

IMAGING RESOLUTION OF DIGITAL CONFOCAL MICROSCOPY

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ABSTRACT: When bio-optical microscope is used to imaging biological cell or tissue thick specimens, the image resolution decrease significantly due to the combined impact of diffraction and defocus. Digital confocal microscopy can improve the image resolution and restore image clear as quondam object, by Optical-Sectioning Microscopy based on the Optical-Sectioning images and the three-dimensional image restoration method. In this paper, a simulated thick specimen is designed it has some points and lines they have different lateral and axial spacing between them inside the simulated specimen; the criterions of resolution degradation ratio and resolution improvement ratio are proposed; the half-peak width is used for measurement, evaluation and analysis in image resolution of thin specimen diffraction imaging, thick specimen imaging containing out-of-focus ingredients and image by restored digital confocal microscopy. The results show that the digital confocal microscopy has high resolution improve ratio, and perfect effect of the image restoration can be got; the infection of out-of-focus ingredients can be wiped off effectively but also impact of diffraction can be weakened obviously; both the lateral and axial resolution of thick specimen are recover effectively, and the recovered resolution closed to the resolution of quondam object fully. Figure 1 and Figure 2 are the improvement of the image resolution.

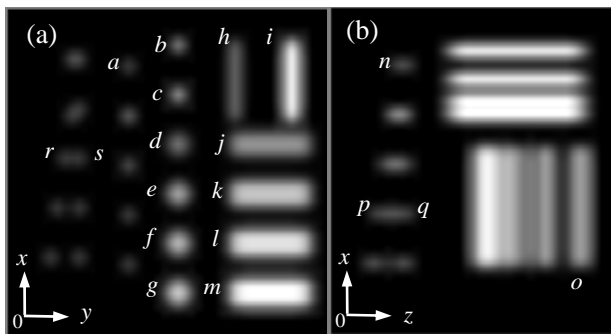


Figure 1: Optical section imaging of simulated thick specimen
(a) 10th optical section in lateral Direction
(b) 17th optical section in axial Direction

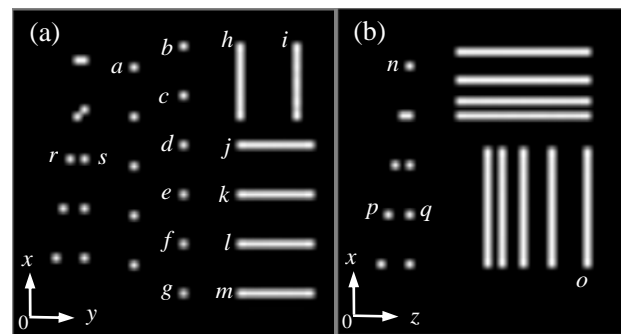


Figure 2: Result restored by digital confocal microscopy
(a) 10th optical section in lateral Direction
(b) 17th optical section in axial Direction

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