

## **THUNDER** – Decode 3D biology in real time

*Leica Microsystems, Germany*

KEY WORDS: Live cell imaging, 3D imaging, 3D cell culture, Computational clearing, THUNDER

Widefield and especially live cell imaging faces many challenges, such as how to improve spatial and temporal resolution as well as how to keep cells healthy for extended periods of time. At the same time 3D cell cultures such as spheroids or organoids offer more physiological relevance compared to 2D samples. Latest technologies such as IPS cells or CRISPR CAS are used with 3D cell cultures and allow to create powerful models to target diseases such as cancer, diabetes, Alzheimer and Parkinson's disease. THUNDER allows the meaningful use of three-dimensional specimens such as spheroids or organoids that shows brilliant results even deep in your sample. The result is a powerful live cell imaging system which gives sensitivity, speed and ease of use of a camera based detection system.

THUNDER, a proprietary Leica technology, is a new opto-digital technology that uses the new Computational Clearing method to generate high resolution and high contrast images. It fully automatically differentiates between signal and background by taking the size of the targeted sample features into account. Computational Clearing analyzes each pixel of a single image and removes its background components in real time while conserving the original Signal to Noise Ratio (SNR) and the true spatial dimensions of the sample with respect to feature scale.

Depending on the type of application, Computational Clearing can be combined with adaptive deconvolution using the Leica proprietary decision mask technology. A voxel-precise evaluation of image properties determines the optimum parameters for the subsequent deconvolution for each associated volume segment. This enables fully automated deconvolution independent of manual user input.