

CHOOSING AND USING OBJECTIVE LENSES FOR ADVANCED AND QUANTITATIVE MICROSCOPY

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Objective lenses are the most decisive components of the light microscope regarding image quality. Choosing the right objective lens by understanding typical specifications is crucial for obtaining optimal images, high signal levels, and reliable quantitative data especially for demanding applications.

Furthermore understanding the objective's inevitable aberrations and limitations as well as their sensitivity to experimental and instrumental parameters [1] is essential for using them in the best possible way.

Fortunately the number of critical specifications is limited, and many of them are made readily accessible by the microscope manufacturers. Some specifications are even internationally standardized, hence can be compared with some basic knowledge only.

We will give an introduction to the most important (optical) parameters and show how they affect relevant applications in 3D-imaging, confocal, light-sheet and super-resolution microscopy.

Given that the objective's necessary standard properties are met, these aforementioned advanced microscopy techniques will benefit from some unique features that we will introduce.

The talk will also cover the optical relevant environmental conditions and how they should be mastered. Some lens parameters can be measured easily in a research lab in order to verify that the optical preconditions for a successful experiment are fulfilled. Much more effort is made at the microscope manufacturers' in order to provide quantitative data and reliable quality control.

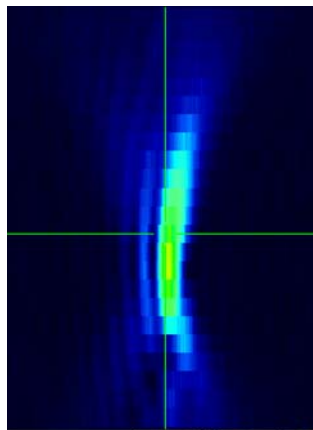


Figure 1: xz-section of a microscope objective PSF, showing coma.

[1] R. W. Cole, et al., “*International test results for objective lens quality, resolution, ...*”, *Microsc. Microanal.*, 2013 Dec;19(6):1653-68.