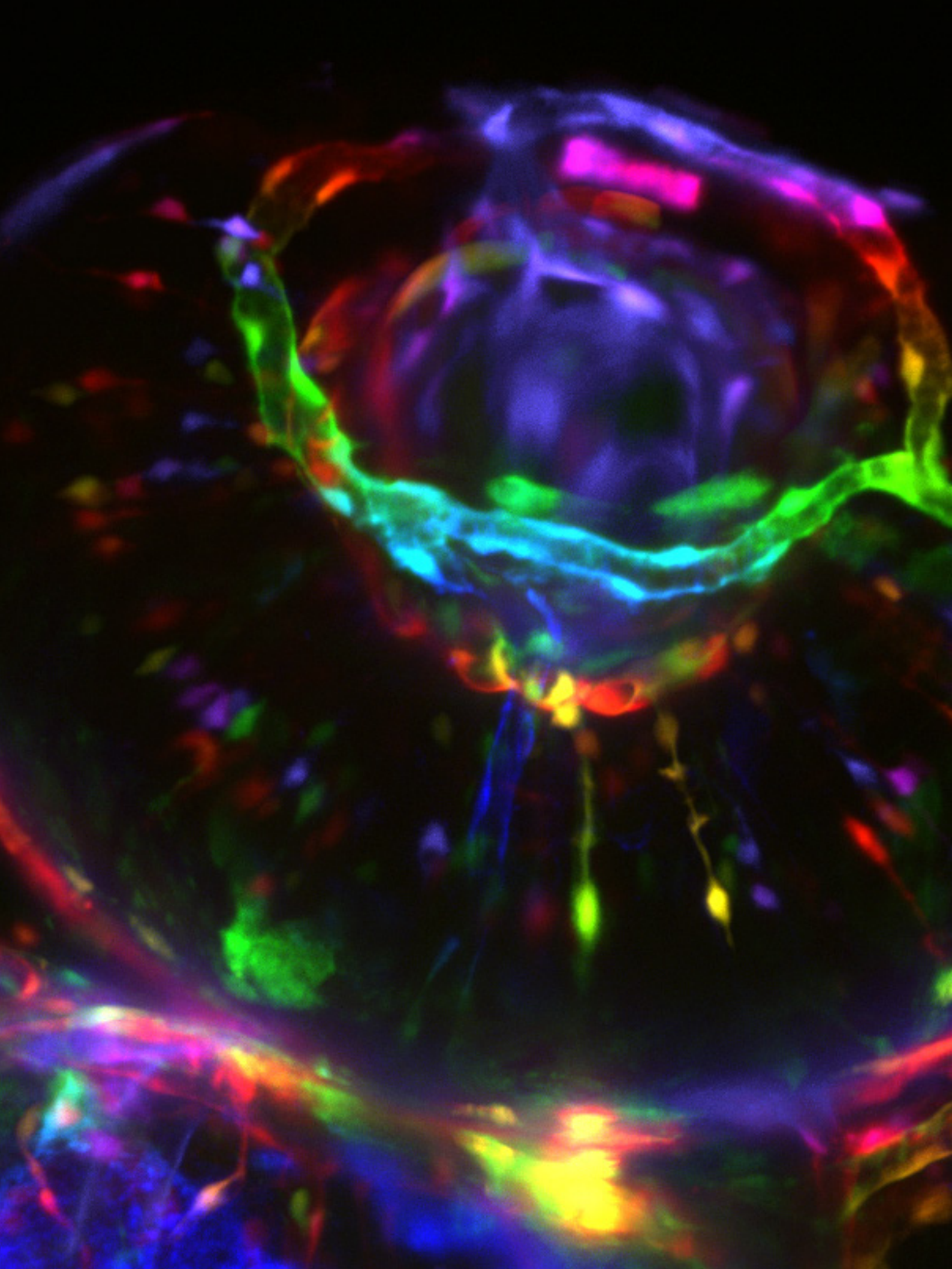
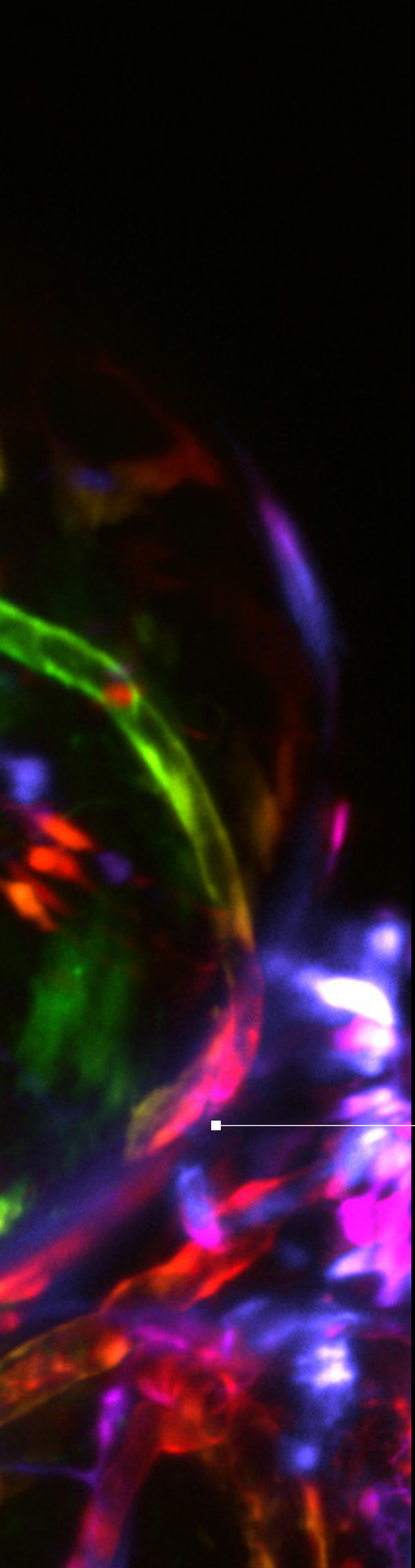
Leica
MICROSYSTEMS

STELLARIS DLS
LIGHT SHEET RE-IMAGINED

OPEN YOUR RESEARCH TO LIGHT SHEET





LIGHT SHEET RE-IMAGINED

STELLARIS LightSheet (DLS) unites in one place a confocal system and a light sheet microscope –
a unique combination aimed to make your research more versatile. The exclusive vertical design of DLS, enabled by Leica Microsystems proprietary TwinFlect mirrors, allows confocal and light sheet imaging to be combined in the same system, so you can easily adapt your microscopy method to your experimental needs.

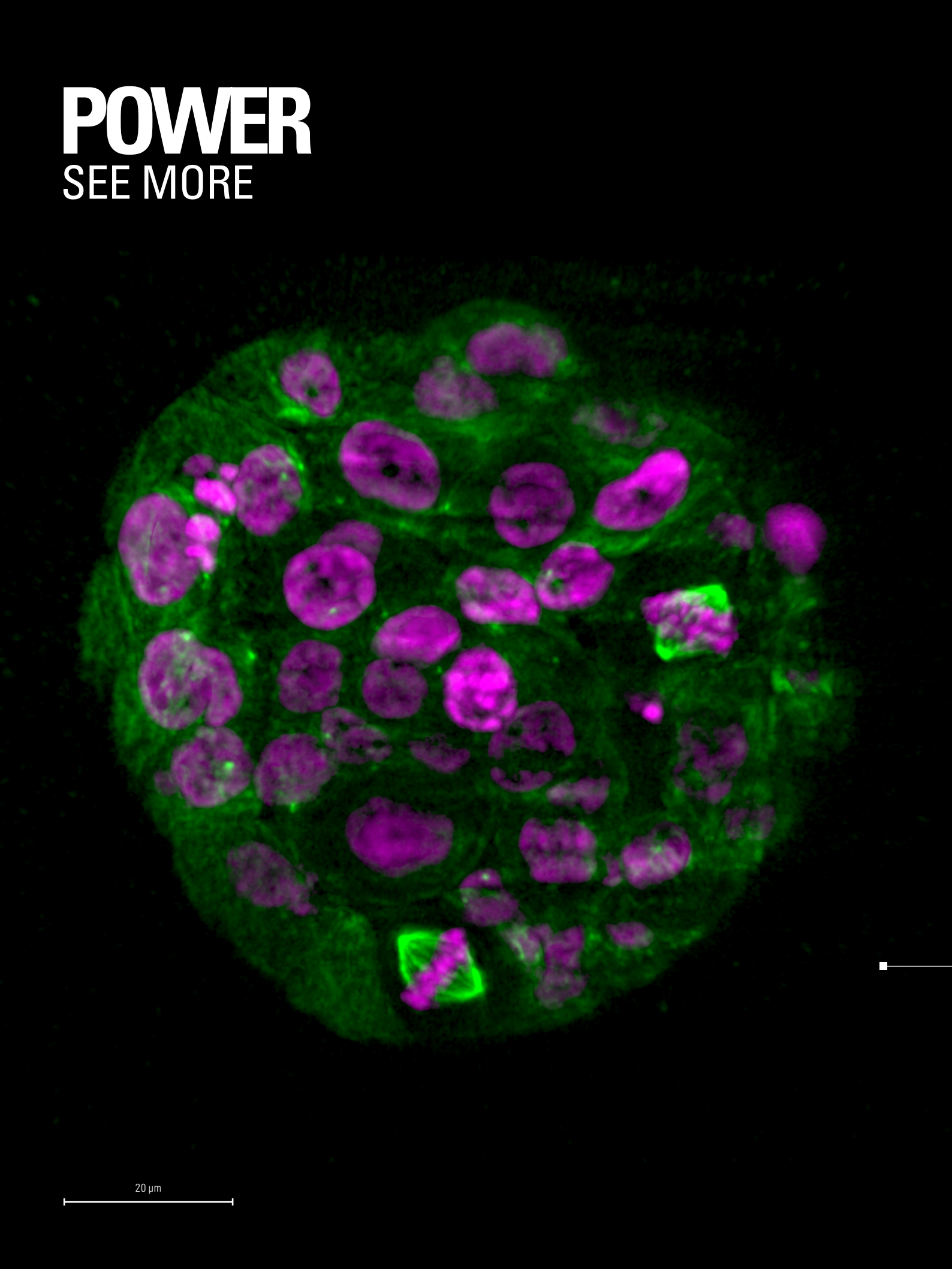
DLS also brings flexibility to your research with the capacity to image different types of samples – model organisms, organoids, or cleared tissue. Benefit from a large excitation spectrum, thanks to the STELLARIS White Light Laser and the ability to perform light sheet imaging whilst using standard glass bottom plates.

DLS combined with STELLARIS enables fast volumetric imaging in near physiological conditions to study developmental processes.

To capture the major morphogenetic rearrangements that occur in the eye during growth requires fast repeated imaging of a large z stack with minimal phototoxicity. Those features combined with the convenient sample mounting strategies of the DLS enable gentle, and fast volumetric imaging of living embryos for extended periods of time.

Depth Coding of Endothelial Cells in Zebrafish Eye. Courtesy of Basile Gurchenkov, Imaging Center of the IGBMC, Illkirch-Graffenstaden, France.

POWER
SEE MORE



EXPERIENCE THE POWER OF FAST AND GENTLE VOLUMETRIC IMAGING

Obtain more physiologically relevant data

Obtain more physiologically relevant results when imaging your live specimen over time thanks to the ability to perform fast and gentle volumetric light sheet imaging. The combination of STELLARIS and DLS provides you with an option to image with low phototoxicity even for extended periods of time.

COMBINE LIGHT SHEET AND CONFOCAL IN ONE PLATFORM

Have the choice of more dyes

Perform light sheet experiments with the choice of more fluorescent dyes and even gentler imaging using excitation wavelengths in the far-red spectrum. STELLARIS white light laser (WLL) is used as the excitation source to generate the light sheet with the possibility of using additional fixed lasers, significantly increasing the number of spectral possibilities for the setup of your light sheet experiments.

By combining excitation wavelengths in the far-red spectrum with the capacity to generate the light sheet with resonant scanner – which results in shorter pixel dwell times and, consequently less phototoxic effects – DLS and STELLARIS enable even gentler imaging. This helps to keep your sample healthy for longer, so you can get better results from your live-imaging experiments.

Improve the contrast and signal-to-noise ratio of your light sheet images

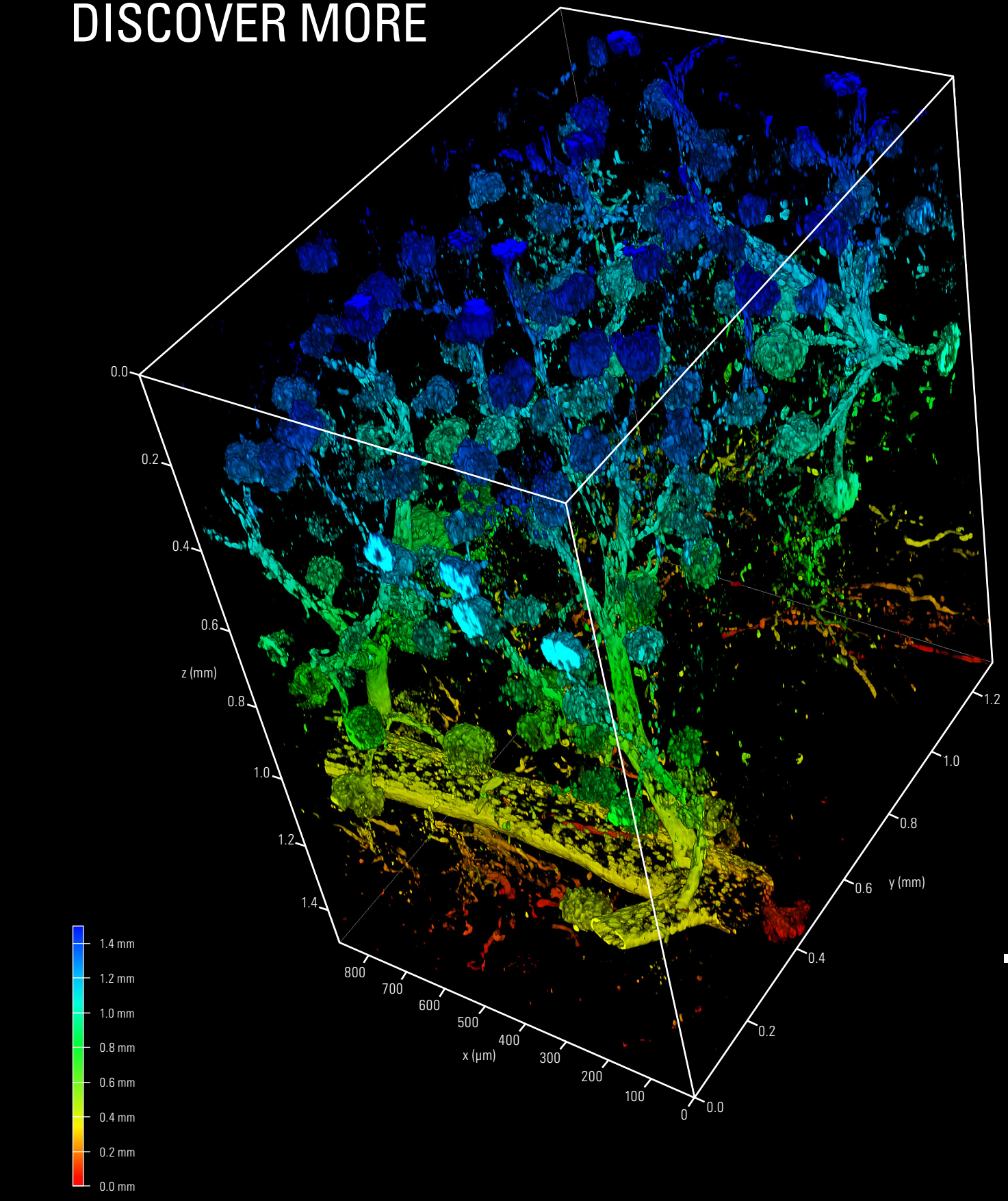
Obtain light sheet results with improved contrast and signal-to-noise ratio thanks to the LIGHTNING information extraction solution for DLS data. When used in combination with DLS, LIGHTNING automatically considers the objectives that were used during acquisition to simulate the correct PSF of the system when processing the data. This way, LIGHTNING for DLS improves contrast and the signal-to-noise ratio of your light sheet results and extends the image resolution for any channel by detecting the finest structures and details which are otherwise simply not visible.

Organoids and spheroids allow recreation of mammalian organ architecture and physiology

Organoids and spheroids provide unique opportunities for the study of human disease and complementing animal model studies. These models can grow up to a few hundred µm in size which can make it challenging to observe biological processes towards the center of your specimen. Light sheet experiments of organoids or spheroids with DLS allow you to image >100 µm in depth. The image shows a snapshot of a 7.5 hour, 3D recording of mammary epithelial micro spheroids where nuclei and the tubulin cytoskeleton are labelled. Several specimens were acquired in one experimental run.

Live mammary epithelial spheroid: green nuclei, (MCF10A H2B-GFP); red tubulin cytoskeleton (SiR-tubulin). Courtesy of B. Eismann and C. Conrad at BioQuant/DKFZ Heidelberg, Germany. Data were processed with LIGHTNING for DLS.

POTENTIAL
DISCOVER MORE



ENHANCE THE POTENTIAL OF YOUR RESEARCH WITH A SYSTEM THAT ADAPTS TO YOUR NEEDS

Experience the flexibility to image different types of samples

Research is complex and to break new ground often requires adaptability to different samples and experimental questions. DLS allows you to perform light sheet imaging using both living samples and cleared specimens, such as organoids, tissue, or whole-developing organisms, in the same system and without difficult hardware changes. Thanks to an easy exchange of a growing number of detection objectives and TwinFlect mirrors, you can get the flexibility you need and pick the perfect combination for your experiment.

Shape the light-sheet depending on your needs – to reveal the finest details or have a larger field of view (FOV), DLS objectives cover water-based to organic clearing reagents – giving you a wide spectrum to discover options for your experiments.

Manipulate your specimen. Image with light sheet

DLS and STELLARIS allow for straightforward sample manipulation. Access your sample easily, as you would do in a traditional confocal system, to perform drug treatments or manipulate your specimens using the confocal technology. Then image with DLS for following the effects of photoconversion and wounding experiments.

Image with different modalities

The integration of DLS with STELLARIS enhances the potential of your research by giving you the option, in one single system, to study your sample using light sheet, confocal imaging or to obtain lifetime information. The unique TwinFlect mirror concept can turn STELLARIS into a digital light sheet microscope, so you can explore different dimensions of your specimen in one place.

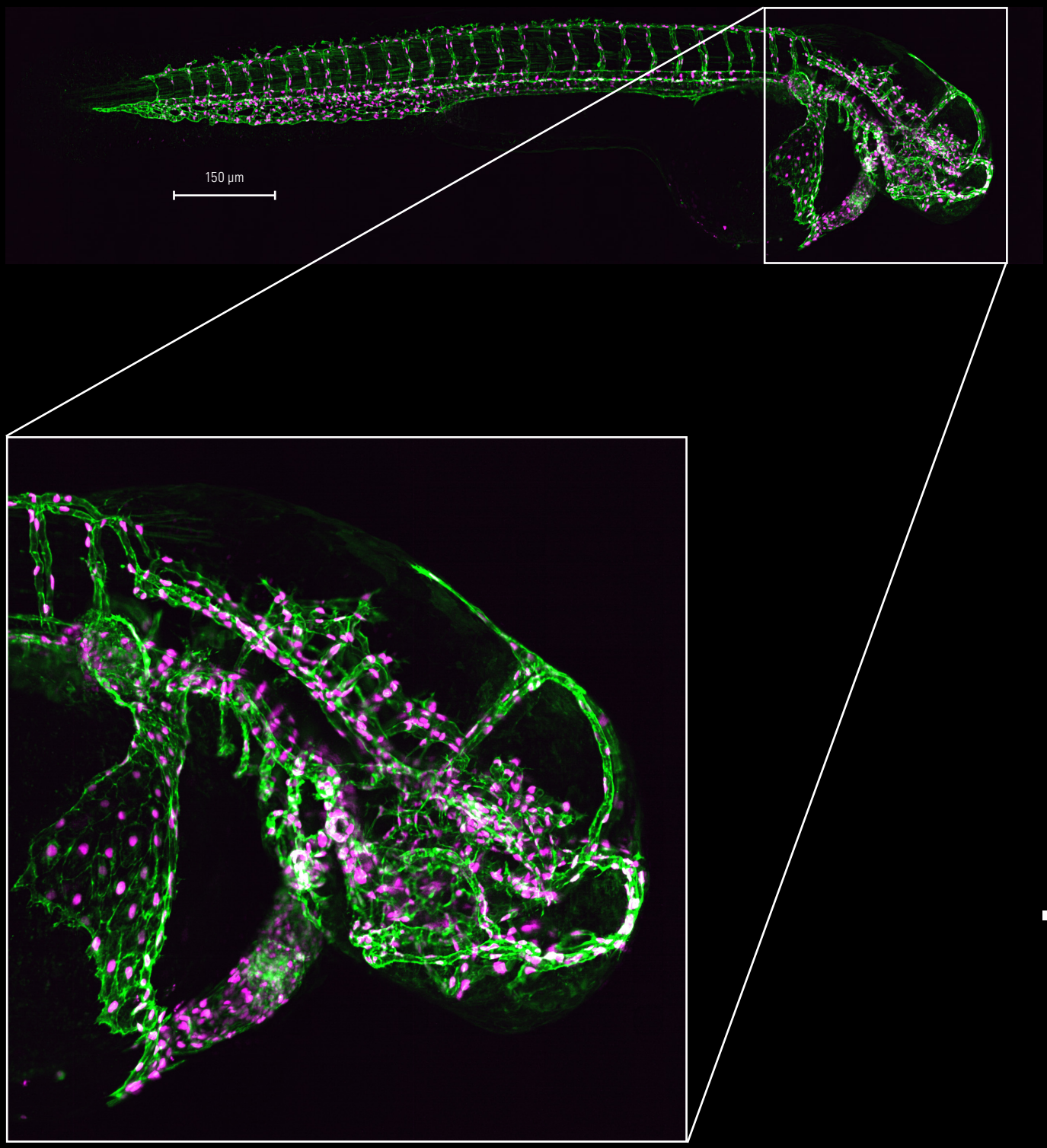
A SYSTEM THAT ADAPTS TO DIFFERENT SAMPLES AND EXPERIMENTAL QUESTIONS

State-of-the-art tissue-clearing methods provide subcellular-level optical access to intact tissues from individual organs.

Deep tissue microscopy is difficult due to the opacity of biological tissues. This is where the ever-growing number of tissue clearing protocols comes into play, but they can be a challenge for many imaging systems. The DLS module not only delivers outstanding results with live samples, but also with samples that have undergone a variety of different clearing techniques. This image shows a cleared mouse kidney sample acquired using the 16x multi-immersion objective. Illumination was performed using 730 nm.

Cleared mouse kidney sample, courtesy of Prof Gretz, University of Mannheim, Germany.

PRODUCTIVITY
DO MORE



INCREASE PRODUCTIVITY OF YOUR LIGHT SHEET EXPERIMENTS

The unique Twinflect design of DLS enables the easy incorporation of your specimens into the light sheet experimental workflow. Just as you prepare your sample for confocal experiments, you can transition to light sheet imaging without the need of additional cumbersome experimental setups.

INCREASE EXPERIMENT EFFICIENCY WITH EASY INCORPORATION OF YOUR SPECIMEN INTO THE IMAGING WORKFLOW

Familiar sample handling for your light sheet experiments

Mount your specimens in conventional glass bottom petri dishes where they are directly accessible for imaging with DLS. Due to the vertical experimental setup of DLS, no special sample holder or setup is required as for traditional light sheet systems - you can just keep your familiar sample preparation.

Mount and image several samples or a whole large sample in one experiment

Image several samples in one experimental setup with multi-positioning experiments or perform a tile scan of very large samples by using DLS in combination with the confocal system stage automation. With DLS you can easily switch between fluorescence and widefield imaging which allows easy definition of tiles for scanning large samples, as well as easy navigation and selection of multiple positions within the same experiment.

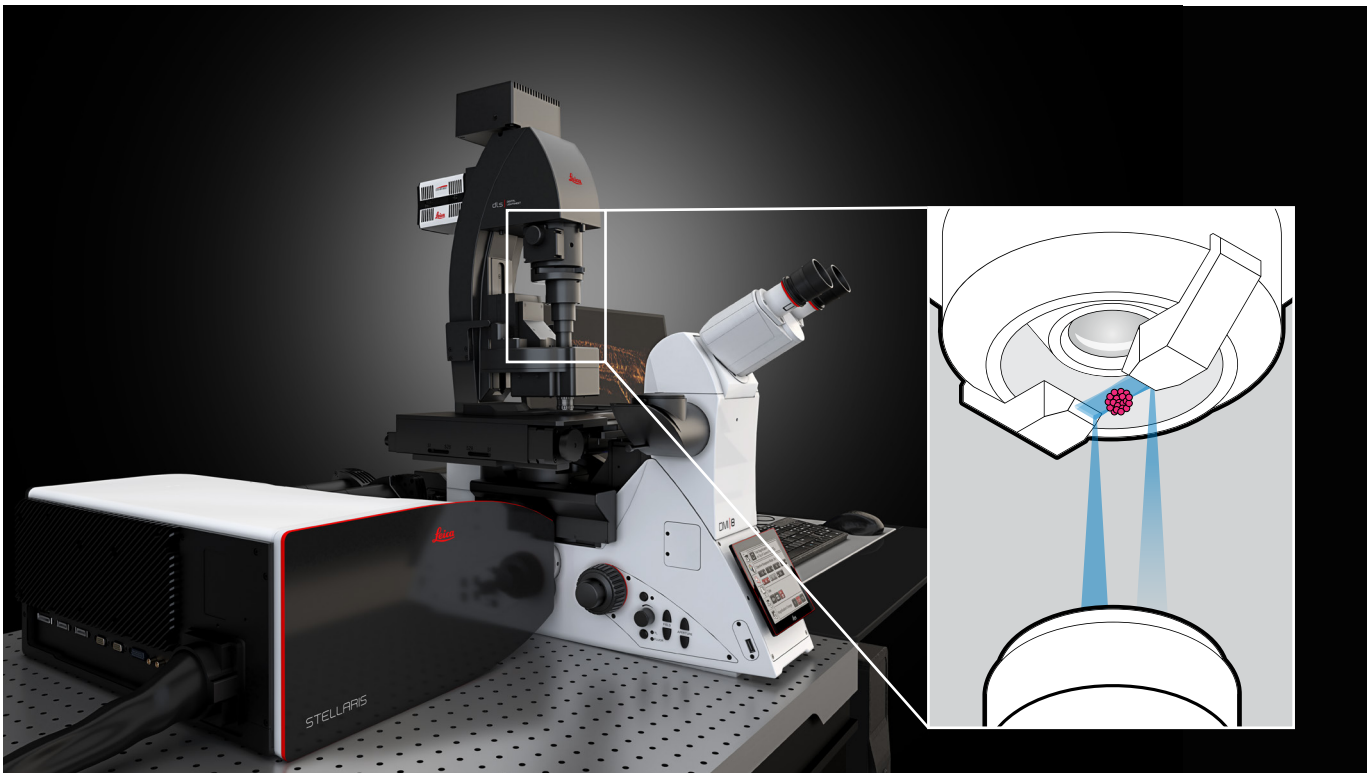
The widefield mode can also be used for acquisitions which can be a great feature that provides cellular and organismal context for fluorescence optical sections.

Complete imaging of large specimens at high resolution

The tile scan option allows complete imaging of large specimens, like whole zebrafish embryos, at high resolution. Higher magnifications with better resolution result in a smaller field of view which means that larger specimens cannot be entirely observed and analyzed at high resolution in a single image. The tile scan records a defined number of adjoining single images of the sample (the "tiles") during which the sample is moved using motorized stages with high precision. The images are subsequently assembled into a large mosaic image using specifically designed stitching algorithms.

Zebrafish tile scan. Courtesy of Elvire Guiot, IGBMC Imaging Center, Illkirch-Graffenstaden, France and Julien Vermot, Imperial College London, United Kingdom.

HOW IS DLS COMBINED WITH STELLARIS?



DLS makes light sheet microscopy easily accessible. The unique TwinFlect mirror device deflects the illuminating light sheet at a 90° angle. This improvement allows the integration of the illumination and detection beam path into the vertical axis of every STELLARIS system with an inverted microscope stand. It turns STELLARIS into a fully functional light sheet system without compromising confocal functionality.

A 3D stack of a specimen is acquired by moving the sample through the light sheet.

DLS Advantages at a glance:

- Benefits of confocal and light-sheet technology in one system
- True multimodal imaging
- Two-sided illumination
- Flexibility:
  - WLL & NIR Excitation @730 nm
  - Simple change of optics

PICK THE OPTIMAL COMBINATION OF OBJECTIVES AND TWINFLECT FOR YOUR EXPERIMENT

Illumination Objectives

Detection Objectives	1.6x/0.05	2.5x/0.07	4x/0.13	All	Widefield	FOV (in µm)
Resolution (µm)	**Axial** with/wo BE*	**Axial** with/wo BE*	**Axial** with/wo BE*	**Lateral** @530nm	**Axial** (in comparison)	full chip
5x/0.15	5.8 /13	4.0/8.9	2.3/5.7	2.2	37	1470 x 1470
10x/0.3	4.9/7.8	3.7/6.5	2.2/4.9	1.1	9.3	735 x 735
16x/0.6 (water)	2.2/2.4	2.1/2.3	1.7/2.2	0.54	2.4	460 x 460
16x/0.6 (glyc)	3.1/3.5			0.54	2.6	460 x 460
16x/0.6 (BABB)	2.5/2.8			0.54	2.8	460 x 460
20x/0.5	2.8/3.2	2.5/3.1	1.9/2.8	0.65	3.3	368 x 368
25x/0.95	1.0/1.0	0.9/1.0	0.9/1.0	0.34	1.0	295 x 295
TwinFlect (mm)	7.8 5 2.5	5 2.5	2.5			

*BE = Beamexpander

Standard	Optional
Dynamic Signal Enhancement (DSE)	LIGHTNING for DLS
Tile Scan	Aivia
ImageCompass	Glass capillaries, rotation device, and mounting frames
STELLARIS DLS: 7 configurable lines plus WLL	Resonant scanner
Choice of two different high performance sCMOS cameras	

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LASER RADIATION

VISIBLE AND INVISIBLE- CLASS 3B
AVOID DIRECT EXPOSURE TO BEAM

P < 500 mW 350- 700nm
IEC 60825-1: 2014

LASER RADIATION

VISIBLE AND INVISIBLE- CLASS 4
AVOID EYE OR SKIN EXPOSURE TO
DIRECT OR SCATTERED RADIATION

Paverage < 4 W 350- 1600nm >40fs
IEC 60825-1: 2014

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