Panoramic Stitching in Photomicrography

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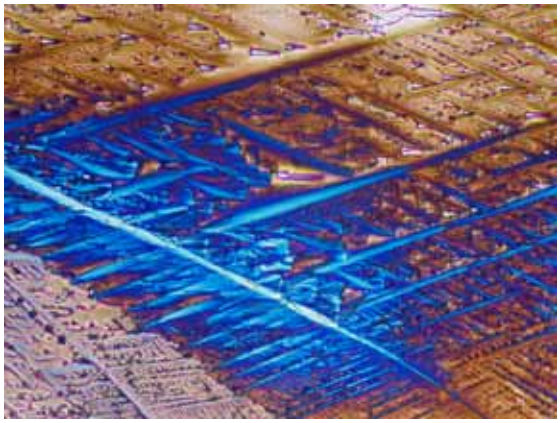
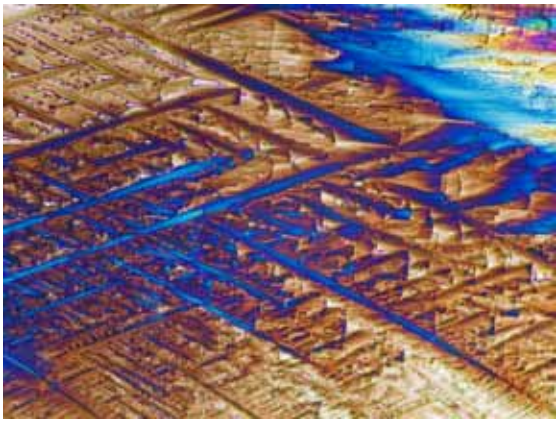
Panoramic stitching can be a useful technique in photomicrography. It enables capturing a larger area of a subject not covered by a single photograph, yielding more information and more detail. It allows use of higher power objectives to provide more detail than could be produced using a lower power objective.

There are a number of applications that can be used for stitching, the most common being the Photomerge function in Adobe Photoshop programs. I have found that the most effective (and powerful) application to be Microsoft Image Composite Editor, hereafter referred to as ICE. It is a free software which can be downloaded at http://research.microsoft.com/en-us/um/redmond/projects/ice/

Using ICE, stitching can be performed with series of images captured on the X, Y and X-Y axes. It is vital to use a mechanical stage to position the overlapping captured images. I also focus stack the majority of my captured subjects using Zerene Stacker.

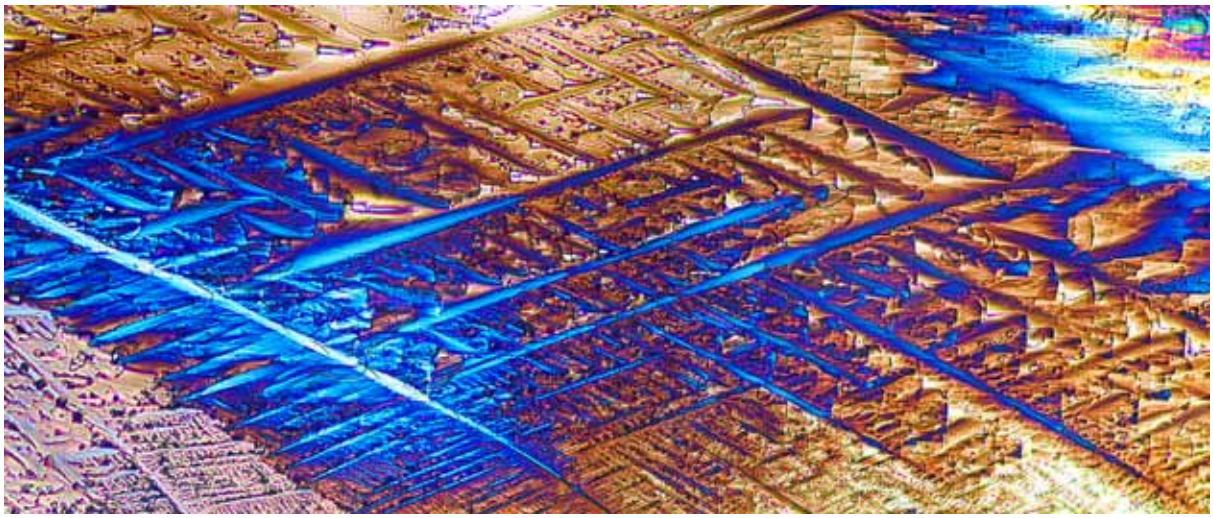
My first example of panoramic stitching is a very simple two-shot X-axis stitch of cross-polarized Metformin crystals. As you can see, while the two distinct images are interesting, stitching them together produces a more dynamic final image. Here are the two source images:



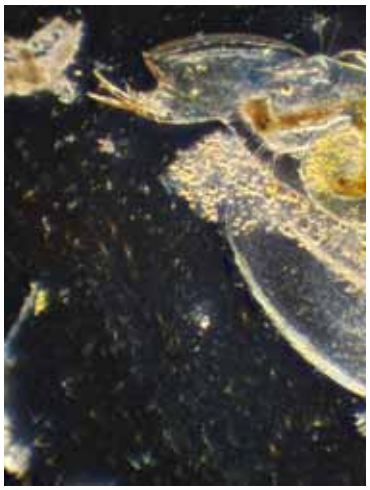


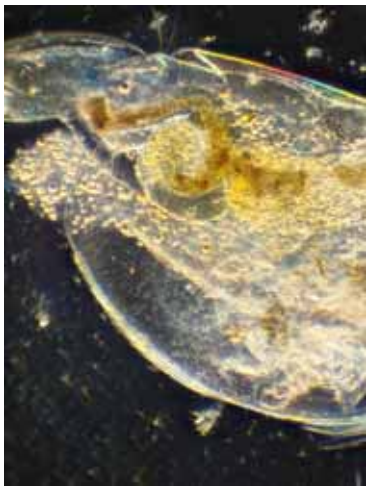
You can see that at capture, a generous amount of overlap was created to enable the stitch. When the stitch was completed this is how it appeared in ICE:

Using the “Export to disc…” function, the final image was saved to the Desktop (it can be saved to any location).

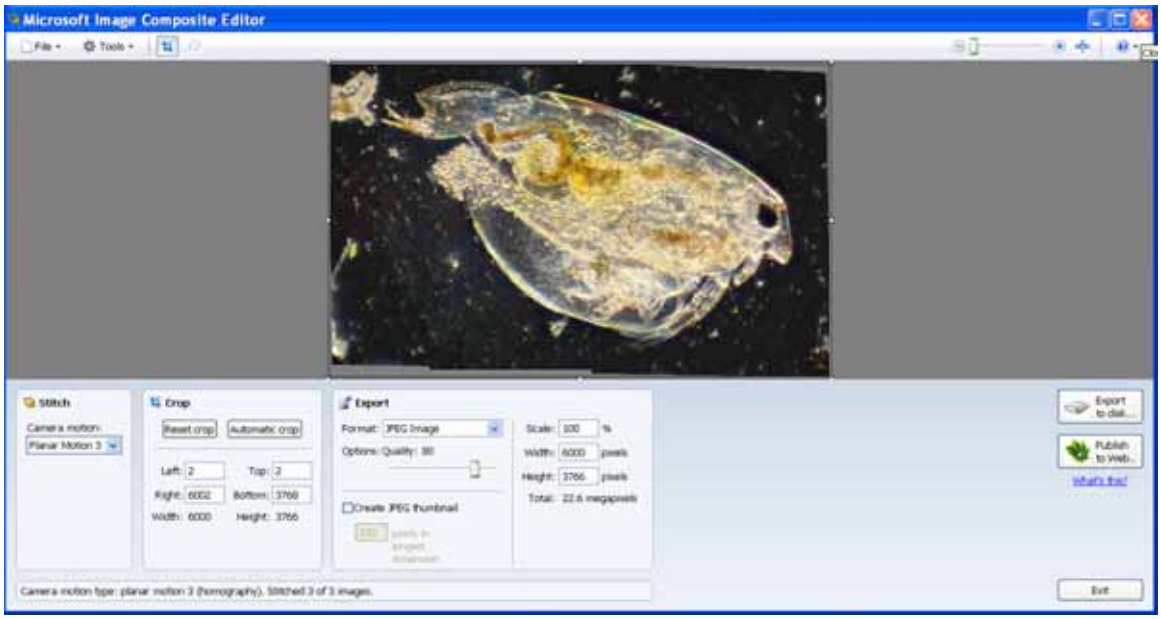


As I mentioned before, stitching can also be employed to use higher power objectives to produce images with greater detail than could be provided using a lower power objective. The water flea that is the subject of the next stitch could have been captured with a 4X objective in one shot, but by capturing three separate shots with a 10x objective, a more detailed image could be produced.

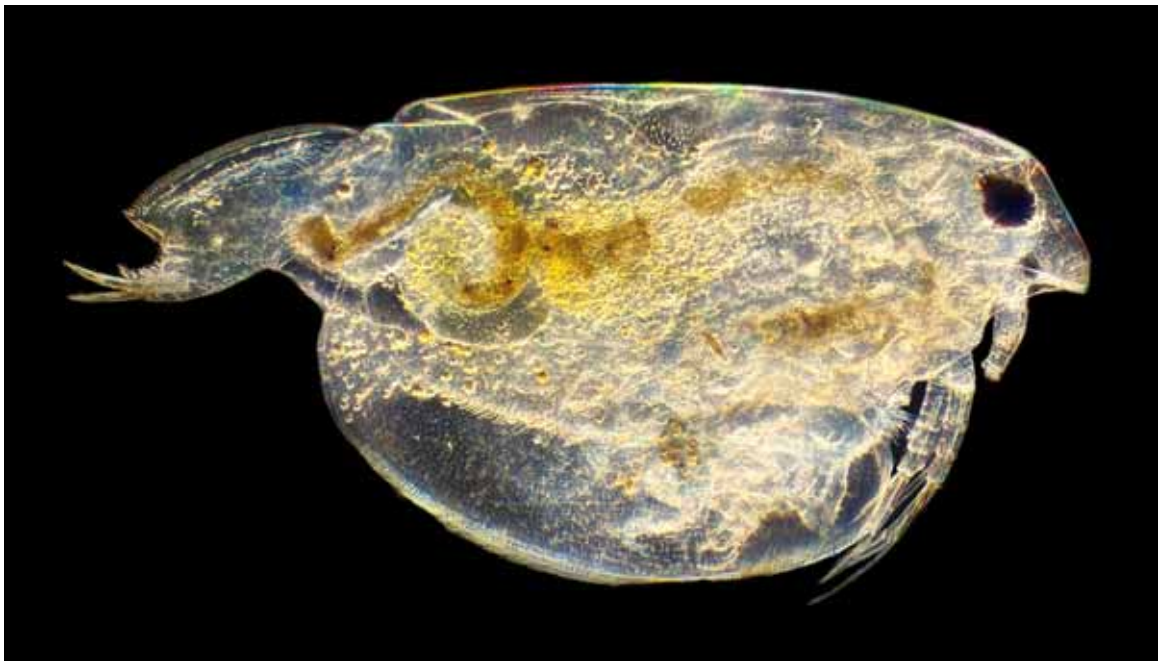




Here is how the stitch appeared in ICE:

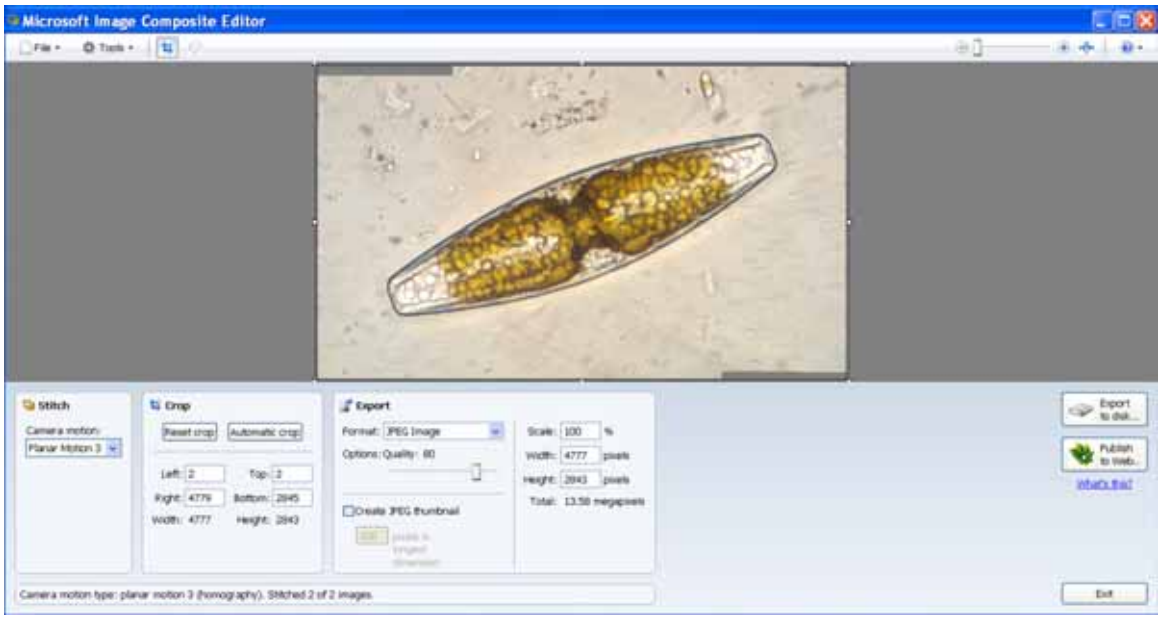


After exporting the stitched image and post-processing in Photoshop (rotation, cleanup and sharpening), this is the final image:



Another example of using a higher powered objective is this two-shot stitch of a diatom. While I could have gotten the entire diatom in one shot with a 40x objective, I could get better detail using a 60x objective and capturing the subject in two shots.

Here is the stitch in ICE:

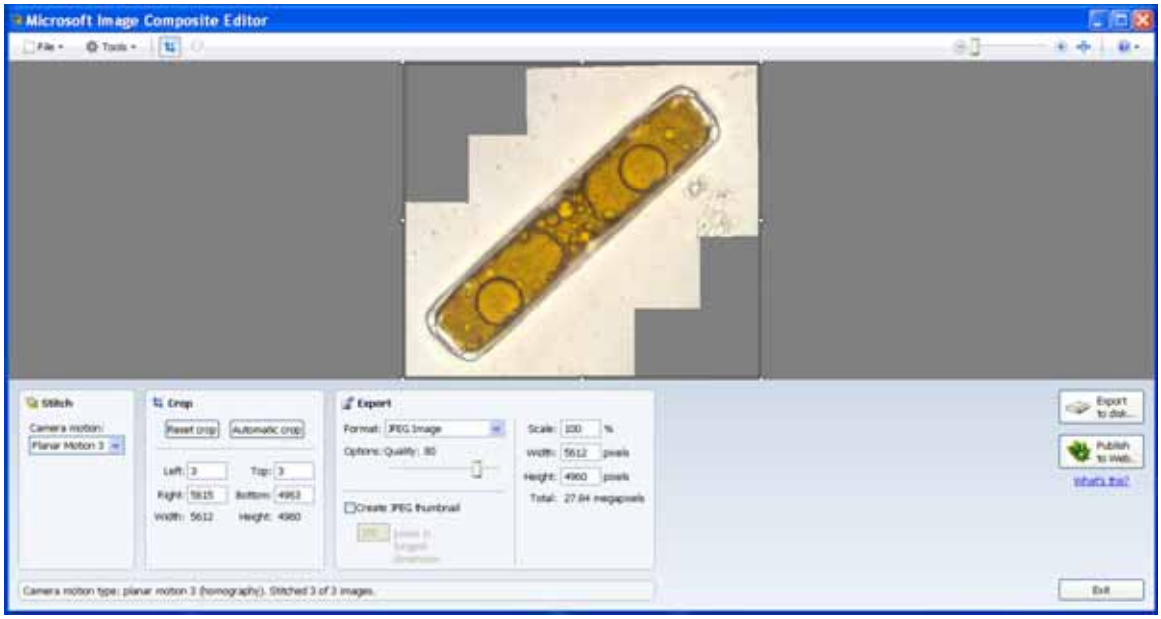


After exporting the image and post-processing in Photoshop, here is the final image:

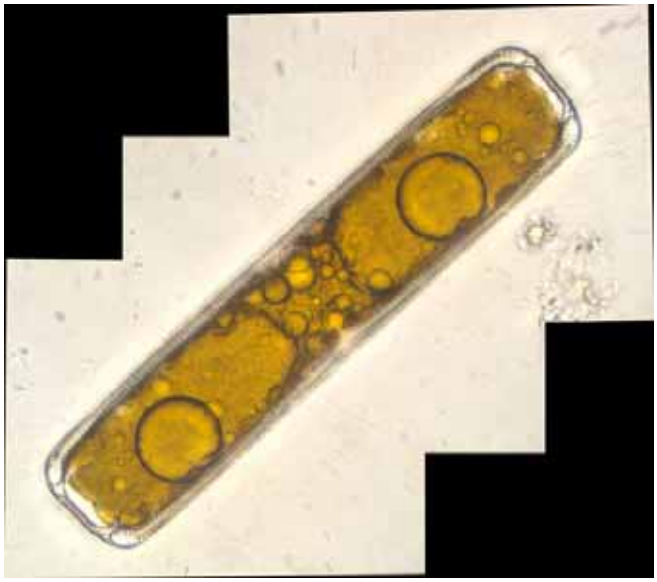
Next, here is an example of a very simple X-Y axis stitch, again using a 60x objective instead of a 40x. Since this diatom was positioned at an angle, it required three shots to capture the entire subject.



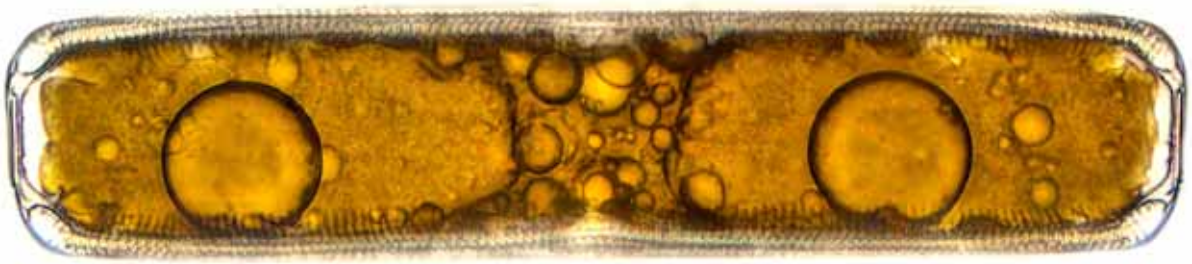
Here is how the stitch appeared in ICE:



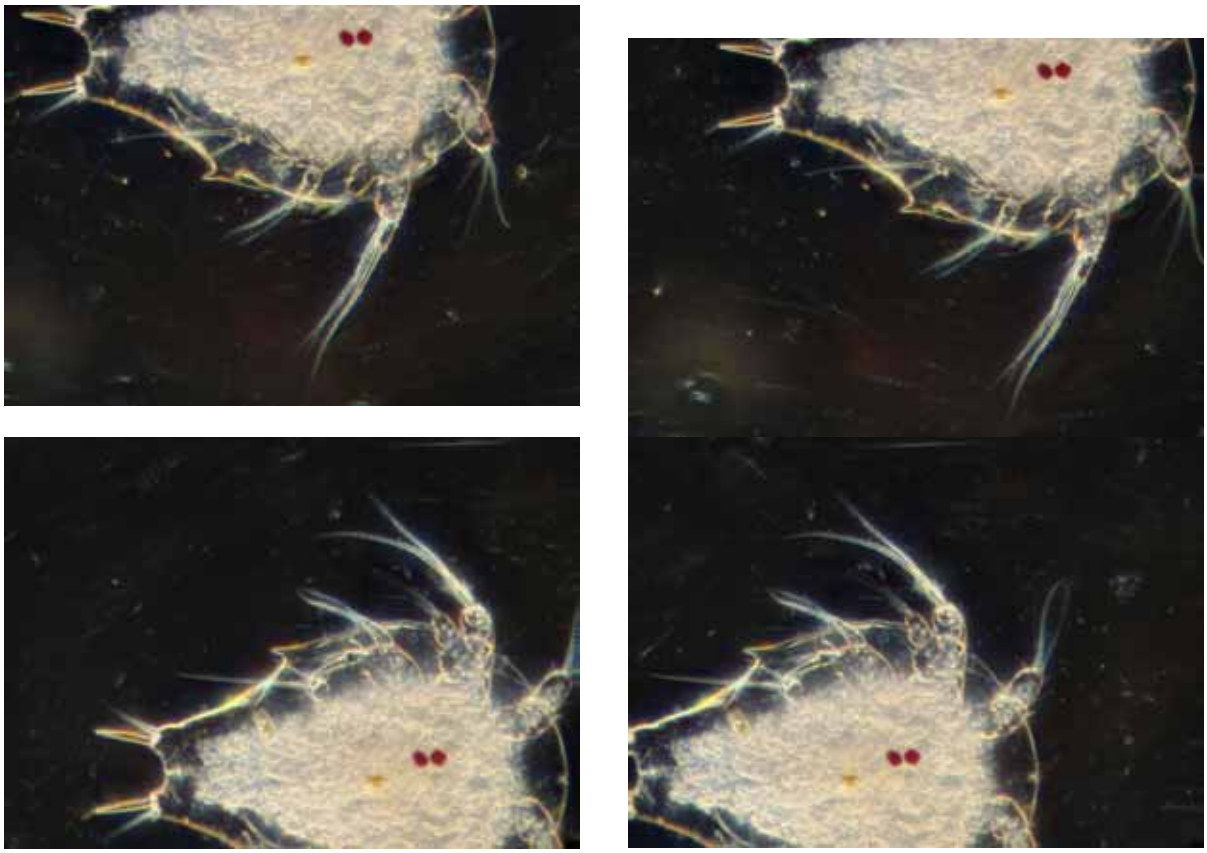
And this is how the exported image appeared:



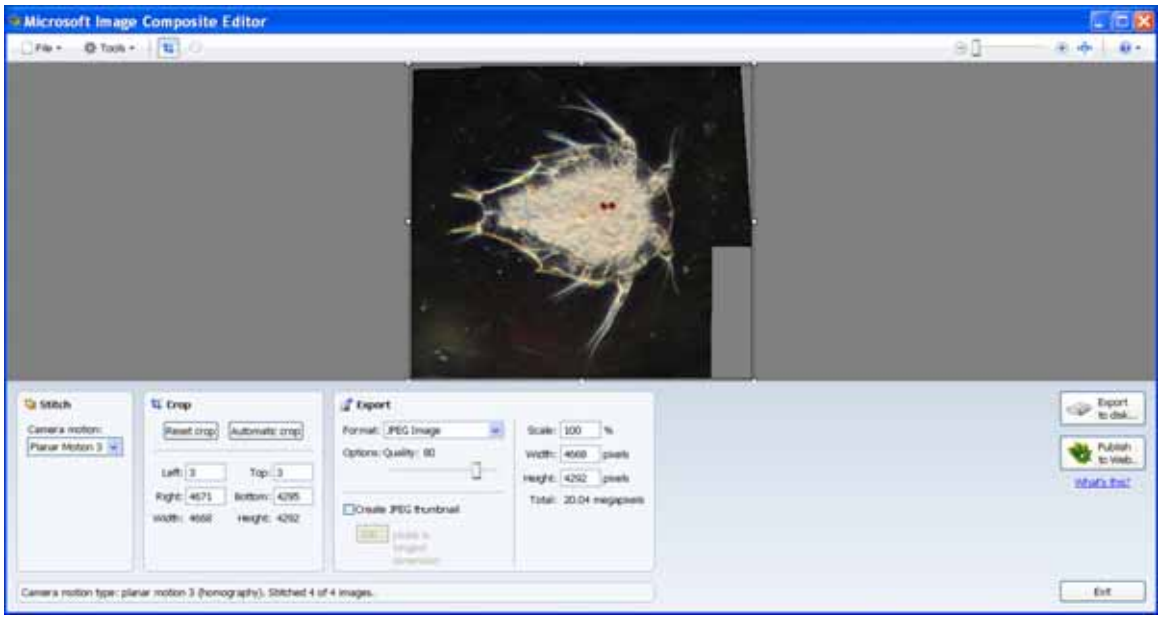
After post-processing in Photoshop, here is the final image:
X-Y axis stitches can be very complex. While the next example is only a four image



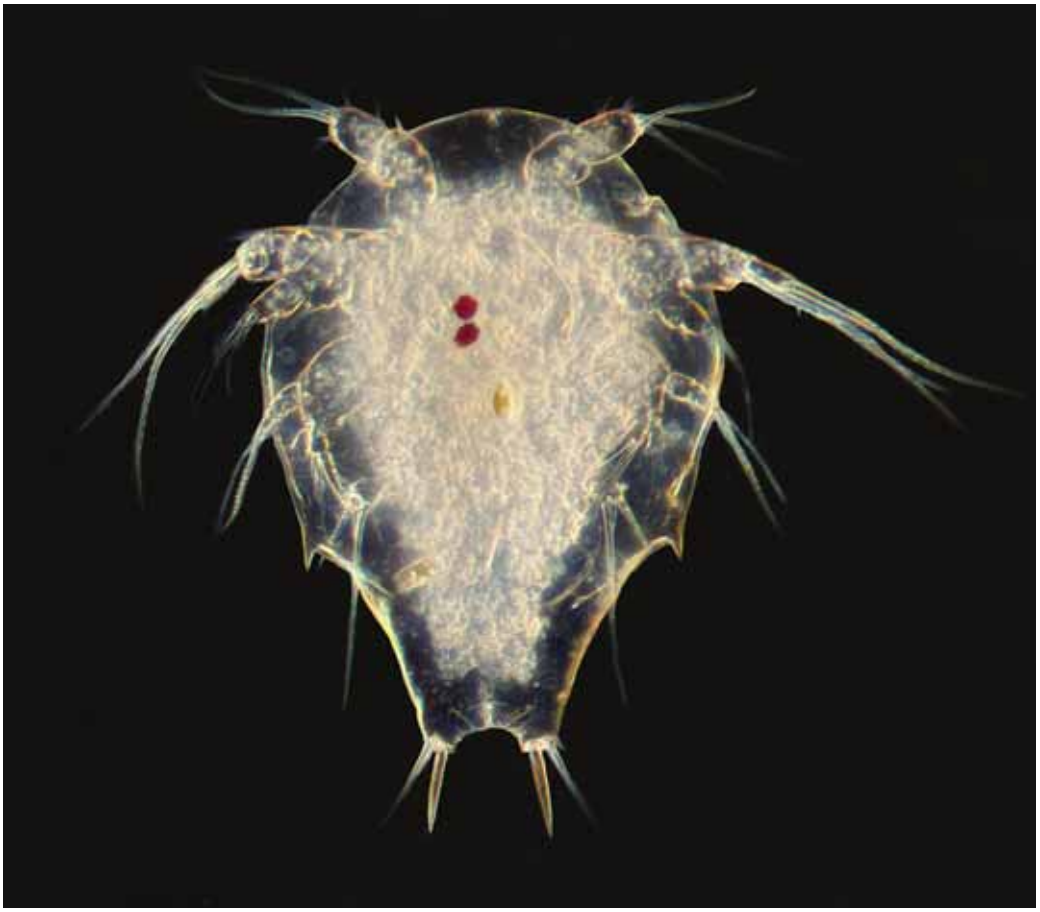
stitch, I have made composites of up to sixteen images.



These darkfield source images were shot with a 10x objective to produce greater detail in the antennae and bristles of the nauplius than could be obtained in one set of stacks with a 4x objective. Here is the stitch in ICE:



And here is the final image of the nauplius after post-processing in Photoshop:



So, you can see that panoramic stitching can be a valuable tool in photomicroscopy.

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Published in the April 2015 issue of Micscape magazine www.micscape.org .