THE MICROSCOPE • Vol 59:1, pp 29-31 (2011)

Introducing Children to the Micro Life of Fish Lake[1]

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ABSTRACT

My friend's family and I have enjoyed exploring the live micro life of Fish Lake in rural Indiana. We collected our water samples near the shore and examined the specimens in a micro aquarium slide using a Meiji stereomicroscope, my multimode trans-illuminator, and the 2X and 4X paired objectives. The same specimens were then examined with my modified LOMO Biolam equipped with a multimode condenser and water-immersion caps on the objectives. The girls were fascinated with watching a live copepod and a worm under the stereomicroscope using transmitted darkfield illumination.

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During the summer of 2009, I conducted a brief experiment to determine the level of interest of my friend JoAnn's 15- and 10-year-old granddaughters, Hannah and Rachel, in using my Meiji stereomicroscope and multimode transmitted light illuminator to examine living organisms in a lake water sample (1). They were fascinated and preferred darkfield illumination. Their father was more interested in the interference color patterns exhibited by calcite particles in the hard water lake when viewed between crossed polars. I then realized that a more detailed and documented experience of JoAnn's granddaughters exploring the water organisms early the next summer could be a good topic for a presentation at Inter/Micro 2010 in Chicago, where I demonstrated the Meiji stereomicroscope with the multimode trans-illuminator.

The multimode condenser with the Meiji stereomicroscope is shown in Figure 1. Figure 2 is a schematic ray diagram for this illuminator used with a half-inch diameter fiber-optic light guide. The illuminator has a slider (Figure 3) with a clear opening for brightfield illumination and inserts in the other openings for polarized light, first order red retardation and darkfield illumination. This time, we conducted the micro life study using my modified Biolam with its multimode condenser (2). The same water specimen in a micro aquarium slide could then be viewed with both microscopes. The water-immersion caps on the Biolam objectives allow direct immersion into the micro

Figure 1. Meiji stereomicroscope with the home-built multimode transmitted light illuminator.

[1]Presented at Inter/Micro 2010, Chicago.
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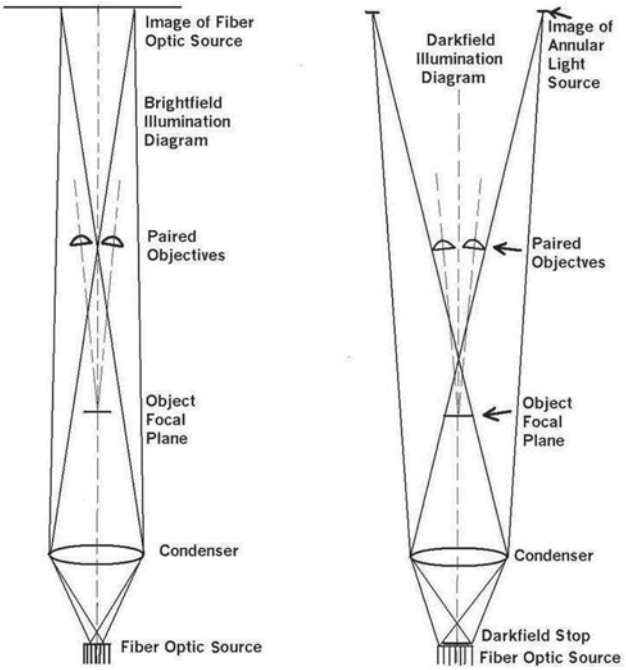

Figure 2. Schematic ray diagram for the multimode illuminator shown in Figure 1.

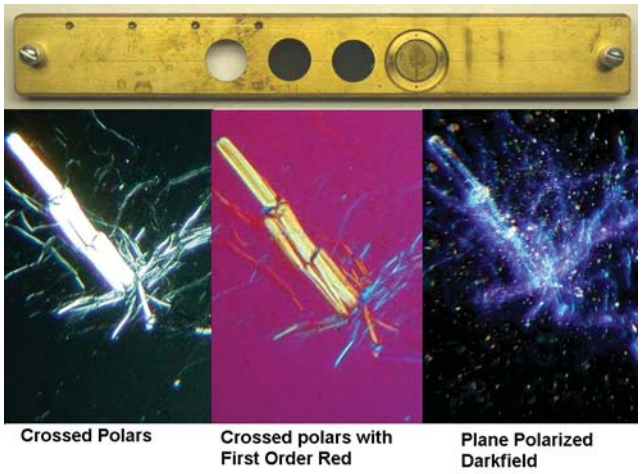

Figure 3. Top: The slider from the multimode illuminator has a clear opening for brightfield illumination and inserts in the other openings for polarized light, a first order red compensator and darkfield illumination. Bottom: Images of chrysotile asbestos in 1.550 mountant taken with the slider.

Figure 4. JoAnn (from left), Hannah and Rachel examine lake water organisms with the Meiji stereomicroscope.

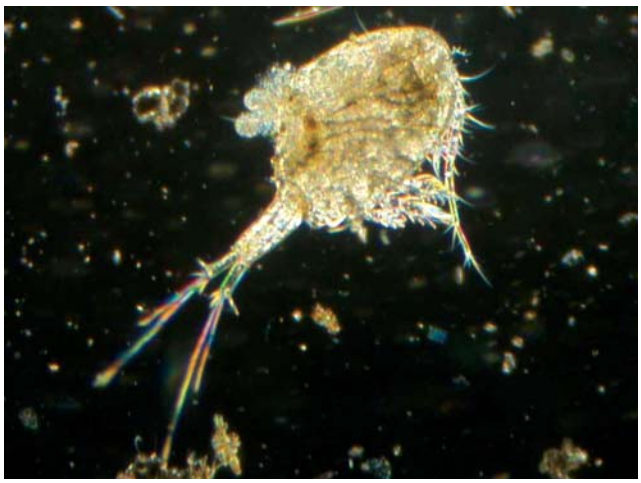

Figure 5. Image of a parasitized copepod taken through one of the eyepieces of the stereomicroscope using darkfield illumination.

aquarium slide (3).

JoAnn and her granddaughters watched as I gathered the water sample near the lakeshore. The exploration of lake water organisms began with the girls viewing a specimen in a micro aquarium slide with the Meiji stereomicroscope (Figure 4). The micro aquarium slide, instead of a conventional specimen with a cover glass, allows a much larger specimen volume to be examined. Darkfield was again the preferred illumination.

The girls found copepods (Figure 5) and worms (Figure 6) most interesting to observe as they scanned the slide. (Brian Ford noted that the copepod in Figure 5 has been parasitized.) Upon closer examination of the specimen in Figure 6, diatoms and desmids are also evident. The sheets of the diatom fragillaria were the subject of a higher-magnification study using the 20X objective of the Biolam and darkfield illumination (Figure 7). Darkfield was also used with the 20X objective

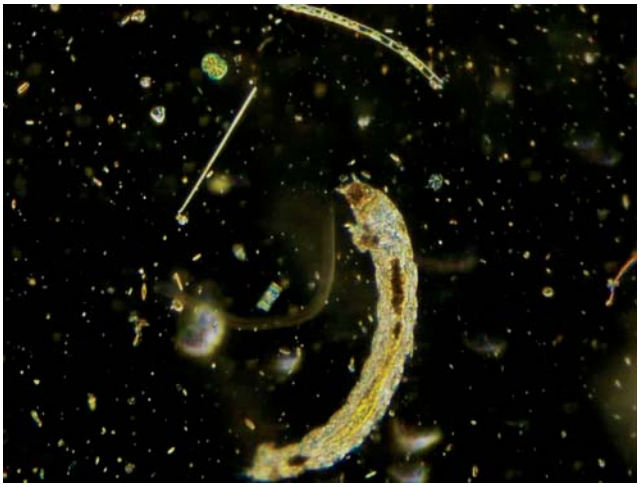

Figure 6. Image of a worm taken through the stereomicroscope with darkfield illumination.

Figure 7. Rachel (right) views water organisms through the secondary eyepiece of the modified Biolam microscope.

equipped with a water-immersion cap.

The quarter-inch-diameter light guide was coupled to an LED flashlight instead of the 150-watt quartz halogen illuminator used with the stereomicroscope. The girls viewed the organism through the secondary eyepiece, while I controlled the microscope and used the eyepiece pointer to indicate key details such as fragillaria (Figure 8). We recorded the image with an Olympus E-330 DSLR equipped with a 28 mm f/2.8 wide angle lens over the secondary eyepiece.

My daughter Susie and 4-year-old granddaughter Kira also visited Fish Lake. My granddaughter was very interested in looking at insects through the stereomicroscope with top lighting. She observed a housefly covered with hairs. I purchased a LOMO SF-10 stereomicroscope for my daughter to use with her daycare kids and her own children, and JoAnn bought a beginner's microscope for her granddaughters.

Intergenerational learning experiences such as this one have been shown to enrich children's knowledge of the sciences (4) and complement school science curriculums. Intergenerational learning is not limited to get-togethers with family and friends. There are many opportunities for older adults in the science community to share their knowledge with youngsters (5). Perhaps schools at all levels can bring scientists and children together so we can encourage them to pursue scientific exploration.

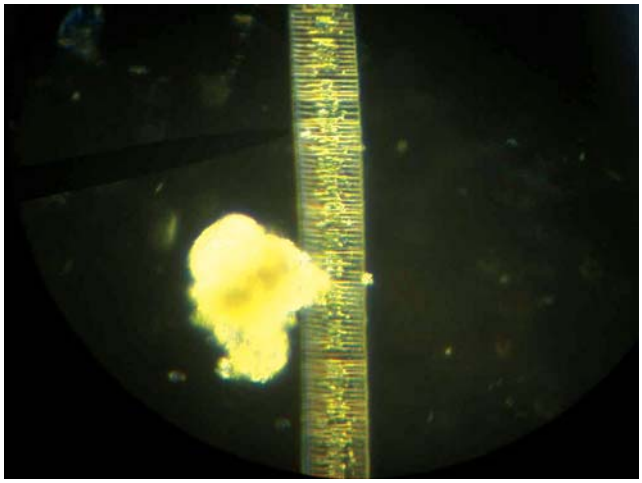

Figure 8. Image of fragillaria taken through the secondary eyepiece of the Biolam with the 20X objective and darkfield illumination.

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