Mites by Phase Contrast, DIC & Polarized Light

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Recently I acquired a 20x phase objective and a polarizer for my Olympus BH2, primarily to examine animal material rather than inorganics. The microscope also has DIC capabilities. With the arrival of cold weather there is not much microscopic animal life to find. An unexpected discovery were a few mites beneath the elytra of a small Picnic Beetle (*Glischrochilus fasciatus*). I have no idea of the identification of the mites but they proved to be interesting subjects.

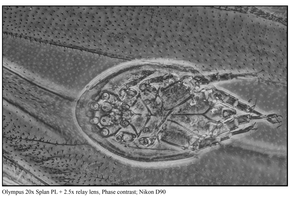
Picnic Beetle

Mites

This 1st image is with brightfield illumination; note the 9 (should be 10) dark inclusions, one pointed to and position of others will be obvious in later images.

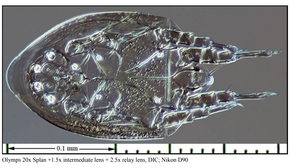
Olympus 20x Splan +1.25x intermediate lens + 2.5x relay lens, BF; Nikon D90

The 2nd image is with phase contrast of a mite on the beetle's wing. Shows a few more structural details but fails to isolate the dark inclusions seen under BF



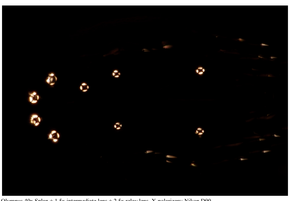
Olympus 20x Splan PL + 2.5x relay lens, Phase contrast; Nikon D90

The 3rd image of the same mite shown in the first image is under DIC; details become more obvious and the 9 circles with inclusions become especially obvious.



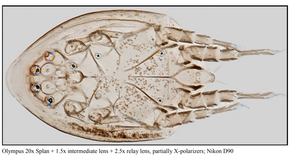
Olympus 20x Splan +1.5x intermediate lens + 2.5x relay lens, DIC; Nikon D90

Illuminating the mite with fully crossed polarizers resulted in complete loss of detail except for the 9 inclusions (these are paired and it is obvious where the 10th should be).



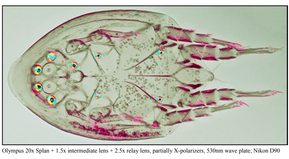
Olympus 40x Splan + 1.5x intermediate lens + 2.5x relay lens, X-polarizers; Nikon D90

Rotating the substage polarizer to allow more light to pass through the condenser resulted in good morphological detail with the bonus that the inclusions took on a red/blue colour.



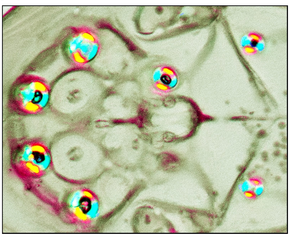
Olympus 20x Splan + 1.5x intermediate lens + 2.5x relay lens, partially X-polarizers; Nikon D90

Sliding in an Olympus 530nm wave plate into the top polarizer (analyser in Olympus speak) resulted in some dramatic colours in the inclusions and along the edges of the appendages.



Olympus 20x Splan + 1.5x intermediate lens + 2.5x relay lens, partially X-polarizers, 530nm wave plate; Nikon D90

Enlarging the posterior end of the mite shows the inclusions in more detail.



A colleague on Photomacrography.net identified these 'inclusion structures' as possibly "ring organs" involved in osmoregulation.

Microscope and Photographic Equipment

My basic equipment is an Olympus BH2 with 2x, 4x, 10x, 20x, 40x, 60x, and 100x objectives; Olympus 2.5x NFK relay lens; Nikon D90 with Nikon PB-6 bellows; Nikon flash in place of Olympus' halogen lamp. All images are stacks of several frames processed by Zerene Stacker.

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