

## **Fusion of Optics and Digital Imaging**

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Fluorescence microscopy is one of the key imaging technologies in the life sciences to model complex biological processes. In the future, however, “classical” optical imaging of biological samples will no longer be sufficient to completely capture the complexity of structures and signaling pathways. Access to this information is provided by the latest image and data analysis technologies. While in the past such methods were only available to proven experts, developments in hard- and software have made quantitative life sciences accessible for standard applications.

The accessibility of image information was previously based on the analyses of post-acquisition image data, i.e. downstream processing. Through a fusion of intelligent image and data analysis tools with optical imaging modalities, the latest microscope generation provides true real-time representations of the inherent information content of biological samples.

With novel opto-digital technologies such as LIGHTNING for confocal and THUNDER for wide field microscopy, Leica Microsystems realized system-integrated digital modules for fully automated image information extraction. LIGHTNING’s ‘Adaptive Deconvolution’ and the new ‘Computational Clearing’ of THUNDER provide feature-preserving signal extraction and massively increase the recognition possibilities of “classical” microscopy. Super-resolution and high contrast images are generated in near real-time by a voxel-precise calculation of image properties, removing background and noise components by conserving the original signal in parallel.

**Fusion of Optics and Digital Imaging** provides an overview of LIGHTNING ‘Adaptive Deconvolution’ and THUNDER ‘Computational Clearing’ and shows an outlook on the future of digital imaging.