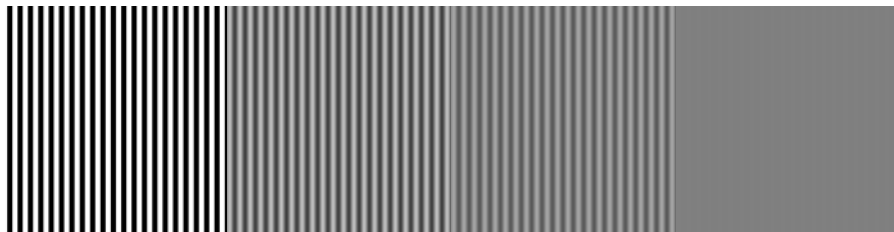


## How Abbe would have done it.

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At the heart of Abbe's theory of the microscope is the imaging of a diffraction grating. His concern was to understand the limits of lateral resolution however a careful analysis of how a single spatial frequency diffraction grating is imaged when the microscope is defocused leads to a simple method whereby optical sectioning can be introduced into the conventional wide field microscope. The figure below shows the image of a grid pattern. The original grid pattern is shown at the left and progressively defocused images of the grid are shown to the right where we see that finally a uniform image results.



This observation is the basis of the method. The illumination system of a microscope is modified so as to project a grid pattern onto the specimen – structured illumination. The figure above suggests that the grid pattern will be imaged efficiently only when it lies near the focal region. In essence we use the structured illumination to label or delineate the optical section – it is revealed in the raw image as that region of the specimen where the grid lines are clearly visible. It is then a matter of simple computer processing to extract both the ‘optical section’ and the traditional conventional image from the composite raw images.