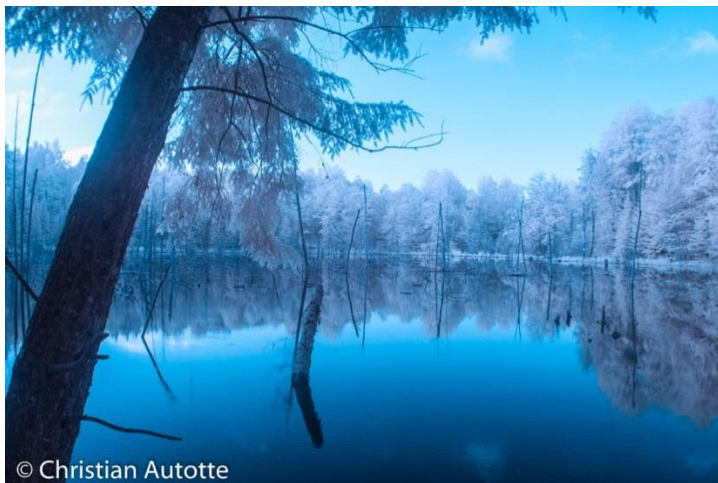


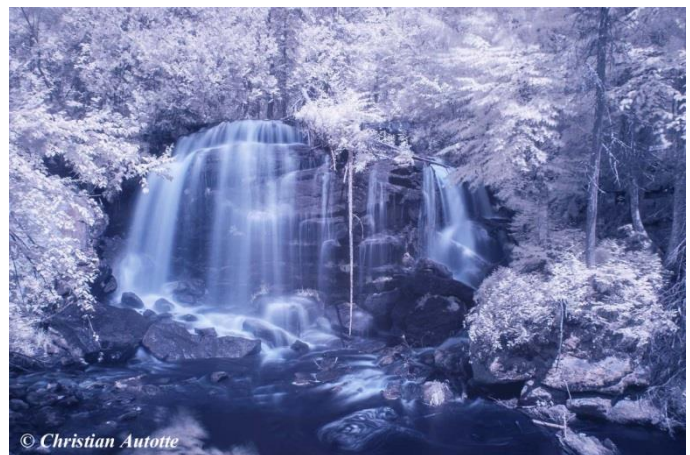
INFRARED PHOTOMICROGRAPHY

For some photographers the idea of changing reality to produce unusual pictures can be very alluring. Many will use special filters or unusual focal length to get out of the beaten path. Some go even further with some radical changes to their cameras. One such change consists of modifying a body to make it sensitive to infrared wavelengths.

In North America one company is well known for making such modifications: Life Pixel. They remove the “low pass” filter or any other protective filter that might be on the camera sensor and replace it with the filter of your choice. In infrared (or near infrared if you really want to be technical about it), they offer several choices of wavelength to create various effects in the final pictures. Once converted, the camera can no longer take regular pictures and will only shoot through the chosen filter. Other options include ultraviolet and a de-filtering for astronomy photography. Two of my bodies have been converted for



infrared, and I am thinking of doing the same with a third. First and foremost, the modification was mostly to shoot unusual pictures of landscapes. Vegetation turns white and looks almost as if shot in winter even though photographed in summer. Add a bit of Photoshop magic and the pictures can be truly amazing.

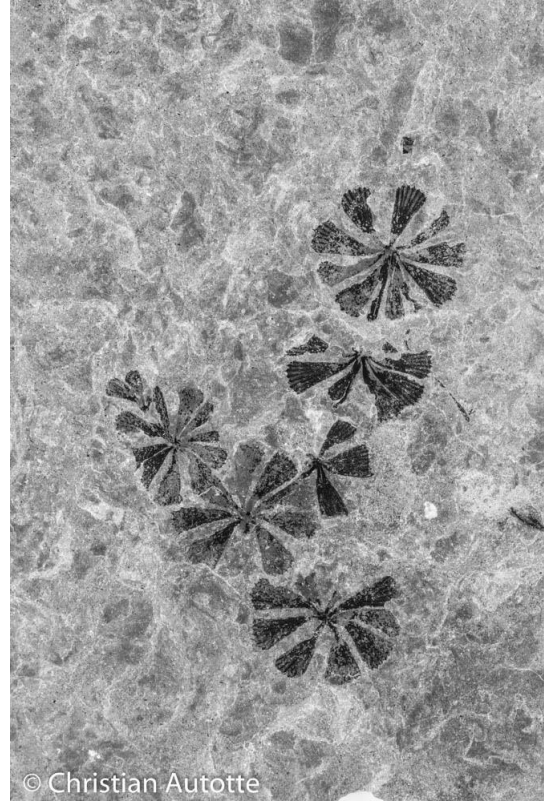


Another interesting possibility of infrared photography is what it can reveal in palaeontology. Some fossils barely visible in normal light literally jump out of the rock when viewed in infrared.



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Sphenophyllum schrotheimeii, in normal light



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Sphenophyllum schrotheimeii, in infrared



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Prunus sp. Leaf, in normal light



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Fossil fish in infrared



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Prunus sp. Leaf, in infrared

There is a caveat to shooting in infrared. In regular photography focusing is straightforward, but infrared light focus a bit further. Older lenses had a dot or some other mark that had to be used in infrared photography; you would first focus normally, then look at the lens and refocus accordingly. More recent digital lenses no longer show such marks; we no longer use 35mm infrared film. If autofocus is used in infrared it will be always a bit off; not a big problem in landscapes shot at $f/16$, but a big problem in close-ups. Life Pixel offers the possibility of adjusting the autofocus so that the camera will focus properly in the infrared.

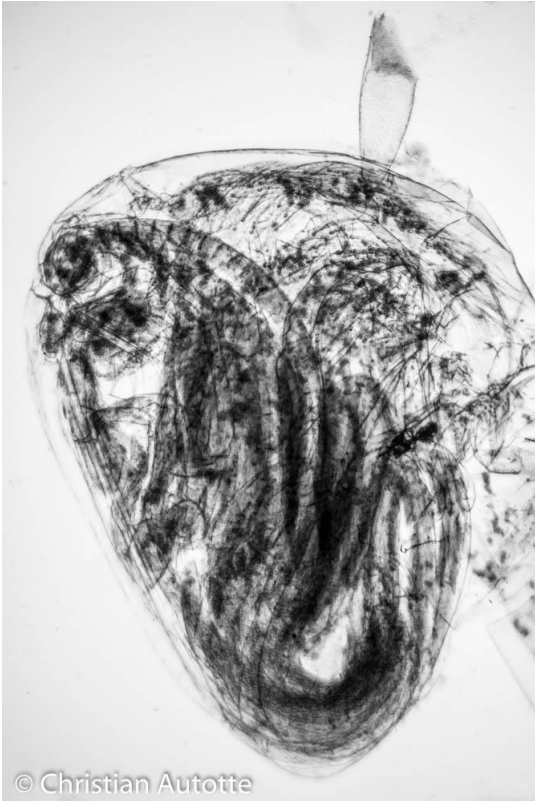
But what happens when shooting through a microscope? There is no autofocus possible, so the focusing has to be done manually. You cannot focus through the optical viewfinder. The focusing must be done entirely on the LCD screen or by tethering the camera to a computer. One of my modified cameras, an old Canon 20D, just cannot be used with the microscopes as it cannot shoot in Live View mode. At the moment, the only one of my camera that can shoot infrared on a microscope is a Canon 7D. I still own two of them, one normal and one modified. My next converted camera will be an Olympus OMD E-M1, first generation. Comparative pictures will be possible with my two newer Olympus bodies.

Shooting infrared is not like shooting in natural light. While the focus can be properly adjusted, the camera's light meter does not react to the infrared the way it does to natural light; the infrared filter added to converted cameras blocks out a large part of the spectrum that is normally recorded. As a consequence, it is always necessary to overexpose the image; when shooting landscapes I regularly overexpose by one or two stops. But remember, landscapes are lit by the sun, which produces a lot of infrared radiations.

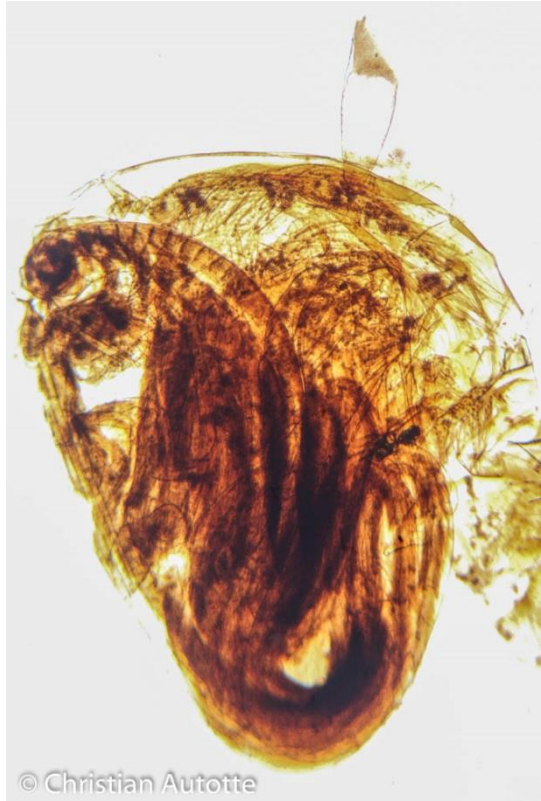
Shooting with artificial light sources is different, as they may not produce as much infrared. We will see more about that in a minute. The light meter could not be trusted; at best, overexposing by two or three stops is only a starting point and getting a good shot remains a process of trial and error.

When I first started shooting through the microscope in infrared, the image on the LCD screen was way too dark when the camera was set for a proper exposure. The speed had to be slowed down greatly before I could see an image on screen. Once focusing was done, the speed was set back faster to take the picture. Then, I remembered a feature on that camera: in the menu it's possible to turn off the "exposure simulation"; the camera then render the best possible image on the LCD screen, regardless of the exposure. Eventually, I also set the camera to black and white, to eliminate one more correction in post-processing.

The whole idea of shooting infrared pictures of insects with a microscope came in a private communication with Micscape's David Walker. He brought to my attention the possibility that infrared photography could be useful in seeing "through" some dense mounted insects. David even wrote a few articles on the subject (see some links at the end of this article). It didn't take me long to mount my infrared camera on a microscope and try a few shots, making comparisons with regular light color photographs.

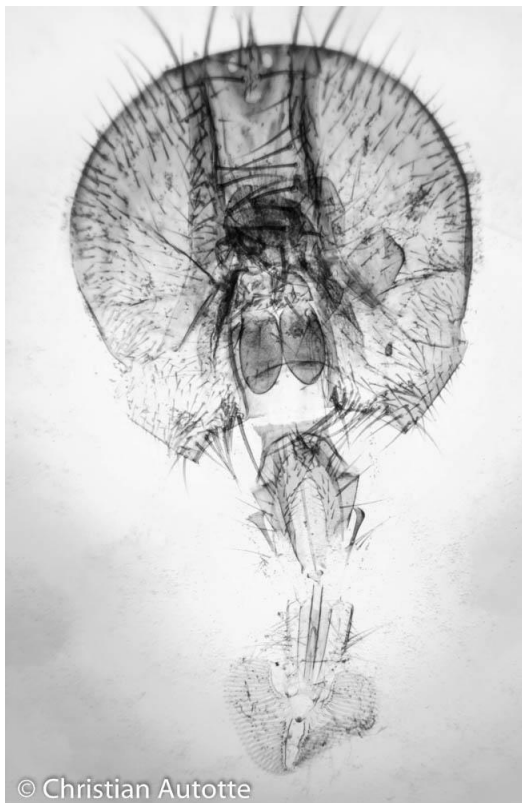


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Mosquito nymph, 60x, infrared and normal light



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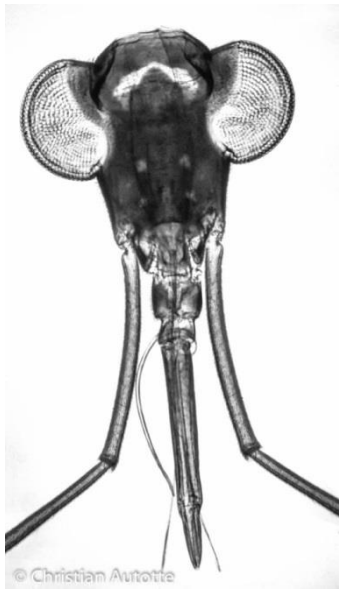


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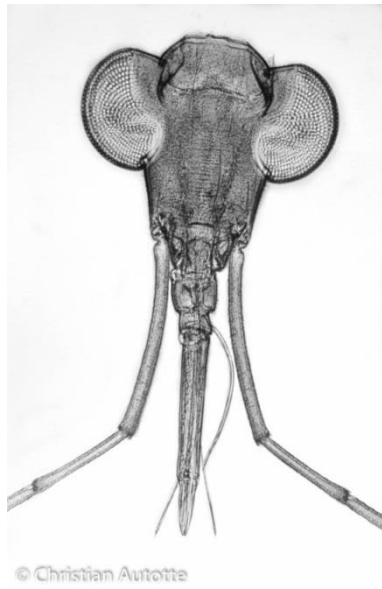
Fly head, mosaic of 4 pictures shot at about 24x

In some cases, I was not impressed with my results. I could barely see more in infrared than in the normal light pictures. Something was not quite right.

Then, reading one of Dave Walker's articles, a little light bulb popped in my head: if you want to shoot in *infrared*, you need an *infrared light source*, like the sun in my landscapes... My first attempts were made with a microscope whose original light source had been replaced by a LED that remains cool even after being on for hours. So I made some tests with another one of my microscopes, one with its original tungsten lamp that gets so hot I can burn myself on its heat drain. Then results were eye opening.



Water strider head, mosaic of 4 pictures at about 60x



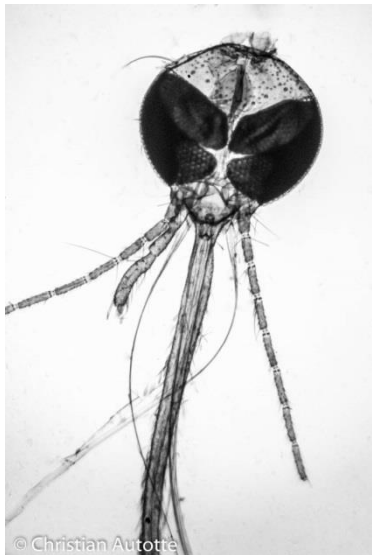
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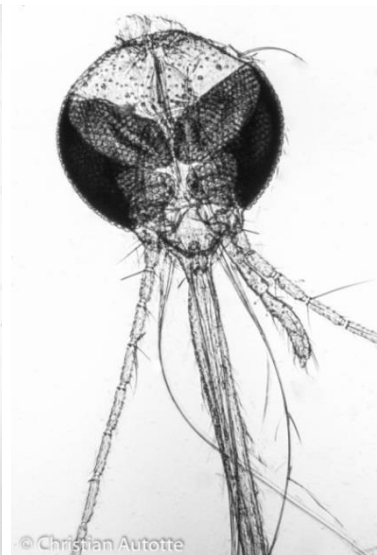


Red mite, 60x



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Mosquito head, 60x



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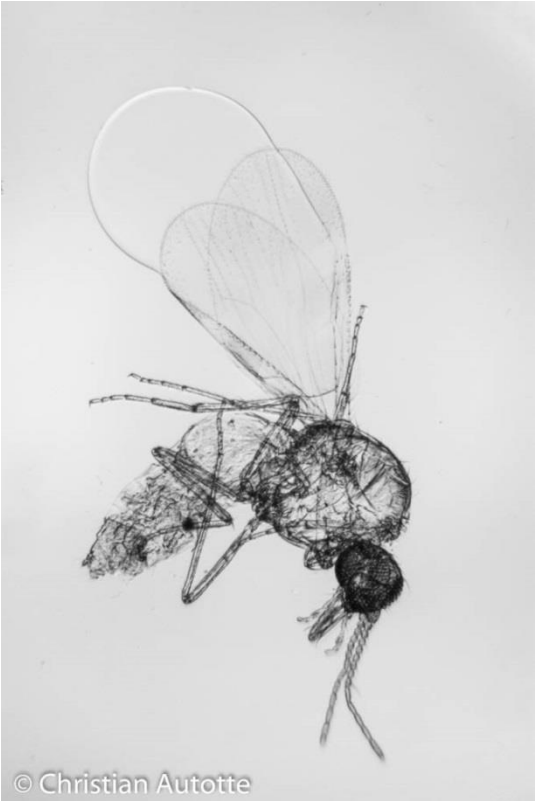
The first shot of these examples was done with a LED light, the second one with a hot tungsten light source. As we can see, the "hot" light source made it possible to see "through" the subject and get more details.

Microscope pictures of insects shot in infrared are often said to look like x-rays, a claim plainly visible here. Either that or they look like antique ink drawings.



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Bed bug head, 60x



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NoSeeUm, 60x



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Small fly, 60x



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Damselfly jaws, 60x



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Beetle antenna, 60x



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Centipede back end, 60x



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Centipede trachea, 160x



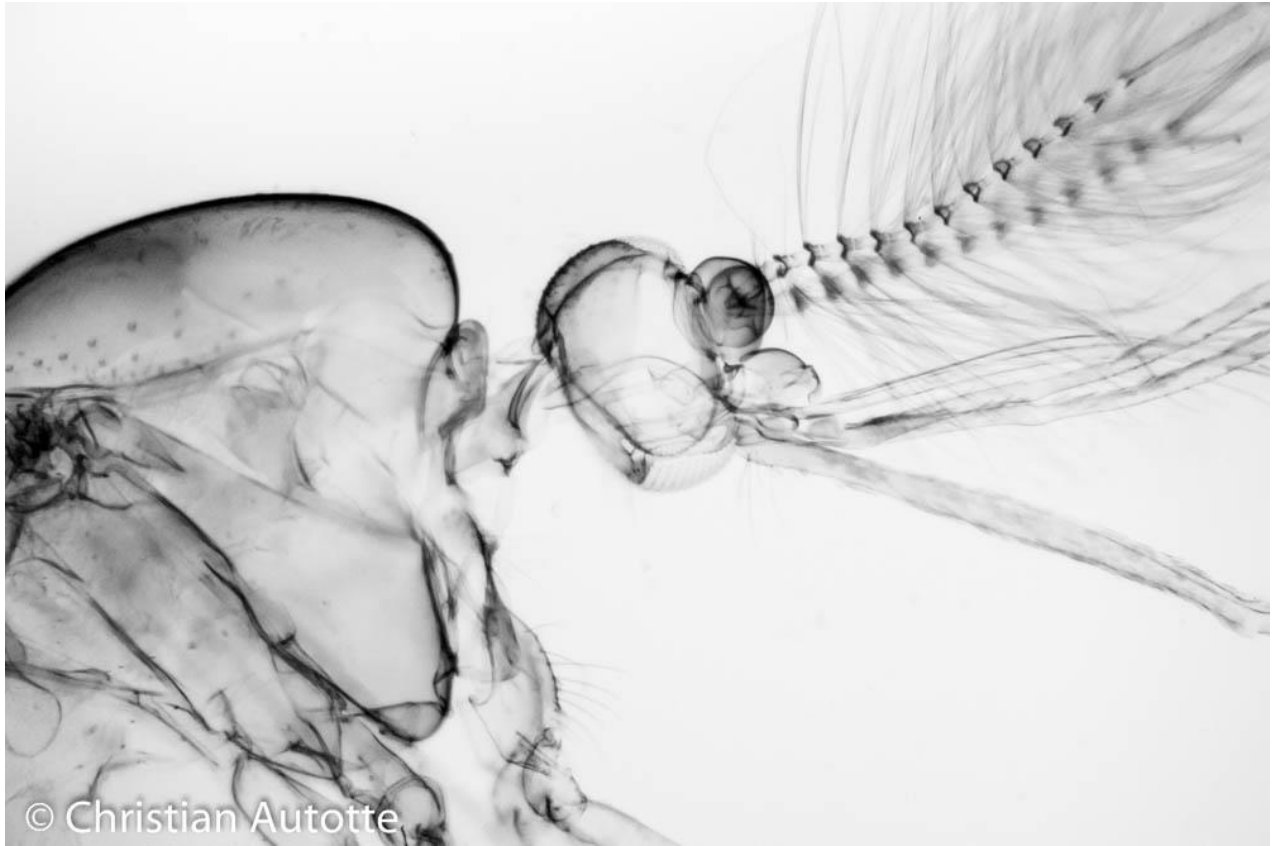
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Fly leg, 60x



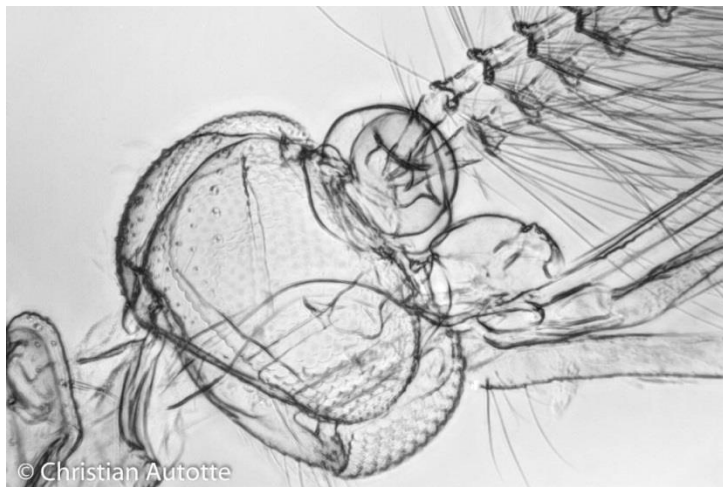
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Spider jaws, 60x, two pictures assembled as panoramic



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Male Mosquito, 60x



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Male Mosquito head, 160x, stack of 6 pictures

After shooting the above picture, I returned to the slide to do a better close-up, seen at left. We can see the feeding tube that goes from the mouth parts on its way to the digestive system.

Below is another example of an image that looks just like an x-ray.



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Front end of a fly maggot, 60x



Always curious and willing to experiment, I tried to take infrared pictures of snail shells in an attempt to see “through” them, X-Ray style; it didn’t work, even after heating up the shells for some time on a hot plate. I then tried the same with the empty skin of a small crab. Now, this was interesting. The first shot is what came out straight from the camera. I rather like the colors. What is often done with such pictures is to reverse the red and blue with Photoshop channel mixer; it works very well for landscape pictures, but somehow I prefer the first shot over the blue version. Another thing done with infrared pictures is to save them as black and white, as I did with all the microscope pictures. Here again, it doesn’t quite work with the crab. I finally tried something unusual: using the preceding three images, I put them through a focus stacking software. The resulting color is very interesting...

A few articles by David Walker on near infrared microscope photography:

<http://www.microscopy-uk.org.uk/mag/indexmag.html?http://www.microscopy-uk.org.uk/mag/artapr04/dwir2.html>

<http://www.microscopy-uk.org.uk/mag/artoct05/dwd50ir.html>

<http://www.microscopy-uk.org.uk/mag/indexmag.html?http://www.microscopy-uk.org.uk/mag/artjun98/infrared.html>

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Published in the February 2021 issue of *Micscape* magazine.

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