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## A Web-Based Simulation for Students Learning to use a Compound Microscope

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Bob Ketcham majored in biology at Wesleyan University, then obtained his Masters and PhD degrees at the University of Delaware, working in the area of microbial ecology. Currently, he is laboratory coordinator for the non-science majors' labs at the University of Delaware.

Becky Kinney is part-time multimedia developer at the University of Delaware. On the side, she is sole proprietor of Moonlight Multimedia. Becky spent 6 years teaching math and science.

Many students, on being introduced to the compound microscope, will put their eyes to the oculars before putting the specimen in a position that gives them a fair chance of successful viewing. This unhappy situation will be recurrent unless the instructor can intervene one-on-one, which is difficult to do in many class situations. We created a digital microscope to help instructors teach the basics of using a compound microscope.

Our microscope is fully functional. It offers two views, one in which the student is looking *at* the microscope, as though it is in front of her/him on a lab bench, and one in which the student is looking *through* the eyepieces. In either view the student can choose an objective lens, adjust the iris diaphragm, move a slide in the vertical or horizontal direction, and use both coarse and fine focus controls. It is a binocular microscope; in the "*through*" view the eyepieces can be moved together and apart, and there is a simulated ocular micrometer that can be rotated.

The simulation opens in the "*at*" view. It starts with an open dialog box that offers to take the student on an interactive tour. If a student follows the tour, this will take him/her step-by-step from turning on the light to viewing the specimen at higher objective powers. Once a student has finished the tour, or opted not to take it, there is a checklist available so she/he can be sure all adjustments have been made correctly before turning from the "*at*" view to the "*through*" view. There are also a half dozen puzzles, situations in which a specimen is not in good view and the problem is to discover adjustments that need to be made to bring it into good view. Finally, there are a half dozen measurement problems so students can practice using the ocular micrometer.

Experienced instructors in our large-enrollment, non-majors lab course are enthusiastic about the simulation. They say it helps them to get more of their students over the initial hurdle of finding their first specimen in the microscope.

Our simulation is available on the web. The URL is:

<http://www.udel.edu/Biology/ketcham/microscope/scope.html>