Understand cellular ultrastructure in 3D context

ZEISS Volutome

Volume Data Acquisition through Automated Sectioning and Imaging

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ZEISS

Seeing beyond

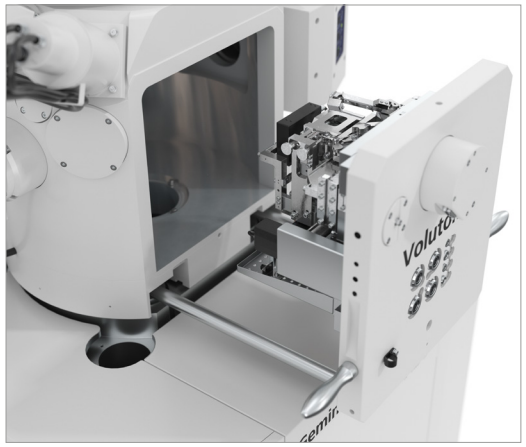
Volume Data Acquisition through Automated Sectioning and Imaging

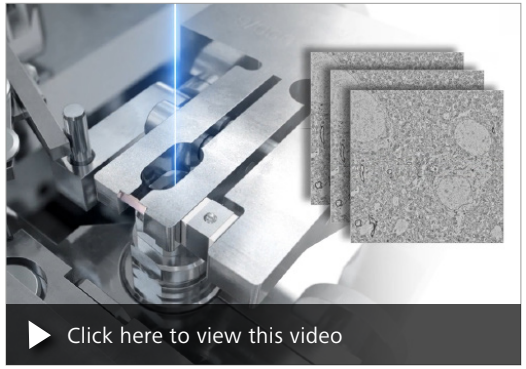
ZEISS Volutome is an in-chamber ultramicrotome for ZEISS field emission scanning electron microscopes (FE-SEM) designed to image the ultrastructure of biological, resin-embedded samples in 3D over a large area.

A diamond knife cuts away sections from the sample block and the newly exposed surface is imaged with the backscattered electron detector, ZEISS Volume BSD, which is specifically designed for serial block-face imaging. The cutting and imaging process is repeated thousands of times in an automatic, autonomous process. The increased sensitivity of the detector allows fast image acquisition with low acceleration voltages, protecting your sample from beam damage and mitigating charging effects.

By activating the ZEISS patented Focal Charge Compensation (Focal CC), even the most charge-prone samples can be investigated without degrading image quality. Focal CC neutralizes charges directly at the block face with no compromise in signal-to-noise ratio or resolution.

ZEISS Volutome is an end-to-end solution from hardware to software including image processing, segmentation, and visualization. The ultramicrotome can be easily replaced by a conventional SEM stage, converting your 3D FE-SEM into a standard, multipurpose FE-SEM, making your system adaptable to a multi-purpose environment.

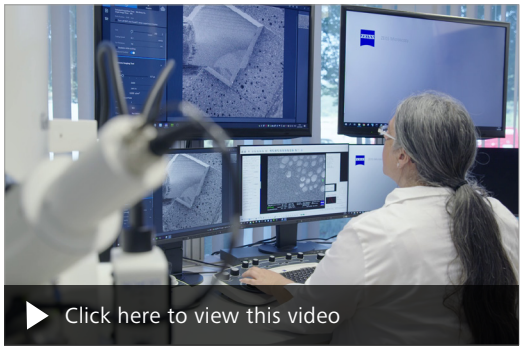




Simpler. More Intelligent. More Integrated.

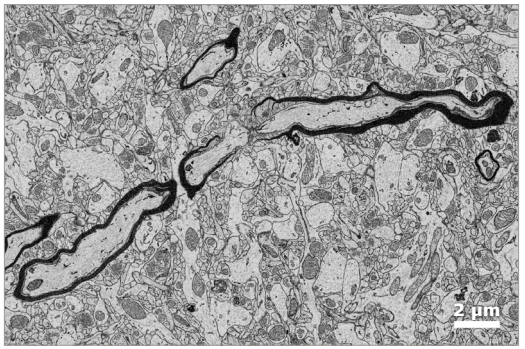
Save Time with Automated Cutting, Image Acquisition, and Pre-processing

Acquisition of structures with high resolution in a broader context can last for days. Therefore, in-chamber ultramicrotome SEM requires stable acquisition conditions over a long period of time. ZEISS Volutome allows highly automated and unattended cutting and imaging. To save even more of your precious time, the cutting cycle is sped up and image acquisition is accelerated using the dedicated detector ZEISS Volume BSD. During image acquisition, images are simultaneously pre-calculated for stitching and z-stack alignment – meaning results are at your fingertips in one click.



Superb 3D Imaging in Every Way

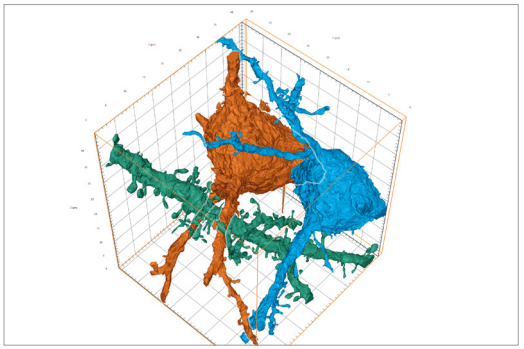
Biological, resin-embedded samples are challenging to image. High quality images with good contrast are normally acquired with higher acceleration voltages. However, high acceleration voltage can damage your sensitive sample. Imaging at low kV ensures sample integrity – but produces images with less contrast if you do not have a high-sensitivity detector. ZEISS Volume BSD is the new high-speed, high-sensitivity detector specially designed for ZEISS Volutome, ensuring high-contrast images even at low kV. In combination with Focal Charge Compensation, charge-prone samples can be easily imaged by charge neutralization at the block face. Built-in ZEISS Volutome stage facilitates the acquisition of large volume EM datasets.



Mouse brain tissue acquired with ZEISS Volutome and ZEISS GeminiSEM; pixel size: 3 nm. Sample courtesy of Christel Genoud, Université de Lausanne, Switzerland

One Solution – One Contact: ZEISS Your Trusted Partner for Volume EM

Providing the complete, integrated serial block-face solution from hardware to software, ZEISS Volutome is ideal for users with a vested interest in streamlining their number of equipment suppliers. Whether you have questions about the ultramicrotome, the detector or FE-SEM, or even your applications, rest assured ZEISS is your contact. With many years of experience in volume EM, ZEISS is your partner in serial block-face imaging.



3D reconstruction of mouse brain neurons. Sample courtesy of Christel Genoud, Université de Lausanne, Switzerland

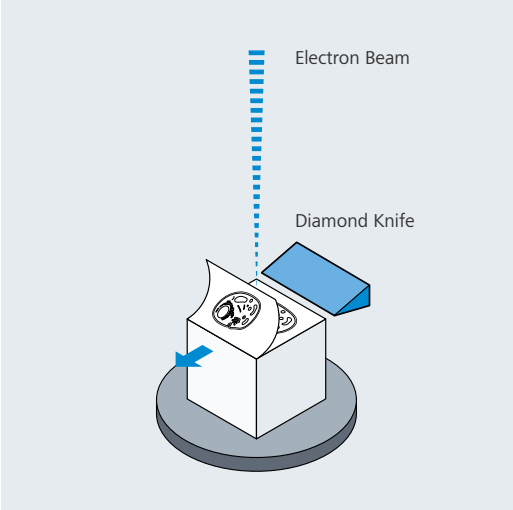
Your Insight into the Technology Behind It

ZEISS Volutome: A Valuable Addition to the Volume EM Landscape

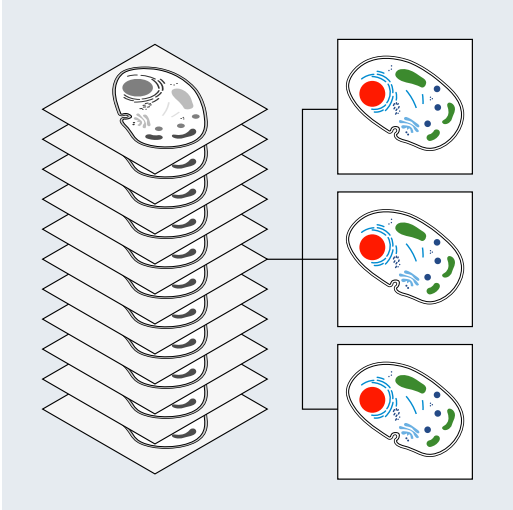
Scanning electron microscopy (SEM) can be used to explore intricate, ultrastructural 3D information with various methods known collectively as volume EM (vEM). vEM techniques can acquire larger volumes of sample data to better understand ultrastructural details within a larger 3D context – each with specific strengths such as automation, resolution, or accessible volume. Like other vEM methods, serial block-face SEM includes these three key steps:

1. EM sample preparation
2. Collecting a stack of 2D images from a series of sections
3. Computationally reconstructing the images in 3D

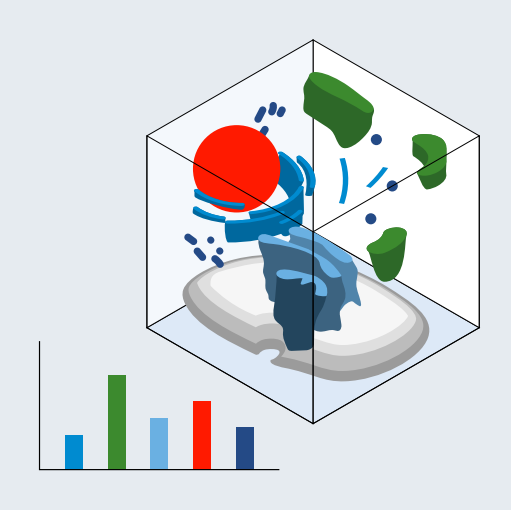
Serial block-face SEM is your vEM technology of choice when you are interested in easy sample handling, a highly automated imaging process, a higher z-resolution than what is found with array tomography, and imaging of larger volumes than possible with FIB-SEM. With ZEISS Volutome, the next generation serial block-face solution is now available: highly automated, fully integrated and optimized for large volume data acquisition.



A resin-embedded sample is cut slice by slice with ZEISS Volutome mounted inside the FE-SEM chamber. The newly exposed sample surface is imaged. This cutting and imaging process is repeated until the structure of interest is completely imaged.



The acquired EM images are processed and digitally aligned into a 3D data set. Cell compartments can be identified and segmented.

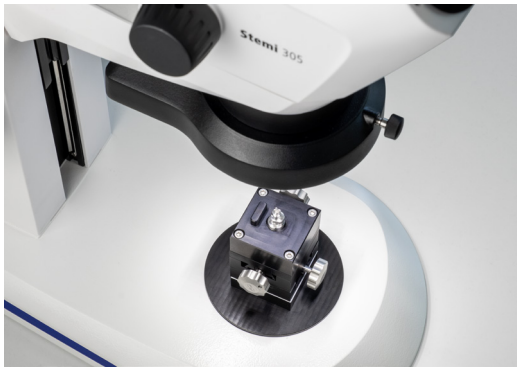


The segmented 3D data set can be visualized, investigated, and statistically analyzed.

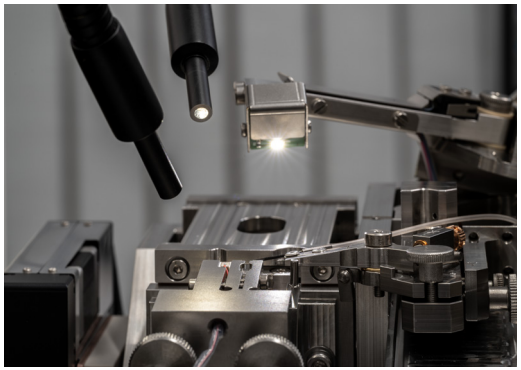
Your Insight into the Technology Behind It

The Hardware Behind ZEISS Volutome

The hardware components of ZEISS Volutome work hand in hand to facilitate the streamlined workflow, from sample alignment and knife approach to image acquisition.



Before mounting the sample inside the ultramicrotome, the sample is inserted into a specially designed sample holder and centered by means of a ZEISS stereo microscope.



Once the sample is placed in the ultramicrotome, it is moved towards the diamond knife. Light sources make the reflection of the knife on the sample surface clearly visible and show you when the knife is close to the sample.

Using the ZEISS Controller, the sample can be precisely moved towards the knife, monitored either through the binoculars of a stereo microscope or digitally on a screen.

ZEISS Focal Charge Compensation and ZEISS Volume BSD are fully integrated in the FE-SEM software and can be easily controlled with just a few clicks.

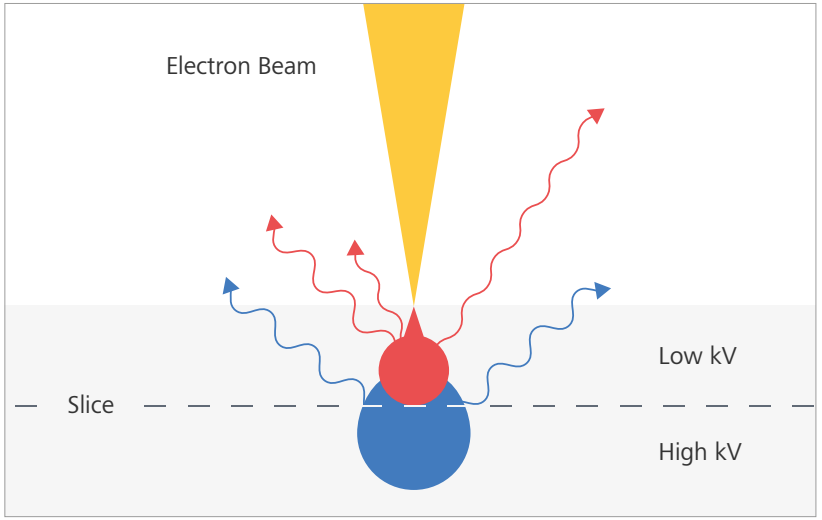
Diamond knife and Focal CC needle

ZEISS Volume BSD

Your Insight into the Technology Behind It

ZEISS Volume BSD – Fast Image Acquisition and Superb Image Quality at Low kV

ZEISS Volutome comes with ZEISS Volume BSD, the optimized detector for serial block-face imaging of resin-embedded biological samples. A new diode design and new electronics make this a highly sensitive detector specifically enhanced for the imaging with low acceleration voltages and fast scanning speeds. Without these improvements, imaging with low acceleration voltages and short beam dwell times would normally result in a low signal-to-noise ratio and reduced image quality. With ZEISS Volume BSD, fast, high-contrast imaging is made possible while your delicate biological sample is protected from beam damage – which is key to reliably creating a 3D dataset.



Low voltage operation reduces the beam penetration into the sample. The BSE signal comes only from a thin surface layer after each cutting step, meaning there is no unwanted signal from deeper inside the sample. A thin-layer interaction volume also reduces sample damage and enables continuous high quality cuts throughout the sample.

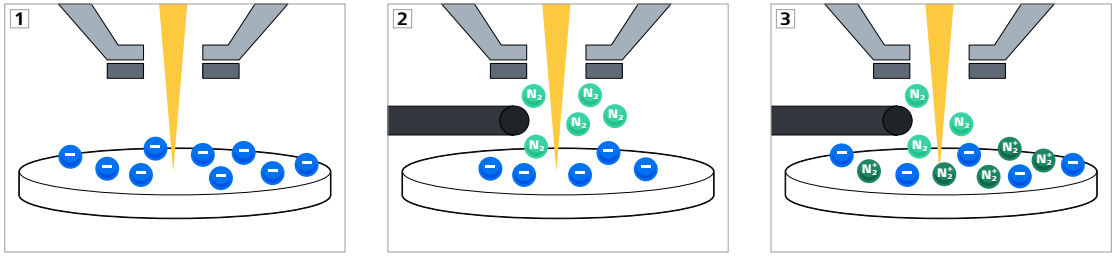
Your Insight into the Technology Behind It

Imaging Your Charge-Prone Sample with ZEISS Focal Charge Compensation

Specimen charging, particularly in samples containing large regions of bare resin (e.g., cell culture monolayers or highly vascularized tissues) results in a significant degradation in image quality and distortion. Typically, charging is mitigated by applying variable pressure, however this is at the expense of signal-to-noise ratio and resolution.

ZEISS Focal Charge Compensation, designed in collaboration with the National Center for Microscopy and Imaging Research (NCMIR), eliminates specimen charging. A gas injection system consisting of a tiny capillary needle is precisely located above the sample. Nitrogen is guided through this needle directly onto the block-face surface while the chamber is maintained under high vacuum. This eliminates charging and assures high image quality. The needle retracts automatically during the cutting cycle, so the workflow is uninterrupted and high acquisition rates are maintained.

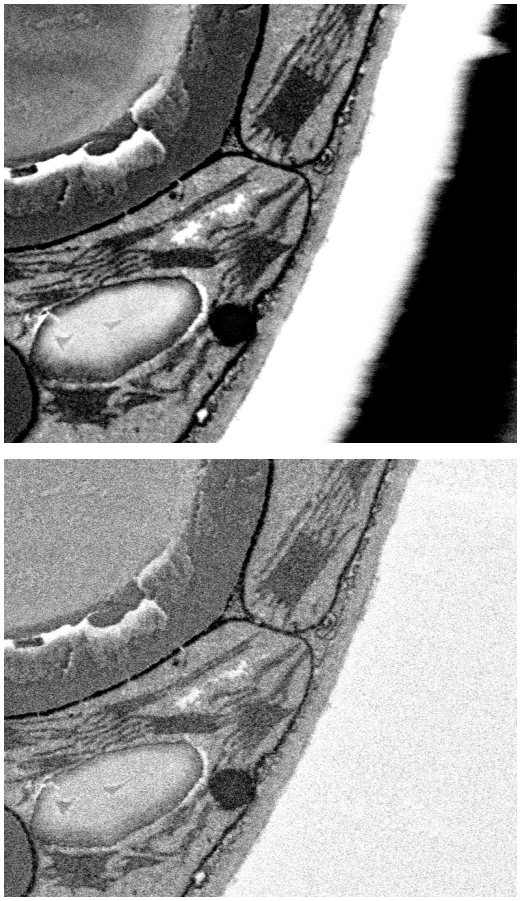
Since its original release, the design of Focal Charge Compensation has been optimized for large area imaging and easier adjustment. Once the needle is adjusted, it can be positioned easily above the sample surface without any additional alignment.



1. Electrons of the primary electron beam interact with the specimen creating charging effects. Secondary electrons are released from the specimen and generate negative charging on the surface. The detector will be overwhelmed by electrons.

2. Through the Focal CC needle, nitrogen gas is applied to the sample and forms a local gas cloud above the specimen surface. Primary and backscattered electrons from the specimen surface ionize the nitrogen molecules.

3. The positively charged nitrogen molecules neutralize the specimen surface. Thus, charging effects are minimized.



Ultrastructure of a plant sample: Leaf of Arabidopsis thaliana, *embedded according the protocol developed by the National Center for Microscopy and Imaging Research (NCMIR). The sample was imaged without Focal CC (top image) and with Focal CC (bottom image). Without Focal CC, the image is deteriorated by charging effects. Sample courtesy of Prof. S.C. Zeeman, ETH Zurich, Switzerland.*

Your Insight into the Technology Behind It

Large Volume Imaging – Reveal the Ultrastructure of Your Sample in a Wider Context

ZEISS Volutome offers a robust stage solution. The ultramicrotome stage reduces drifting effects and makes large volume imaging over a long period of time possible. You can access these large volumes by acquiring single 2D images at up to 32k × 32k pixel resolution.

For applications that require you to push the boundaries of single 2D imaging, you can stitch multiple single images together to create one larger mosaic image. Mosaic imaging is of special interest when cells or cellular structures need to be traced across a wide range in x, y and z.
A prominent example is Connectomics: the neuronal network and connections between nerves must be investigated comprehensively over wide, continuous volumes.

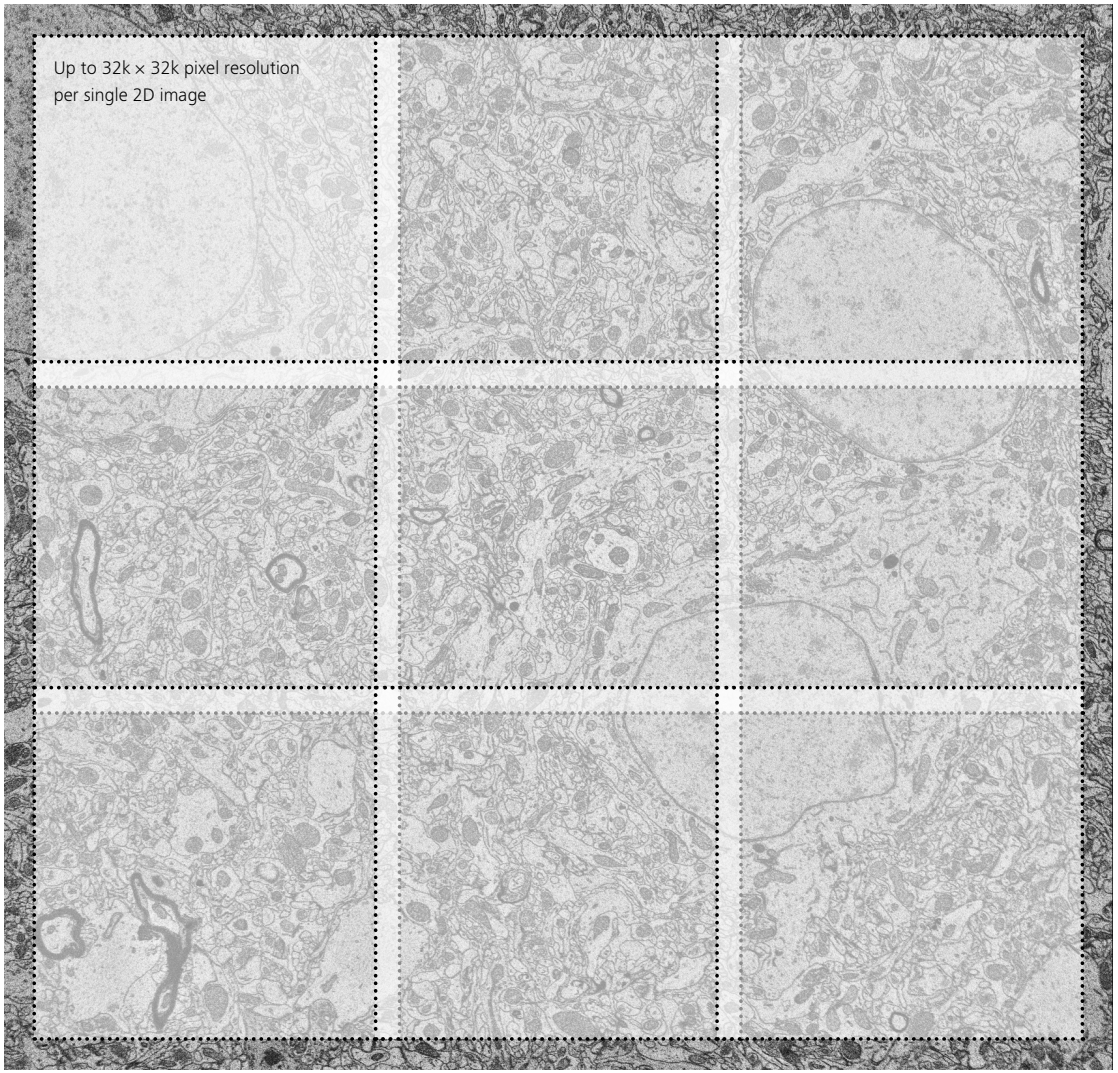


Illustration shows the principle of tiling and stitching for large area imaging.

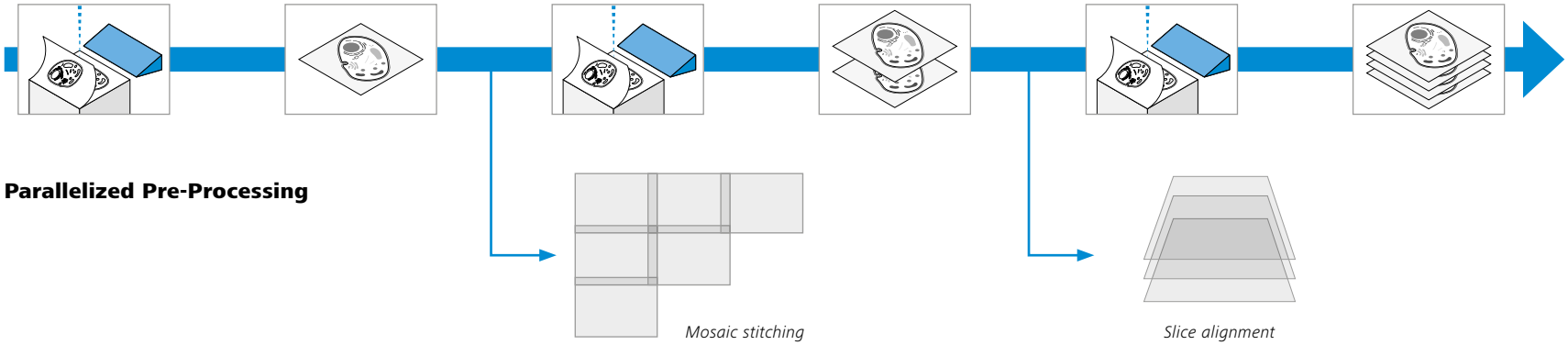
Your Insight into the Technology Behind It

Get Results Faster – Parallelize Your Image Acquisition and Processing

The stack of data collected with serial block-face SEM can be large. The size of your data depends on many factors including the imaging parameters, the nature of your sample, and the scientific question you aim to answer. In addition to the long acquisition times necessary for some experiments, image processing and stack curation, such as mosaic stitching and z slice alignment can add even more time before you can view your results.

Why not begin your processing while still acquiring your images? This parallelization of activities saves time. At the end of the acquisition process, you simply apply the pre-calculation to your data set and review what you have achieved. If you identify errors or prefer to make alternative adjustments, you have the option to manually adjust and optimize the mosaic image stitching or the z-stack alignment to your preference.

Cutting and Image Acquisition



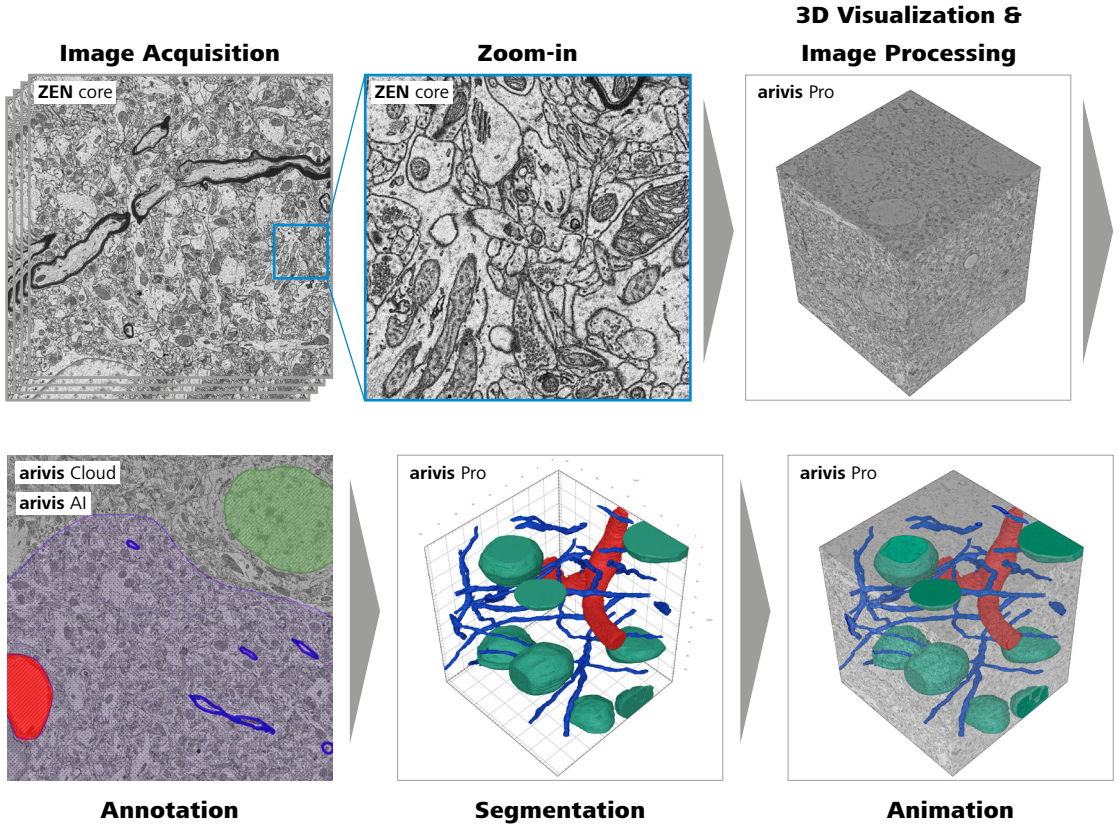
Your Insight into the Technology Behind It

From Image Acquisition to 3D Results

ZEISS software combines the individual Volutome hardware components to make the serial block-face workflow smooth and easy-to-use.
The cutting operation as well as the imaging process are controlled by ZEISS ZEN core. ZEN core workbenches provide intuitive structure to control setup, sample to knife approach and parameters for cutting and image acquisition.

Once the data is collected and the pre-calculation is applied for stitching and z-stack alignment, the results can be visualized and processed with ZEISS arivis Pro.

Take your results a step further, with software from the ZEISS arivis product family you can annotate, segment, and analyze your data – getting the most information out of your images.



Your Insight into the Technology Behind It

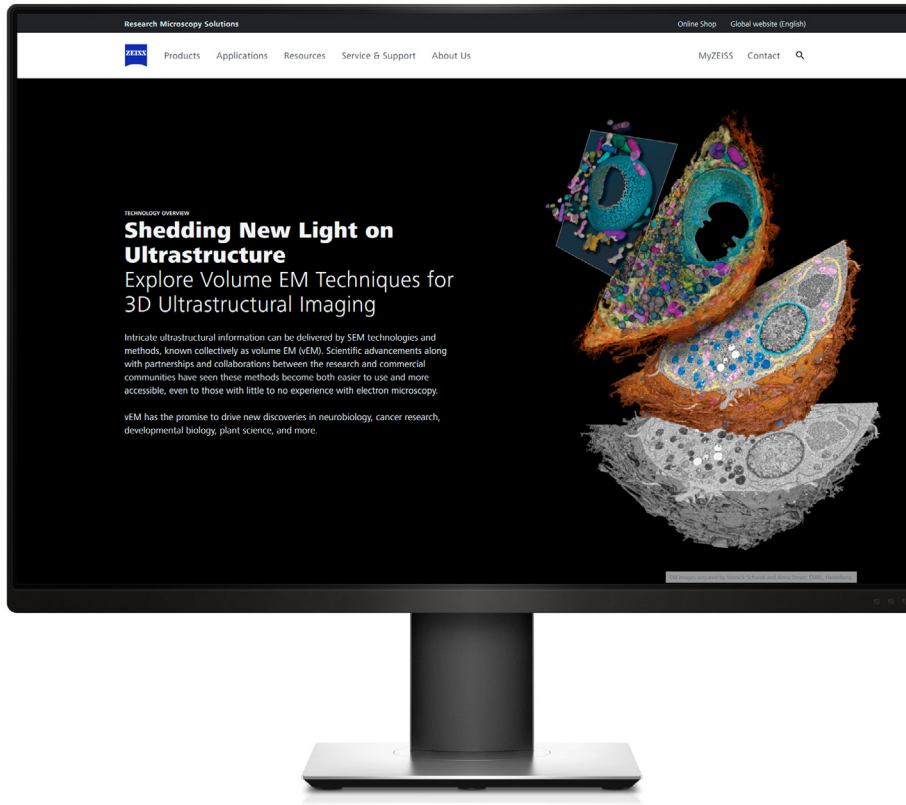
ZEISS – Your Trusted Partner for Volume EM

With years of experience in vEM involving serial block-facing imaging, ZEISS can now offer an end-to-end solution from hardware to software. The in-chamber ultramicrotome developed by ZEISS is based on the basic research technology of Max-Planck Institute for Neurobiology in Martinsried, Germany. We are in close contact with the research community to provide solutions that are tailored to your needs.

ZEISS Volutome has been improved with the addition of several accessories to overcome issues realized in the past. New innovations have been implemented with the next generation of Focal Charge Compensation and the Volume BSD, enabling imaging of even sensitive biological samples. ZEISS software supports the entire workflow from image acquisition through to analysis and visualization.

ZEISS is your contact for all service, technical or application questions. Drawing on years of experience, ZEISS can support you in every step of your workflow.

To learn more about how ZEISS supports your scientific ambitions with a variety of volume EM solutions please visit: **www.zeiss.com/volume-em**



Tailored Precisely to Your Applications

Serial block-face imaging can be used to investigate cellular structures in any resin-embedded biological sample prepared for electron microscopy. Use ZEISS Volutome for every research area where the ultrastructural 3D information is needed to answer your scientific question. Neuroscience, cell biology, plant science, or general tissue imaging are prominent research fields and sample types to mention.

Field of Research	Scientific Interest / Application / Task
Neuroscience	Investigation of ultrastructure in 2D and 3D to ■ Trace neurons over a large scale and identify synapses (Connectomics) ■ Understand the origin and development of neurodegenerative diseases ■ Study morphological alterations caused by aging ■ Analyze processes for learning, behavior, and memory
Cell Biology	Investigation of cellular ultrastructure to ■ Count cells and cell organelles ■ Analyze the volume of cells and cell organelles ■ Compare the architecture of pathological and normal tissues ■ Understand essential cellular processes
Plant Science	Investigation of ultrastructure in relation to ■ Plant anatomy ■ Ultrastructural changes in healthy versus diseased tissues ■ Mycorrhizal and bacterial root relationships ■ Drug discovery and interactions ■ Crop yield and food production ■ Climate change effects ■ Genetically modified organisms
Tissue Imaging	Investigation of ultrastructural changes due to ■ Diseases ■ Metabolic alteration ■ Drug Treatment

ZEISS Volutome at Work

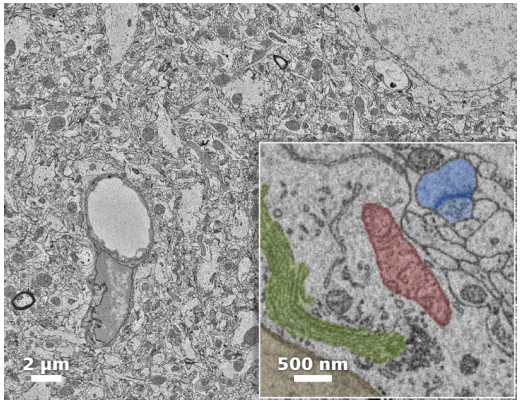
Neuroscience

Various fields within neuroscience seek to elucidate the structure and function of the nervous system and brain. From basic research in developmental, cellular, or molecular neuroscience to applied research in aging or neurodegenerative diseases, researchers across many neuroscience disciplines continue to pursue better understanding of neuronal connections and signaling pathways. Serial block-face imaging is the appropriate solution to image and follow neurons with long and thin protrusions, such as dendrites and axons. It is well suited to trace neurons within the large volumes necessary to capture the often-unpredictable paths of these cells. ZEISS Volutome enables acquisition of large mosaic images over all three dimensions at high resolution. This is supported by the stability of the ultramicrotome stage solution. Once the cutting and imaging parameters are set-up, the experiment runs automatically and autonomously. Sections as thin as 25 nm with pixel sizes as small as 3 nm can be cut to follow the dendrites and axons precisely over long distances. The high resolution of the images reveals synapses, synaptic clefts, or pre-synaptic vesicles. Going beyond image acquisition, ZEISS arivis Pro, the software for image processing, segmentation, and visualization, facilitates the analysis of your ultrastructural 3D data set to elucidate the path of the individual neurons.

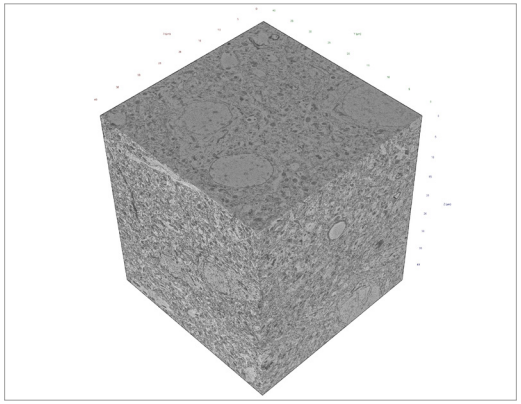
Cutting and Imaging Parameters:

- Pixel size: 6 nm
- Cutting thickness: 25 nm
- Dimensions: 43 µm × 43 µm × 45 µm (1800 sections)
- EHT: 1.2 kV / Ip: 90 pA
- Dwell time: 0.8 and 1.6 µs, respectively
- Acquired with ZEISS GeminiSEM 460

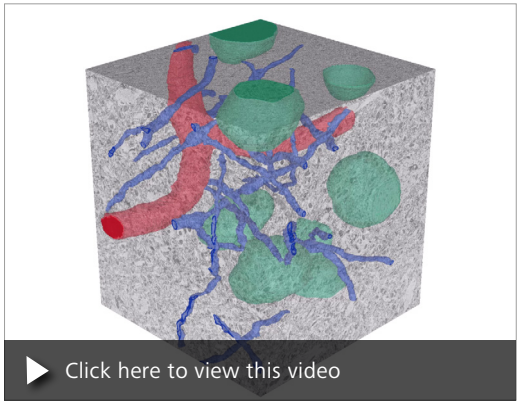
Sample courtesy of Christel Genoud, Université de Lausanne, Switzerland



Single tile image of mouse brain. The inset shows a magnified area and clearly reveals individual structures such as nucleus (brown), Golgi (green), mitochondria (red) and synapses (blue).



3D reconstruction of the acquired data set from mouse brain tissue. The final volume consists of 1800 sections in total and spans 43 µm × 43 µm × 45 µm.



The data set was processed, segmented, and visualized with ZEISS arivis (red: blood vessel, cyan: nuclei, blue: neurons)

ZEISS Volutome at Work

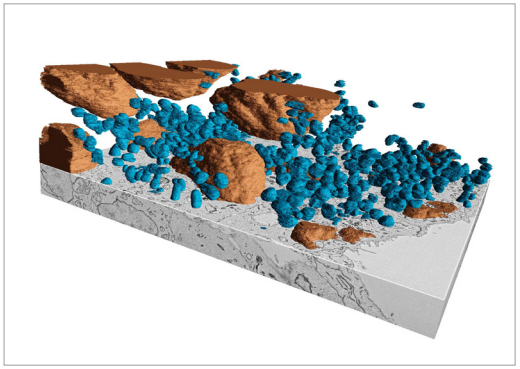
Cell Biology

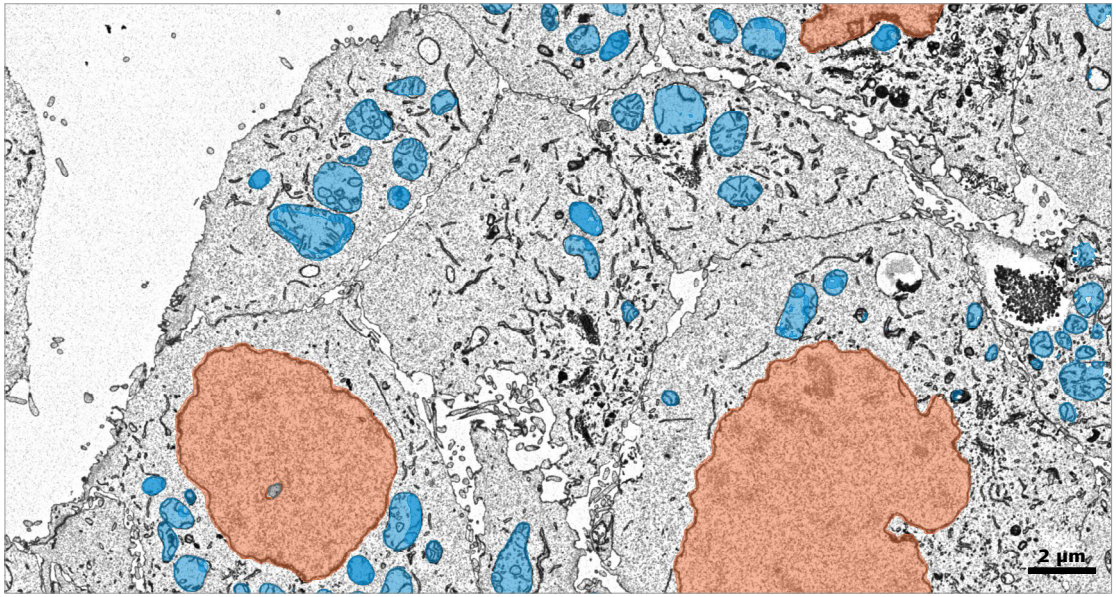
Cells are the building blocks of all living organisms no matter if multicellular or unicellular. Understanding how cells work – and what happens when they don't work properly – provides us an understanding into our own health as well as insights into cancer, antibiotics, drug delivery, and novel therapies such as stem cell regeneration.

High resolution imaging is necessary to visualize the ultrastructure of cells and cellular components, analyze morphology, and quantify structures of interest. As with other biological samples, cells must be resin-embedded for many electron microscopy techniques. Imaging resin-embedded samples can be challenging because the resin is often non-conductive and samples with large areas of bare resin are particularly prone to charging, which degrades your image quality. Overcome this challenge with Focal Charge Compensation which avoids the charging effects and jitter and delivers high-quality images. To further avoid charging, low kV imaging is necessary. The sensitivity of ZEISS Volume BSD permits low kV imaging without sacrificing image contrast or acquisition time. Under these conditions, various cellular components, such as mitochondria, Golgi, and even vesicles can be identified and analyzed.

Cutting and Imaging Parameters:

- Pixel size: 10 nm
- Cutting thickness: 30 nm
- Dimensions: 51 µm × 51 µm x 15 µm (~550 sections)
- EHT: 1.5 kV / Ip: 100 pA
- Dwell time: 2.8 µs
- Acquired with ZEISS GeminiSEM 460





Genetically modified stem cells cut and imaged with ZEISS Volutome in a ZEISS GeminiSEM 460 to investigate morphological changes. Various cellular components, such as mitochondria or nuclei can be easily identified and analyzed. Cellular components were annotated, segmented, and visualized with ZEISS arivis. Sample courtesy of Alexandra Graff-Meyer and Marc Buehler, Friedrich Miescher Institute for Biomedical Research, Basel, Switzerland

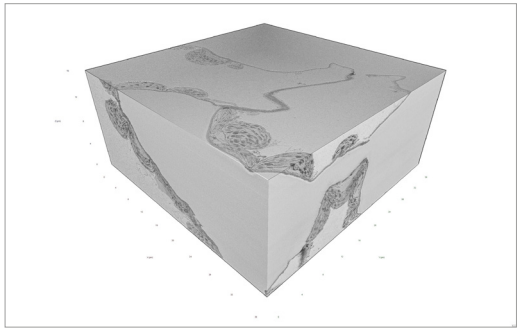
ZEISS Volutome at Work

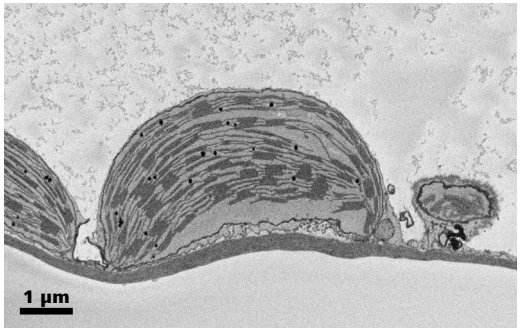
Plant Science

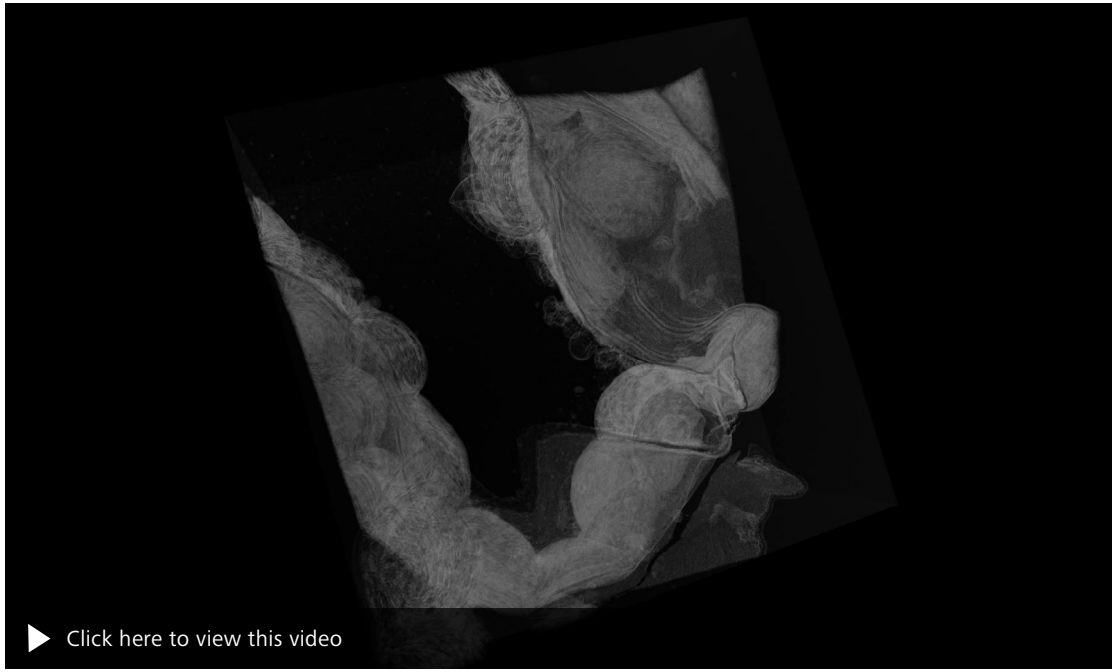
Plant science is more than investigating plant anatomy. It is understanding the microscopic relationships that are impacted by drought, climate change, pollution, and genetic factors. These translate into health and disease states in plants which impact crop yield, food production and, ultimately, human wellbeing. Serial block-face SEM reveals the ultrastructural effects of these parameters within the plant. Imaging plant samples can be challenging due to their anatomy, such as cell walls and vacuoles. For serial block-face imaging, biological samples must be embedded in resin. Resin-embedded plant samples are particularly challenging because they often contain large areas of bare resin which are prone to charging effects that degrade the image quality. Low kV, high-speed acquisition with Volume BSD, and the use of Focal Charge Compensation enable high-contrast plant imaging without compromise.

Cutting and Imaging Parameters:

- Pixel size: 6 nm
- Cutting thickness: 40 nm
- Dimensions: 36 µm × 36 µm × 16 µm (400 sections)
- EHT: 1.5 kV / Ip: 110 pA
- Dwell time: 1 µs
- Acquired with ZEISS GeminiSEM 460







Arabidopsis thaliana *leaf prepared according to the protocol developed by NCMIR. ZEISS Volutome in combination with Focal CC and Volume BSD enables very fast, high-quality imaging even at low kV. Thylakoid stacks are clearly visible despite large areas of non-conductive resin and low kV. Sample Courtesy of Prof S. C. Zeeman, ETH Zürich, Switzerland*

ZEISS Volutome at Work

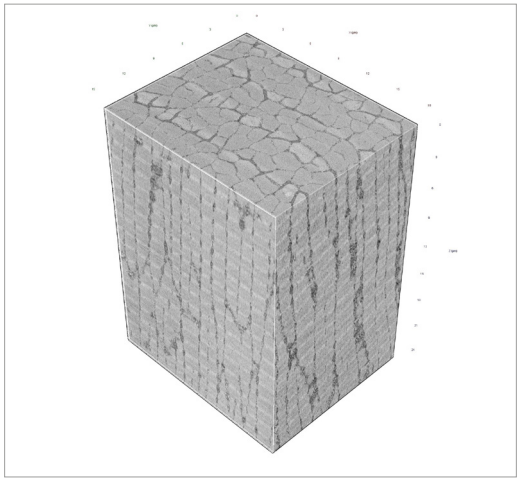
Tissue Imaging

Volume electron microscopy enables imaging of much larger sample sizes, making visualization of larger tissue sections a more routine application for life scientists across many disciplines. Whether you work with tumors and biopsies, organ or tissue sections, organoids, embryos of model organisms and more, serial block-face imaging allows large sample volumes to be imaged and analyzed within a broader 3D context. Investigate your samples in healthy or diseased states, or examine the effects of metabolic changes, genetic factors, drug treatments, and more.

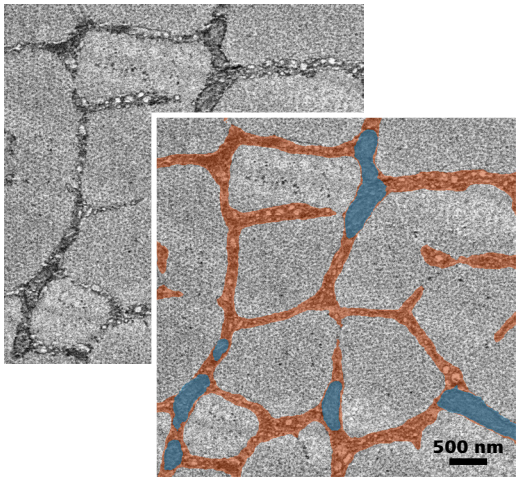
The figures show a high-resolution data set of a mouse skeletal muscle prepared according to the Hua sample preparation protocol (Hua et al., 2015, Nat. Comm), revealing isotropic and anisotropic muscular bands.

Cutting and Imaging Parameters:

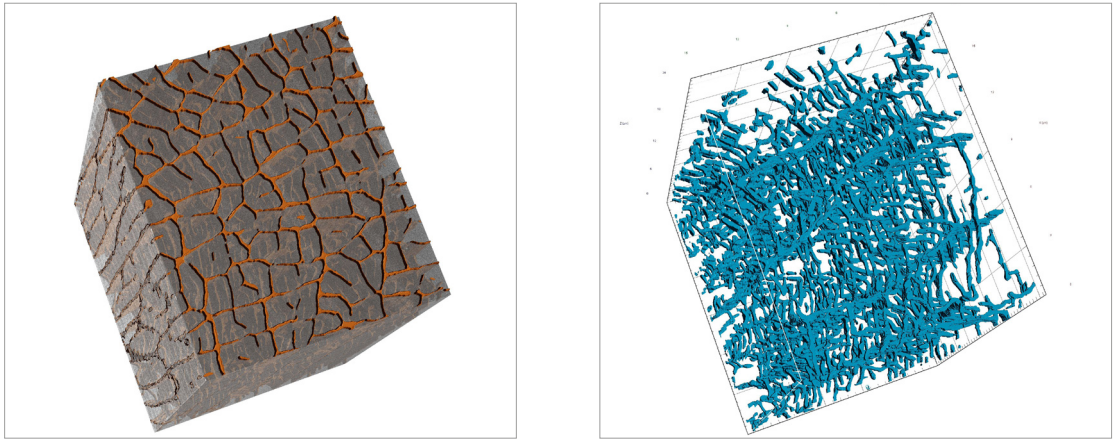
- Pixel size: 3 nm
- Cutting thickness: 100 nm
- Dimensions: 18 µm × 15 µm × 25 µm (250 sections)
- EHT: 2 kV / Aperture: 20 µm, high current
- Dwell time: 1 µs
- Acquired with ZEISS GeminiSEM 360



3D reconstruction



High-resolution, annotated 2D images (orange: sarcoplasmic reticulum and T tubules encircle myofibrils, blue: annotated mitochondria)

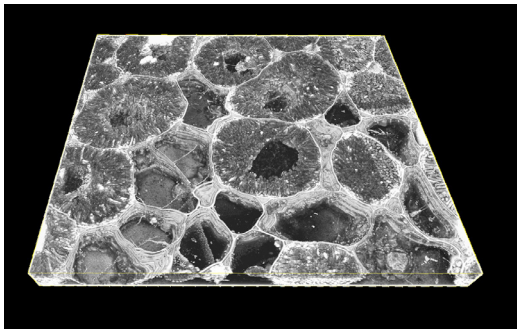


Reconstructed and segmented 3D data sets of the skeletal muscle. Isotropic and anisotropic muscular bands are clearly visible (top left). Isotropic bands display a light grey structure, instead of anisotropic ones which exhibit a distinctive median line between two darker grey regions. Segmentation and visualization was performed with ZEISS arivis.
Sample courtesy of the Experimental Neurology Unit, University of Milano-Bicocca, Monza, Italy

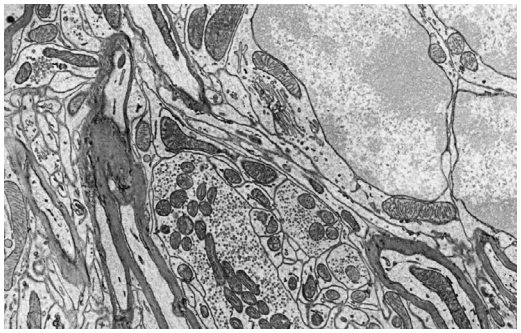
Expand Your Possibilities

Transform Your FE-SEM Easily from SBF-SEM to a Conventional SEM

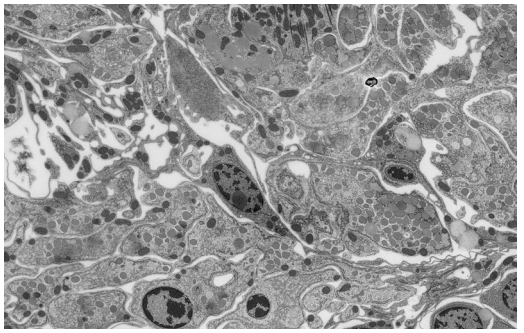
The ZEISS Volutome stage can be easily replaced with a conventional SEM stage using a convenient exchange trolley. Either stage can be stored in a dedicated storage device under vacuum. The multipurpose functionality of your FE-SEM allows you to explore your biological samples beyond serial block-face imaging:



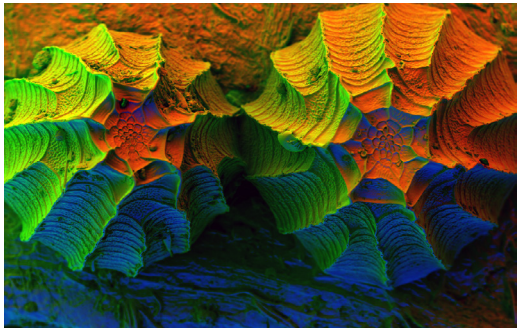
Array Tomography: *3D reconstruction from serial sections of root nodules at ultrastructural resolution. Courtesy of D. Sherrier, J. Caplan, S. Modla, University of Delaware, USA.*



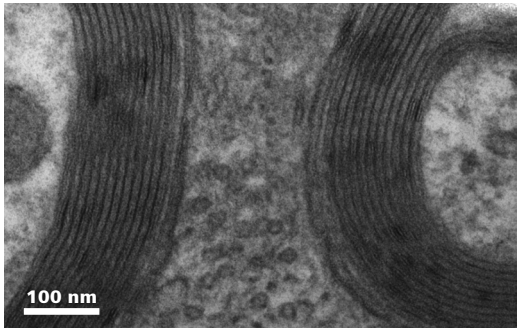
2D ultrastructural imaging: *High resolution images of brain tissue provide incredible insights into connectivity. This image of mouse brain is a single image from a 3D dataset that has been captured with ZEISS GeminiSEM. Sample courtesy of C. Genoud, FMI, Basel, Switzerland*



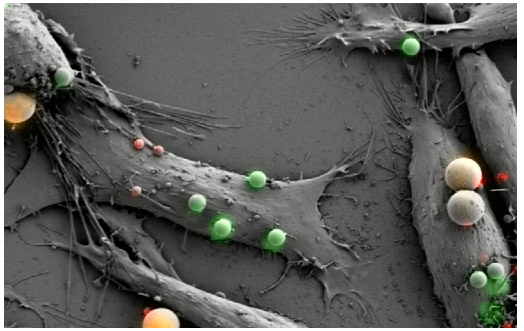
High-resolution, fast BSE imaging: *Ultrastructure of the bryozoan* Tricellaria inopinata *acquired with ZEISS Sigma 560 and ZEISS Sense BSD at 1 kV and 30 pA. Sample courtesy of Anna Seybold and Harald Hausen, Sars Centre for Marine Molecular Biology, University of Bergen, Norway.*



Topographical imaging: *False-colored image of butterfly eggs acquired with ZEISS Sigma.*

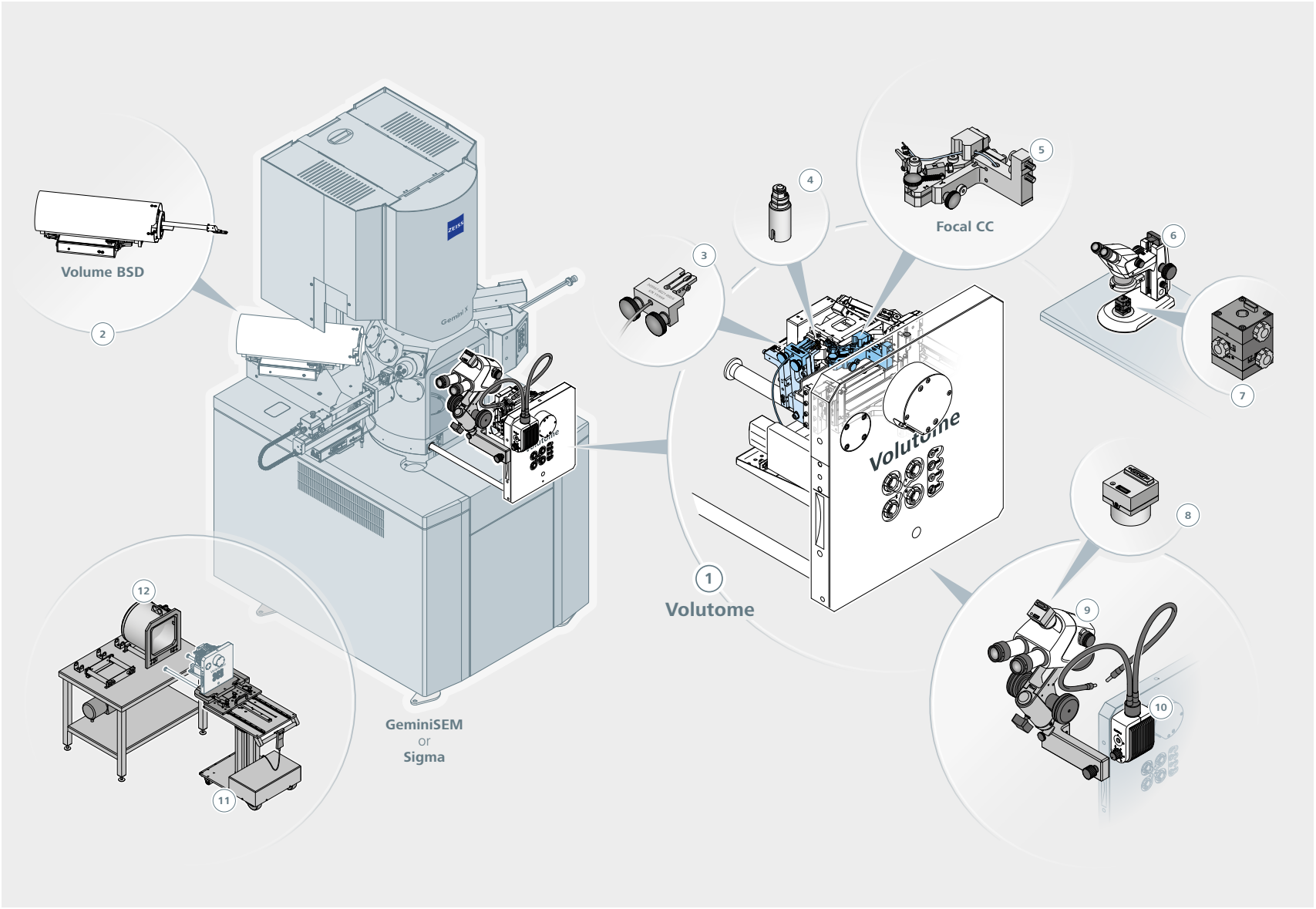


STEM imaging: *Ultrathin section of mouse brain tissue. The image reveals details of myelin sheaths using the STEM detector in brightfield mode at 28 kV.*

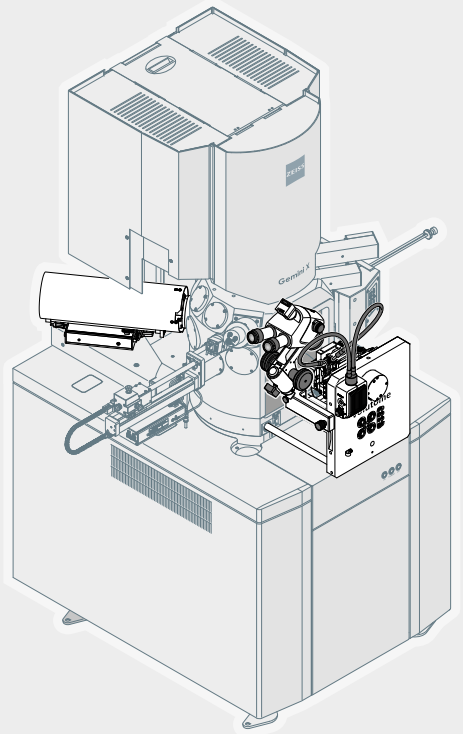


Correlative Microscopy: *Macrophages with fluorescence beads imaged with an LSM and an EM. For correlation of the data, the fluorescence image is overlaid with the SEM image. Sample courtesy of Jeffrey L. Caplan and Kirk J. Czymmek, Bioimaging Center, Delaware Biotechnology Institute.*

System Overview



System Overview



		Description		Order Number
@ SEM	[1]	**Volutome microtome hardware kit***	-> GeminiSEM:	349567-9103-000
		SEM in-chamber ultramicrotome for serial block-face imaging	-> Sigma:	349567-9105-000
		Volutome microtome hardware package including:		
		■ Ultramicrotome [1]		
		■ Sample alignment stand [6] with cross table [7]		
		■ Stereo microscope [9] & camera [8]		
		■ Gooseneck light source [10]		
		■ One diamond knife [3]		
		■ Tool box with two specimen holders (one specimen holder shown) [4]		
	[2]	**Volume BSD**		349506-9036-020
		Detector for low kV BSE detection & high speed data acquisition		
Optional	[3]	**Knives**	-> 1.5 mm:	349567-8022-000
		Diamond Knife for cutting specimens with ZEISS Volutome	-> 2.5 mm:	349567-8021-000
	[5]	**Focal Charge Compensation**	-> GeminiSEM:	349567-9008-000
		for imaging charge-prone samples	-> Sigma:	349567-9008-010
	[11]	**Exchange Trolley**	-> 230 V:	349567-8038-000
		Lifting trolley for stage exchange between Volutome and standard SEM stage	-> 110 V:	349567-8038-010
	[12]	**Storage solution**		349567-8037-000
		Storage device for the Volutome stage or the standard EM stage		
Software		**Software**		
		SmartSEM		
		ZEN core EM		
		ZEN core Toolkit Volutome		
		ZEN core Toolkit Automated Imaging		
		Special arivis software package		
		Optional: Software for Image Processing, Segmentation and Visualization		
		arivis Pro for 3D Visualization and Data Analysis		
		■ SMA for arivis Pro software local license		
		■ Online training		
		arivis Pro VR Visualization Module		
		■ arivis Pro VR SMA		
		ZEISS arivis AI Toolkit Academia: Cloud/local DL Trainer		

*** for Korea:** special order numbers available

Technical Specifications

Microtome	
SEM in-chamber ultramicrotome	Dedicated high precision stage which replaces SEM stage, easy to exchange
Cutting	Microtome mechanical hardware precision in Z: step size 5 nm – 200 nm, in 1 nm increment (user definable)
	Minimum cut thickness achievable on biological samples: down to 25 nm (sample dependent)
	Maximum cutting thickness: 200 nm
Cutting speed	0.01 mm/sec – 6.5 mm/sec (user definable)
	Typical cutting speed: 0.1 mm – 1 mm
Oscillation during cutting	available
Cutting window	> 5 mm (user definable by software)
Diamond knife size	1.5 mm or 2.5 mm (by DiATOME)
Motorized sample Z travel range	1.2 mm
Microtome stage X/Y travel	2 mm × 2 mm

Typical Specimen Size and Requirements	
Maximum sample size	1 mm × 1 mm × 1 mm
Typical block size	600 µm × 600 µm × 600 µm
Contrast	En-bloc staining (heavy metals)

Serial Block-Face Experiments (SBF) and Supporting Software (ZEN core Toolkit Volutome)
Setup and control of microtome, SBF experiment setup
Once set up: unattended SBF experiments, exceeding 72 hours
Stack datasets ranging from single images per slice to mosaics through stage motion exceeding 100 image tiles per slice; exact region of interest (xROI)
Single or dual channel signal acquisition
Direct processing used for interactive stitching and z-stack alignment
Stitched and aligned results available in CZI or TIFF format
Image Pixel Count up to 32k × 32k

Software for 3D Visualization and Data Analysis
ZEISS arivis software package for 3D visualization and analysis of multi-dimensional images, including local or cloud-based segmentation, visualization, analysis

Technical Specifications

Focal Charge Compensation (optional)	
Charge neutralization	Dynamically retractable focal gas injector for charge compensation during automated SBF workflow (variable pressure or dedicated SEM vacuum configuration recquired)
ZEISS Volume BSD	
Dedicated low kV Backscatter detector for SBF imaging	Silicon based diode for direct detection of backscattered electrons, with one segment
	Highest BSE collection efficiency, high sensitivity, optimized for good contrast under low kV imaging conditions on biological serial block-face specimen
	Protective slim cover for diode, pneumatically retractable
Acceleration voltage	Up to 7 kV
Optimum primary beam current	50 pA – 1 nA
Working distance	≤ 5 mm
System integration	Fully integrated, default settings optimized for ease of use, collision control with ZEISS hardware implemented, Electron optics (EO) correction is applied
Field of view	Depends on electron optics of the SEM, imaging parameters and accelerating voltage
	Typical achievable FOV settings for images in serial block-face experiments: 30 – 60 µm
	1 mm detector diode aperture
Typical pixel size of serial block-face experiment	5–20 nm to achieve 30–50 nm cut thickness (depending on the base unit chosen and the samples used)
Compatibility	
Can be used with ZEISS FE-SEM	■ Sigma 360, Sigma 560 ■ GeminiSEM 360, GeminiSEM 460

ZEISS Service – Your Partner at All Times

Your microscope system from ZEISS is one of your most important tools. For over 175 years, the ZEISS brand and our experience have stood for reliable equipment with a long life in the field of microscopy. You can count on superior service and support - before and after installation. Our skilled ZEISS service team makes sure that your microscope is always ready for use.

Procurement

- Lab Planning & Construction Site Management
- Site Inspection & Environmental Analysis
- GMP-Qualification IQ/OQ
- Installation & Handover
- IT Integration Support
- Startup Training

Operation

- Predictive Service Remote Monitoring
- Inspection & Preventive Maintenance
- Software Maintenance Agreements
- Operation & Application Training
- Expert Phone & Remote Support
- Protect Service Agreements
- Metrological Calibration
- Instrument Relocation
- Consumables
- Repairs

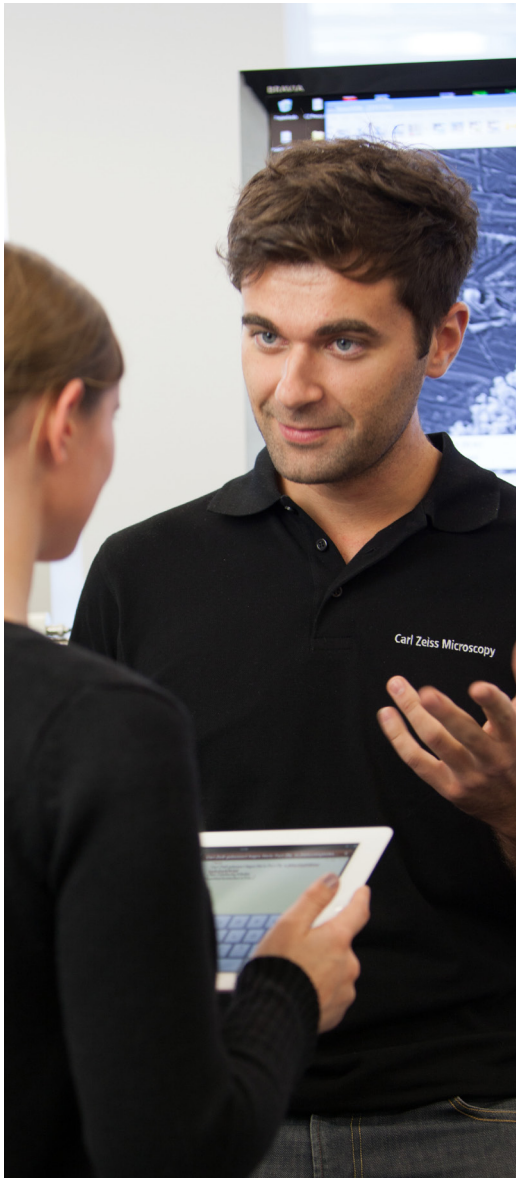
New Investment

- Decommissioning
- Trade In

Retrofit

- Customized Engineering
- Upgrades & Modernization
- Customized Workflows via arivis Cloud

Please note: Availability of services depends on product line and location



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