

Amira-Avizo Software version 2023.2

Release notes

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Introduction

This document covers the most important new features, improvements, and changes in this version of Thermo Scientific™ Amira™ Software and Avizo™ Software. In addition, you will find a list of new Xtras including video tutorials, recipes, and workflows which have been published in the [Xtras Library](#) since the previous release.

Visit our [Customer Support and Service Center](#) to access services and resources that help you make the best use of your product.

We value your feedback. If you encounter any problems or have any suggestions for improvement, do not hesitate to [contact us](#).

Definitions and glossary

OS requirements:

While we have a list of supported operating systems (OS) for our software, some functionalities may only work on certain dedicated operating systems. For each functionality, we will indicate whether it works with all supported operating systems, or only dedicated systems.

Licensing

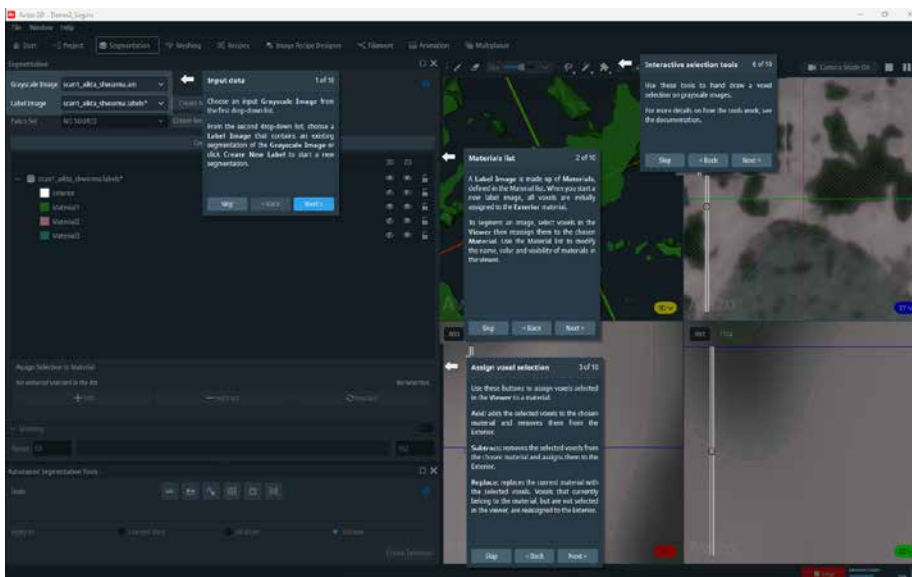
Amira and Avizo Software are available as packages that can be enhanced with extensions geared to specific tasks or industries. These packages include:

- **Standard packages**
 - Amira 3D Software
 - Avizo 3D Software
- **Advanced packages**
 - Amira 3D Pro Software
 - 3D Cell Biology Package for Amira Software
 - EM Systems Package for Amira Software
 - Avizo 3D Pro Software
 - 3D Industrial Inspection Package for Avizo Software
 - EM Systems Package for Avizo Software

Segmentation+ Workroom

The 2021.2 release introduced the first version of a new segmentation environment called **Segmentation+**, which provided ergonomic improvements, new segmentation tools, and compatibility with larger datasets, while also enabling workflows that were not actionable in prior versions of the segmentation workroom.

The previous segmentation environment is now officially deprecated; it is currently still accessible but will be permanently removed in a future release.



Guided tutorial for the new Segmentation+ workroom.

Ergonomics

- **Entry behavior:**

When you open **Segmentation+**, the grayscale image, label image, and patch set fields are automatically filled according to the data that has been loaded and selected.
- **Rename or delete label images and patch sets:**

Rename a label image or patch set by double clicking on it in the tree view. You can then specify the new name. Once a label image or patch set has been selected, it can also be deleted with the delete key. These two features are also available in the context menu.
- **Viewers in Segmentation+:**

The last selected viewer layout option (single-, two-, or four-viewer mode) is restored when you open **Segmentation+**.

This means that you do not have to systematically configure the viewer layout option whenever you change workrooms or restart the software.

- **Context menu of viewers:**

The context menu displayed when right-clicking in the viewers has been simplified to display only the most pertinent options.
- **Interactive tutorial:**

You can now easily discover the main features of the **Segmentation+** workroom with an interactive tutorial. There is also an interactive tutorial for the brush tool. These tutorials are accessible from the *Help* menu.

Navigation

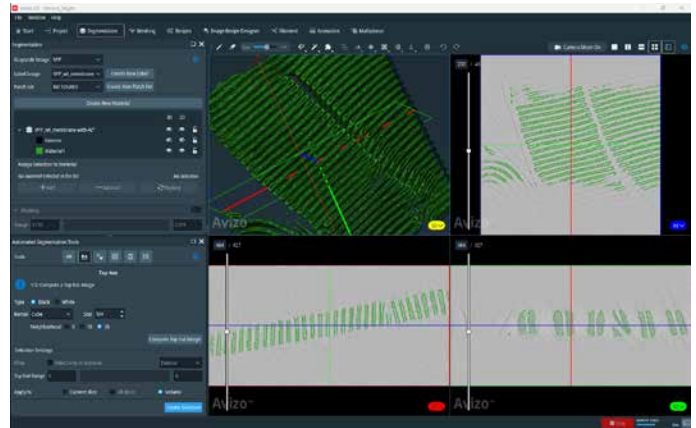
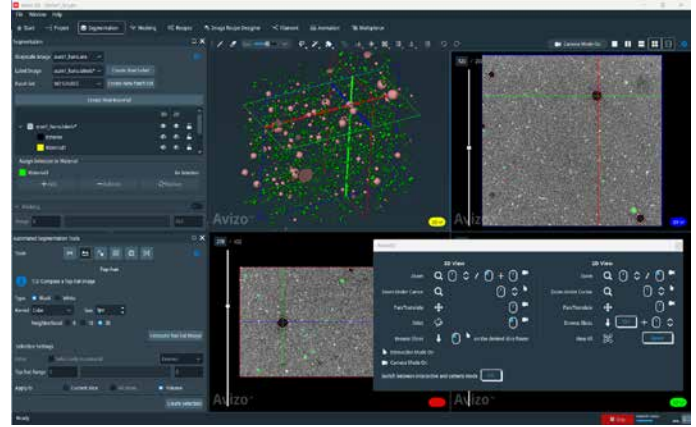
- **Crosshair navigation:**
A user-friendly crosshair now allows you to navigate within the 3D volume by synchronizing all 2D viewers to show the location that is selected from any viewer.
- **Zoom under cursor in 2D/3D viewers:**
In **Interaction Mode**, you can now zoom on the area under the cursor by using the mouse wheel. For instance, it is now possible to brush and zoom in/out on a targeted area in order to toggle between higher and lower precision, as needed.

Interactive segmentation tools

- **2D lasso improvements:**
The 2D lasso is now polygonal by default; place control points with the left mouse button to trace the lasso. Click and hold the **left mouse button** to create the origin point, then move your mouse to automatically add points at regular intervals along your defined path. Zooming in reduces the space between the control points, allowing for greater precision. Modify the position of control points by dragging and dropping. Add points before and after the selected control point to refine the lasso. Press the **Enter** key to confirm the selection of voxels.
- **Brush:**
A drop in brush performance that caused the brush to lag has been fixed, and the brush size can now be set to maximum without a negative impact on performance.
- **Top hat:**
The *select only current material* option confines the changes applied by the functionality to the selected material.
- **Threshold tool:**
The *select only current material* option confines the changes applied by the functionality to the selected material.
- **Magic wand:**
The seed selection, indicating where the region begins growing, is displayed in the 2D viewers. A red line is also visible in the masking histogram to indicate the seed's intensity.

OS requirements: All supported platforms

Licensing: Standard Packages.



Graphical user interface of the interactive segmentation workroom.

Deep Learning Denoising

Noise2Void version 2 (N2V2)

Denoising modules help you run faster acquisitions and digitally preserve image quality and signal-to-noise ratio.

The Noise2Void approach is an unsupervised denoising method that does not require noisy image pairs or clean target images. Therefore, a model can be directly trained with this method using the images you need to denoise without a ground truth. Previously, a module named *DL Training - Noise to Void 2D* was introduced to train a model using this pipeline. However, this method was known to produce visible checkerboard artifacts. A new version, N2V2, has been proposed that significantly reduces such artifacts, as written in doi: [10.48550/arXiv.2211.08512](https://doi.org/10.48550/arXiv.2211.08512). In this version of Amira and Avizo Software, *DL Training - Noise to Void 2D* is updated to train with the N2V2 models.



SEM image of a diatom acquired with a Thermo Scientific™ Phenom™ XL Desktop SEM.



SEM image detail from a 3D NAND sample, acquired with a Thermo Scientific™ Helios™ 5 PXL Wafer DualBeam™ System, at a resolution of 1.22 nm per pixel. A short dwell time is used to prioritize acquisition throughput over signal-to-noise ratio. Left) raw image; middle) image denoised using the original N2V model; right) image denoised using the new N2V2 model, trained in the same conditions as the N2V image.

OS requirements: Windows only

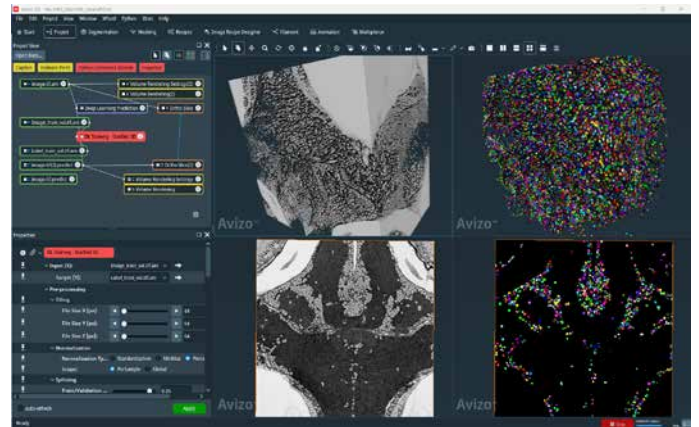
Licensing: Advanced Packages

Other requirements:

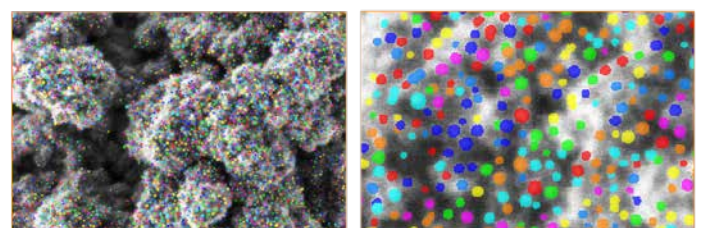
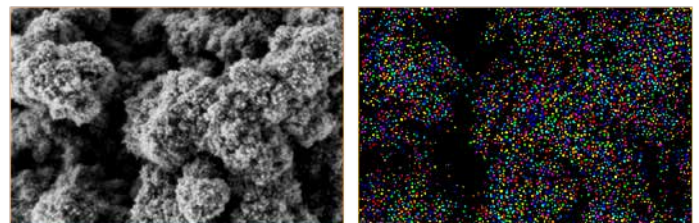
An NVIDIA GPU supporting CUDA Compute Capability 5.2 or higher, with up-to-date drivers. Your CPU must support the AVX2 extensions. The Python environment for deep learning has been upgraded; please remember to install it prior to using the new modules.

StarDist 2D and 3D modules

StarDist represents a well-established and highly efficient deep learning method for instance segmentation of convex objects such as cells. In this version, we introduce two distinct training modules tailored for the development of such models, namely “DL Training Stardist 2D” and “DL Training Stardist 3D.” To facilitate the training process, a gray-level dataset, coupled with the corresponding ground truth (annotated) data, are required. Once a model has been effectively trained, it can be used within the “Deep Learning Prediction” inference module for accurate object segmentation and separation.



Zebrafish neuronal nuclei segmentation in an SEM image using the StarDist 3D method. The data is available from <https://nucmm.grand-challenge.org/>.



Pt/Pd catalyst nanoparticles on carbon, acquired with a Thermo Scientific™ Apreo™ SEM. Data analyzed with 2D StarDist segmentation training and prediction.

OS requirements: Windows only

Licensing: Advanced Packages

Other requirements:

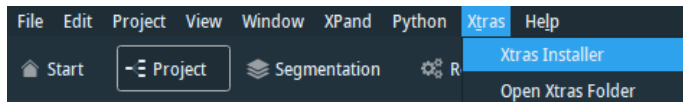
An NVIDIA GPU supporting CUDA Compute Capability 5.2 or higher, with up-to-date drivers. Your CPU must support AVX2 extensions. The Python environment for deep learning has been upgraded; please remember to install it prior to using the new modules.

Xtra Installer

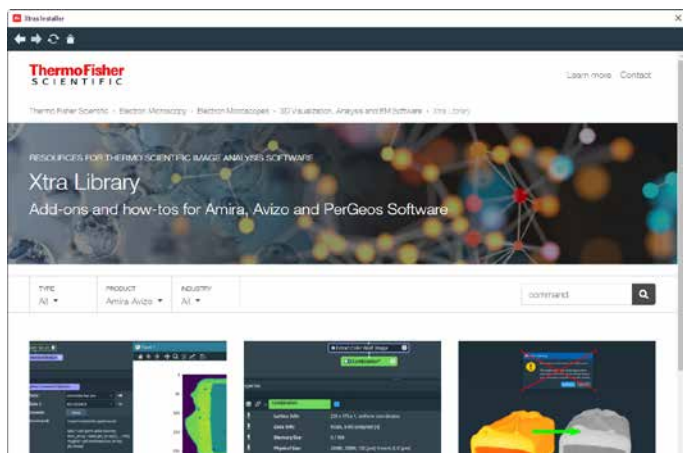
The new Xtra Installer allows you to browse our Xtra Library repository and directly install the modules from within the software. Previously, it was necessary to go online, download the Xtras, unpack them, and install them manually.

A new item in the menu makes the installer visible.

This will launch an embedded browser pointing to the Xtra website. From there, you can search and navigate the entire Xtra library.

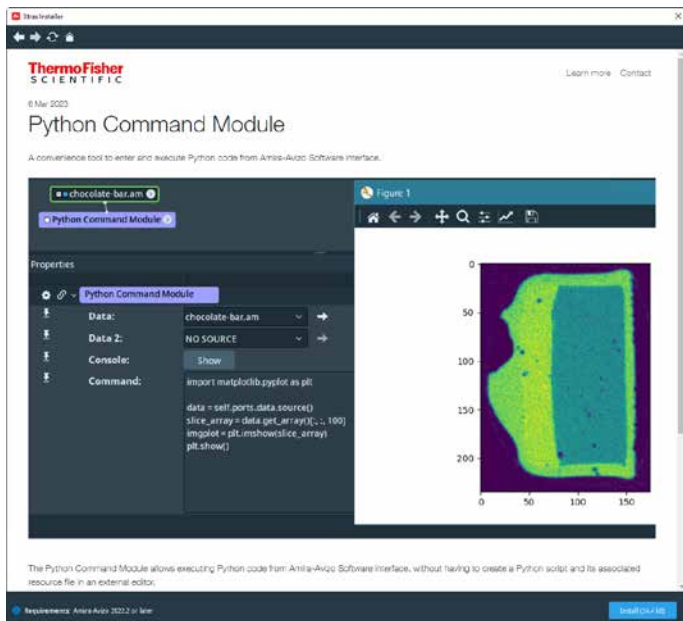


The Xtra Installer can be launched from the software menu.



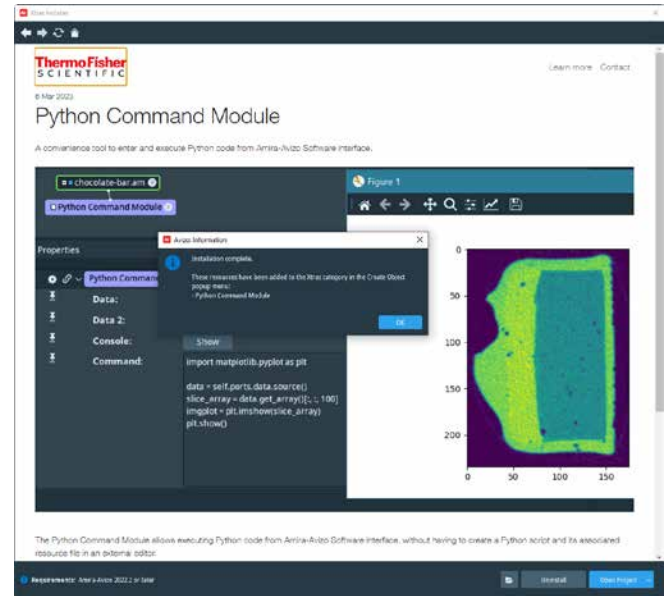
Browse the Xtra Library from within the software (with an active internet connection).

Once an Xtra is selected, you can install it (providing it is compatible with the software version). If the Xtra is not compatible with the software version you are currently using, the required version will be displayed.



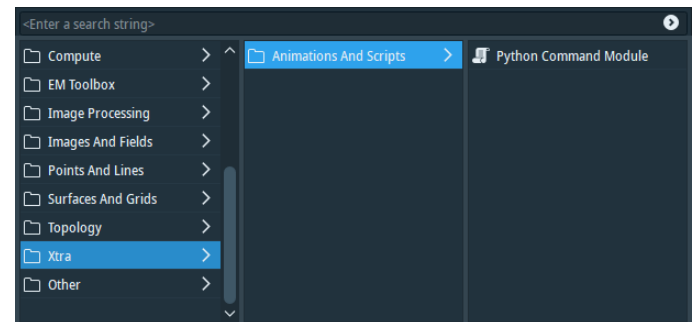
Browse the description of the selected Xtra.

Once installed, a popup lists the modules/recipes added to the software.



An Xtra being installed from within the software. A confirmation of the newly available modules is displayed.

The modules are accessible from the object popup menu under the Xtra category, and are directly usable. There is no need to restart Amira or Avizo Software.



New modules installed through the Xtra Installer are visible in the module menu under the Xtra category.

From there, you can also uninstall any Xtra, open an Xtra project (if available), or access the Xtra directory if needed.

OS requirements: All supported platforms

Licensing: Standard Packages

Other requirements:

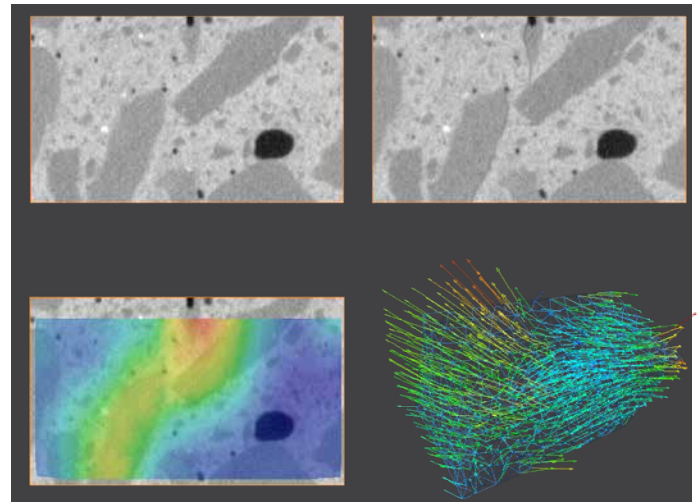
A working internet connection is required to use the Xtra Installer.

Please note that individual Xtras have their own licensing requirements and potential limitations.

Mechanical regularization for digital volume correlation (DVC)

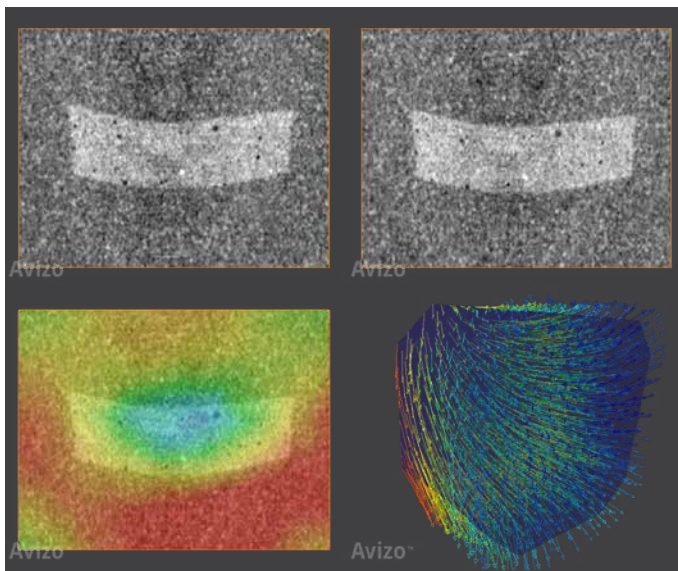
The DVC Global Approach module has been upgraded with a robust mechanical regularization procedure that allows the module to work on materials with a lower resolution or signal-to-noise ratio. It also accommodates reduced support grid size in order to increase the precision of results.

The regularization can be seen as a kind of “mechanical filter” that lowers measurement uncertainties and breaks the traditional spatial resolution limit that arises when only the texture is considered. DVC imposes an elastic assumption on the measurement of displacement fields so that it is no longer limited to high-contrast materials. DVC can now be extended to a large class of materials as it compensates for the detrimental effects of poor microstructural texture, noise, and artifacts. Regularized DVC can also use decreased mesh size around material interfaces and cracks in order to better capture strain concentration.

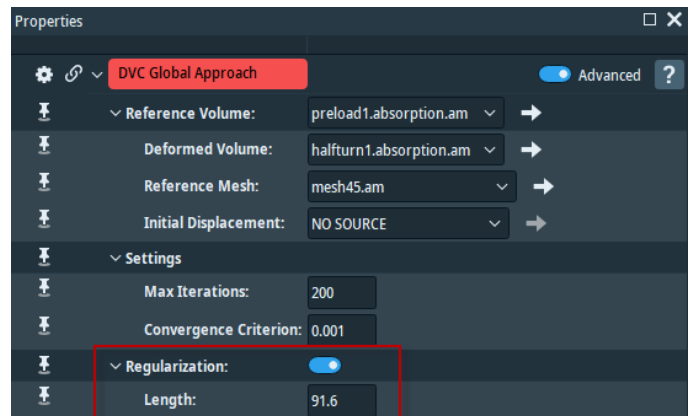


DVC mechanical regularization helps to accurately depict crack propagation during a wedge splitting test on concrete. Data courtesy of P. Carrara, ETH Zurich. More information can be found in A. Mishra, P. Carrara, M. Griffa, and L. De Lorenzis. *Fracture in concrete: in-situ X-ray tomography tests, digital volume correlation and phase field modeling* (2023) or at <http://hdl.handle.net/20.500.11850/633761>.

New ports to enable and adjust the regularization length have been added. The regularization length is automatically initialized relative to the average tetrahedral edge length.



DVC mechanical regularization helps to reveal displacement and strain for data with poor texture.



New length parameter available for controlling mechanical regularization.

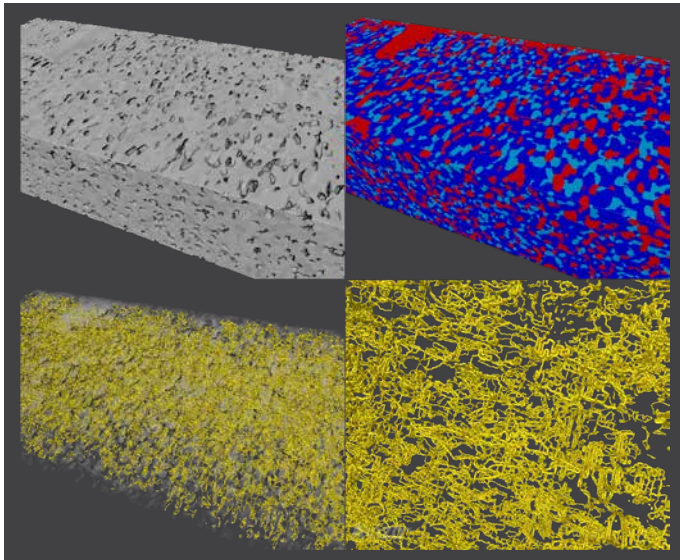
OS requirements: All supported platforms

Licensing: Standard Packages

Triple Phase Boundaries module

Triple phase boundaries (TPBs) represent the linear interfaces between three phases. In the case of fuel cells, where the three phases are the electrolyte, conductor, and porosity, the TPBs are the sites of the electrochemical reactions. Their density (total length per unit volume) is a key metric of cell efficiency.

A new Triple Phase Boundaries module extracts a spatial graph representing the TPB from a surface. The Spatial Graph Statistics module can then be used on the results to obtain the total length.



Volume (μm^3)	TPB Length (μm)	TPB ($\mu\text{m}/\mu\text{m}^3$)
72496.97	66454.57	0.92

	Void	YSZ	Ni
Total Area (μm^2)	32814.32	69157.27	172176.44
Void ($\mu\text{m}^2/\mu\text{m}^3$)		0.76	0.16
YSZ ($\mu\text{m}^2/\mu\text{m}^3$)	0.76		1.32
Ni ($\mu\text{m}^2/\mu\text{m}^3$)	0.16	1.32	

Triple phase boundary extraction performed on FIB-SEM images of a SOFC sample, as well as the derived characteristics. Sample courtesy of Northwestern University.

OS requirements: All supported platforms

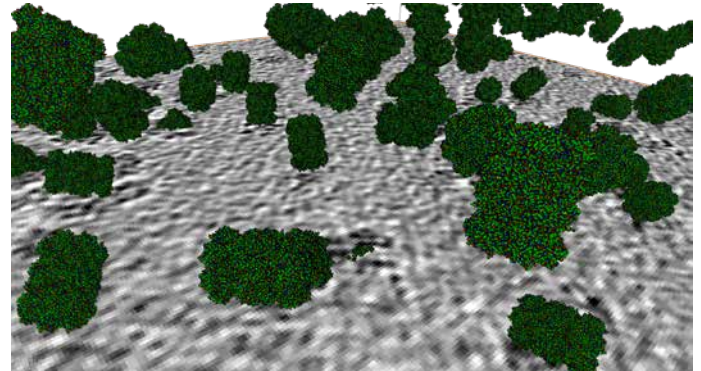
Licensing: Advanced Packages

Molecule Cloud View module

The new Molecule Cloud View module can visualize a set of molecules (as respective van-der-Waals surfaces) in a 3D dataset at given positions and orientations. As input information, the module requires a molecule template (*i.e.*, from the Protein Data Bank) encoding for the molecular structure, X-Y-Z coordinates, and orientation angles of each molecule.

OS requirements: All supported platforms

Licensing: Amira Software for EM Systems



Tomogram with molecular models of a proteasome (from the Protein Data Bank) rendered at correct locations and orientations.

Animation Director improvements

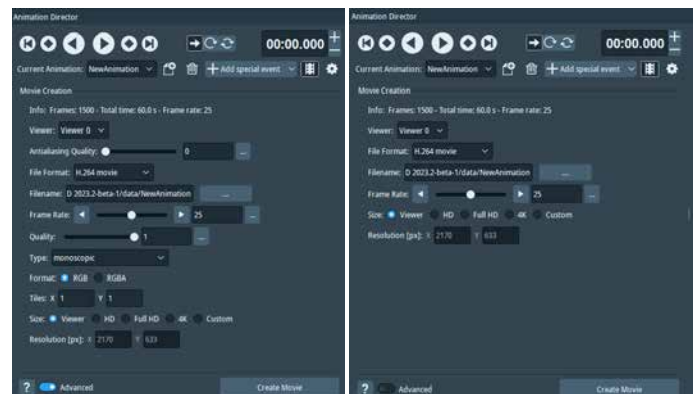
The Animation Director is now able to generate higher quality movies while minimizing file size, thanks to efficient codecs that are directly readable with Windows Media Player, Microsoft Powerpoint, etc.

The new default is now H.264, which yields high quality and compression. The AV1 codec offers the highest compression rate but is slower and is not supported by all movie players. The VP9 codec has intermediate performances between H.264 and AV1 and remains widely readable.

The movie creation interface has also been simplified to show only the most relevant parameters; an advanced mode is available to access less frequently used functionalities such as anti-aliasing rate or stereoscopic modes.

OS requirements: All supported platforms

Licensing: Standard Packages

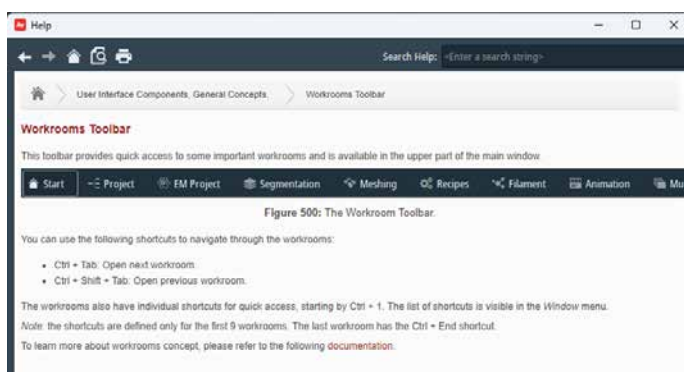


The interface for the Animation Director movie creation panel is simplified, and now allows for advanced codecs to be selected. Additional advanced options can be enabled with the bottom toggle.

Miscellaneous graphical user interface improvements

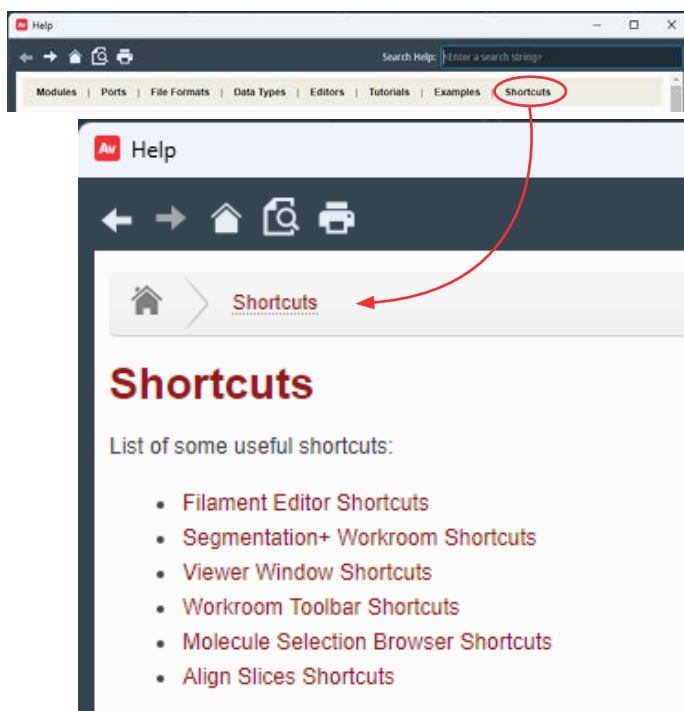
Various improvements have been implemented to improve the consistency and accessibility of the software.

- The *Point Probe*, *Spline Probe*, and *Curve Editor* now allow you to drag and drop points. To use this new feature within one of these modules, hover over a control point while in interactive mode. The mouse cursor will change to a cross; left click the point and keep the left button pressed to drag and modify the point's position.
- New shortcuts have been implemented for quick access and navigation between workrooms.



Documentation highlighting the new shortcuts available for navigating between workrooms.

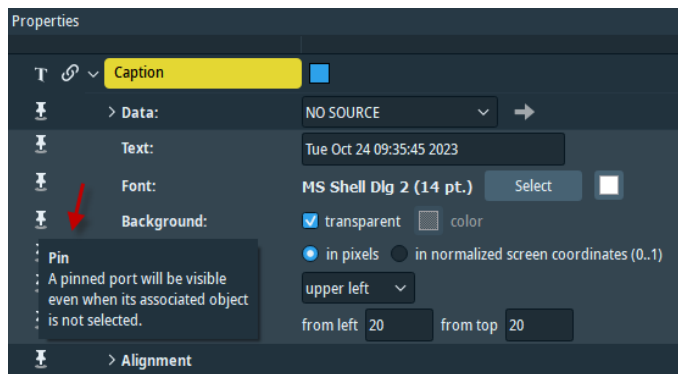
- A dedicated page in the documentation has been added highlighting important application shortcuts (see below)



New documentation page highlighting major shortcuts.

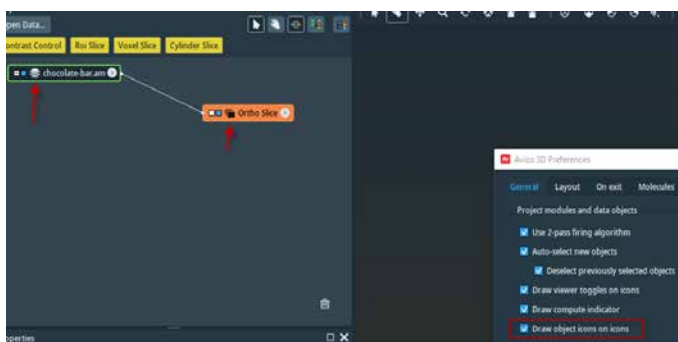
- Alternative descriptions have been added to several static graphical elements and ports, enabling text-to-speech applications such as Microsoft Windows Narrator

- Tooltips have been added on several static graphical elements and module ports



New tooltips on GUI elements.

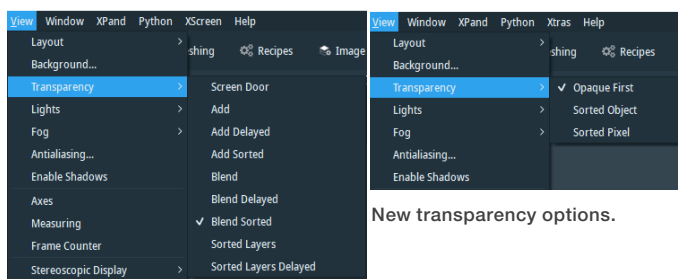
- An option has been added to general preferences for displaying icons that indicate the sub-types of modules in the Project View



Highlighted option to add icons to modules in Project View.

- The options for transparencies have been simplified and renamed. Available transparencies are:
 - Opaque First (default) – previously named Blend Delayed
 - Sorted Object – previously named Blend Sorted
 - Sorted Pixel – previously named Sorted Layers Delayed

Note: Other options that used to be available are deprecated. See compatibility notes for more details.



New transparency options.

Previous transparency options.

OS requirements: All supported platforms

Licensing: Standard Packages

Compatibility notes

Transparency Nodes

Deprecated transparency modes remain accessible for compatibility with TCL script commands, using the TCL command:

```
viewer [<number>] setTransparencyType <type>.
```

The previous type numbers can still be called; they will, however, be removed in future versions.

End of Support

Classic Segmentation

The Classic Segmentation workroom is now deprecated, and Segmentation+ is now the only supported interactive segmentation workroom. You can still use the classic workroom through the application menu, but there will be no further big fixes for this version. If you still require the classic

workroom for your workflows, a survey is accessible from within the application for you to provide this feedback.

OpenGL 2.1 support

Amira and Avizo Software now require, at a minimum, OpenGL 4.2, instead of 2.1 as in previous versions.

Please review the complete system requirements at:

<https://www.thermofisher.com/fr/fr/home/electron-microscopy/products/software-em-3d-vis/3d-visualization-analysis-software/system-requirements.html>

XPand extension requirements

To add custom C++ extensions to Amira and Avizo Software (Advanced Packages), you will need:

- Microsoft Visual Studio 2019 version 16.2 (v142) on Windows
- gcc 9.x on Linux Ubuntu 20.04

Operating systems

Amira and Avizo Software version 2023.2 runs on:

- Microsoft Windows 10 (64-bit).
- Microsoft Windows 11 (64-bit)
- Linux x86 64 (64-bit) running on Intel64/AMD64 architecture and Ubuntu 20.04 (desktop)

Our products are tested on the following configurations:

Platform	GPU	Driver number
Windows 10	NVidia Tesla T4	537.13
Windows 11	NVidia RTX A4500	537.34
Ubuntu-20.04	NVidia T1000	535.113.01

Resolved Issues

Name	ID	Description
Viewer gadgets in snapshots and animations	AA-29120	Compass and trackball are now shown in snapshots and animations if visible in the viewer.
Colormap legend background size	AA-27809	Colormap legend background size is no longer larger than necessary
Tab order of buttons	AA-28042	The tab order of buttons in the Project View area of the project workroom has been fixed
Filament Editor	AA-29118	The Trace Filament tool has been improved to avoid crashes when it is used.
Filament Editor	AA-29304	The Trace Filament tool (linear method) is now available with 2D images.
Unit	AA-29354	The conditions for displaying warning messages on units have been updated to include consistency issues between display units and working units.
New Segmentation+ editor	AA-29466	The orthographic camera is now deactivated in the new Segmentation+ Workroom to avoid unexpected behavior.
New Segmentation+ editor	AA-29443	Tools using the masking feature are now able to handle floating grayscale data.
New Segmentation+ editor	AA-29062	Gray input is now automatically selected when entering in the new Segmentation+ Workroom and a new label is created if no compatible label already exists.
New Segmentation+ editor	AA-29044	The brush tool has been improved to prevent a drop in performance.
New Segmentation+ editor	AA-29028	Masking component documentation has been added.
Trace Correlation Lines	AA-29000	As the Trace Correlation Lines cannot compute the Mean Radius and Volume, they are no longer displayed in the spatial graph statistics result.
FFT Filter	AA-28891	It is now possible to use the FFT Filter on 8-bit signed data.
Image Recipe Designer	AA-29155	Some color issues with the labeling module have been fixed.
STL Reader	AA-28819 AA-28769 AA-28582	STL Reader has been improved to allow the loading of big data.
Patch Extractor	AA-28808	Patch Extractor is now able to handle labels without materials bundles.
Patch Extractor	AA-29807	Patch Extractor has been improved to avoid crashes with some grayscale data.
Interpolate	AA-28649	Interpolation no longer leaves occasional holes in the YZ direction.
Resample	AA-28586	Resampling data with the box filter has been fixed in order to avoid failure when the Input size is not divisible by the voxel size ratio.
Extra viewer	AA-28540	It is now possible to hide the extra viewer in order to avoid displaying a white screen.
Licensing	AA28495-	Some minor licensing issues are now managed as warnings and no longer prevent the application from functioning.

 Learn more at thermofisher.com/amira-avizo

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