

AN INTERACTIVE CD-ROM OF THE ABBE DIFFRACTION KIT

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INTRODUCTION: Ernst Abbe developed his Diffraction Kit to demonstrate to sceptical microscopists at the turn of the century the validity of his diffraction theory of microscope image formation. The diffraction kit has a short, low-power objective ($\times 6.3$, NA .16) which fits on to a rotating collar with a slot cut in it, where various 'tools' (ie specific aperture diaphragms) can be inserted. This collar in turn fits on the nosepiece of the microscope. The other key component is a slide with seven 'specimens' (photo-etched patterns) on it. Most of the experiments need parallel illumination of the sample, which is simply achieved by removing the condenser from its holder and closing down the field iris. The user switches between observing the image through the eyepiece and observing the back focal plane, using either a phase telescope (supplied with the kit) or a Bertrand lens.

The kit was produced by the Zeiss firm for many years thereafter as an educational resource, but is no longer available. Our aim is to recreate it in the form of a CD-ROM, reproducing all the experiments of the diffraction kit in a form which is cheap, light and portable. This will bring the experiments, and their educational outcomes, to a far wider audience than would ever have access to the original kit.

METHODS: Matched images of sample and back focal plane were captured using the diffraction kit on a Zeiss Axioplan microscope equipped with a high-resolution colour video camera and Carl Zeiss Imaging KS400 software. From these a platform-independent sample version of the software has been produced, using Macromedia Flash, containing just one of the seven specimens and a small subset of the tools.

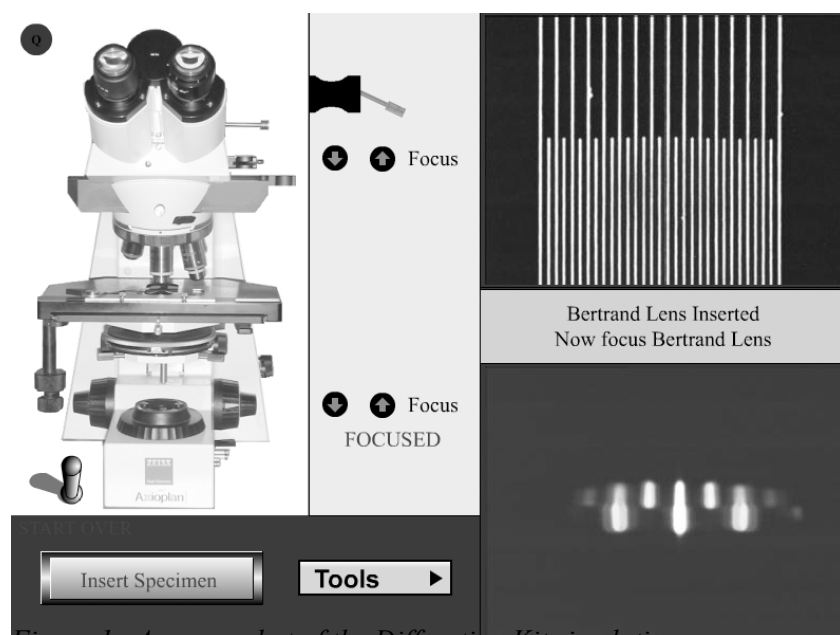


Figure 1. A screen shot of the Diffraction Kit simulation.

RESULTS & DISCUSSION:

Our key design objective has been to keep things as close as possible to using an actual microscope. The microscope itself is shown; when you focus the image, the focus knob turns; when you insert the Bertrand lens, you see the slider go in. Other controls which were not suitably located for display in this way are shown as animated icons which reflect their actual shape and operation. All the time two windows display the matched image plane and back focal plane views.

CONCLUSIONS: The current sample version is a useful educational tool, and is freely available without charge. Our

long-term aim is to attract a publisher or sponsor to commission a complete implementation.

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