

Large Volume and Correlative Scanning Electron Microscopy

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Scanning electron microscopy (SEM) is a versatile method to obtain high-resolution information on a nanometer scale. While traditionally used for imaging the topography of coated biological samples, modern SEMs in biomedical research are utilized increasingly to obtain high resolution, large volume data of 3D biological samples.

New developments in hard- and software as well as in electron optics and detector technology enable an ever-larger range of application. With SEM the researchers are not limited to grid-mounted samples. Today's systems rather allow to produce hundreds of serial section automatically, place them on large solid supports and image them automatically in the SEM. Furthermore, blocks of cells or tissue can be placed and processed directly in the microscope to produce large 3D volumes of pre-selected target areas. Serial block face imaging can be performed by an ultra-microtome, integrated into the SEM chamber, or the application of a focused ion beam which allows to remove layers of a few nanometer from the samples surface.

As a manufacturer of not only electron microscopes, but also wide-field, laser scanning, X-ray to ion beam microscopes, the development of correlative workflows at Zeiss Microscopy gains vital importance for a wide field of modern microscopy applications. Individual microscopes, used to image a certain sample modality, are often highly specialized in order to visualize a dedicated contrast or to provide the highest spatial resolution. On the one hand side correlative microscopy is used to navigate to the area or volume of interest in a high resolution microscope, based on image data which have been pre-selected in standard microscope before. Another application is to overlay different image modalities like fluorescence and ultrastructural information, acquired by different specialized microscopy systems in a multichannel image or 3D dataset.

New software tools help with automation and managing of the various multiscale and multimodal information. Overlaying all or some of these modalities allow to combine specific structural and functional labeling with ultra-structural information across length-scales. Join our presentation and learn about Shuttle&Find, ZEN Connect, Correlative Array Tomography and the ATLAS Correlative Workspace.