

Powerful workflows by Delmic – simplifying large scale EM and cryo-ET

Dr Caspar Jonker, Dr Job Fermie, Marit Smeets

Delmic, Delft, Netherlands

Abstract

Delmic is a passionate high-tech company that develops powerful and user-friendly solutions for light and electron microscopy (EM). With our microscopy solutions, we help researchers and companies to achieve results faster, accelerate development and answer fundamental questions about the world. In this workshop, we will present our most recent solutions to simplify cryo-electron tomography (cryo-ET) and large-scale EM.

Cryo-ET is an imaging technique that allows reconstruction of high-resolution models of protein complexes in their near-native state. However, the current workflow is error-prone resulting in damaged, contaminated, and devitrified samples that cannot be used for data analysis. To overcome these problems, we developed METEOR an integrated cryo-CLEM system to guide cryo-lamella milling and ensure the region of interest is present in the final lamella. We will also present CERES, our ice defence system minimizing ice contamination in every step of the workflow. This will allow researchers to obtain better quality cryo-EM and cryo-ET results, higher throughput, and higher resolution.

Large scale EM aims to integrate nanoscale observations into the larger context of the sample, which can cover a large area or span through a three-dimensional volume. With conventional large-scale EM workflows, operators are forced to balance the size of the imaged area against the resolution needed to visualize the required level of detail. Despite best efforts, large projects still take days to months of continuous imaging when high-resolution data is needed. To overcome this challenge, we have developed FAST-EM, an automated multibeam scanning EM, which combines simultaneous 64-beam electron imaging with an automated workflow. This enables users to tackle current and future large-scale projects such as volume-EM of cells and tissues, connectomics, and large-scale 2D nanotome projects within hours or days instead of weeks or months.