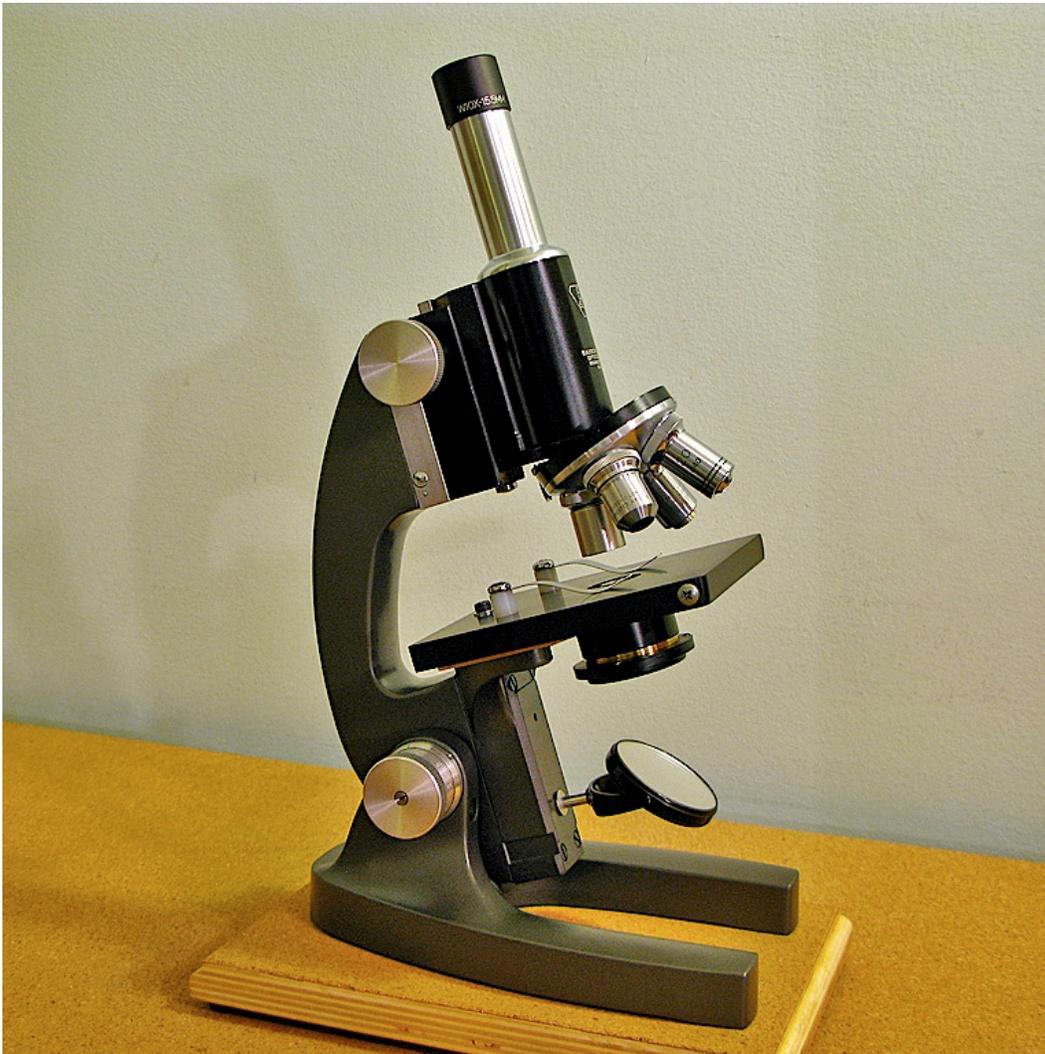


Photomicrography with a vintage Bausch and Lomb microscope

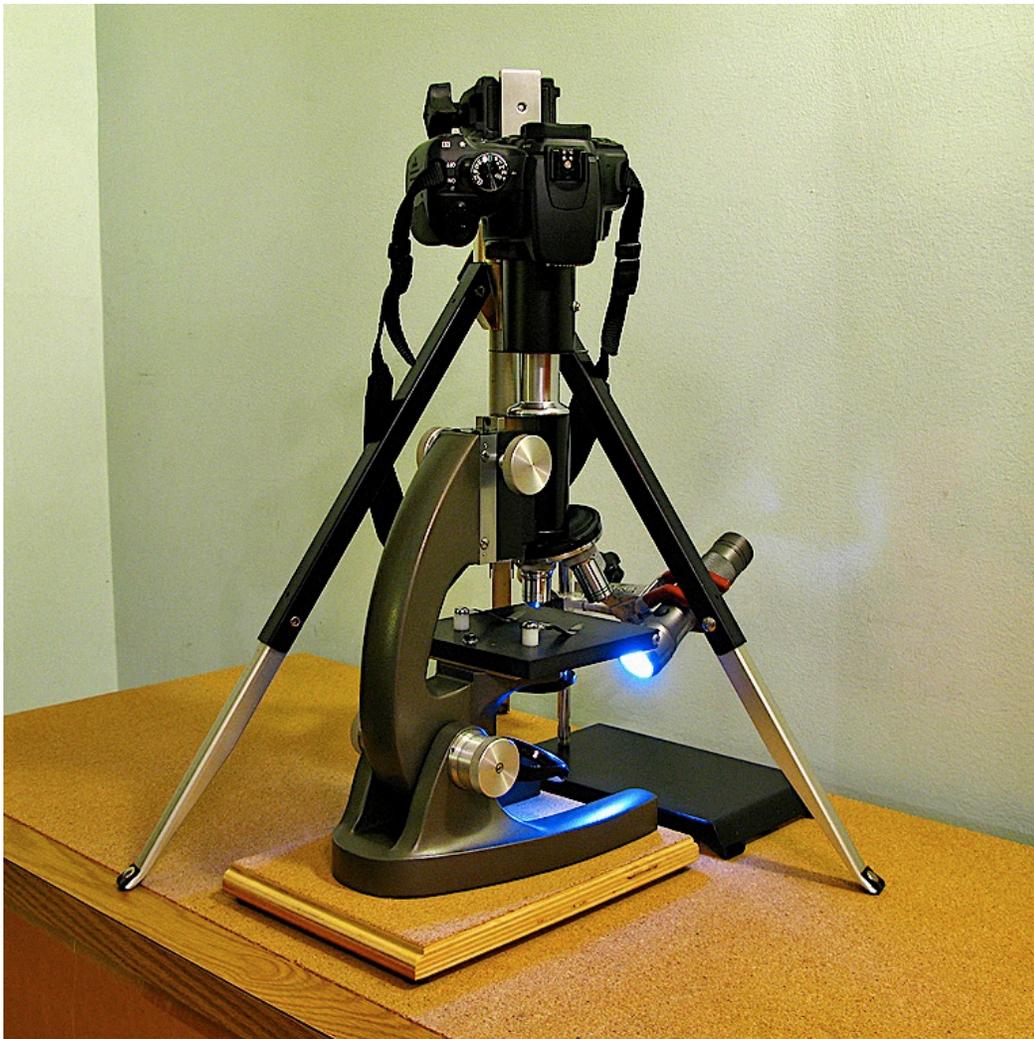
Ed Neuzil (USA)

A few years back I acquired a vintage Bausch & Lomb microscope from eBay. It was in fair condition, so I restored it including repainting the limb and base. It is a B&L Dynoptic monocular. From a catalog I found online I determined it is model CPR-9. This was the student/amateur microscopist model. It has an Abbe condenser in a sleeve mount, plain stage, and quadruple nosepiece. It appears to date from the early to mid 1950s. It was notable for having much of the body made from aluminum, a ball-bearing nosepiece, linear ball bearings on the fine-focus, and the low position fine-focus knobs. The mirror bracket was missing so I improvised one, as well as the posts for the stage clips. The objectives are 5x (Edmund Scientific), 10x (B&L), 20x (Edmund), and 43x (B&L). I also have a 97x B&L oil-immersion objective and a 4x Swift. All are JIS standard achromats using a tube length of 160mm.



One of the best articles I have ever read on Micscape was [Photomicrography a Marriage of Science and Art](#) by Dr. Robert Berdan in the October 2018 issue. I had done photomicrography long ago using black and white film and a medium format camera, but my attempts at digital imaging didn't quite match the quality of the old film images. After reading the article, and the authors website, I wanted to "up my game" so to speak.

The setup I use is shown below. The camera is supported on an old tabletop tripod. The camera is a Canon 400D DSLR. There is no lens attached, just an extension tube intended for astrophotography connected with a T-mount. There is a homemade sliding baffle on the eyepiece tube. This has the great advantage that the camera is physically isolated from the microscope. Although some might think you need a mechanical stage for photomicrography, I have no problems just using stage clips. A trick I did was to polish the bottoms of the clips with fret paper, used for polishing guitar frets, and then wax them. Illumination is a very bright 14 LED flashlight, with a diffuser placed in the condenser filter holder.



Contrary to what I have read elsewhere, I use an ordinary 10x eyepiece for camera projection, not a specialized photo-eyepiece. As long as the eyepiece is one of the better corrected types, such as a Periplan, Kellner, or achromatic Ramsden, they work fine. A simple Huygens eyepiece, however, produces strong field curvature. I use a Swift 10x widefield.

In the article above, many of the images were taken using phase contrast and DIC. I am limited to brightfield and darkfield, but since another hobby of mine is astrophotography and there are many processing techniques used to create high contrast images from low contrast objects, I decided to experiment with these.

A step-by-step procedure is too lengthy to include here, but this is a summary of my workflow: All images are shot at ISO 200, manual mode, camera RAW (Canon CR2). The image is opened with Adobe Camera Raw, where I align the RGB channels, adjust the brightness, set the black point, boost contrast slightly and set clarity to 80%.

Then the image is exported to Photoshop, set to 16-bit mode, and resized to 1024 x 768. I open the curves tool and look at the histogram. Usually in a photomicrograph the histogram lies in a very narrow dynamic range. I reset the black and white points to bracket the histogram. This greatly boosts contrast and also increases color saturation and results in a much greater dynamic range. I also use the curves tool to brighten or darken the overall image if needed. If necessary, I clean up the background using the spot healing brush, and/or the lasso tool with a Gaussian blur of 25 pixels radius. Then I apply the sharpen filter, and fade it to ~50%. Next I use the unsharp mask filter, radius 2.5 pixels, ~40%. The end result I refer to as a "pseudo-phase contrast" effect. I save the image as an uncompressed TIFF file. I then open this in Neat Image, a noise reduction program. After removing noise, and if needed using Neat Image's sharpening filter at ~25%, I save it as a final JPG file.

Below is a gallery of images taken over the last 3 months. The specimens came from either pond water samples or hay infusions I made from the pond water.

Hydra - darkfield 40x



Cyclops with egg cases - darkfield 40x



Daphnia - darkfield 40x



Planarian sp. - 40x



The “angry cross-eyed flatworm”

Paramecium Caudatum with *Arcella* sp. (a shelled amoeba) - 200x



The star-shaped contractile vacuole is visible on the top right side.

Paramecium Caudatum - 200x



Vorticella sp. - 200x



The myoneme (contractile fiber) is visible in the stalk.

Vorticella telotroch (free swimming) - 430x

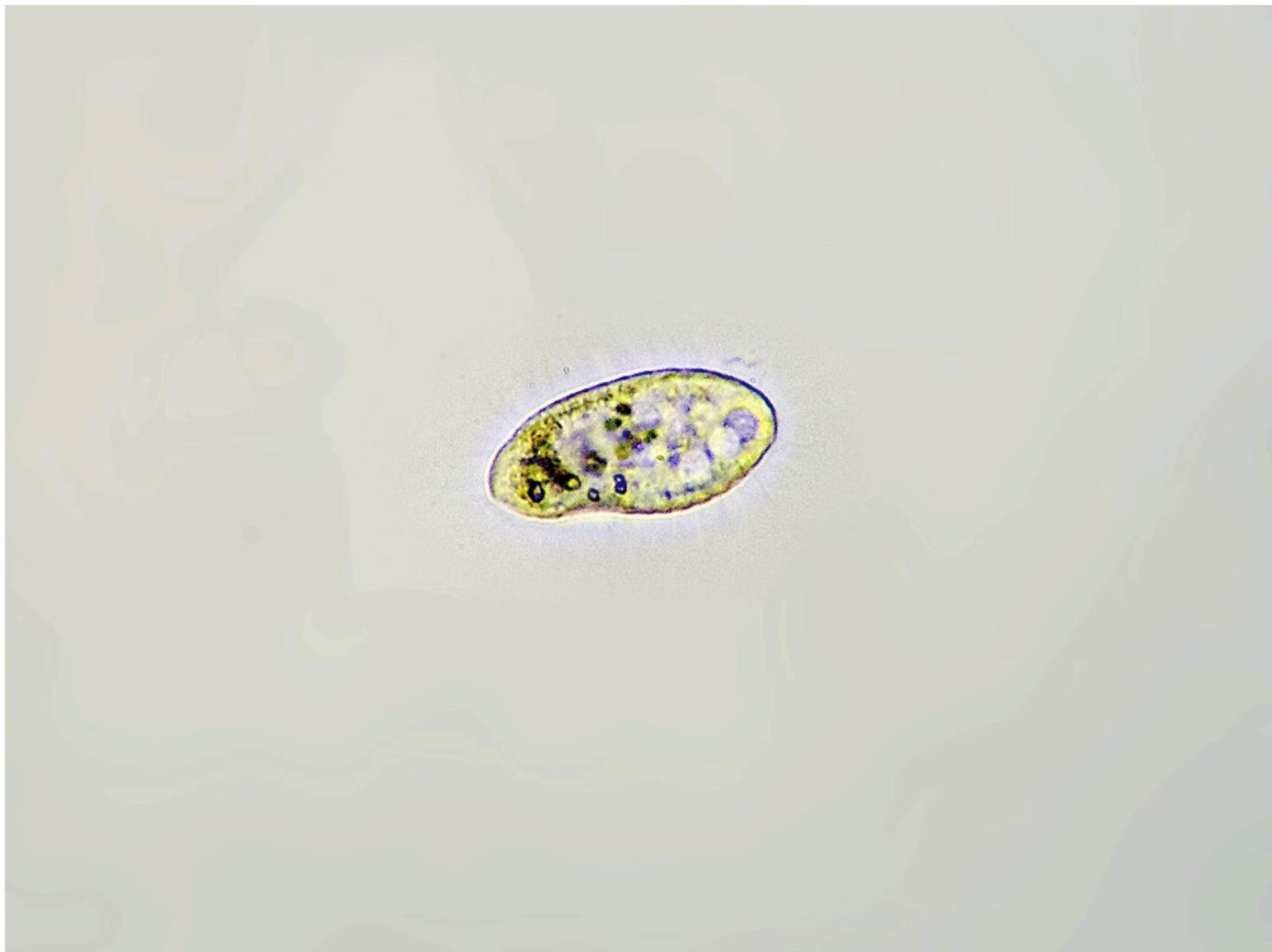


Vorticella - 100x



Unknown ciliate - 430x.

If anyone can identify this please email me at the address below.



Arcella - 430x

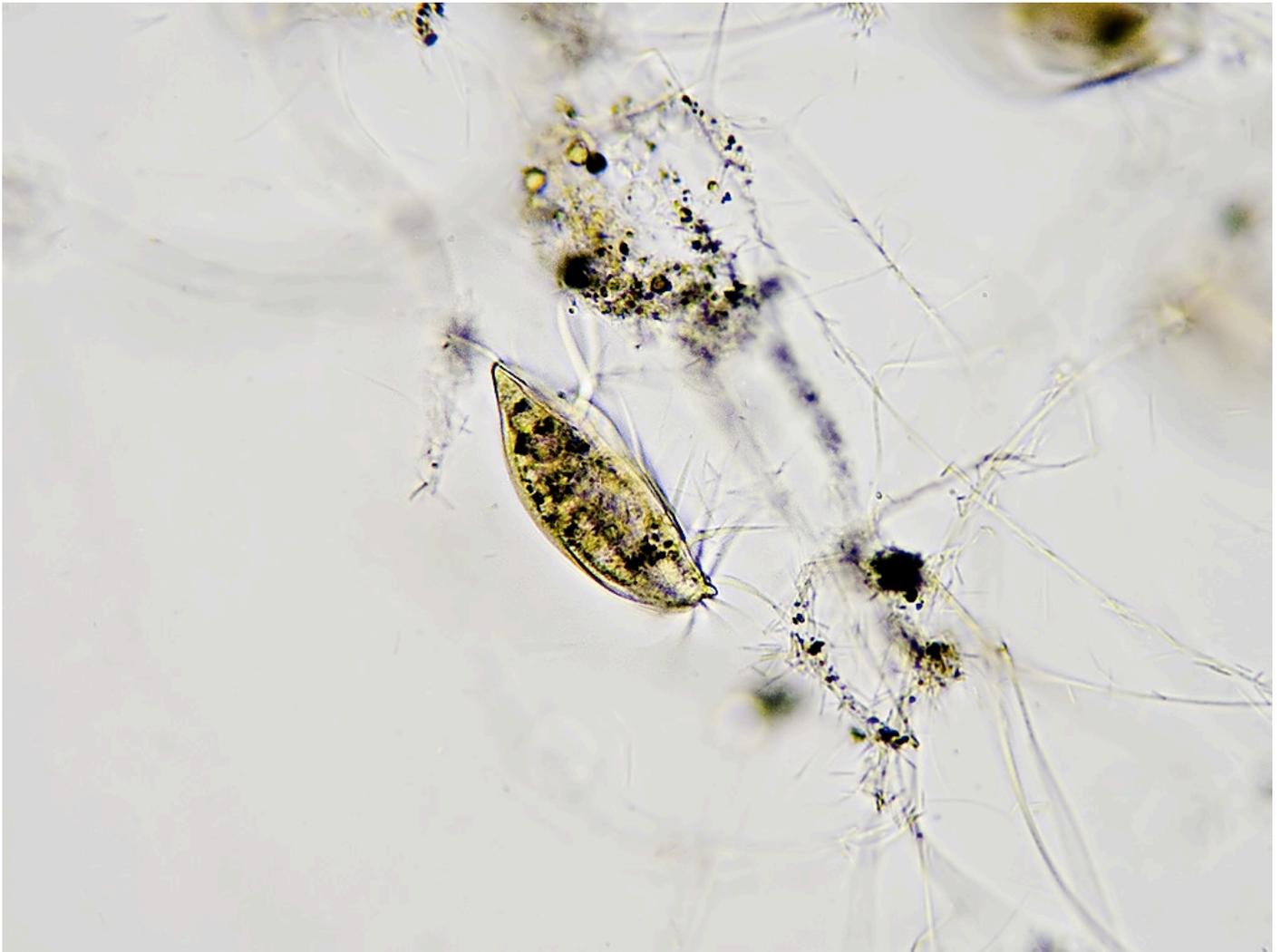


Euplotes sp. - 200x



This image shows the tufts of cilia which are fused into structures called cirri.

Euplotes side view - 200x



*Comments to the author are welcome.
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