

Product Information
Version 2.5

ZEISS ZEN Connect

Overlay and Organize Images From Any Source to
Connect Your Multimodal Data



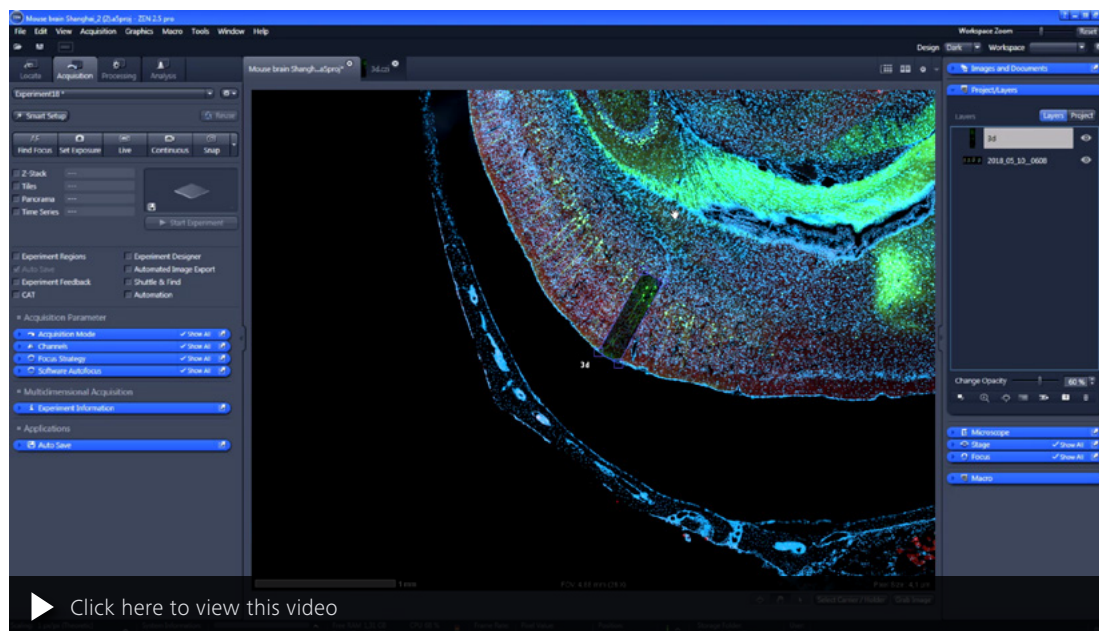
Overlay and Organize Images From Any Source to Connect Your Multimodal Data

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Imagine the possibilities if you could combine multiple perspectives of your sample across scales and imaging modalities. It's easy now, using the ZEN Connect software module to bring all of your imaging technologies together – ZEISS or not – to answer your scientific questions.

Simply acquire an overview image of your large sample on a low magnification system, then move to your confocal or electron microscope and align. Just once. You're now set to use the overview image for navigation and all subsequent images will automatically be shown in context. Or you can simply use ZEN Connect to align and overlay images from any source.

Your multimodal data is saved in well-organized projects with intuitive image labels. ZEN Connect always shows your data in context – you get unique insights, gain efficiency and save time.



*Mouse brain, tissue section.
This overview image was acquired with ZEISS Axio Scan.Z1 to identify regions of interest (ROIs). The sample was then transferred to ZEISS LSM 800 with Airyscan and ZEN Connect allowed all ROIs to be relocated and imaged easily with superresolution. The unique ZEISS Airyscan detector lets you resolve and image neuronal structures like spines which could not be done with classic confocal imaging. Neurons were labeled with GFP (green) and Alexa Fluor 568 (red).
Sample: courtesy of L. Guanghong, College for Life Science, Shanghai University, China.*

Simpler. More Intelligent. More Integrated.

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Overlay and Align All Your Images

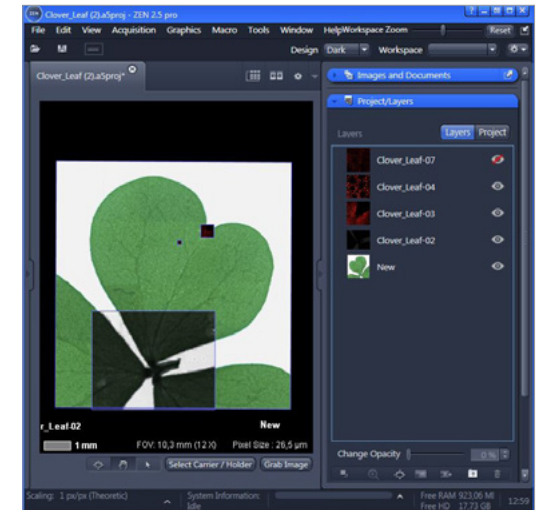
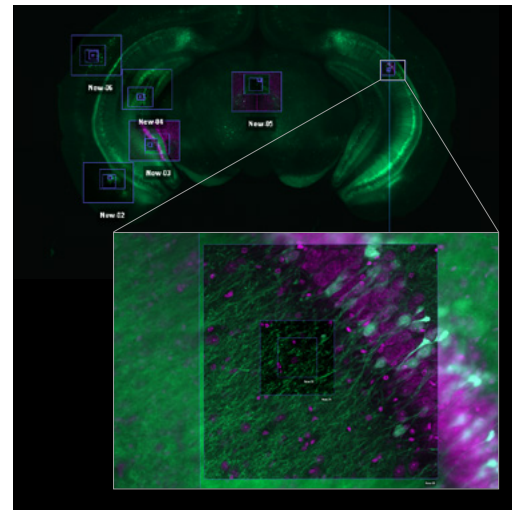
ZEN Connect is open to all your images: you can load complex multidimensional images as easily as simple overview images from your mobile phone. It makes no difference whether your imaging technology is from ZEISS or from third parties. All image data can be aligned and shown in context. So long as your external images adhere to the well-established Bio-Formats standard, ZEN Connect will even keep their metadata.

Acquire Overview Images for Easy Navigation

Image your sample with a ZEISS stereo microscope or any other low magnification system. Then move to your high-resolution system of choice. With ZEN Connect you only need to align it once, then use the overview image to navigate and find your ROIs. All subsequent high-resolution images will be shown in context as you zoom in and out across the borders of resolution domains and imaging technologies. A single click on the overview image brings your stage to the right position to examine or re-evaluate any of your ROIs.

Smart Data Management

All the images you acquire with ZEN Connect are saved in well-structured database projects – complete with an intuitive label attached automatically to each image file. You'll always stay on top of things – during your experiments as well as months afterwards when analyzing your work. It's easy to find all your images and their connected datasets. You can even search for microscope type and imaging parameters with ZEN Connect's new filter function.



Your Insight into the Technology Behind It

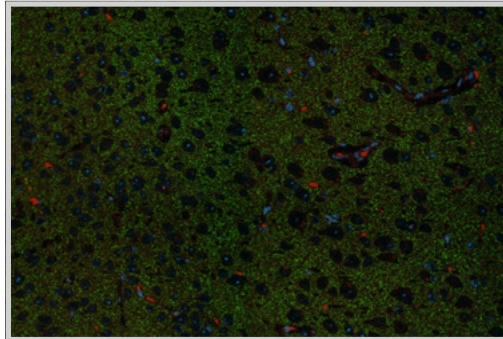
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Connect Your Microscopes and Data

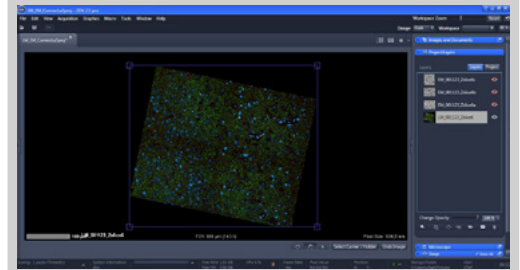
Use the workflow of ZEN Connect to get from a quick overview image in a light microscope to advanced imaging with a high resolution system from ZEISS. Seeing all multimodal data in context, you'll save time and gain unique insights into your sample.

Mouse brain section. Stained for Synapsin-1 (green), Gephyrin (red) and nuclei (blue). An overview image was acquired with ZEISS Axio Observer 7 (Step 1) and organized in a ZEISS ZEN Connect project (Step 2). Sample and data were then transferred and aligned on ZEISS GeminiSEM 300 (Step 3). The overview image is then used for navigation and all subsequent images are shown in context (Step 4). Sample: courtesy of M. Ocana, Harvard University, Boston, USA.

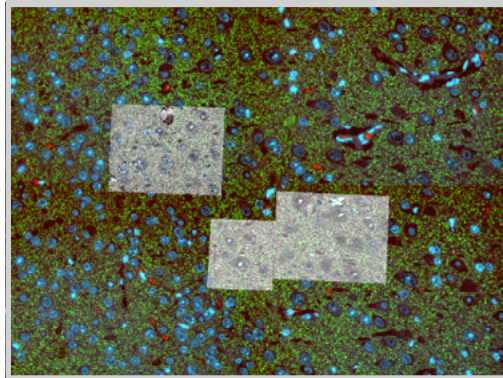
1. Use your favorite low magnification system to acquire large fields of view.



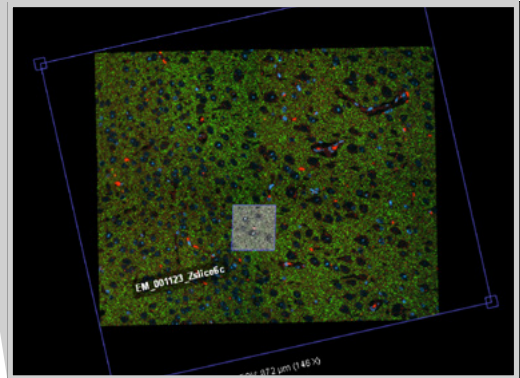
2. ZEN Connect organizes your images in a well-defined project.



4. Use the overview image to navigate and observe your high-resolution data in context.



3. Align your high-resolution system to the overview image.

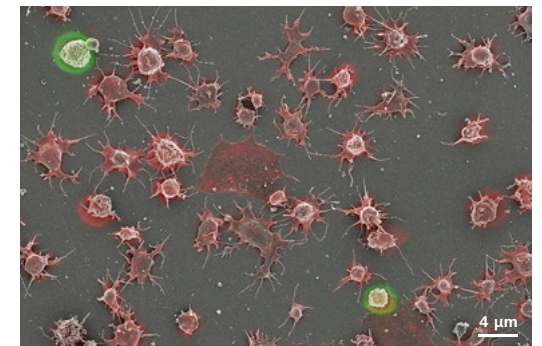
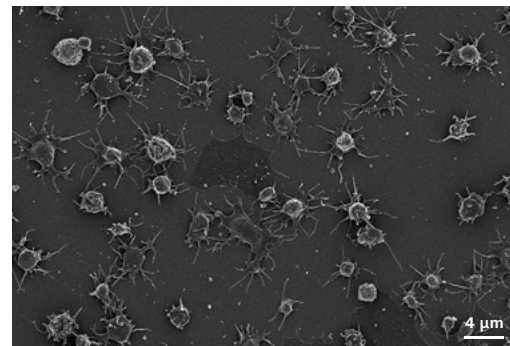
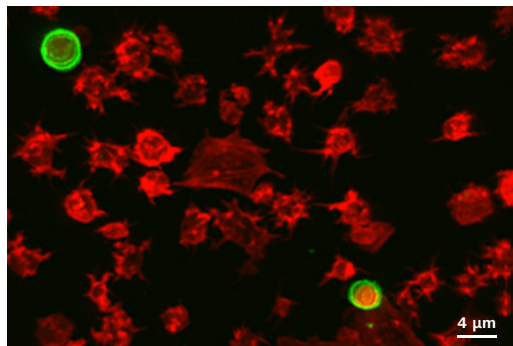
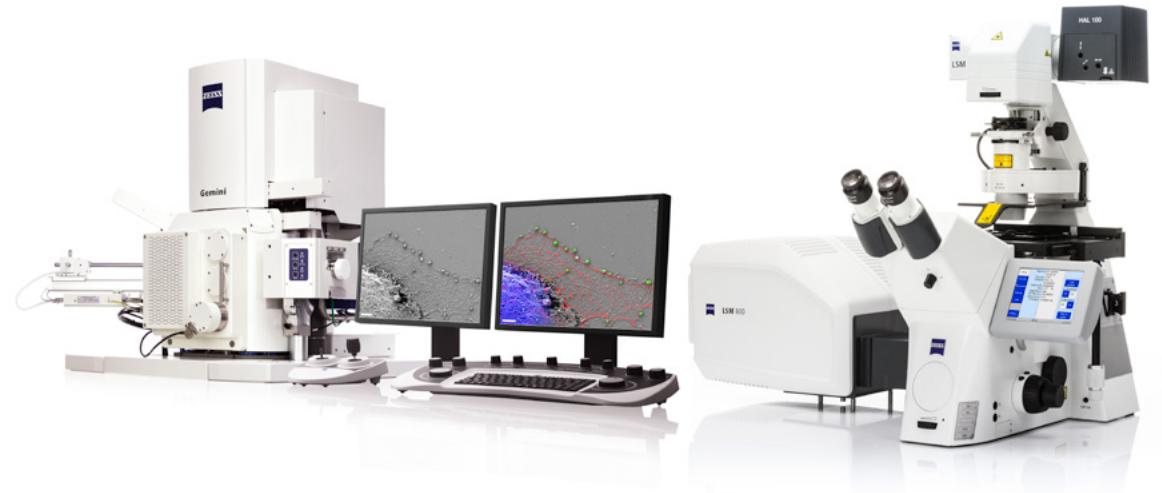


Expand Your Possibilities

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ZEN Shuttle & Find

Use ZEN Shuttle & Find to map the distribution of fluorescently labeled proteins to subcellular ultrastructure – with the highest possible precision. The efficient coordinate transfer between light microscope and SEM makes it easy to relocate your ROI's. After acquisition, the correlative overlay image gives you an altogether new perspective on your sample where you will now see functional information in the ultrastructural context.



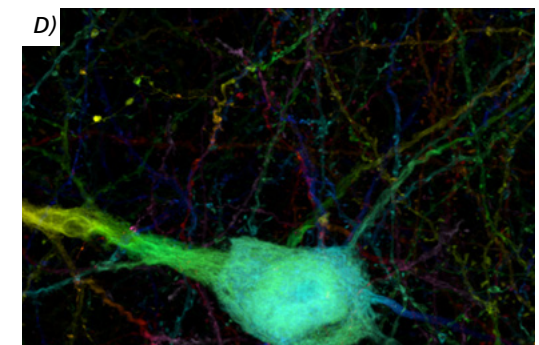
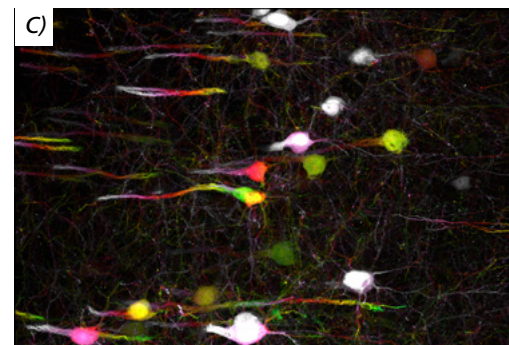
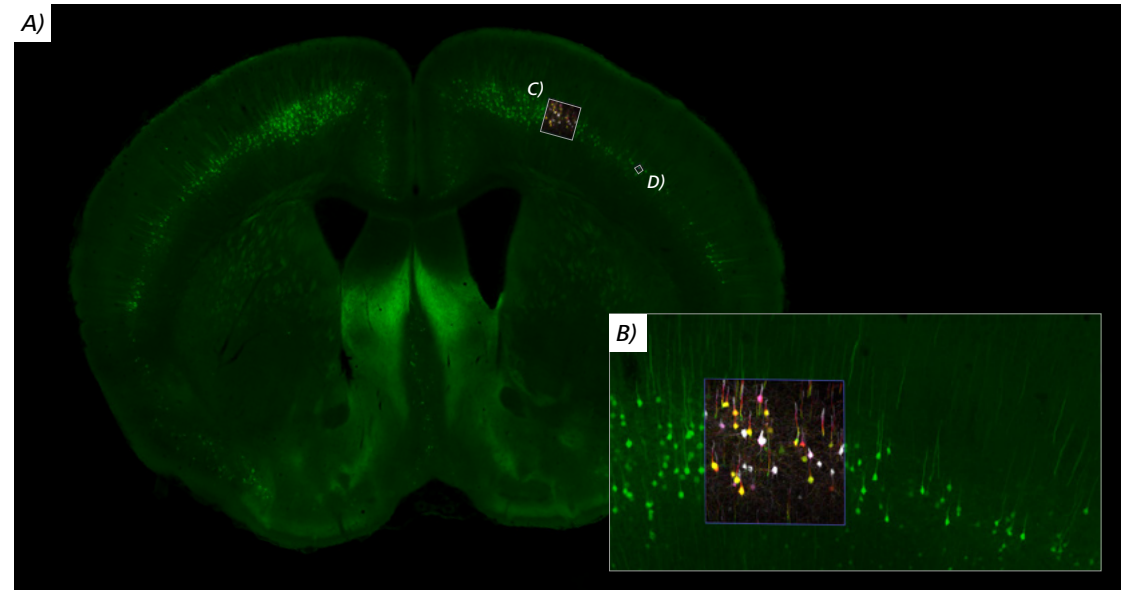
Platelets are stained for cellular platelet protein (green) and actin (red). Left: LSM fluorescence image. Center: SEM image. Right: overlay. Samples: courtesy of D. Woulfe and J. Caplan, University of Delaware, Newark, DE, USA.

Tailored Precisely to Your Applications

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Neuroscience

With ZEN Connect it's easy to image entire mouse brain sections. First, acquire a quick overview image with the automatic slide scanner Axio Scan.Z1. Then move the sample and data to your LSM 800 with Airyscan. Use ZEN Connect to align the LSM 800 to the overview image. Now simply use the overview image to navigate around your sample, identifying and relocating ROIs as you go. As you acquire your Airyscan superresolution images, they will be displayed instantly on top of the overview image. This overlay view means you will always see your multimodal data in context.



Section of a Thy1-YFP mouse brain. Thy-1 (green) is involved in the communication of cells in the nervous system. Overview image (A) acquired on ZEISS Axio Scan.Z1. Inset shows enlarged ROIs imaged on ZEISS LSM 800 with Airyscan (B, C) The neuronal network is clearly visible. The depth of the Z-stack is color-coded. (D) shows a single neuron. Sample: courtesy of R. Hill, Yale University, New Haven, CT, USA.

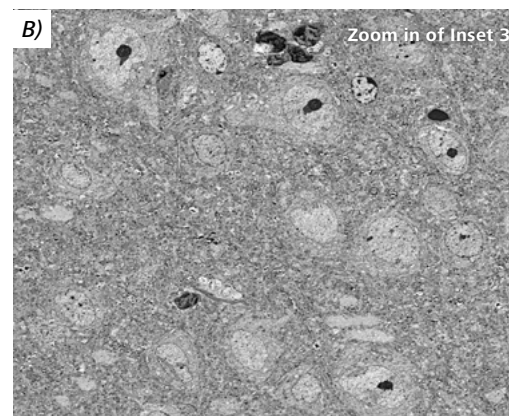
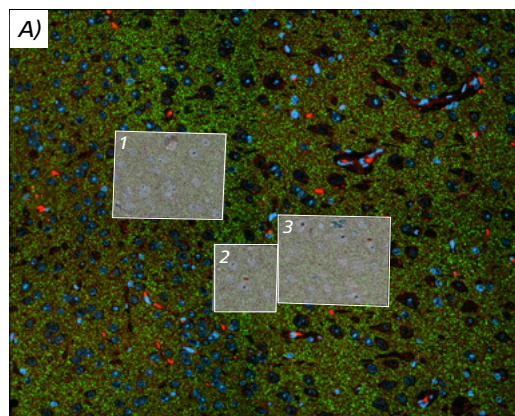
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Connectomics research aims to explain the 'wiring' of brains and, ultimately, how brains work. One of the biggest challenges in this field is the sheer scope of the investigation. You need ultrastructural information to be able to resolve single synapses. On the other hand, brain samples are huge in microscopic terms and you'll need to image large regions of interest to observe the interaction between different parts of the brain and various types of neuronal cells involved.

ZEN Connect lets you analyze ultrastructural data in a wider context, connecting large fields of view imaged on a widefield light microscope. Now you can work with multimodal data, bringing together different imaging modalities and resolution domains - from low magnification widefield to nanometer resolution EM data.



Ultrathin mouse brain section. (A) Overview image acquired with ZEISS Axio Observer 7 and ZEN Connect. Synapsin-1 was labeled with Alexa Fluor 647 (green) targeting the pre-synaptic vesicles and Alexa Fluor 594 labeled Gephyrin (red), targeting a part of the postsynaptic protein network. Nuclei were stained with DAPI (blue). The overview image was used for navigation and ROI relocation. The insets (1-3) were acquired with ZEISS GeminiSEM 300 and show the ultrastructure of the ROIs. (B) shows a zoomed image of inset (3).

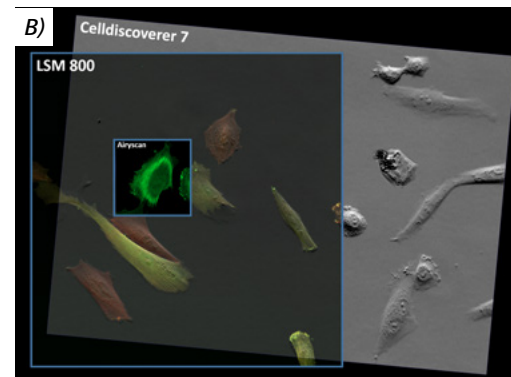
Sample: courtesy of M. Ocana, Harvard University, Boston, MA, USA.

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Cell Biology

In live cell imaging, your samples are especially sensitive to light and environmental stress. ZEN Connect helps to keep light doses small. Simply acquire a quick overview image, then navigate freely around the petri dish or slide – without needing to illuminate your specimen further. In addition, you will often want to image the same sample a number of times over the hours or days of your experiment. With ZEN Connect, it's easy to relocate your ROIs after taking a sample out of the incubator for the next round of imaging.



Fox lung fibroblast cells expressing Actin GFP (green) were imaged overnight with ZEISS Celldiscoverer 7. After widefield live cell imaging, the sample was fixed and stained with CellMask plasma membrane stain (red).

(A) The movie shows a petri dish with single cells and a time series showing cellular dynamics and cell division. After fixation and staining, the cells were imaged with ZEISS LSM 800 and Airyscan.

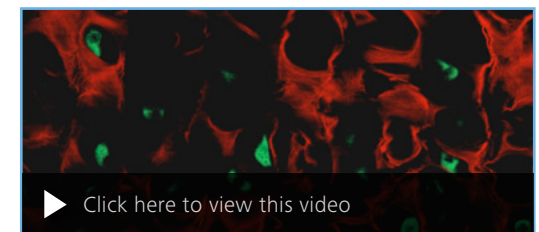
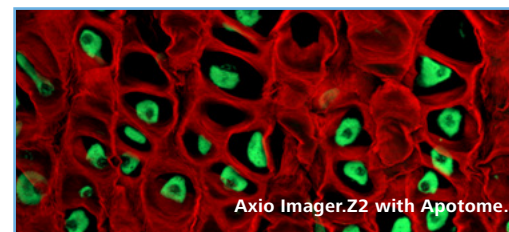
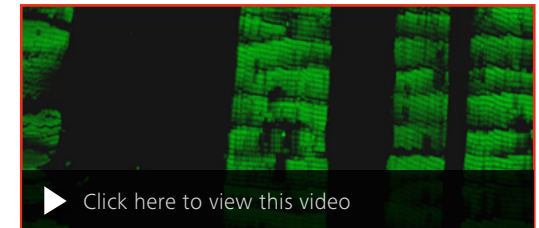
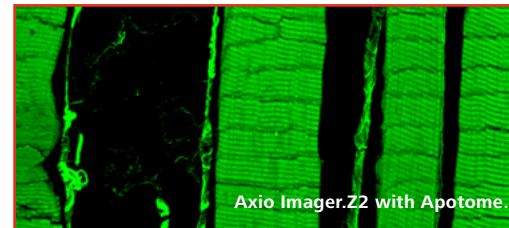
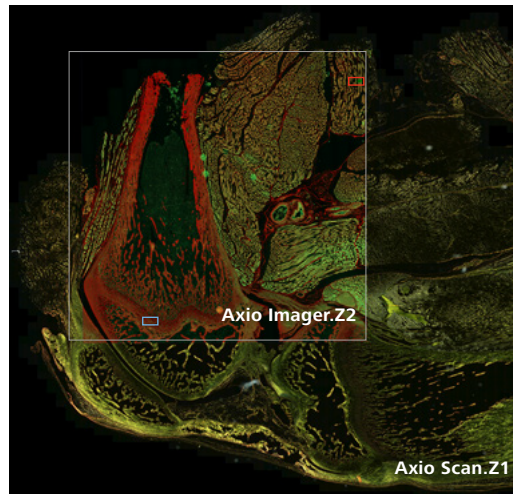
(B) Overlay image of one time point of the time series with confocal and ZEISS Airyscan data.

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Histology

In histology, you study cells and tissue with light or electron microscopes. You often need to combine multiple contrasting techniques to understand the structure and function of your specimens. For an even deeper understanding, you may sometimes need to go from large tissue sections to subcellular ultra-structure. Frequently this also requires you to combine complementary imaging technologies.



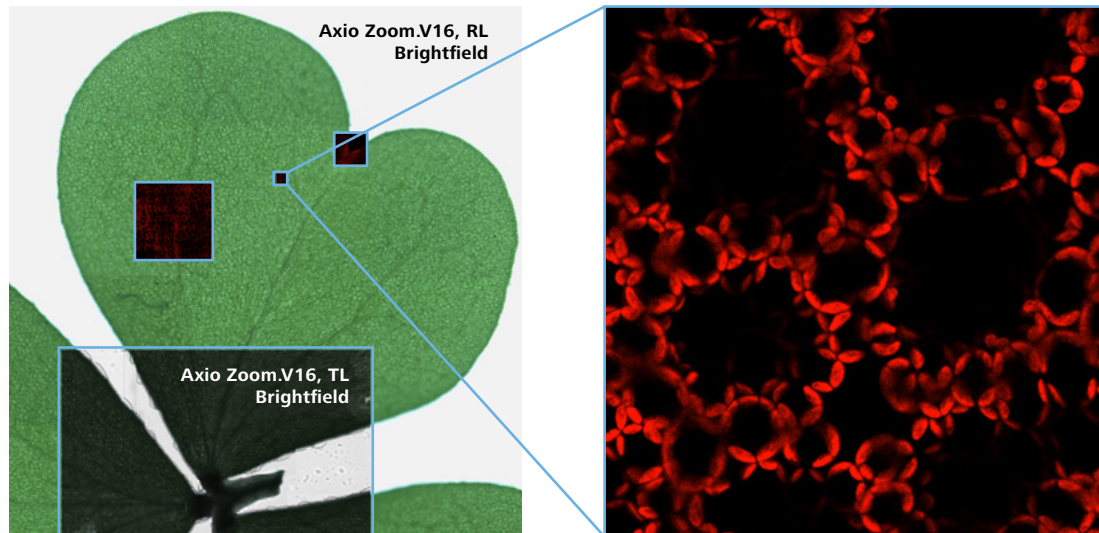
In this example, a 5 μ m thick section of an embryonic rat knee was first imaged with ZEISS Axio Scan.Z1 and polarized transmitted light. The rapid tiling of this automated slide scanner allowed to acquire a large area of the sample in the shortest possible time. The specimen and data were then transferred to ZEISS Axio Imager.Z2 with Apotome.2 for fluorescence imaging of muscle and physal growth plate (red: Sirius-red, green: autofluorescence). ZEISS Apotome.2 allowed the acquisition of Z-stacks of striated muscle (upper row) and chondrocytes in the growth plate (lower row) with a Z-resolution of 1.4 μ m.

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Botany

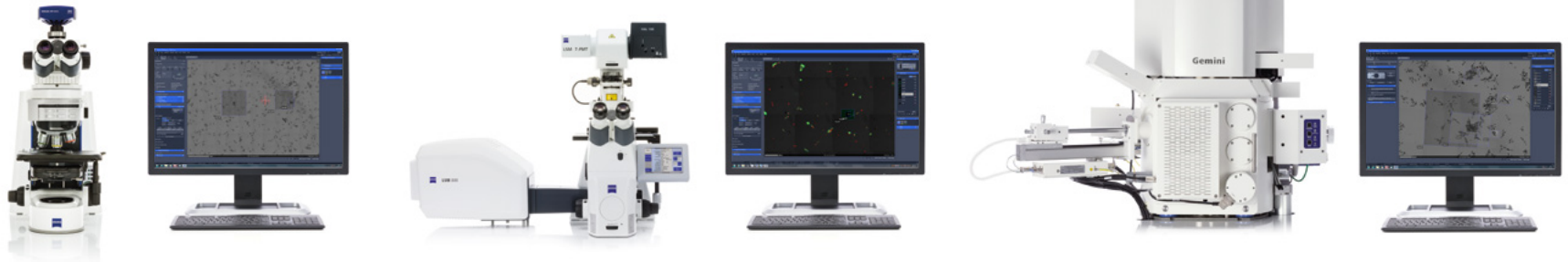
Working with a living sample calls for speed since it's hard to maintain physiological conditions. Here, for example, immersing a clover leaf in Perfluorodecalin provides excellent gas exchange and allows long-term live cell imaging. This fills the plant air spaces and produces a matching refractive index for deep tissue imaging. But you still need to work fast. ZEN Connect lets you acquire an overview image with the extremely large field of view of Axio Zoom.V16, then transfer the specimen and data to LSM 800 with Airyscan. Now ZEN Connect makes it quick and easy to find and image your ROIs, even though plant mesophyll cells show highly similar structures over large areas.



Clover leaf. The overview image was acquired on ZEISS Axio Zoom.V16. The reflected light and transmitted light brightfield images clearly show the morphology of the leaf. The insets show chloroplasts (red) in high resolution. Autofluorescence of chlorophyll was acquired with ZEISS LSM 800 and Airyscan.

Your Flexible Choice of Components

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Light microscopes:

SteREO Discovery, Axio Zoom, Axio Scope, Axio Imager, Axio Examiner, Axio Observer, LSM 800

Electron microscopes:

EVO, Sigma, GeminiSEM, Crossbeam

Software:

- ZEN (blue edition)
- SmartSEM

Optional:

- Specimen holder CorrMic Life Sciences for cover glasses
- Specimen holder CorrMic Life Sciences for TEM grids
- Cover glasses with fiducials
- Compatible with any sample carrier
- ZEN Shuttle & Find

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Module	Functionality	Specification
ZEN Connect Entry	Correlative workspace	<ul style="list-style-type: none"> ■ Correlative Workspace: zoom in from the full macroscopic view of your sample down to nanoscale details. ■ Combine data from any image source in ZEN imaging software. ■ A comprehensive, sample-centric correlative environment handles multiscale and multimodal images. ■ View multiple layers with adjustable transparency. ■ Multiresolution imagery ■ Manual alignment of images allows correction of xy-shift, rotation, re-scaling, shearing and mirroring.
	Data management	<ul style="list-style-type: none"> ■ Automatic file labeling ■ Project-based file architecture
ZEN Connect Advanced*	Correlative workspace	<ul style="list-style-type: none"> ■ Correlative Workspace: zoom in from the full macroscopic view of your sample down to nanoscale details. ■ Import and combine data from any image source in ZEN imaging software. ■ A comprehensive, sample-centric correlative environment handles multiscale and multimodal images. ■ View multiple layers with transparency including display of current stage position and field of view. ■ Multiresolution imagery ■ Manual alignment of images allows correction of xy-shift, rotation, re-scaling, shearing and mirroring. ■ Efficient stage navigation and correlation of images
	Data management	<ul style="list-style-type: none"> ■ Import any microscope image including the metadata as supported by Bio-Formats (A list of supported formats is at: https://www.openmicroscopy.org/bio-formats/) ■ Automatic file labeling ■ Project-based file architecture ■ Provides a project-based data storage ■ Data storage filter search functionality using metadata
	Project export	<ul style="list-style-type: none"> ■ Export of merged images with different resolutions ■ Supported formats: CZI, TIF, JPG, BMP, RAW

Compatibilities	Specification
Software compatibility	<ul style="list-style-type: none"> ■ Light microscopes: ZEN 2.5 (blue edition) or higher ■ Electron microscopes: ZEN 2.5 SEM or higher, SmartSEM 6.3 with API 5.4 or higher
Hardware compatibility	<ul style="list-style-type: none"> ■ Light microscopes: SteREO Discovery.V12/V20, Axio Zoom.V16, Axio Scope.A1, Axio Imager.2, Axio Examiner.Z1, Axio Observer 3/5/7, LSM 800 ■ Electron microscopes: EVO, Sigma, GeminiSEM, Crossbeam

Optional accessories
<ul style="list-style-type: none"> ■ Software: ZEN Shuttle & Find ■ Hardware: Correlative sample holders, light- and electron microscope high precision stage, high-end workstation (recommended)

* Requires ZEN Connect Entry

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Availability of correlative software modules

Microscope Technology	Microscope	Available Acquisition Module
Widefield microscopy	Axio Examiner	ZEN Shuttle & Find and / or ZEN Connect
	Axio Imager M2/Z2	
	Axio Imager Vario	
	Axio Observer 3/5/7	
	SteREO Discovery.V12/V20	
	Axio Zoom.V16	
Confocal laser scanning microscopy	LSM 800	ZEN Shuttle & Find
	LSM 880	
Superresolution microscopy	Elyra P.1/S.1/PS.1	
Automated widefield microscopy	Axio Scan.Z1	n/a
	Celldiscoverer 7	
Electron microscopy	EVO 10/15/25, Sigma 300, 500 / GeminiSEM 300, 450, 500	ZEN Shuttle & Find and / or ZEN Connect and / or Atlas 5
	Crossbeam 340, 550	
	MultiSEM 505 / MultiSEM 506	
Ion microscopy	Orion Nanofab (Helium Ion Microscope)	ZEN Shuttle & Find
X-ray microscopy	Xradia Ultra 800/810, Xradia Versa 410/510/520, Xradia Context	n/a

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Feature Comparison Correlative Microscopy Software	ZEN Shuttle & Find	ZEN Connect (Advanced)	Atlas 5
Semi-automatic calibration with calibration markers and calibration wizard	●	○	●
Automatic relocation (after calibration)	●	●	●
Navigation	● (restricted to one image)	●	●
Google Earth-like view	○	●	●
Context image (overview image from images of different modalities and resolution domains)	○	●	●
Project-based file architecture	○	●	●
Data storage functionality with project list and filter search functionality	○	●	○
Use of OME-Bio-Formats metadata	○	●	○
Availability on microscopes	Widefield, LSM, superresolution, SEM, Crossbeam, MultiSEM, HIM NOT automated widefield	Widefield, LSM, superresolution, SEM, Crossbeam, MultiSEM, HIM NOT automated widefield (but image import possible)	SEM, Crossbeam
Offline version available (ZEN desk or Atlas)	○	●	●
Image alignment	3-point calibration	Scale, rotation, translation, shear	Scale, rotation, translation, shear
Project export	○	●	●
Open platform	○	●	●
Tile image acquisition*	○	○	●
Automatic image acquisition	○	○	●

*Possible via ZEN module Tiles & Positions

Count on Service in the True Sense of the Word

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Because the ZEISS microscope system is one of your most important tools, we make sure it is always ready to perform. What's more, we'll see to it that you are employing all the options that get the best from your microscope. You can choose from a range of service products, each delivered by highly qualified ZEISS specialists who will support you long beyond the purchase of your system. Our aim is to enable you to experience those special moments that inspire your work.

Repair. Maintain. Optimize.

Attain maximum uptime with your microscope. A ZEISS Protect Service Agreement lets you budget for operating costs, all the while reducing costly downtime and achieving the best results through the improved performance of your system. Choose from service agreements designed to give you a range of options and control levels. We'll work with you to select the service program that addresses your system needs and usage requirements, in line with your organization's standard practices.

Our service on-demand also brings you distinct advantages. ZEISS service staff will analyze issues at hand and resolve them – whether using remote maintenance software or working on site.

Enhance Your Microscope System.

Your ZEISS microscope system is designed for a variety of updates: open interfaces allow you to maintain a high technological level at all times. As a result you'll work more efficiently now, while extending the productive lifetime of your microscope as new update possibilities come on stream.



Profit from the optimized performance of your microscope system with services from ZEISS – now and for years to come.

>> www.zeiss.com/microservice



Carl Zeiss Microscopy GmbH
07745 Jena, Germany
microscopy@zeiss.com
www.zeiss.com/zen-connect

