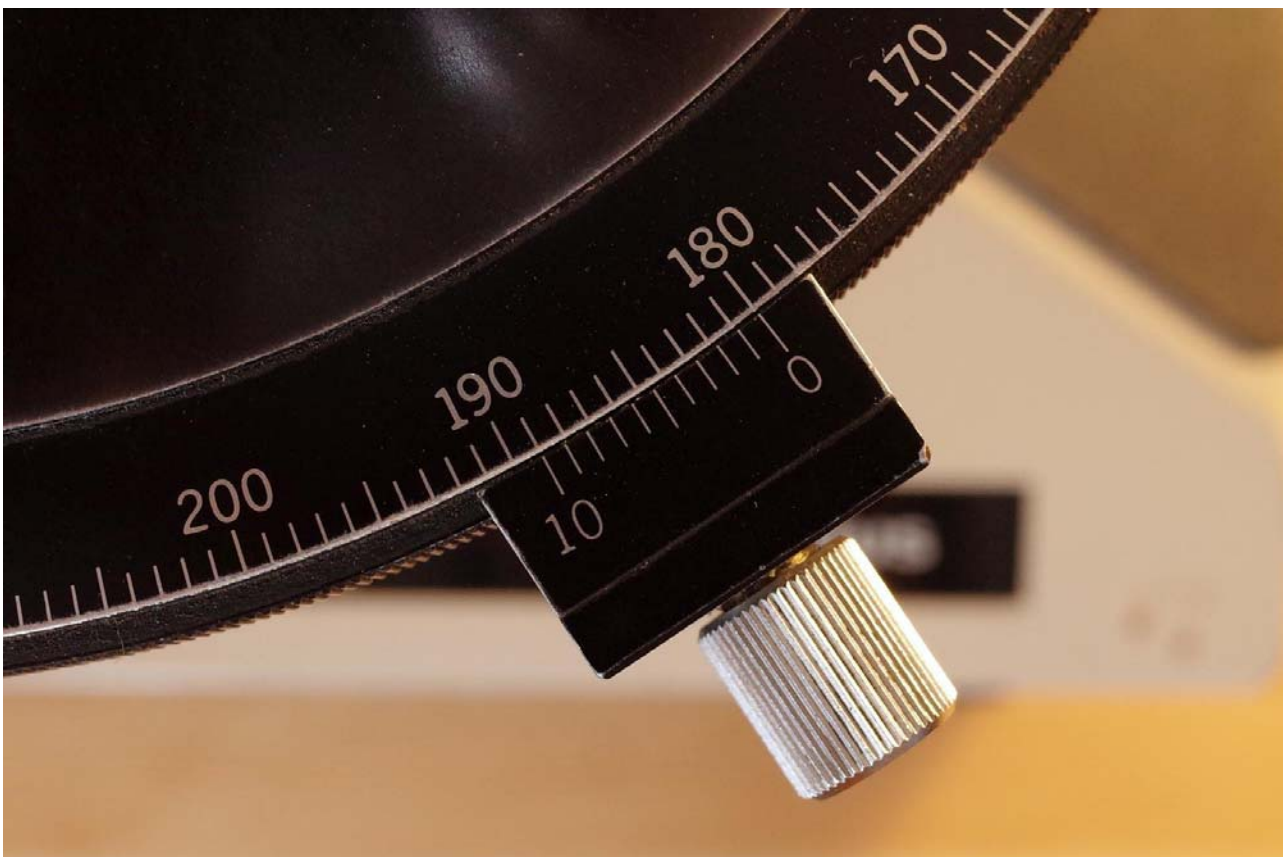


Any euhedral anisotropic crystal with high birefringence and parallel extinction can be used for alignment. For convenience, Olympus makes available an orientation plate U-PJ consisting of a uniaxial mineral with parallel extinction mounted with its optic axis parallel to the optical train.

However, the user manual only tells you how to align the crosshairs to the polarizers, without aligning all of them to the compass directions. This could give you slanted crosshairs and disregards the fact that the eyepieces of petrographic microscopes have an alignment pin that makes it impractical to rotate them at will. Some websites add on the part about aligning the polarizers to the compass directions. But they don't explain how to also zero the scales of *graduated* polarizers, which requires more complicated adjustments than simply rotating the polarizers.

Given the incomplete existing documentation of the use of the orientation plate, I have established the following steps for a complete and precise polarization alignment of a fully equipped petrographic microscope. This should be done before centering the objectives, as it involves adjusting the tube connections. Specific details refer to the **Olympus BHSP** but most petrographic microscopes are similar.

Set up transmitted Köhler illumination with the lowest-magnification objective.



Clip the orientation plate slide into the mechanical slide holder, rotate the stage until the vernier goniometer reads  $180.0^\circ$  and clamp the stage. The slide should now be in a perfect east-west orientation. Everything else will be aligned to this. This step assumes that the slide and crystal are perfectly rectangular and parallel to each other. I measured the angle using the stage controls and eyepiece graticule and found my slide and crystal  $0.1^\circ$  off-parallel.

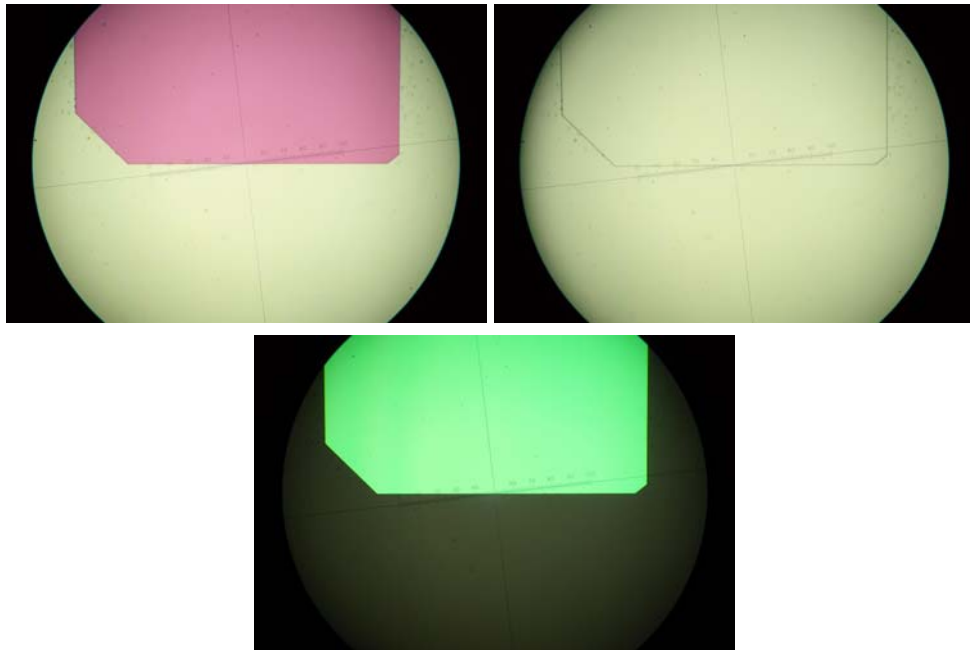




Check that the polarizer's click stop position adjustment screw is locked. Rotate the polarizer until it clicks into 0.

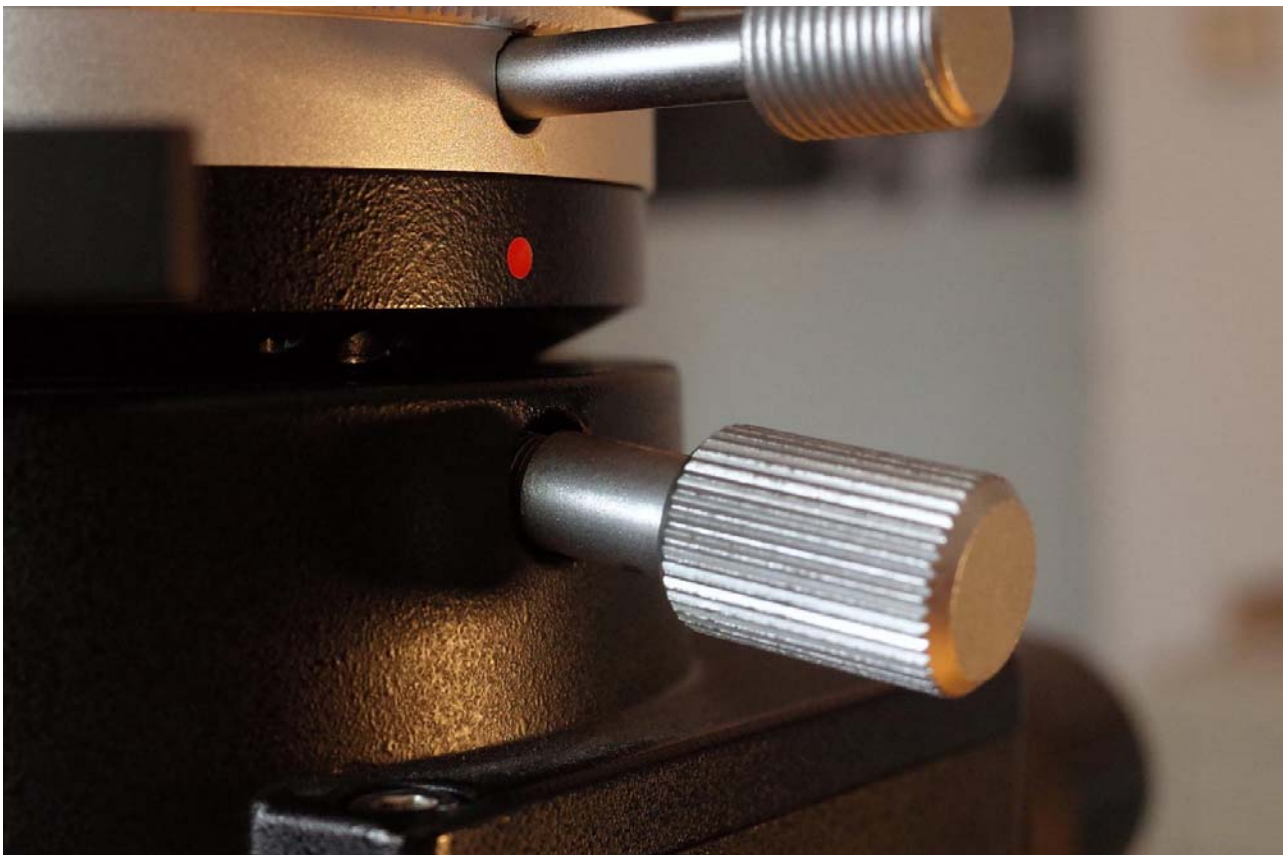


Rotate the analyzer until the vernier scale reads 0.0°. Tighten the locking pin. Insert the analyzer.



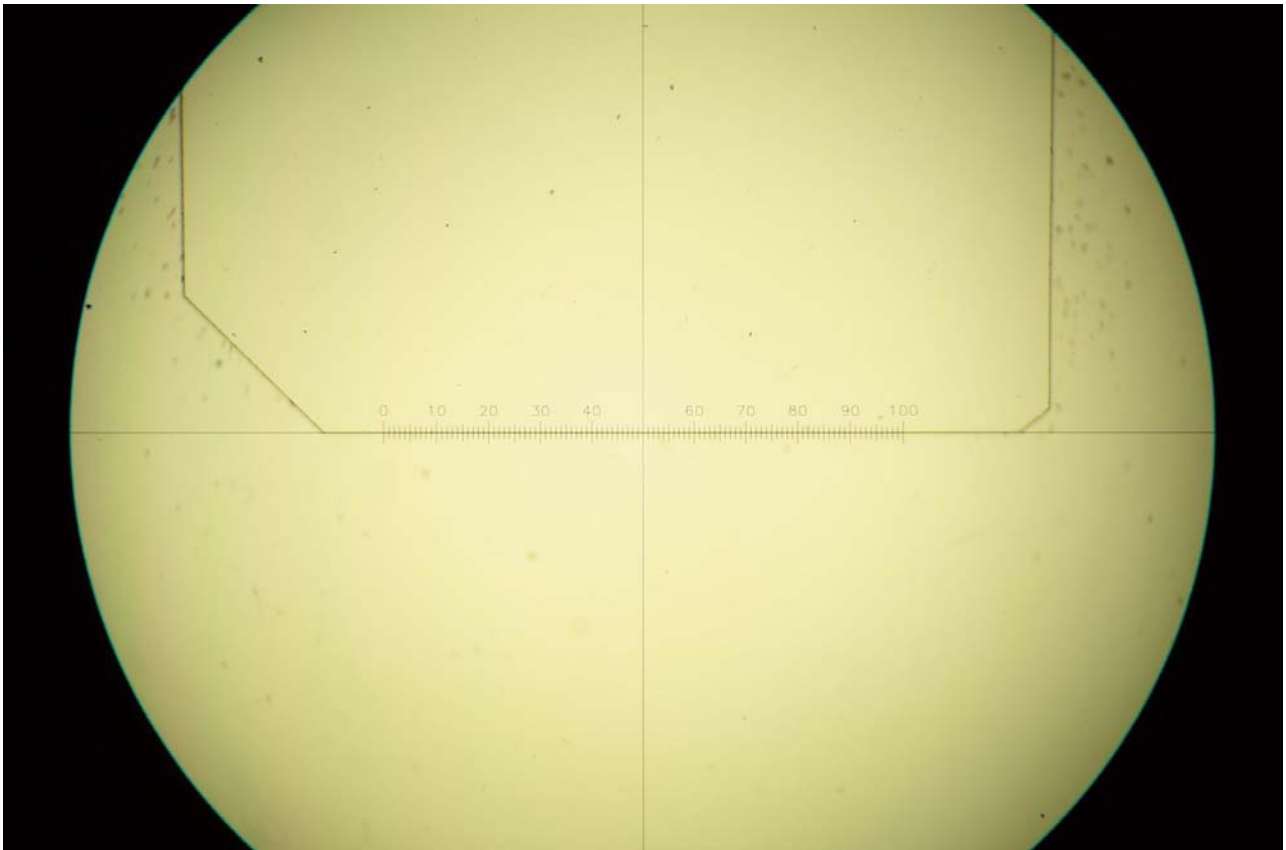
*[vignetting caused by camera]*

Loosen the polarizer's click stop position adjustment screw and rotate the click stop position until the crystal on the orientation plate is of exactly the same colour as the background (centre image), neither pink nor green which arise from opposite signs of interference. The background may be black or of the colour of the light source depending on the orientation of the analyzer at this point. Tighten the click stop position adjustment screw. The polarizer is now zeroed in a perfect east-west orientation.



Loosen the dovetail below the analyzer assembly. Rotate the analyzer assembly (and everything above it) without rotating the analyzer itself, until the field of view is in maximum darkness. Ignore the red dot on the assembly housing. Tighten the dovetail. The analyzer is now zeroed in a perfect north-

south orientation and crossed with the polarizer. Remove the analyzer from the light path.



*[vignetting caused by camera]*

Ensure that the eyepiece graticule is installed with the crosshairs in or very close to the compass directions relative to the eyepiece's alignment pin. Loosen the dovetail below the viewing head and turn the head until the graticule crosshairs are parallel to the edge of the crystal on the orientation plate. Tighten the dovetail. The microscope is now fully aligned.