


Amira Software for electron microscopy

Unlocking the secrets of complex biological structures
and processes with exceptional accuracy



Thermo Scientific™ Amira™ Software is a powerful, robust, and versatile solution that offers comprehensive visualization, analysis, and understanding of life science and biomedical research.

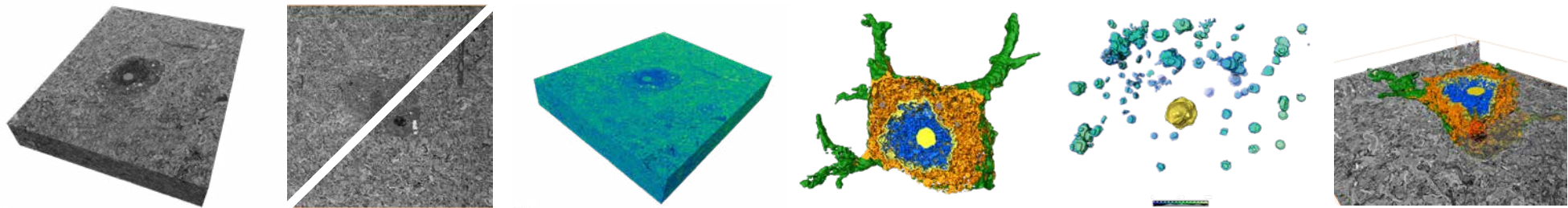
Regardless of the electron microscopy technology used to capture digital data, Amira Software is designed to support advanced bioimaging workflows. From structural and cellular biology to tissue imaging, neuroscience, and preclinical imaging, Amira Software enables you to gain valuable insights and make significant advancements in your scientific endeavors.

Amira Software provides you with classical tools and state-of-the-art AI Deep Learning technology embedded in an ergonomic user interface, seamlessly supporting time-efficient qualitative and quantitative characterization of your complex data. You can benefit from dedicated EM specific solutions within Amira Software to accelerate your research.

Our constant effort to improve and enrich Amira Software makes it a future-proof and reliable solution for your EM-based research.

Amira Software: Transforming images into understanding

From straightforward visualization to advanced image processing, quantification, segmentation, and analysis, Amira Software provides a comprehensive, multimodal toolbox for advanced 2D–5D biological characterization.



Data import

- Seamless automatic import of your images, including the meta data
- Robust large data handling
- Full support of almost all established file types (BioFormats compatibility)



Pre-processing

- AI-based and conventional image quality enhancement
- Correction for EM-specific imaging artifacts
- Stack alignment for 3D EM data
- Registration of correlative microscopy data



Visualization

- Interactive high-quality and high-precision visualization
- Embedding quantitative information into visualization
- Simultaneous multi-window visualization for better understanding of the data



Segmentation

- AI based segmentation including shallow and Deep Learning model training in 2D and 3D
- User-friendly environment for ground-truth annotation, training and segmentation using AI
- Comprehensive set of conventional segmentation methods



Measurement/Analysis

- More than 200 built-in measurements such as counts, volume, size, diameter, or distances
- Custom, user-defined measurements



Animation/Presentation

- Advanced animations and video creation
- Charts, spreadsheets, and more

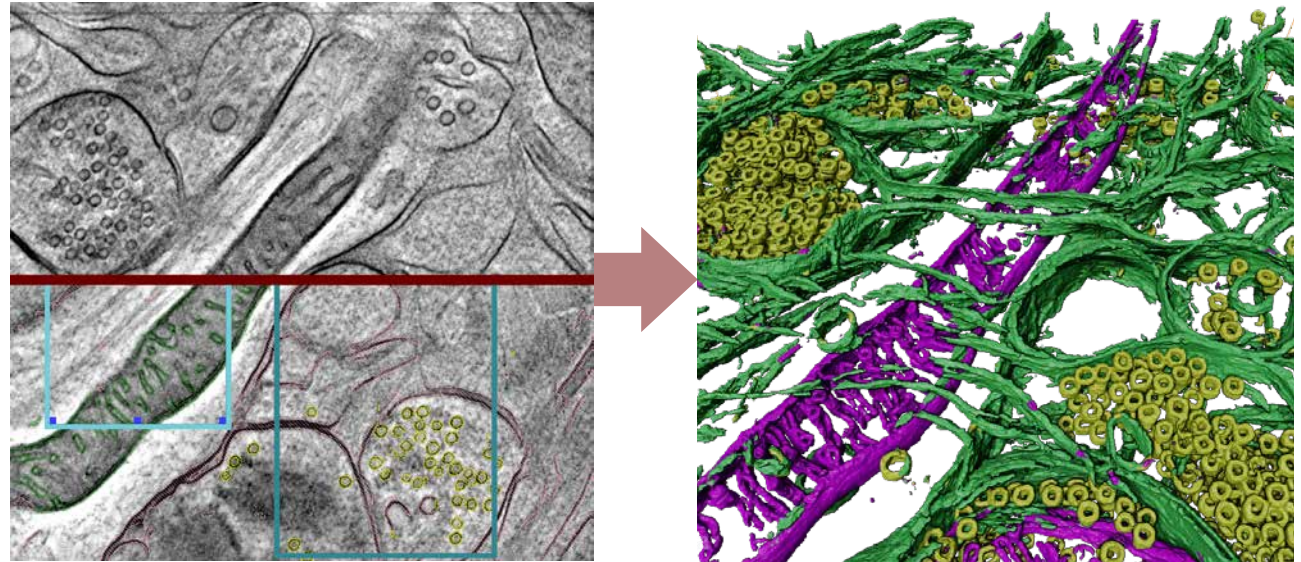
Amira Software increases time-efficiency, reliability, and reproducibility by providing automated and performant tools for the analysis of different types of electron microscopy data in life science research.

Easy, powerful, precise AI segmentation: Transform your EM data into quantifiable insights

Amira Software comes with advanced AI-driven segmentation tools, designed to deliver remarkable accuracy and efficiency for EM data analysis. Our dedicated segmentation workroom integrates advanced artificial intelligence, simplifying the creation of ground truth data with intuitive annotation tools.

Amira Software offers versatile AI segmentation models, providing both shallow models for speed in less complex tasks, and deep models for high precision in intricate image analysis. You can perform training in 2D or 3D, depending on your data's requirements.

With a user-friendly interface, high accuracy, and efficient processing, Amira Software is the ideal choice for professionals in research and industry. Transform your EM images into quantifiable insights with Amira Software's AI-powered tools.

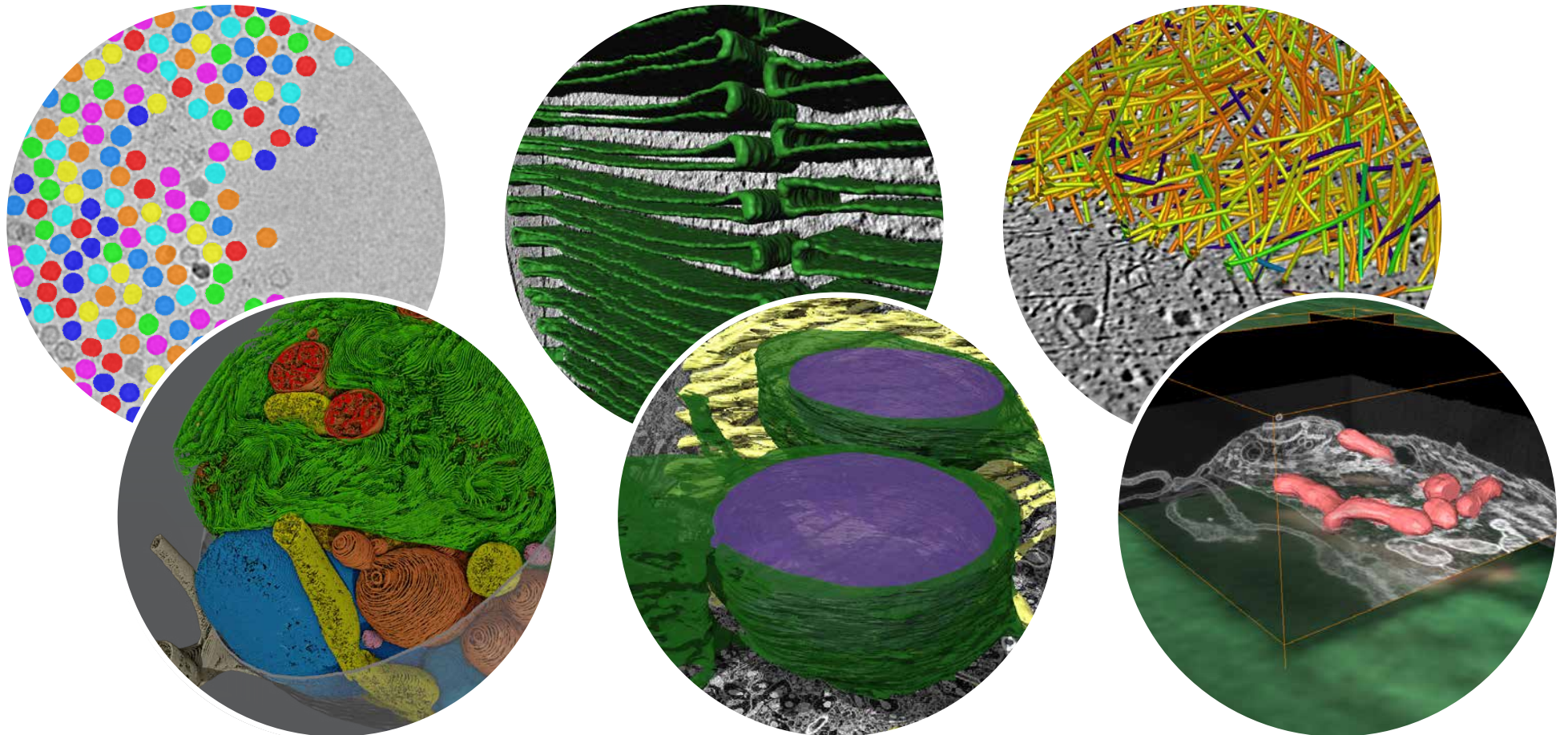


Talos F200C G2 (S)TEM

The Thermo Scientific® Talos® F200C G2 (S)TEM is a versatile and powerful tool designed for advanced 3D visualization and characterization of biological samples, biomaterials, and nanoparticles. Its robust design and automation functions ensure system stability and ease of use. The system supports a broad range of applications, including both traditional EM and cryo-EM workflows, single-particle analysis, tomography, and electron diffraction, offering incredible flexibility for multidisciplinary use.

Amira Software for image analysis and visualization along different scales and modalities

Amira Software offers advanced AI tools for comprehensive data analysis across various scales and EM imaging modalities. It supports seamless integration of data from different techniques, including serial block-face SEM (SBF-SEM), transmission EM, and focused ion beam-SEM, enabling detailed multi-scale investigations. This versatility allows you to analyze complex structures and relationships with precision, enhancing the depth and accuracy of scientific insights.



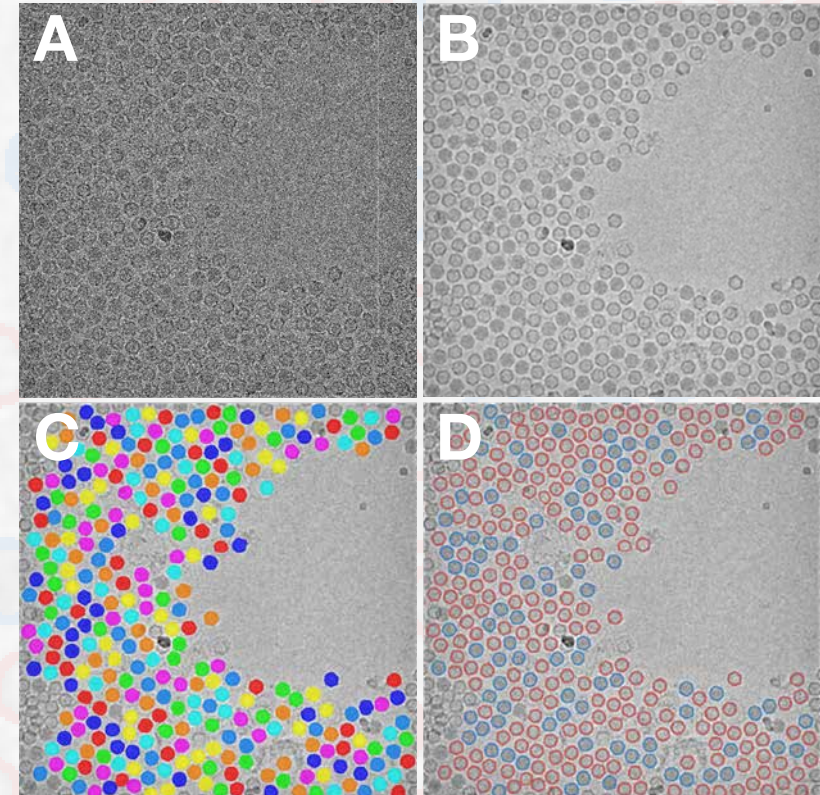
Enhancing viral particle analysis in pharmaceutical research with AI

Understanding the complex structure of viral particles and nanocarriers, such as LNPs or AAVs, and accurately determining their critical quality attributes (CQAs) are essential for successful drug development. Over the past decade, cryo-transmission electron microscopy (cryo-TEM) has emerged as a key tool for investigating these vectors.

Amira Software complements the image acquisition technology provided by Thermo Fisher Scientific by leveraging AI tools for semi-automated quantitative analysis of these vectors. This approach significantly reduces time-to-results while ensuring reliable and standardized analysis.

Tundra Cryo-TEM

The Thermo Scientific® Tundra® Cryo-Transmission Electron Microscope (Cryo-TEM) is an affordable cryo-EM solution for all skill levels, featuring simplified data collection, rapid sample handling, and high-resolution structural analysis. Ideal for obtaining biologically relevant structures in-house or preparing high-quality samples for further analysis on advanced cryo-TEM systems.



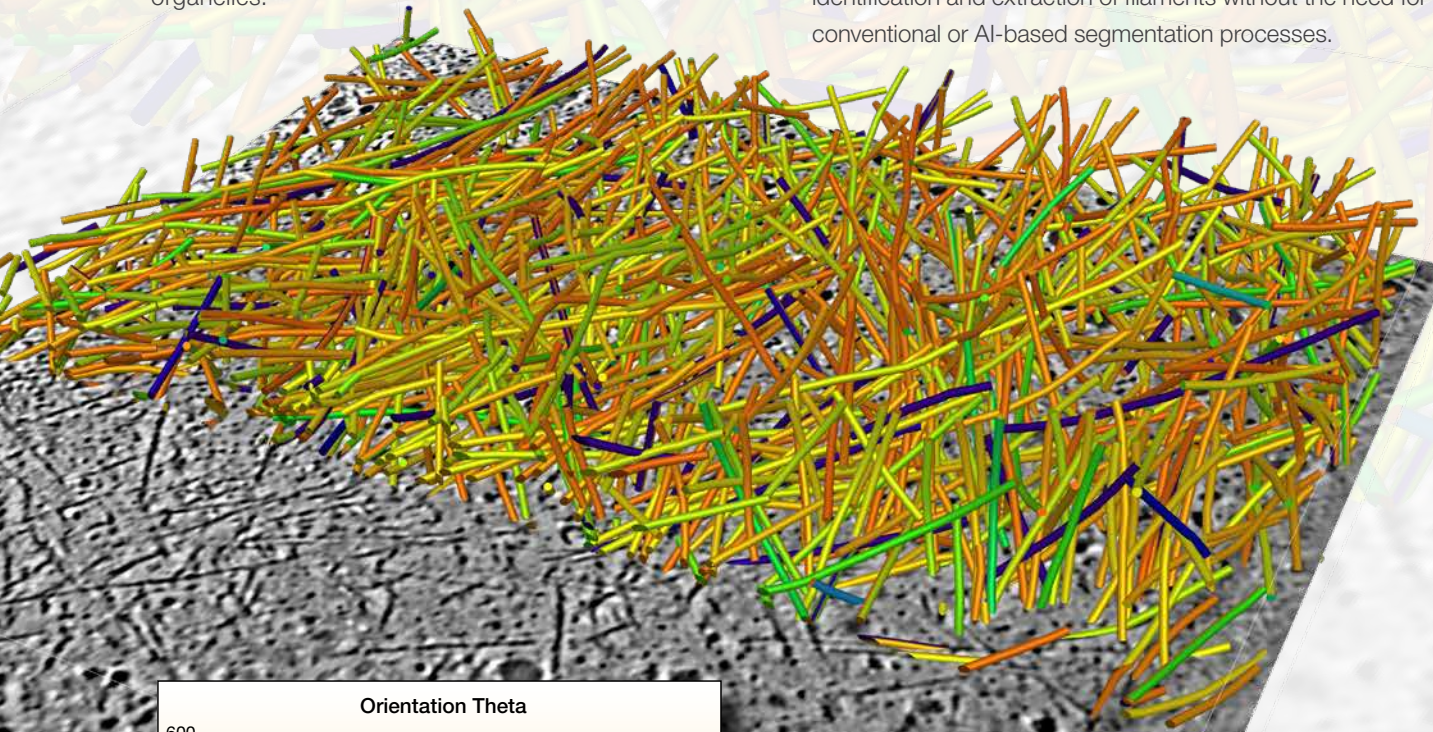
Cryo-TEM images of AAVs were automatically segmented using an AI Deep Learning approach, and various Critical Quality Attributes were computed. A) Original data shows limited contrast and high noise levels. B) Individual AAVs are clearly recognizable after image quality enhancement. C) AAVs are segmented and separated in an automated process. D) Full (blue) and empty (red) particles are automatically classified.

Advanced filament analysis

Cell biologists analyzing electron tomography data require precise image pre-processing and segmentation to quantitatively describe and visualize processes at various scales, from individual molecules to sub-organelles and organelles.

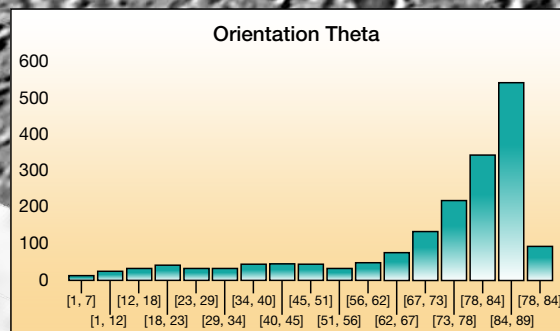
Amira Software, equipped with a comprehensive suite of tools, allows for the effortless detection and extraction of cytoskeletal structures. By leveraging a high-precision cross-correlation approach, Amira Software enables the accurate identification and extraction of filaments without the need for conventional or AI-based segmentation processes.

In addition, Amira Software offers a comprehensive toolset for the quantitative analysis of identified filaments, enabling researchers to gain new insights from their data.



Krios G4 Cryo-TEM

The Thermo Scientific® Krios® G4 Cryo-Transmission Electron Microscope (Cryo-TEM) is a very compact transmission electron microscope (TEM) that allows you to explore life at the atomic level with incredible ease, speed, and reliability. This award-winning microscope features a highly stable 300 kV TEM platform and the trusted Autoloader, a cryogenic sample manipulation robot.



3D cryo-ET image of a *D. discoideum* cell showing a propagating actin wave. Actin filaments were detected using the fiber analysis module in Amira Software. The direction of the fibers has been computed and is represented with a color code. The distribution of the direction angle is shown in the histogram.

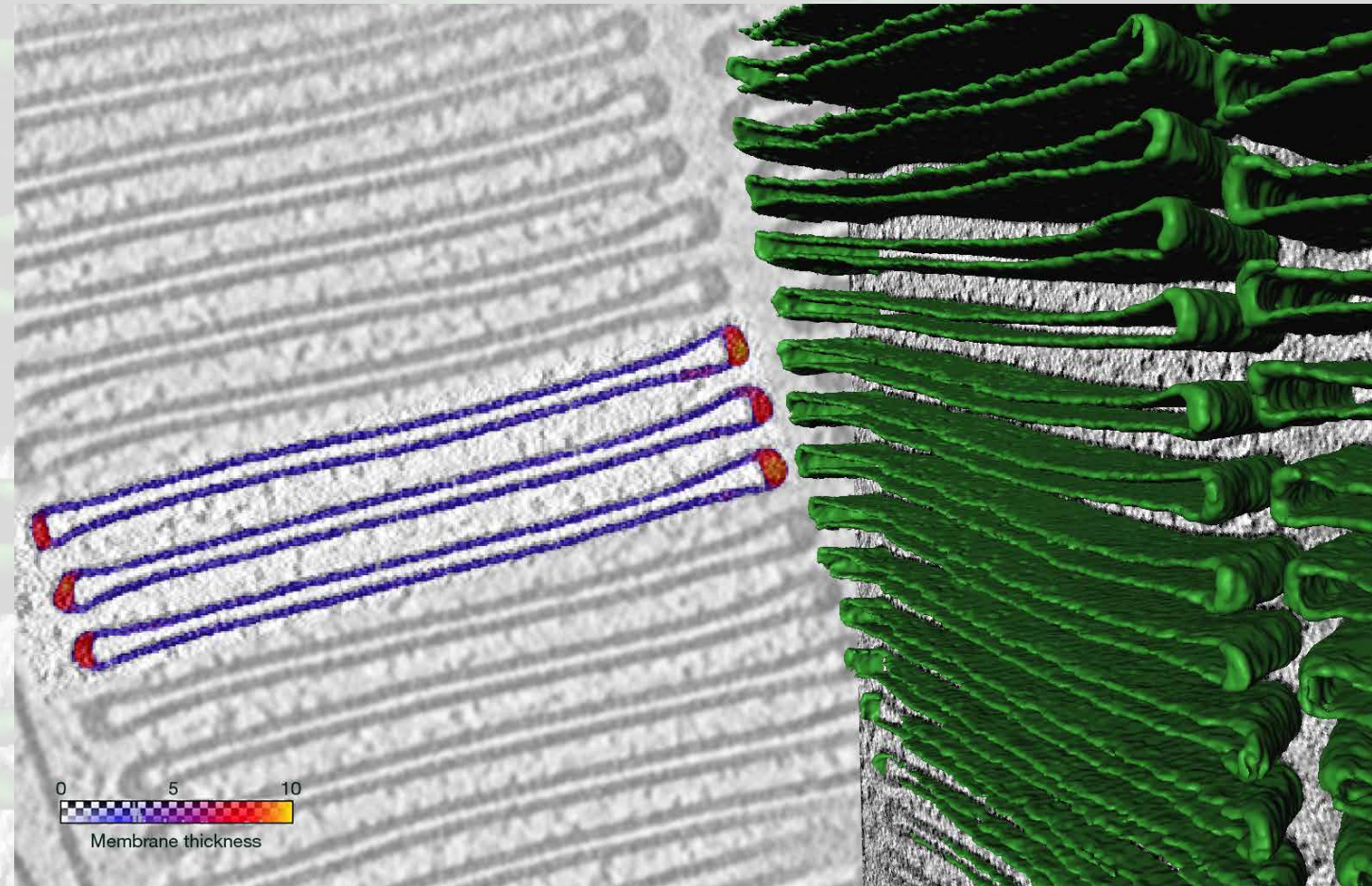
Understanding electron tomography data

Cryo-electron tomography (cryo-ET) stands at the forefront of life science research, offering the highest resolution for studying cell ultrastructure in its native environment. Despite its revolutionary capabilities, cryo-ET data analysis remains a significant challenge, often necessitating advanced AI solutions.

However, customer-centric, robust, and precise AI-based segmentation tools deliver excellent results for structural analysis of cryo-EM data. When combined with automated workflows, such as the user-friendly and intuitive recipe approach in Amira Software, these tools enable reliable and rapid quantitative data analysis.

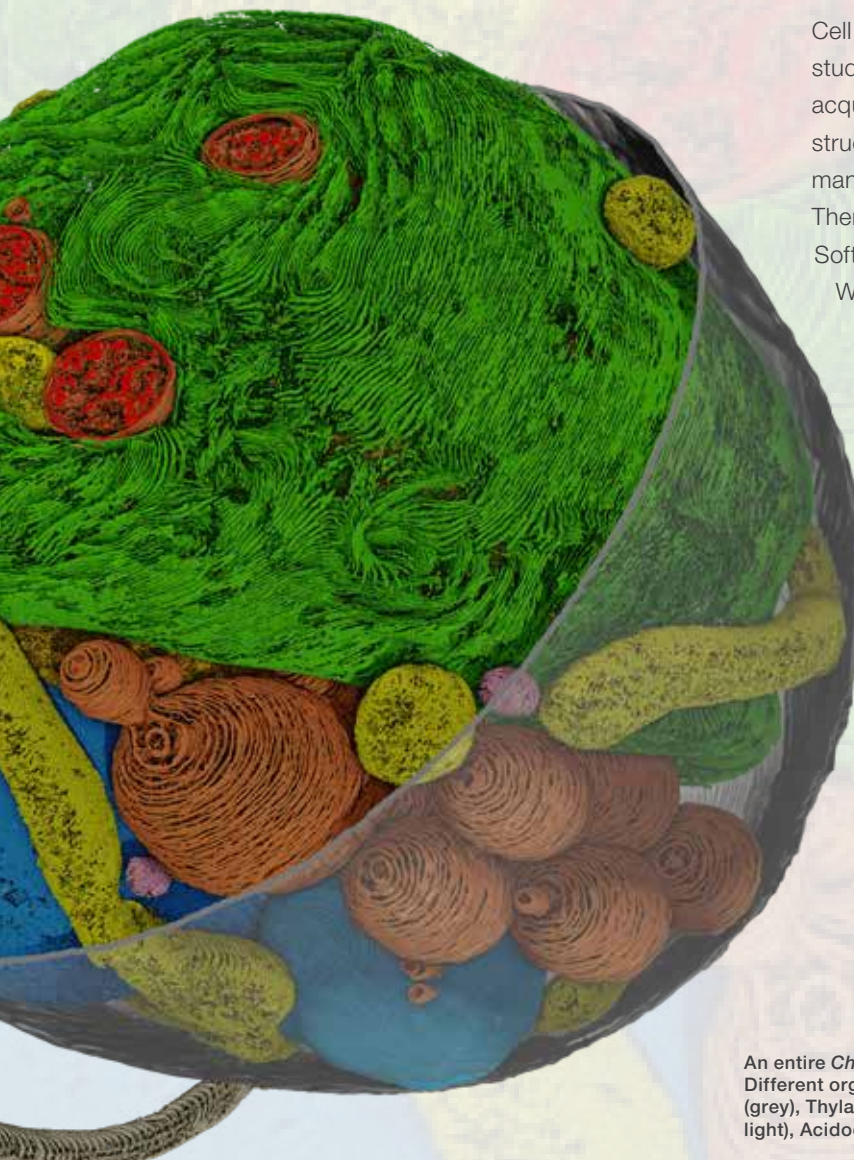
Krios G4 Cryo-TEM

The Thermo Scientific® Krios® G4 Cryo-Transmission Electron Microscope (Cryo-TEM) has improved ergonomics for easier sample exchange. Data acquisition setup is easier and faster thanks to enhanced automation, systematic user guidance and advanced performance monitoring (APM), a built-in self-diagnostic function that ensures microscope alignments are optimal for acquiring high-resolution data.



Rod outer segment in mice imaged at cryogenic conditions with the Titan Krios™ (S)TEM (formerly produced by FEI).

Leveraging state-of-the-art deep learning AI for segmenting 3D FIB-SEM data



Cell biologists face two significant challenges when studying cellular processes and organelle interactions: acquiring images that accurately preserve cellular structure at the highest resolution and effectively managing the large, complex datasets that result. The Thermo Scientific™ Hydra™ Bio Plasma-FIB and Amira Software offer a powerful solution to these challenges.

When operating under cryogenic conditions, the Hydra Bio Plasma FIB-SEM maintains cellular structure integrity and generates high-quality images.

Amira Software excels by providing a comprehensive, holistic workflow for image analysis. This includes user-friendly ground-truth generation and advanced AI-based Deep Learning segmentation, specifically tailored for electron microscopy. Together, these features enable researchers to precisely identify numerous structures within specimens, significantly enhancing the efficiency and accuracy of data processing and interpretation.



Hydra Bio Plasma-FIB

The Thermo Scientific™ Hydra™ Bio Plasma-FIB enables volume electron microscopy at both ambient and cryogenic temperatures, supporting a wide range of specimen types. With four ion species available, it offers versatile imaging and sample preparation approaches and supports high-resolution PFIB imaging, array tomography, correlative light and electron microscopy, and high-throughput lamella preparation for cryo-tomography.

An entire *Chlamydomonas* cell was imaged at cryogenic conditions with the Hydra Bio Plasma-FIB. Different organelles were segmented using AI Deep Learning based segmentation: Cell membrane (grey), Thylakoid membrane (green), Mitochondria (yellow), Vesicles (orange and red), Nucleus (blue light), Acidocalcisomes (pink) .

Integrated workflow solution for large volume imaging

Volume electron microscopy is increasingly benefiting the scientific community. The range of techniques that can generate 3D insights is becoming easily accessible, and serial block-face SEM is a popular choice. By combining automated serial sectioning with large-volume imaging at high resolution, SBF-SEM provides excellent insights into the spatial relationships and organization of complex structures.

The Thermo Scientific Volumescope 2 SEM and Amira Software offer a powerful combination for this approach. The fully integrated workflow from acquisition to image analysis seamlessly transforms the images into quantitative information. Amira Live Tracker allows visualization and navigation of the 3D image data during acquisition, optimizing imaging outcomes and automating 3D volume reconstructions. The imported 3D images can be further processed and analyzed within Amira Software using AI-based automated workflows.

Experience faster, more accurate insights with Thermo Scientific Volumescope 2 SEM and Amira Software, offering streamlined workflows, enhanced data analysis, and optimized research outcomes.

Volumescope 2 SEM

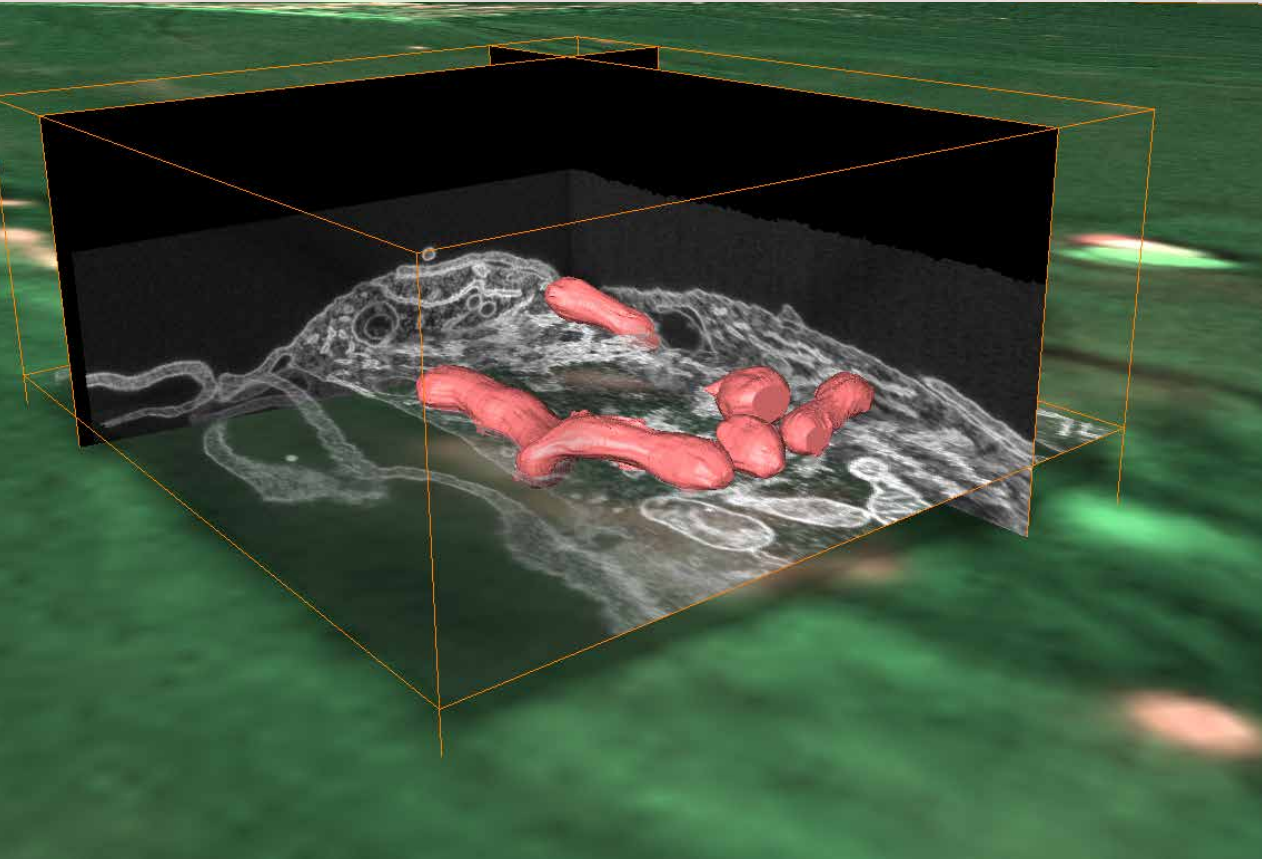
The Thermo Scientific™ Volumescope™ 2 Scanning Electron Microscope (SEM) is an innovative serial block-face imaging system. Keep control of experiments with easy-to-use technology and protect a wide range of possible samples with tried and tested solutions for every acquisition step.



Mouse brain tissue imaged with Volumescope 2 SEM. Cellular structures were segmented using AI deep learning tools. Cell membrane (green), Nucleus (violet), Myelin (yellow).



Integrating CLEM data with Amira Software for deeper cellular insights



Mouse *mesenchymal* stem cell imaged with a Thermo Scientific Helios FIB-SEM. Fluorescent images were acquired with Leica TCS SP8. Data courtesy of Jaromíra Kovářová from Laboratory of Molecular Therapy, Institute of Biotechnology, the Czech Academy of Sciences.

Scientists aim to investigate localization of molecules of interest and their structural context for a comprehensive understanding of biological phenomena. Correlative light and electron microscopy (CLEM) combines the capabilities of light microscopy for specific molecular imaging with the high-resolution structural imaging of all cellular components provided by electron microscopy.

Analyzing images from both microscopy techniques can be time-consuming due to the complexity of accurately correlating the data. Amira Software provides manual and automatic tools to seamlessly overlay light and electron microscopy images. This functionality enables scientists to efficiently integrate the data, leading to a deeper and more comprehensive understanding of cellular processes.



Helios 5 Hydra DualBeam

The Thermo Scientific™ Helios 5 Hydra DualBeam (PFIB-SEM) offers four ion species (argon, nitrogen, oxygen, xenon) for versatile applications like STEM, TEM, 3D characterization, and cryo-tomography. It enables quick ion switching (under ten minutes) without performance loss and combines a multi-ion PFIB column with the Elstar UC+ SEM Column, supported by intuitive software and automation.

Amira Software: key features and benefits

Discover the advanced capabilities of Amira Software for electron microscopy with these key features and benefits:

- **Structure detection:** detect and extract cytoskeletal structures effortlessly
- **Quantitative analysis:** analyze filaments and structures with comprehensive tools
- **AI segmentation:** use AI-driven Deep Learning for precise data processing
- **Multi-modal integration:** combine data from various electron microscopy techniques seamlessly
- **Cryo-TEM analysis:** perform reliable cryogenic electron microscopy analysis with AI tools
- **3D volume wizard:** easily create 3D volumes from DualBeam™ images with artifact reduction and enhancements
- **CLEM:** overlay light and electron microscopy images for deeper insights
- **User-friendly interface:** characterize complex data efficiently
- **Customization and services:** access tailored solutions, applications, training, and consulting



Amira Software: professional services

Thermo Fisher Scientific offers a comprehensive set of professional services. From training to consulting or custom development, our professional services experts are dedicated to helping you maximize your productivity with Amira Software.

User training

Custom training is tailored to equip you with practical skills that align with your specific goals. It can be conducted on-site at your location or at one of our facilities:

- Introductory
- Advanced
- Customized

Consulting solutions

Our experts help you maximize Amira Software's innovations for your daily work. We partner with you to create solutions tailored to your tasks and expertise:

- Workflows
- Optimization
- Image processing as a service

Application development

With 30 years of 3D and image processing experience and hundreds of completed projects, we deliver solutions tailored to your specific needs:

- Workroom development
- Standalone applications
- Deep learning model training and deployment



Amira Software: optional packages

Amira Software, empowered by extensions, offers advanced capabilities for specific use cases. Check below for which optional package could dramatically boost your productivity and push the boundaries of your image analysis projects.

Packages / Extensions					● Standard	○ Optional
	3D	3D pro	3D cell biology	3D EM systems	Subscription program	
Data import, visualization, segmentation, analysis, animation (basic feature set)	●	●	●	●	●	
Advanced segmentation, quantification, EM Toolbox, ToGo Publisher (extended feature set)	○	●	●	●	●	
Extended image file format support (XBioFormats extension)	○	○	●	●	●	
FIBStack Wizard, EMWorkflows, Thermo Scientific EM Readers, EM Toolbox, Cylinder and Trace Correlation Lines (EM-specific feature set)				●		
Visualization, processing, and animation of large multi-channel and time-series data (Xplore5D extension)	○	○	●	○	●	
Fibers, filament, and tubule segmentation and analysis (XFiber extension)	○	○	○	○	●	
Advanced meshing and export to solvers (XWind extension)	○	○	○	○	●	
Pore network characterization and modeling (XPNM extension)		○	○	○	●	
Digital volume correlation for material deformation measurements (XDVC extension)	○	○	○	○	●	
Localization and visualization of fiber tracts using diffusion tensor imaging (XNeuro extension)	○	○	○	○	●	

Learn more at thermofisher.com/amira