CSR Biotech
Transforming Tools Changing Lives

Cell Xpanse

All-purpose Live-cell Super-resolution Microscope

Multi Scale | Deep Sectioning | High-Throughput | Machine Intelligent



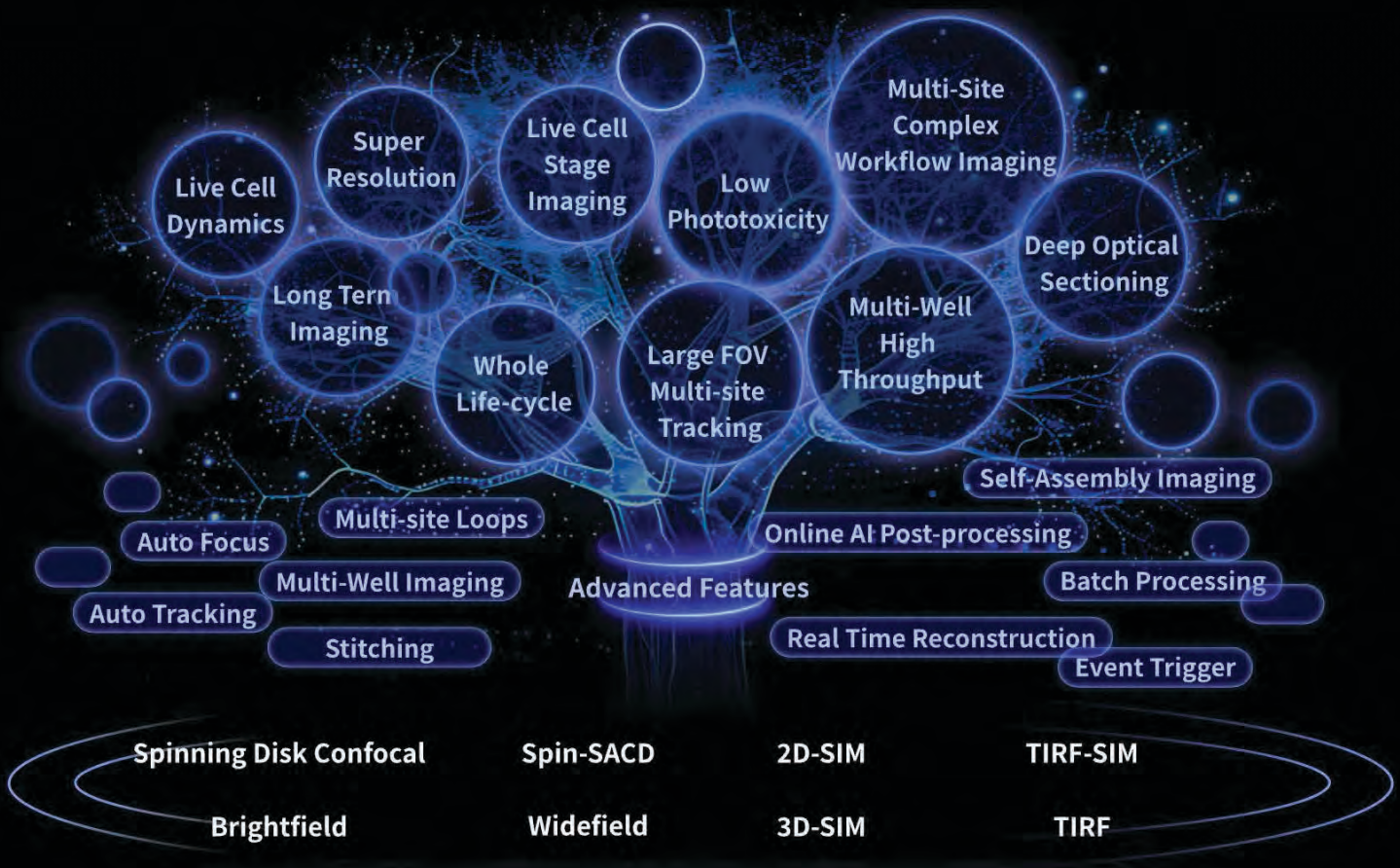
Cell Xpanse: The Ultimate Live Cell Imaging Solution

In early 2025, CSR Biotech unveiled the Cell Xvision series: a new generation of multi-modal super-resolution microscopes for long-term live-sample imaging. The flagship Cell Xpanse delivers an all-in-one multi-scale super-resolution platform capable of imaging 3D samples with extremely high spatial and temporal resolution with minimal photo stress. Cell Xpanse's synergistic technology combination makes it an ideal solution to image a huge range of sample types—from live and fixed cells to tissues, embryos, organoids and model organisms—enabling cross-scale imaging from proteins to tissue-level models.

MI-SIM technology offers resolution down to 60 nm, spinning disk confocal enables users to resolve fine structures deeper into thick specimens, with low photo stress, whilst offering higher throughput and temporal resolution. The system also features CSR Biotech's proprietary Spin-SACD [1] technology, converting your spinning disk confocal into a second super resolution modality. Spin-SACD offers a large FOV confocal imaging capability with 120nm resolution offing a high through-put super resolution solution able to handle much thicker samples than traditional SIM systems.

Cell Xpanse offers a wide range of imaging modalities controlled through unified software workflow enabling seamless real-time switching between contrasting methods.

The system also offers a range of advanced software features enabling users to tackle the most changing experiments Cell Xpanse specifically addresses long-term high-throughput live-cell imaging in multi-well plates with dedicated software and online AI processing solution: Multi-well Sample Xplorer.[2]



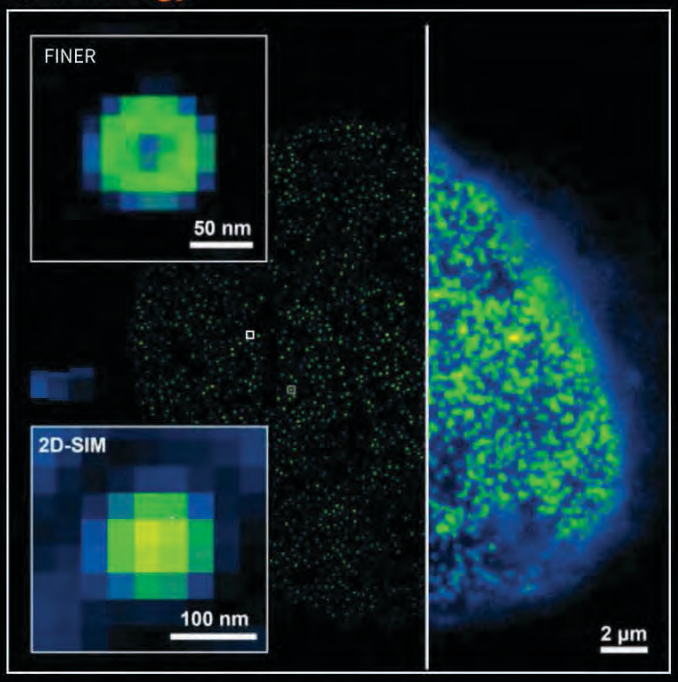
[1] Original technology: Weisong Zhao *Nature Photonics* , 2023. Refer to P4.

[2] Refer to P11-12.

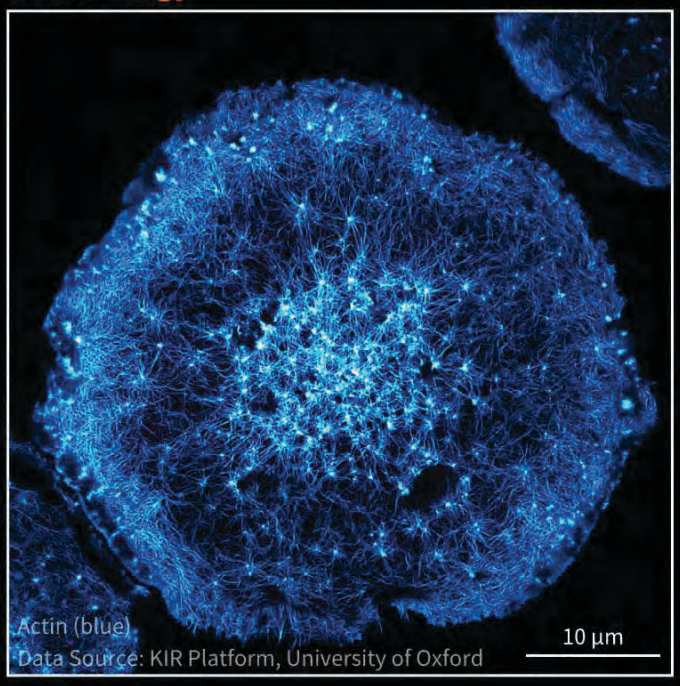
Broad Applications Across Life Sciences

Cell Xpanse empowers life science research across diverse domains – including microbiology, cell biology, plant biology, embryo & organoid research, and model animals studies – combining both MI-SIM super-resolution with high throughput confocal optical sectioning capabilities in one versatile platform.

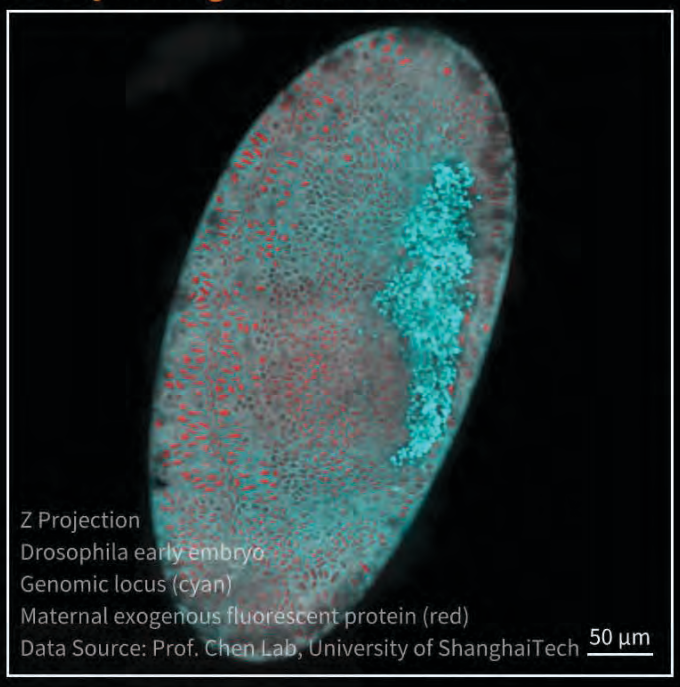
Cell Biology



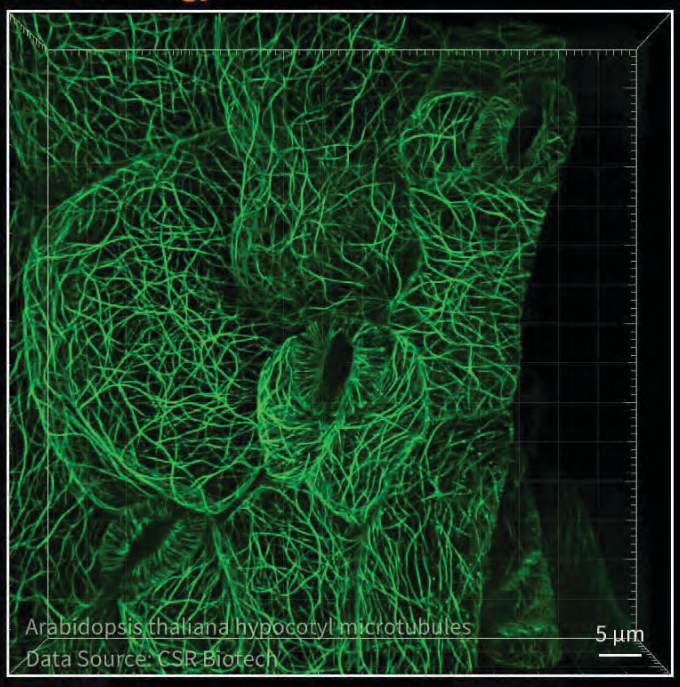
Cell Biology



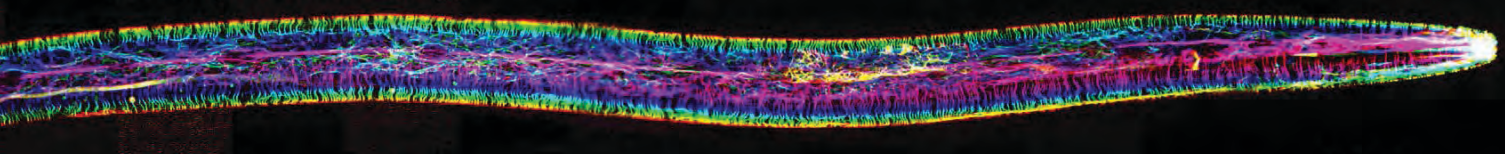
Embryo & Organoid Research



Plant Biology



Developmental Biology



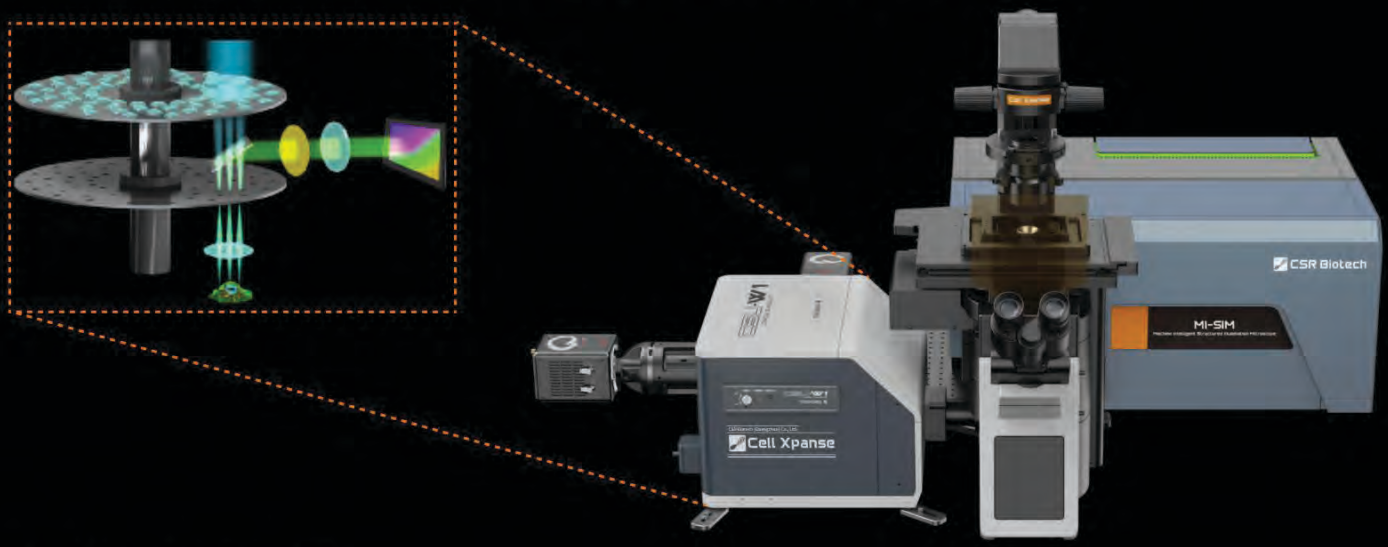
Z Projection
Live C. elegans microtubules
Data Source: CSR Biotech

Cell Xpanse: Dual-Modality SIM + Confocal Imaging System

Cell Xpanse is an all-in-one super-resolution system that integrates MI-SIM structured illumination technology with Yokogawa spinning disk confocal, delivering exceptional performance and versatility. Through its hardware integration, software fusion, and intelligent control design, Cell Xpanse unifies SIM and spinning disk modalities into a cohesive imaging system, offering a revolutionary experience in cross-scale, high-throughput, super resolution imaging.

Compared to single spinning disk systems using only arrayed pinholes, the microlens-enhanced dual spinning disk unit provides three key advantages:

1. Enables highly efficient laser-pinhole coupling, enhancing excitation light utilization.
2. Condenses the excitation Airy disk for sharper and smaller spots, improving resolution and reducing sample photo stress.
3. Reduced pinhole cross talk, for improved imaging performance on thick samples.



Hardware Integration

Utilizes a unified laser source to support both SIM and confocal imaging with real-time control

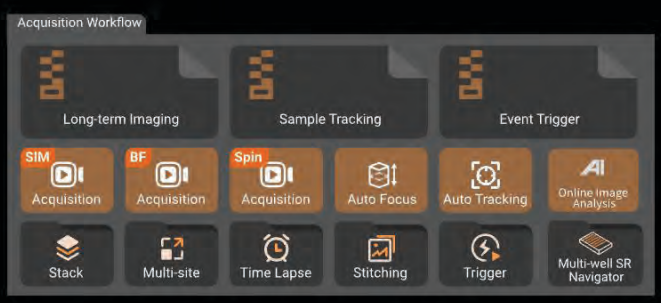
Integrated optical detection path, enabling SIM and Confocal to share common emission filters and detectors.



Software Fusion

One software for both modalities

A single platform deeply integrates all imaging modes of confocal and SIM, enabling seamless switching between modalities while delivering a streamlined, efficient, unified imaging workflow.

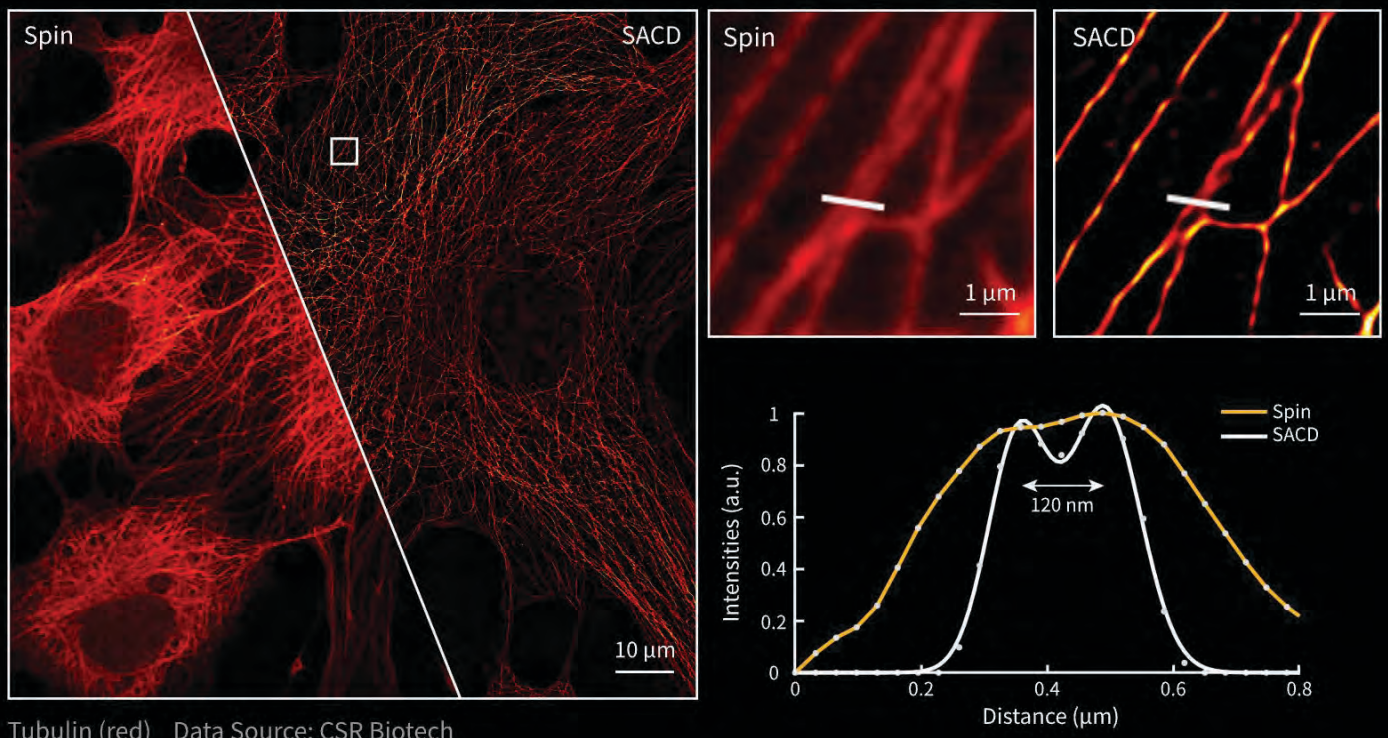


Synergistic Imaging

Both SIM and confocal modes offer specific applications advantages. Cell Xtreme enables you to synergistically combine both techniques into a single workflow offering improvements in both efficiency and performance.

SACD: Super Resolution Spinning Disk Confocal

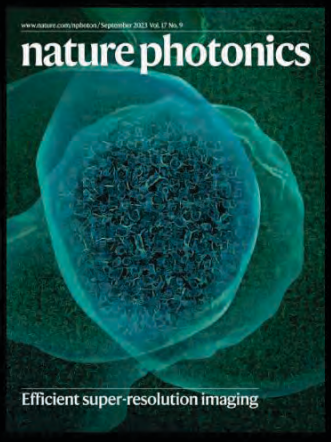
CSR Biotech's proprietary SPIN-SACD technology (Super resolution imaging based on Auto Correlation with two-step Deconvolution)[1] reconstructs a single super-resolution image from multiple frames by leveraging the physical characteristics of fluorescence fluctuation. The method enhances spatial resolution by approximately two-fold with minimal spinning disk confocal images. SPIN-SACD technology is fully integrated into Imager software and can be activated with the click of a button. SACD overcomes the traditional trade-off between throughput and resolution, enabling high-throughput confocal super-resolution imaging across diverse samples and scales.

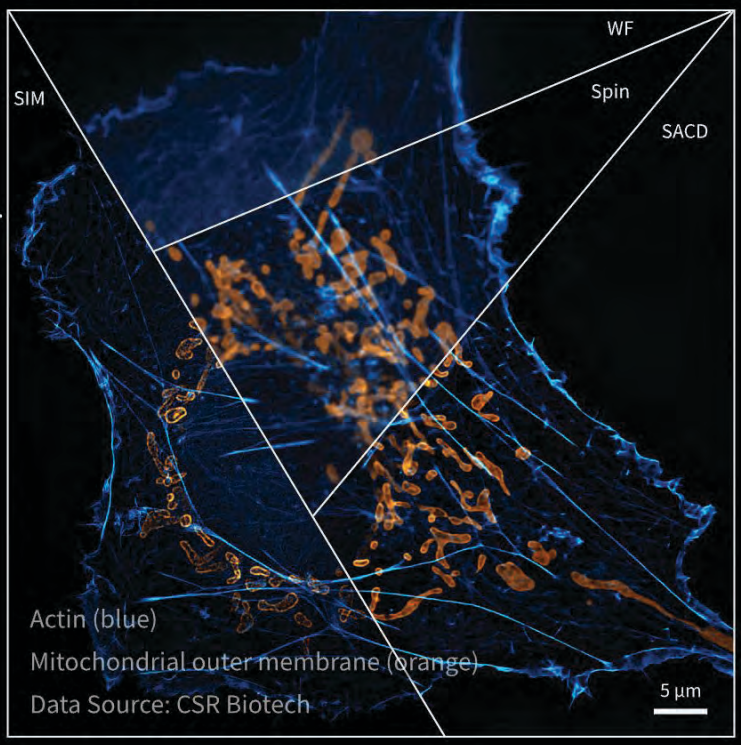


Tubulin (red) Data Source: CSR Biotech

Spin-SACD – An Original Technology Developed by CSR Biotech

By capturing just 20 consecutive spinning disk confocal frames and applying a novel fluorescence-fluctuation-based reconstruction algorithm, it achieves 120 nm spatial resolution with minimal phototoxicity and high throughput.





Actin (blue)
Mitochondrial outer membrane (orange)
Data Source: CSR Biotech

[1] Weisong Zhao et al, *Nature Photonics*, 2023.

Streamlined Imaging Workflow: Unified → Intelligent → High-T

Cell Xpanse delivers unified imaging control and a streamlined workflow, enabling users to seamlessly switch between all available imaging modes for real-time preview.

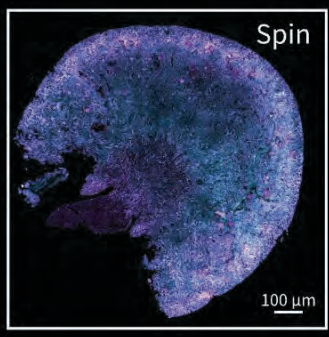
Including Brightfield, FL- Wide-field, TIRF, Confocal, Spin-SACD, 2D-SIM, 3D-SIM, and TIRF-SIM – enhancing experimental efficiency while eliminating the need for sample transfers between different instruments.

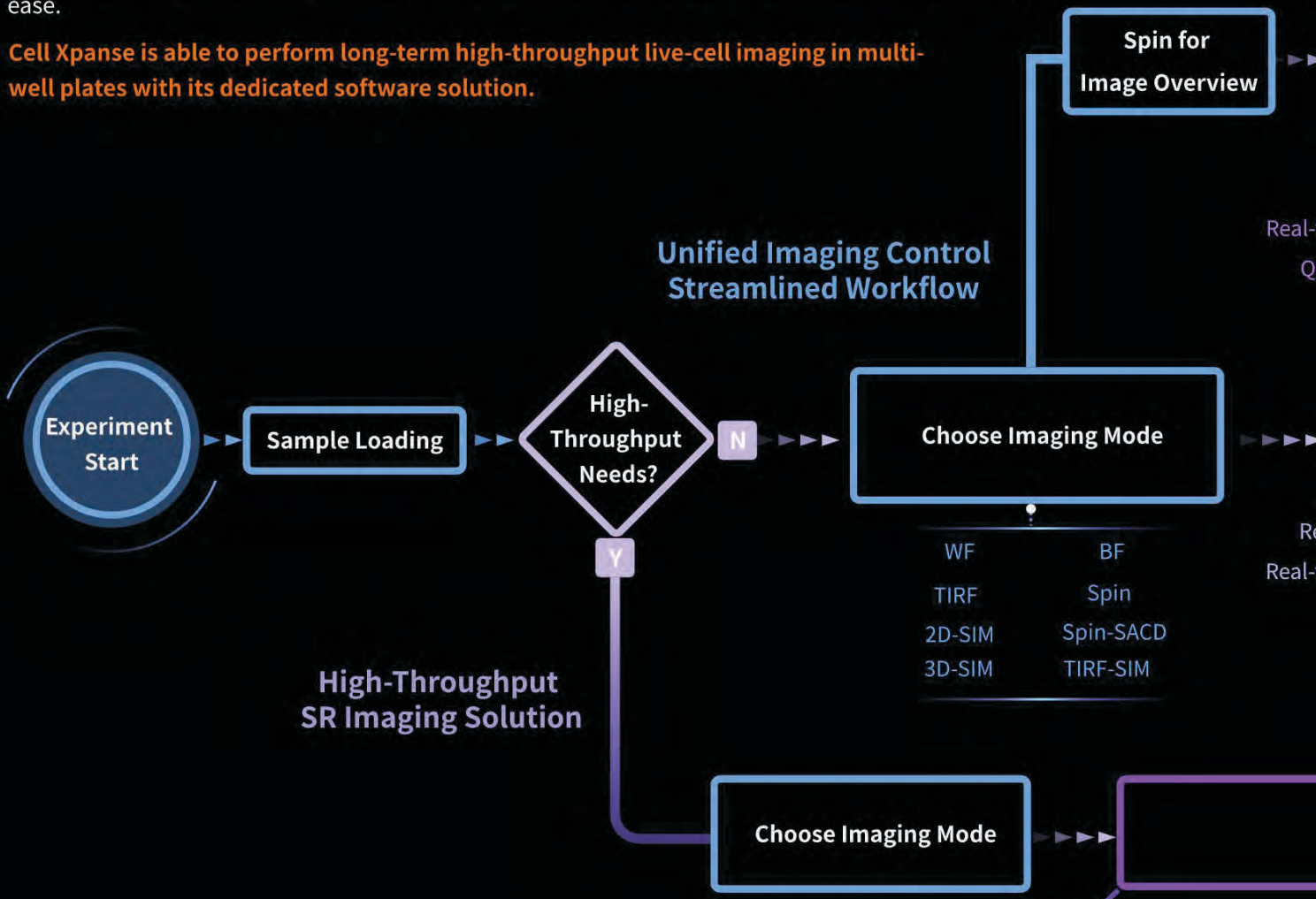
Cell Xpanse integrates CSR Biotech's latest advanced imaging functions.

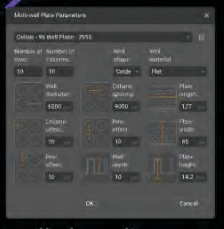
Including multi-position, auto-focusing, sample-tracking, image stitching, event base triggering, multi-site advanced time lapse tools, multi-modal imaging, and complex self-assembling well plate imaging workflows.

These capabilities are designed to deliver highly customizable solution for long-term, high-throughput live-cell imaging, enabling researchers to execute complex automated workflows ease.

Cell Xpanse is able to perform long-term high-throughput live-cell imaging in multi-well plates with its dedicated software solution.

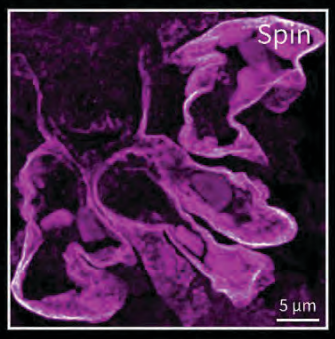


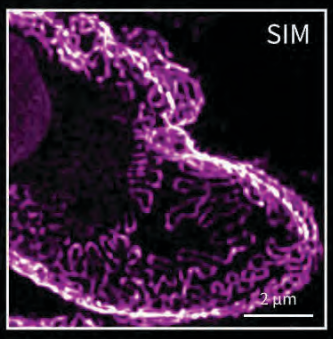




Well Plate Alignment

hroughput





Zoom in for ROI

Seamlessly Switch to SIM

Parameter Setting

time Vignetting correction
uick Scanning Preview
AI Object Detection

Overview

Auto Focus
Auto Tracking
AI Processing
Event Trigger

Batch Processing
AI Segmentation
Statistical Analysis
Visualization

Preview

Intelligent Imaging

Image Acquisition

Data Processing

Experiment End

eal-time SIM SR Preview
time Spin Denoise Preview

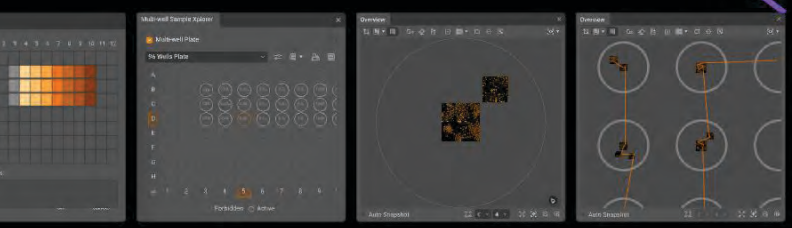
Joint Imaging
Self-Assembly

Parameter Setting

Customized Parameter

Time Loops • Channel • Layer
Multi-Site • Stitching • Mapping
Auto Focus • Auto Tracking • Event Trigger
Self-Assembly Workfow

Multi-well Sample Xplorer

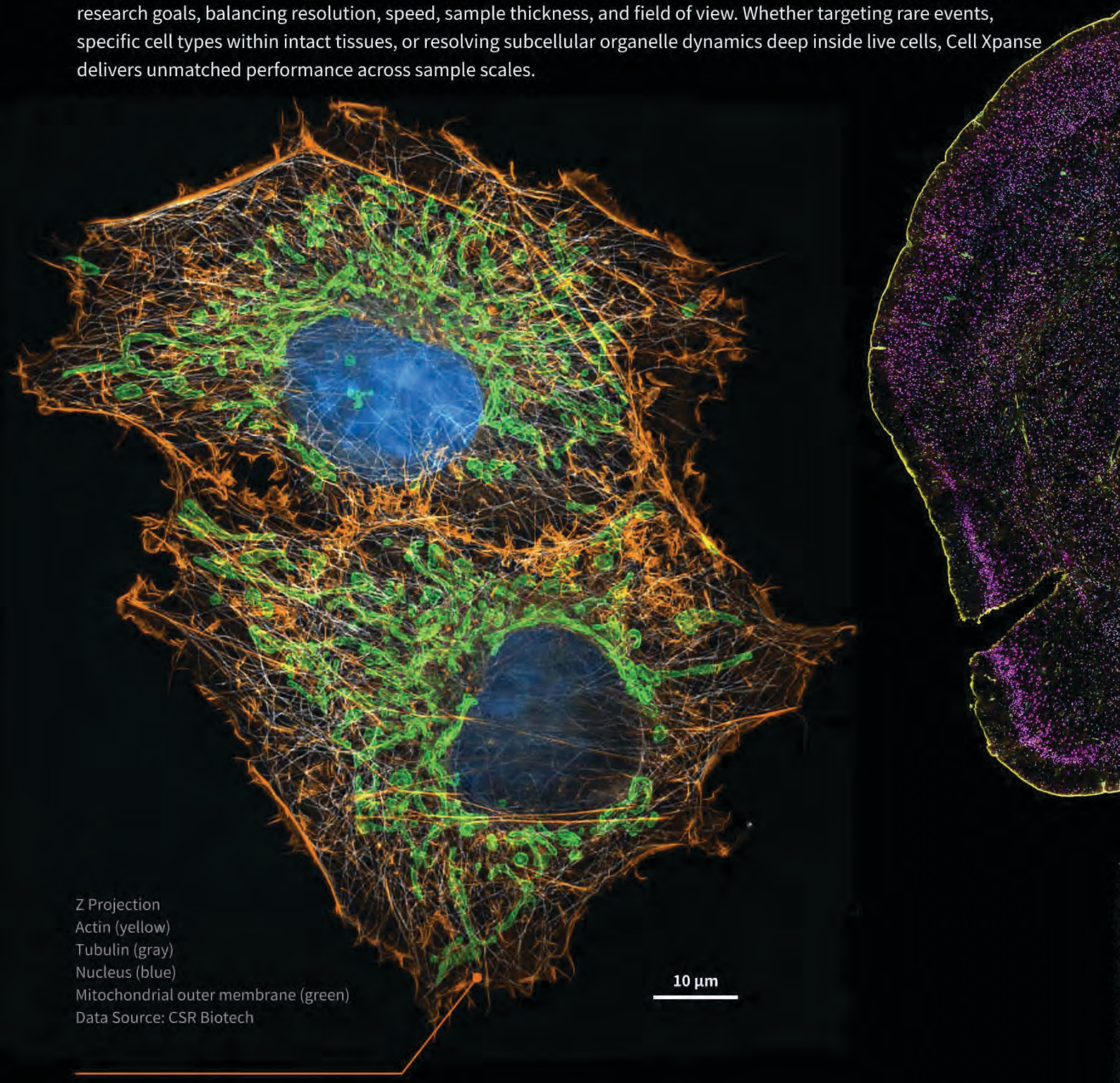


ing & Marking | Well Selection | Snapshot | Imaging

Cell Xpanse Advancing Life Science Research

Imaging without Limits: From Macro to Nano

Through innovative optical design, Cell Xpanse seamlessly integrates laser illumination, Multi camera detection and multiple imaging modalities, all controlled via a unified software interface. Researchers can take advantage of exceptional flexibility offering the freedom to select the optimal imaging mode to match sample characteristics and research goals, balancing resolution, speed, sample thickness, and field of view. Whether targeting rare events, specific cell types within intact tissues, or resolving subcellular organelle dynamics deep inside live cells, Cell Xpanse delivers unmatched performance across sample scales.



Cell Xpanse achieves 60 nm super-resolution using conventional fluorescent probes and standard sample preparation. Its 3D-SIM mode resolves subcellular structures like microfilaments, microtubules, nuclei, and mitochondrial membranes in cells with nanoscale clarity.

Seamless Imaging Across Scales



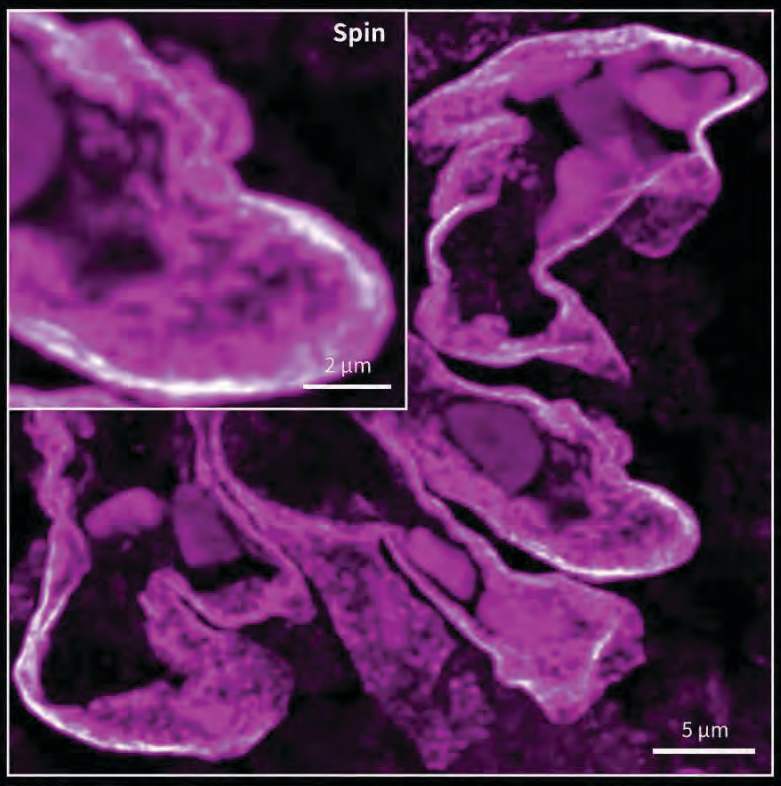
Cell Xpanse's Spin mode enables large FOV stitching of intact mouse brain sections

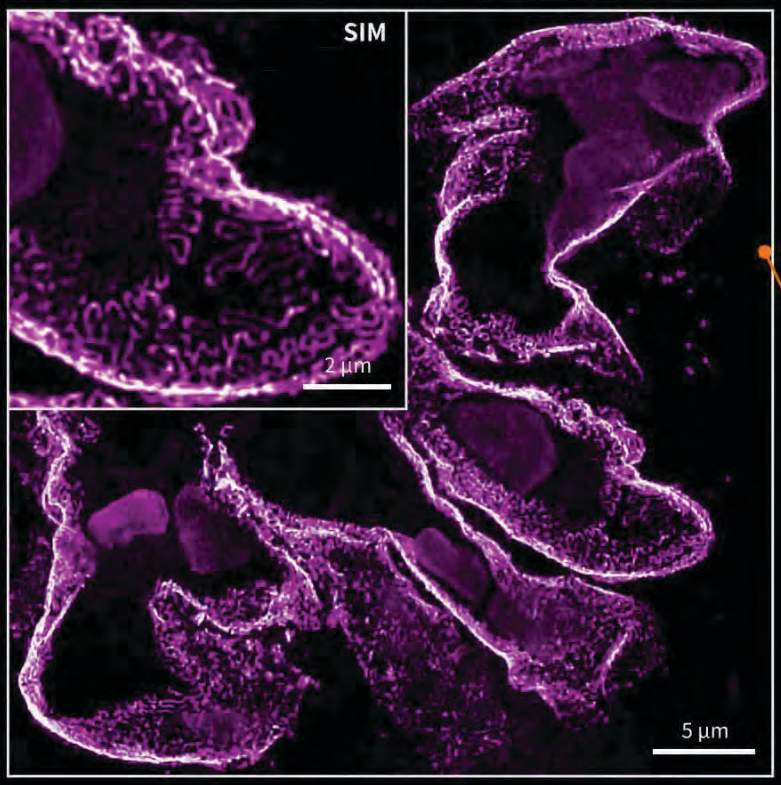
Nucleus (cyan)
Microglia (yellow)
Neuronal nuclear localization marker (purple)
Data Source: CSR Biotech

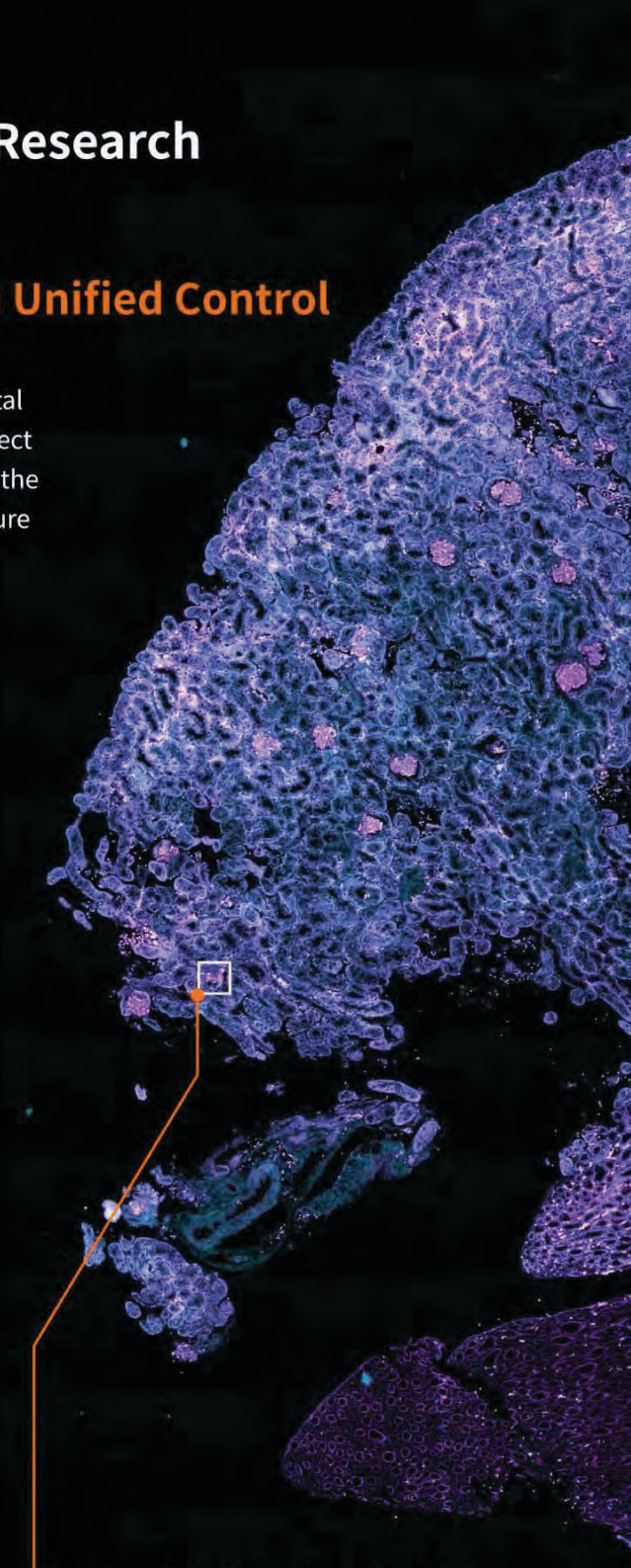
Cell Xpanse Advancing Life Science Research

Maximize Experiment Effectiveness with Unified Control

Cell Xpanse's unified imaging control significantly enhances experimental efficiency: researchers can rapidly scan large samples in SPIN mode, select regions of interest from Images, then progressively zoom in and choose the optimal imaging modality (Spin, Spin-SACD, 2D, 3D or TIRF SIM) to capture the precise data required for their research.

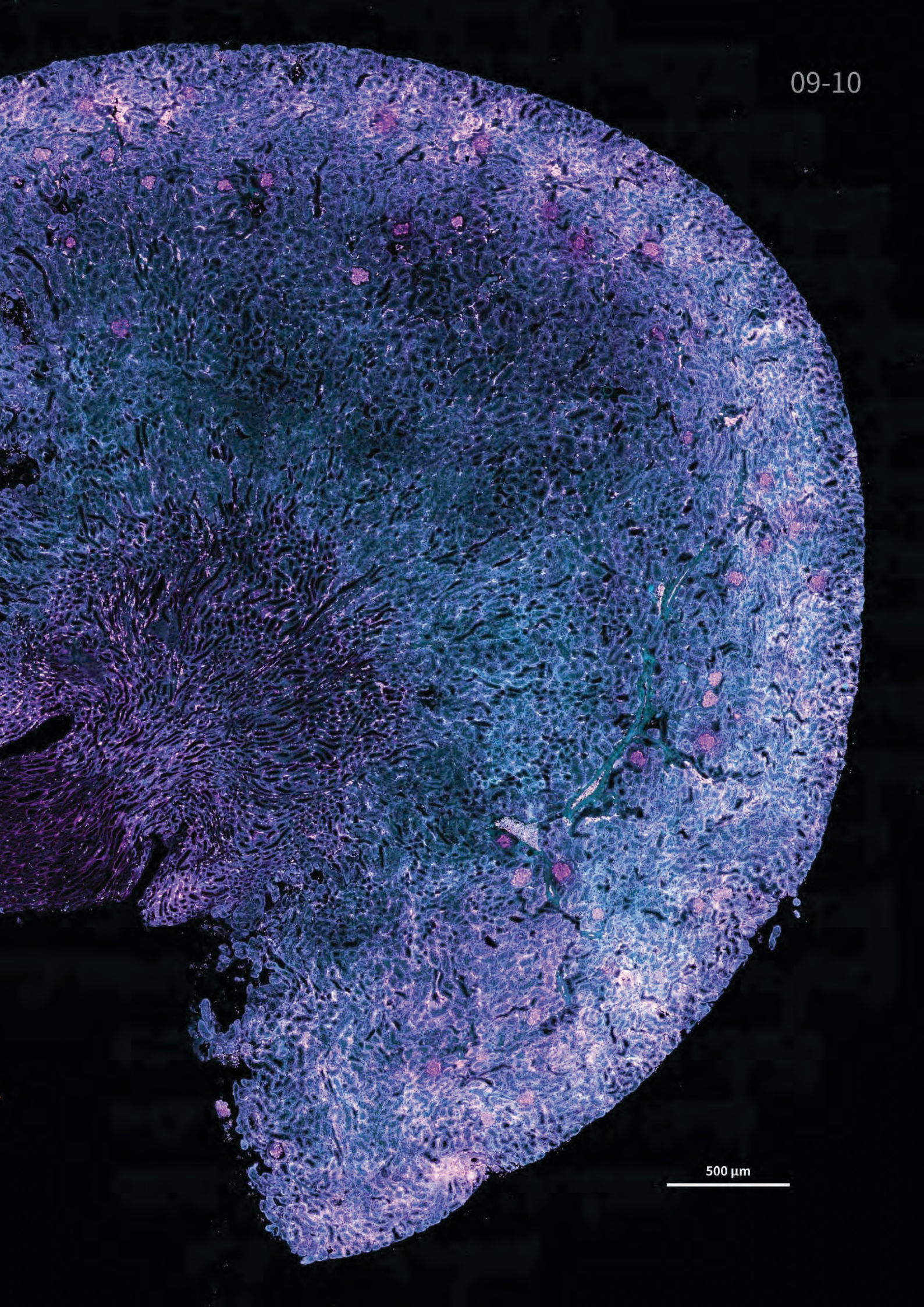






Cell Xpanse's Spin mode performs large FOV stitching imaging of intact kidney sections, enabling rapid localization and selection of target glomerular ROIs. With one-click switching to SIM mode, super-resolution imaging clearly resolves podocyte foot process structures.

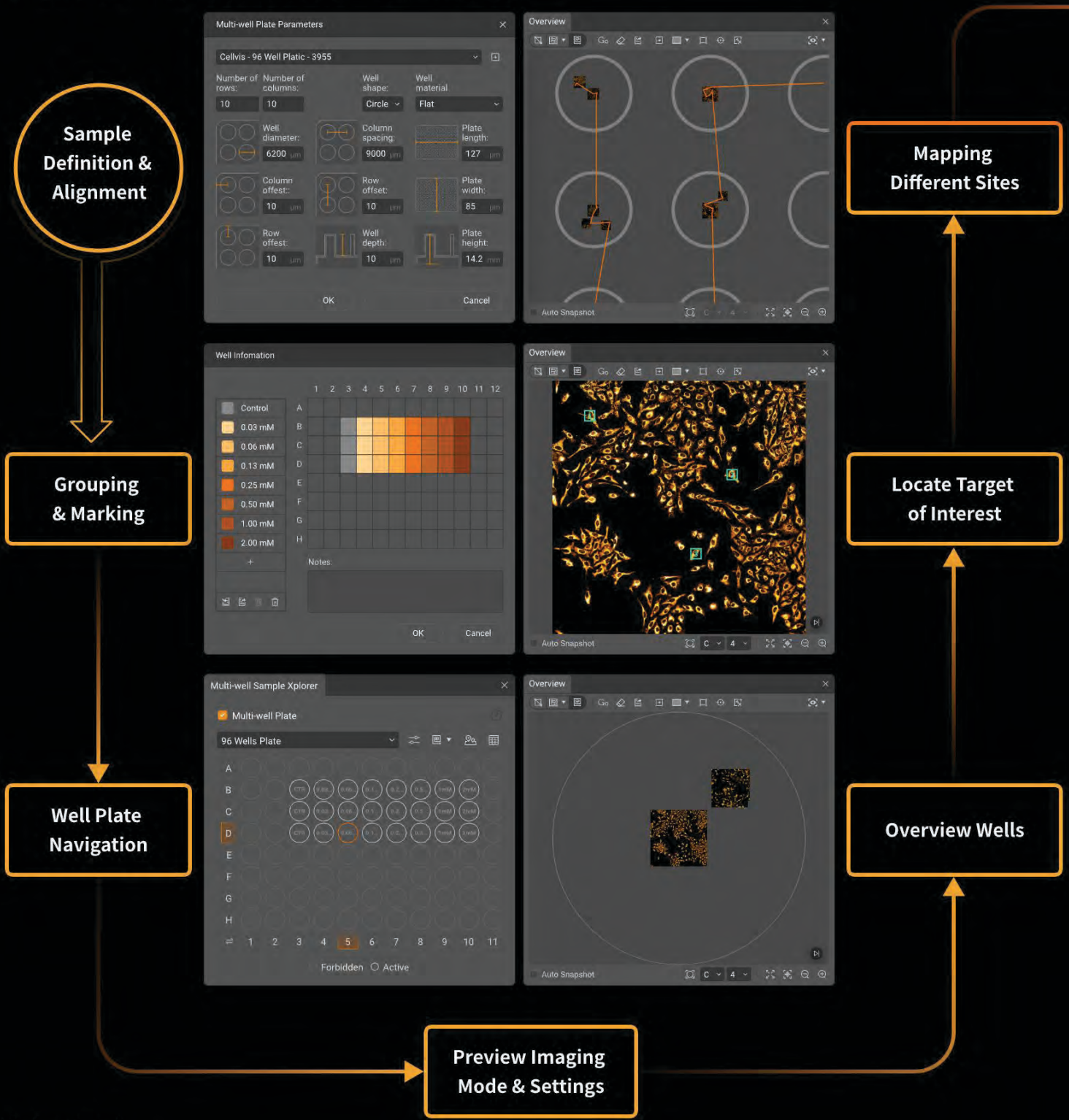
Z Projection
Synaptopodin (magenta), WT1 (blue)
Data Source: CSR Biotech


500 µm

Cell Xpanse: Tailored for High-Throughput Live-Cell Super Reso

The unique mechanism and pathological relevance of ferroptosis have made it a critical research focus for therapeutic interver death is the specific morphological alteration of mitochondria. Cell Xpanse enables high-throughput, super-resolution & longt cristae—and provides end-to-end quantitative analysis.

Cell Xpanse offers the advanced workflow tool—Multi-well Sample Xplorer—designed for multi-well plate imaging. It allows us complex, high-throughput, live-cell super-resolution assays.



Nucleus (cyan)

Mitochondrial inner membrane (yellow)

Data Source: CSR Biotech

lution

ntion in multiple diseases. A defining feature distinguishing ferroptosis from apoptosis, pyroptosis, and other forms of cell erm imaging of key mitochondrial features during ferroptosis—such as mitochondrial shrinkage and reduction or loss of

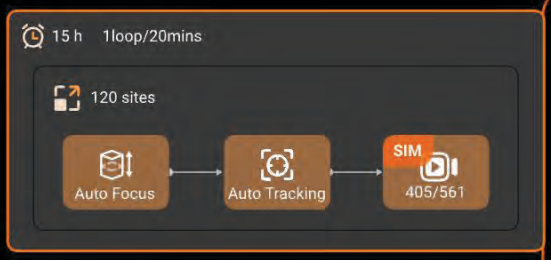
ers to select wells of interest, imaging modes, adjust image parameters, and customize workflows to conduct a wide range of

Self-Assembly High-Throughput Workfow

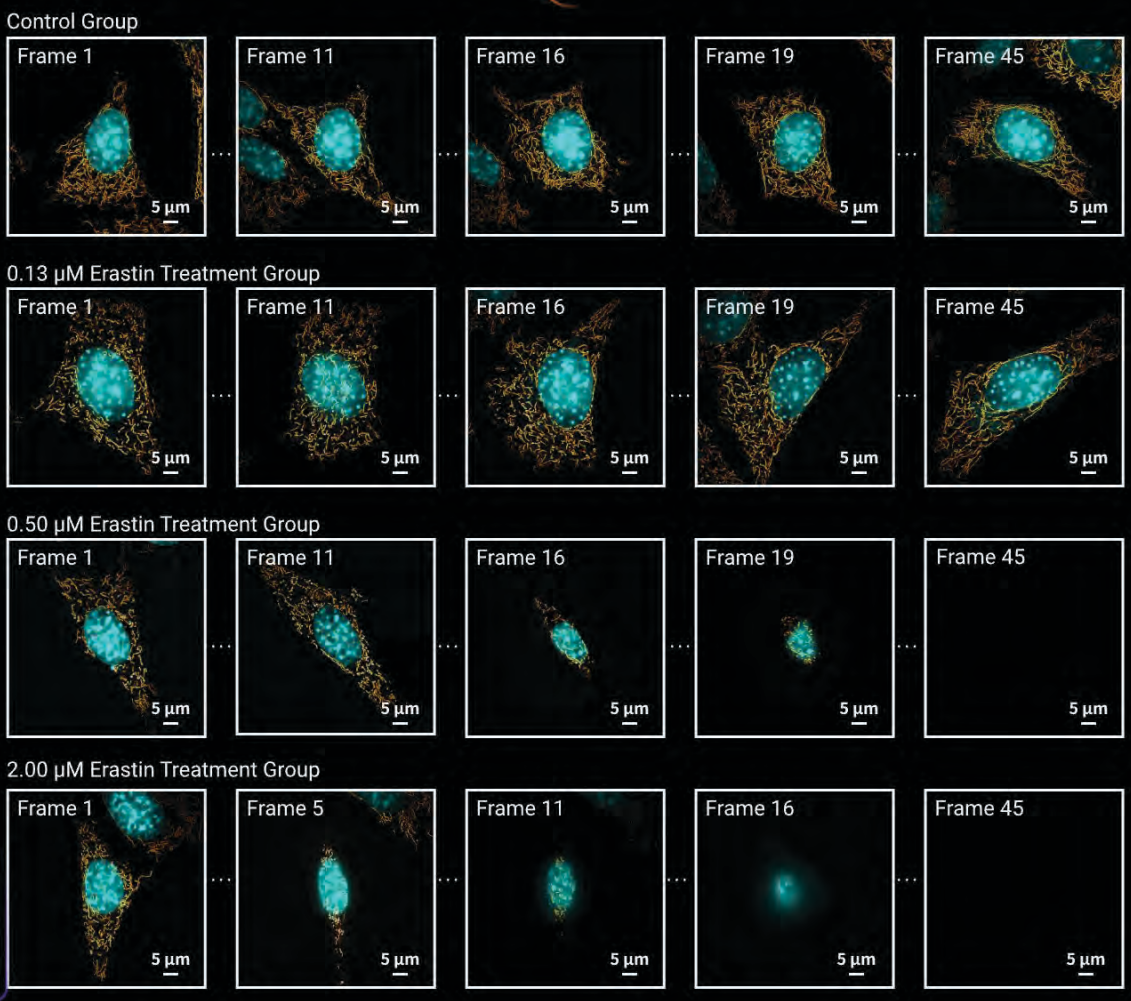
Multi-site Time Lapse Imaging with Auto Tracking

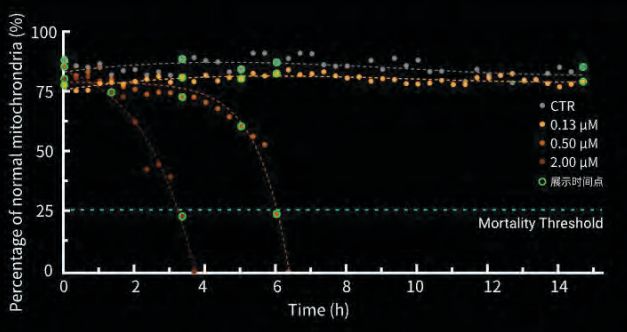
Image Acquisition Batch Reconstruction & Processing

Data Analysis & Experiment Report

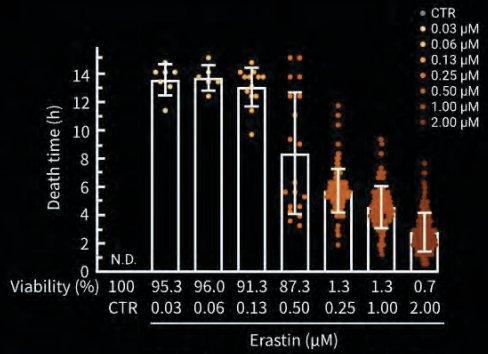


High-Throughput Time Lapse Imaging Workflow: Utilizing multi-channel SIM, the system performed imaging of 120 selected sites across 24 wells at 20-minute intervals over 15 hours. The system employs auto focus and auto tracking before every acquisition cycle to ensure sustained precision throughout the experiment.





Demonstrate full-time morphological dynamics of mitochondria at four representative sites from control and different concentration groups



Cell Viability and Death Kinetics under Erastin Concentration Gradient

Cell Xpanse: AI-Powered Machine Intelligence Microscope

Automatically Detects Rare Events for Enhanced Efficiency

The Trigger module comprises "Imaging Monitoring" and "Imaging Task" – each configurable with distinct parameters including imaging channels, laser intensity, exposure time, Z-stack scanning, duration, and intervals. Based on real-time image analysis results, **Cell Xpanse autonomously determines whether to advance to the data acquisition phase.**

Multi-Site Imaging
Trigger combined with multi-site imaging, enhances data collection efficiency and reduces photo stress in long-term experiments.

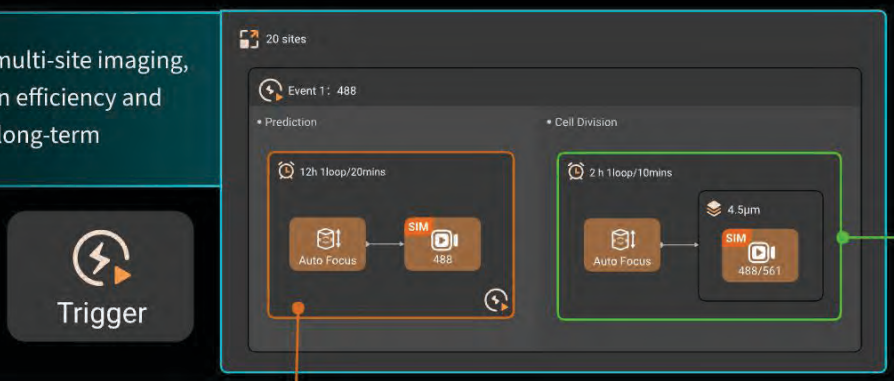
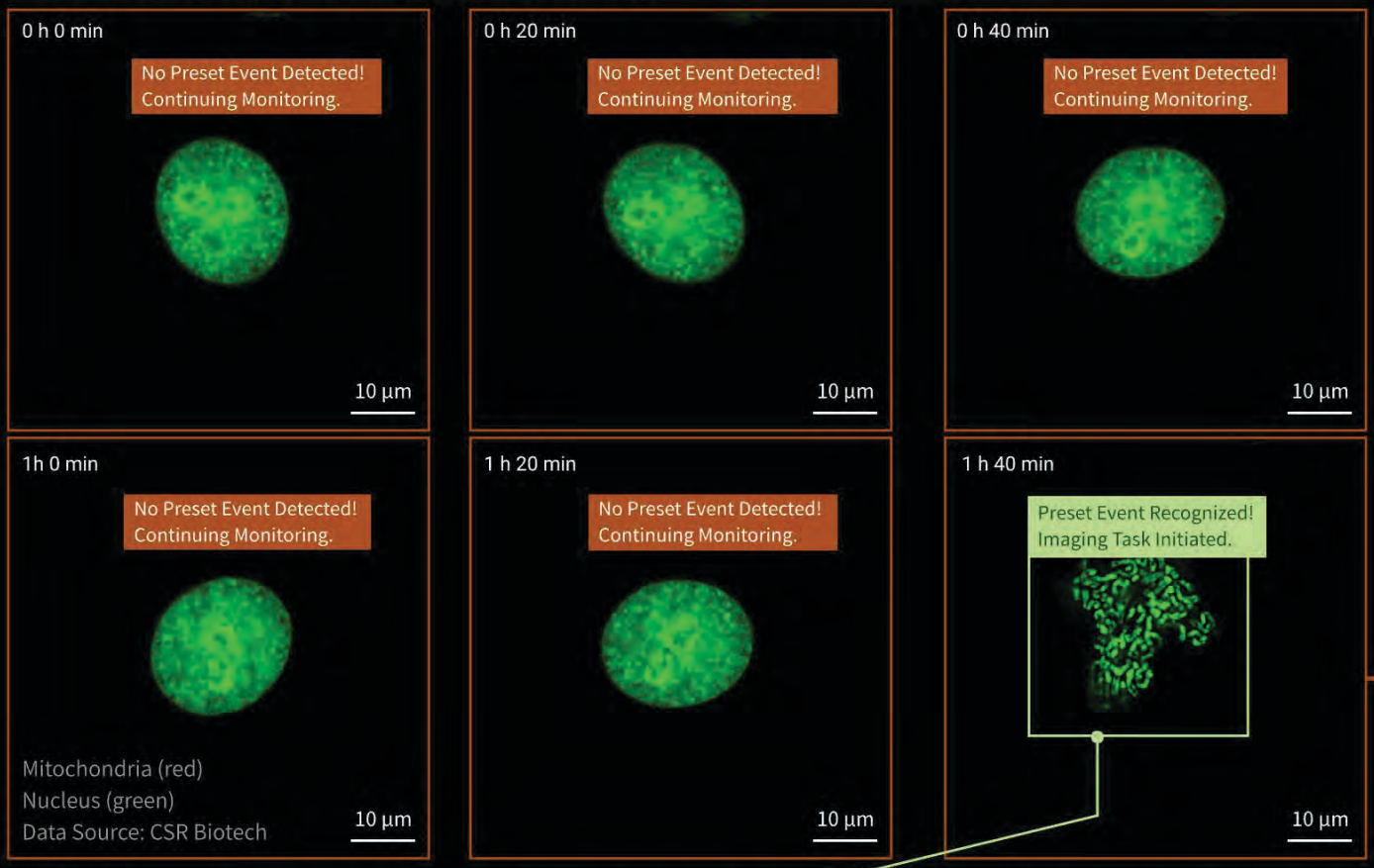


Image Monitoring Phase:
Cell Xpanse acquires a single channel using SIM over a duration of 12 hours at 20-minute intervals. The system uses online image analysis (OIA[1]) using deep learning algorithms to monitor cell division events. Once an event is detected, Cell Expanse automatically transitions to the acquisition stage.



Cell Xpanse's Trigger mode increases imaging efficiency by reducing acquisition frequency and light exposure during non-critical periods. This capability reduces sample photo stress, extending your observation window, enabling you to save your photon budget for imaging events of interest. This enables you to acquire higher quality data from healthier cells, resulting in higher quality experimental data.

[1] OIA: Online Image Analysis

Event Trigger Imaging

The Powerful Event Trigger Module Enables A New Era of Autonomous Feedback Microscopy

Deep Learning-Based Event Trigger Module:

Equipped with preconfigured evens including cell division and apoptosis, the module allows users to define custom trigger conditions and train specialized models – such as fluorescence intensity shifts in designated channels, multi-channel co-localization, or morphology-driven cellular dynamics.

Integrating real-time image acquisition, computational processing, segmentation and recognition, deep learning-driven decision-making, and automated hardware control, the Trigger module enables a new era of intelligent, autonomous imaging without the need for manual intervention.

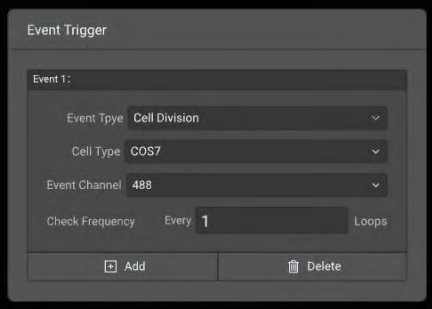
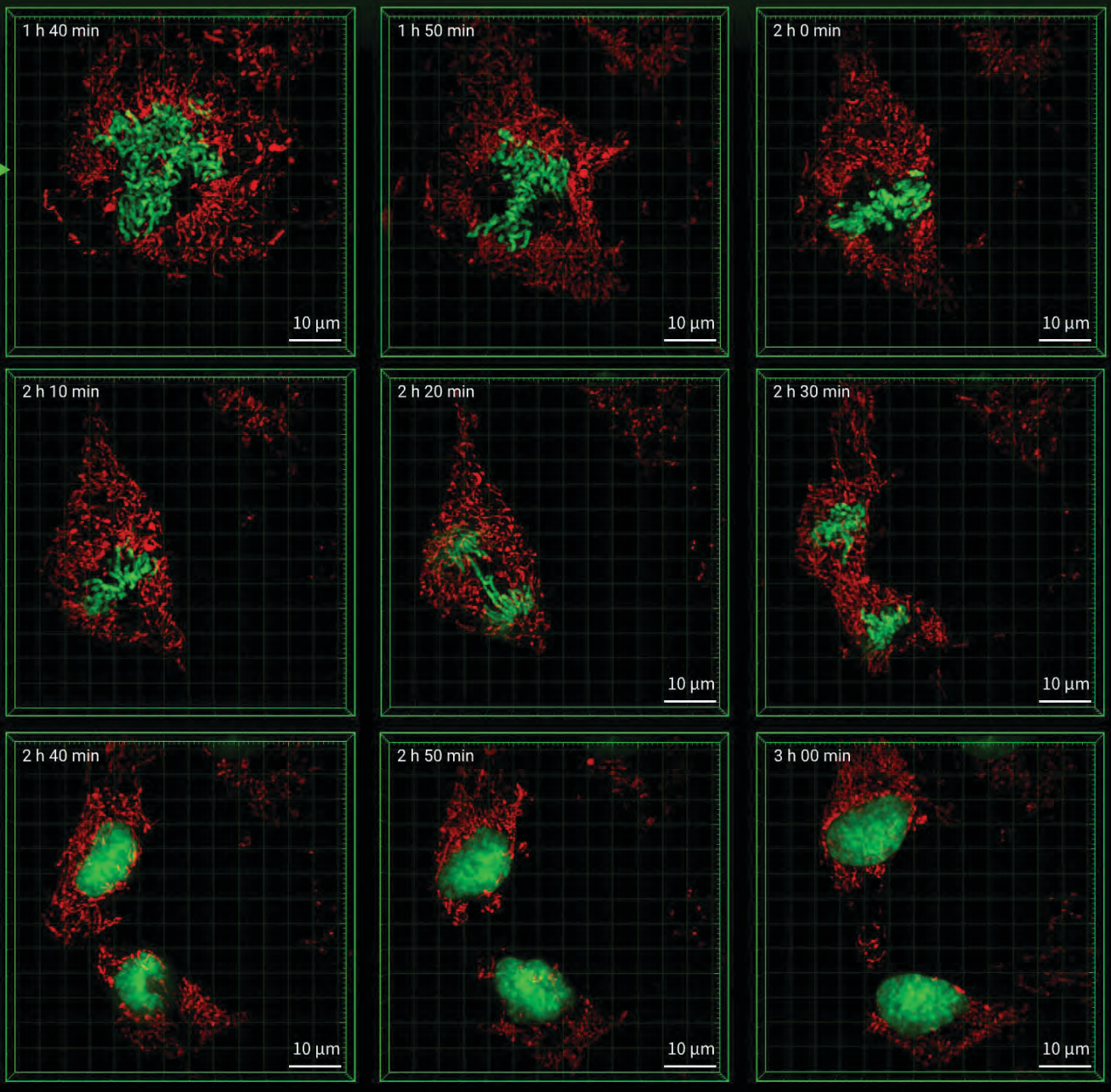


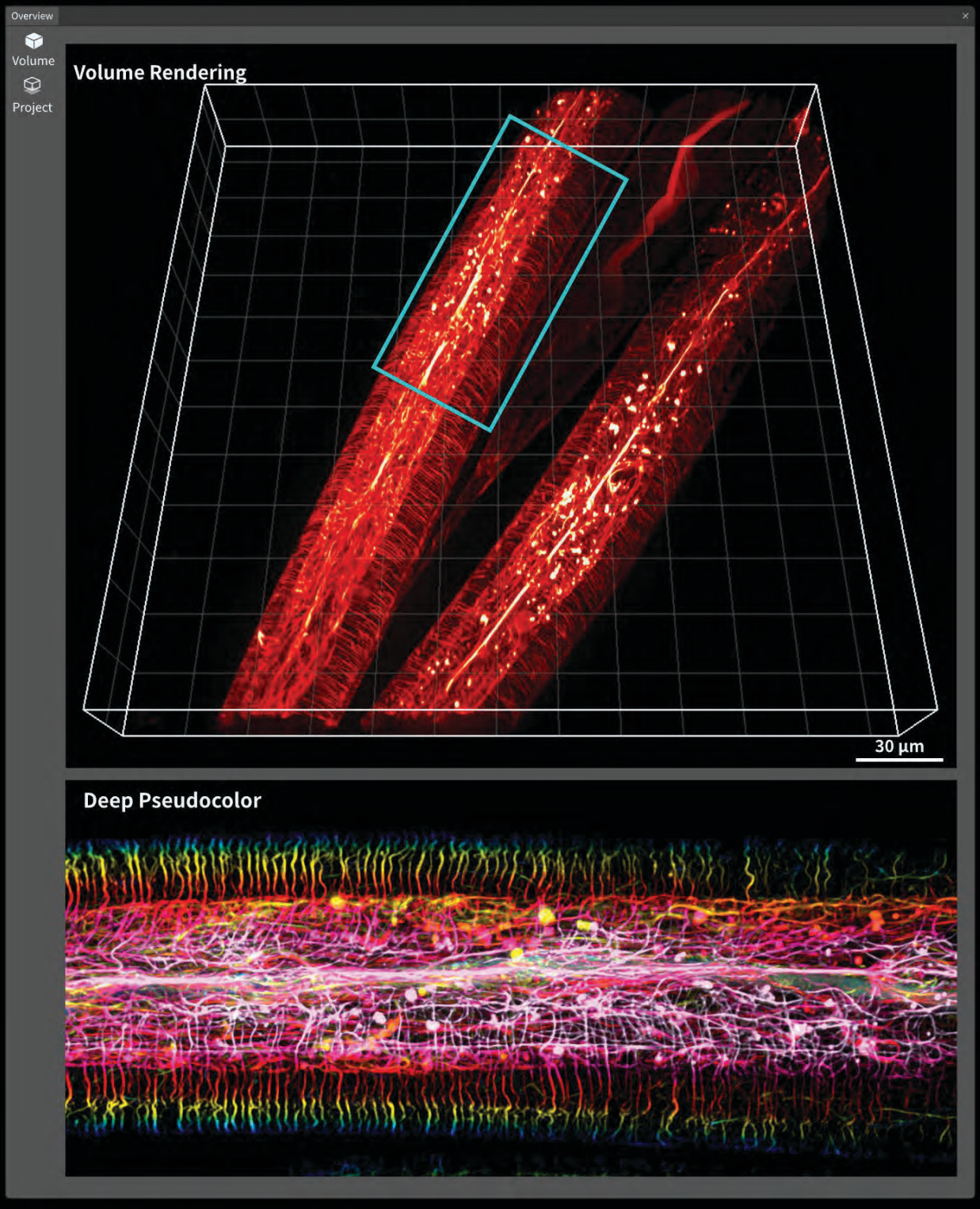
Image Acquisition Phrase:
Upon successful event recognition, Cell Xpanse automatically switches to SIM mode for dual-channel (488/561 nm) Z-stack imaging at 10-minute intervals



Cell Xpanse Advancing Life Science Research

Visualizaiton

Cell Xpanse is enhanced by its dedicated FINER software, offering a comprehensive suite of visualization tools including volume rendering, surface rendering, projection, and tri-planar views. It supports the export of high-quality images and videos. With its powerful 4D visualization capabilities, FINER enables users to intuitively explore and understand all the information embedded within their imaging data.



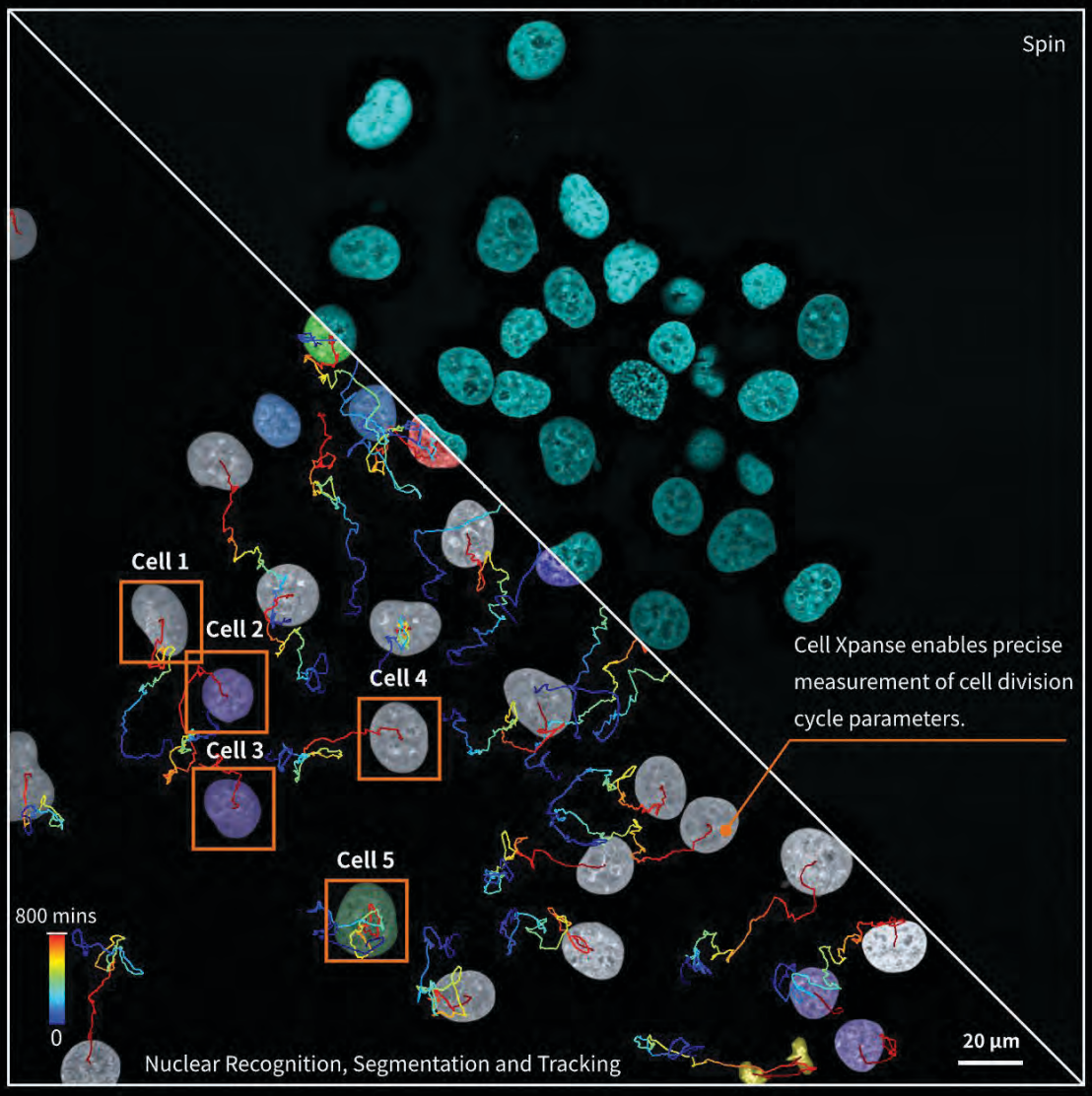
Sample Type: C. elegans microtubules

Data Source: CSR Biotech

Live-Cell Division Cycle Tracking and Analysis

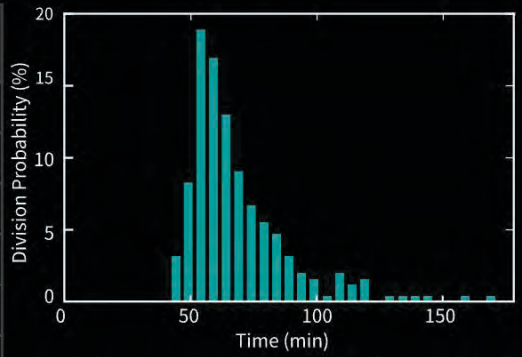
Decoding dynamic features of the cell division cycle holds huge importance for cancer drug screening and target discovery. The AI-powered recognition and analysis module of the Cell Xpanse system enables comprehensive multi-parameter quantification of cell division processes, including division index, cell cycle phase distribution, division duration statistics, nuclear counts and area measurements, fluorescence intensity quantification, and nuclear movement trajectories.

Nucleus (cyan) Data Source: CSR Biotech



Cell ID	Average fluorescence intensity	Area(µm²)	Major Axis(µm)	Minor Axis(µm)	Devision State
1	1302.21	255.69	23.03	14.26	No
2	1122.00	186.51	15.92	14.93	Yes
3	884.18	223.26	18.60	15.34	Yes
4	1422.87	284.47	21.21	17.09	No
5	1211.26	323.61	22.16	18.70	Yes
. . .	. . .	. . .	. . .	. . .	. . .

Cell Xpanse's AI-powered recognition and analysis module supports export of all or user-defined targets, with quantitative statistics.



Cell Xpanse's AI-powered recognition and analysis module delivers quantitative statistics on the duration and proportion of complete live-cell division cycles.

Cell Xpanse Empowering Scientific Discovery

CSR Technologies Empowering Research with 159 Publications

Spanning diverse fields including: Life Sciences (105) Chemical Probes (19) Clinical Medicine (17)

Imaging Algorithms (9) Microbiology (4) Reviews (4)

Imaging Technology (1) Plant Science (1).

Featuring multiple cover articles in top-tier journals such as *Science, Cell, Nature* and their family journals.











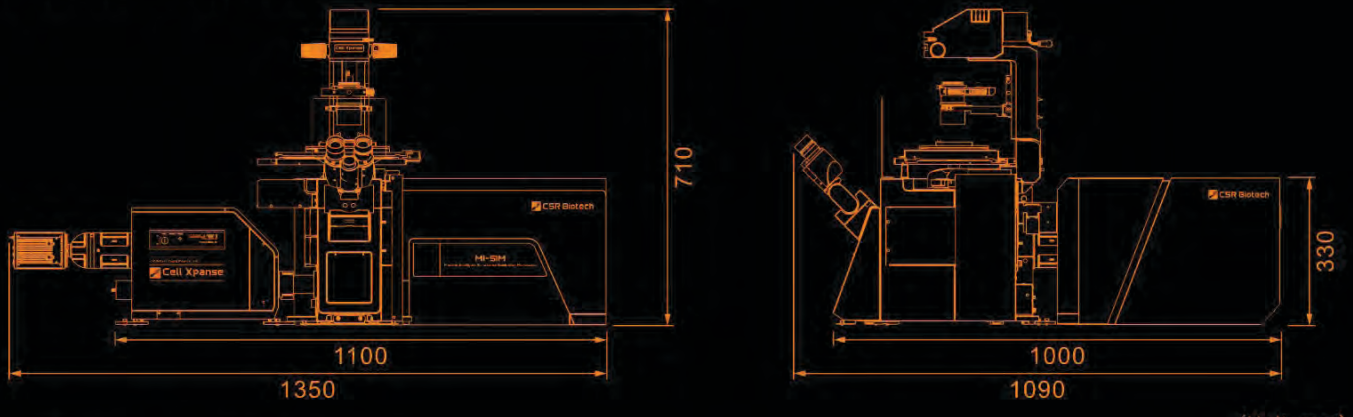
Cell Xpanse Applicable Sample Types

Sample Type	Typical Applications	Imaging Thickness	Imaging Modes
Cell membrane and associated structures	Ultra-thin sample dynamics receptor racking ……	0~200 nm	Multi-angle TIRF Multi-angle TIRF-SIM Optional FINER reconstruction
Live animal/plant cells Fixed animal/plant cells Microorganism	Ultra-shallow sample SR dynamics imaging Multidimensional SR observation of organelles High-throughput SR imaging ……	200 nm~10 μm	Multi-angle 2D-SIM Multi-angle 3D-SIM Spin Spin-SACD Optional FINER reconstruction
Tissue sections	Cross-scale imaging High-throughput large FOV imaging ……	5~50 μm	
Embryos Organoids	Thick sample deep imaging Long-term high-resolution developmental observation ……	⩾50 μm	Spin Spin-SACD Optional FINER reconstruction
Model organisms Cleared/ Expanded samples	Ultra-thick sample volume imaging Large sample fine mapping ……	⩾100 μm	

Cell Xpanse Specifications

Imaging Mode	Brightfield Fluorescent Widefield: including oblique widefield TIRF: multiple angles TIRF-SIM: multiple angles, real-time preview 2D-SIM: including 2D-SIM Slice, 2D-SIM Stack, multiple angles, real-time SR preview 3D-SIM: including 3D-SIM Slice, 3D-SIM Stack, multiple angles, real-time SR preview		Spin Spin-SoRa Spin-SACD	
Resolution [1]	Spin	XY: 150 nm; Z: 280 nm		
	Spin-SoRa	XY: 100 nm; Z: 280 nm		
	Spin-SACD	XY: 120 nm; Z: 280 nm		
	TIRF-SIM & 2D-SIM & 3D-SIM	XY: 60 nm; Z: 200 nm		
Imaging Speed	Equipped with Yokogawa Spinning Disk Module	Max. 400 fps	8 bit/Limited ROI	Optional Cameras: Kinetix ORCA-Flash 4.0V3 ORCA-Fusion/Fusion BT
		Max. 100 fps	16 bit/2048 × 2048	
		Max. 89 fps	16 bit/2304 × 2304	
	Equipped with SIM Structured Illumination SR Module [2]	Max. 1500 fps	8 bit/206 × 4608	
		Max. 49 fps	16 bit/2048 × 2048	
		Max. 25 fps	16 bit/4608 × 4608	
	Equipped with Max. 3000 fps Spinning Disk Module			
Field of View	Max. 150 × 150 μm @100 × objective Max. 250 × 250 μm @60 × objective Optional homogenizer module available for both SIM and Spin			
Illumination Sourse [3]	Integrated multi-color excitation laser source, maximum of 6 lasers supported Standard: 405 nm, 488 nm, 561 nm, 640 nm Optional: 445 nm, 473 nm, 515 nm, 532 nm, 594 nm, 607 nm, 647 nm, 808 nm, 980 nm			
Objectives	10-100 × objectives for multi-modality imaging, compatible with immersion of air, water, silicone oil, oil etc.			
Multi-Channel Imaging	Single-camera imaging: High-speed multi-color sequential acquisition via filter wheel Optional dual-camera imaging: multi-site, multi-channel synchronous or asynchronous acquisition, compatible with single-camera imaging.			
Microscope	Evident IX83 / Evident IX85 / Nikon Ti2-E			

Product Dimensions

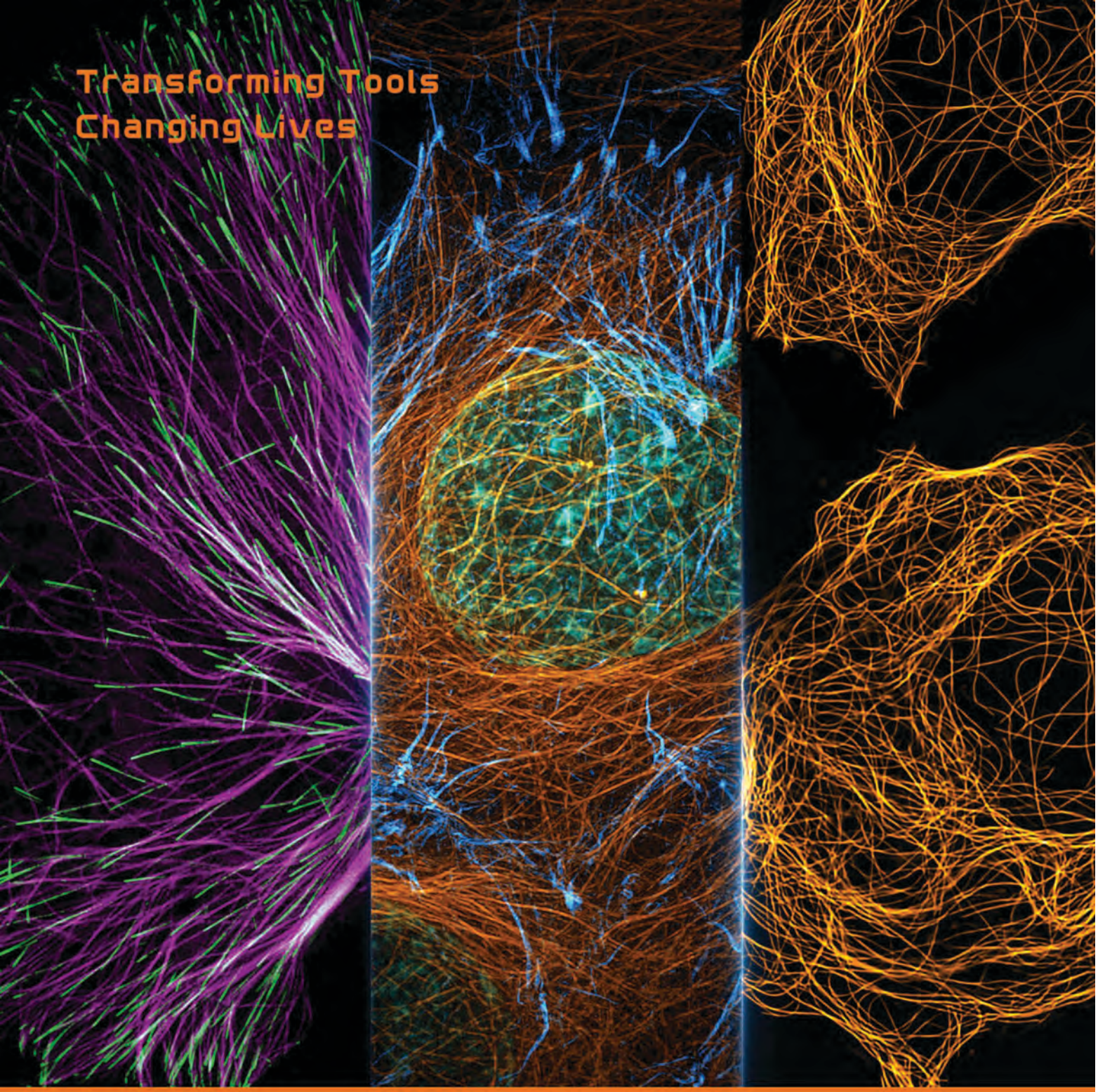


(Unit: mm)

[1] Resolution after FINER reconstruction

[2] MI-SIM reconstruction with Rolling can achieve ultimate speed

[3] It is compatible with common fluorescence excitation wavelengths



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