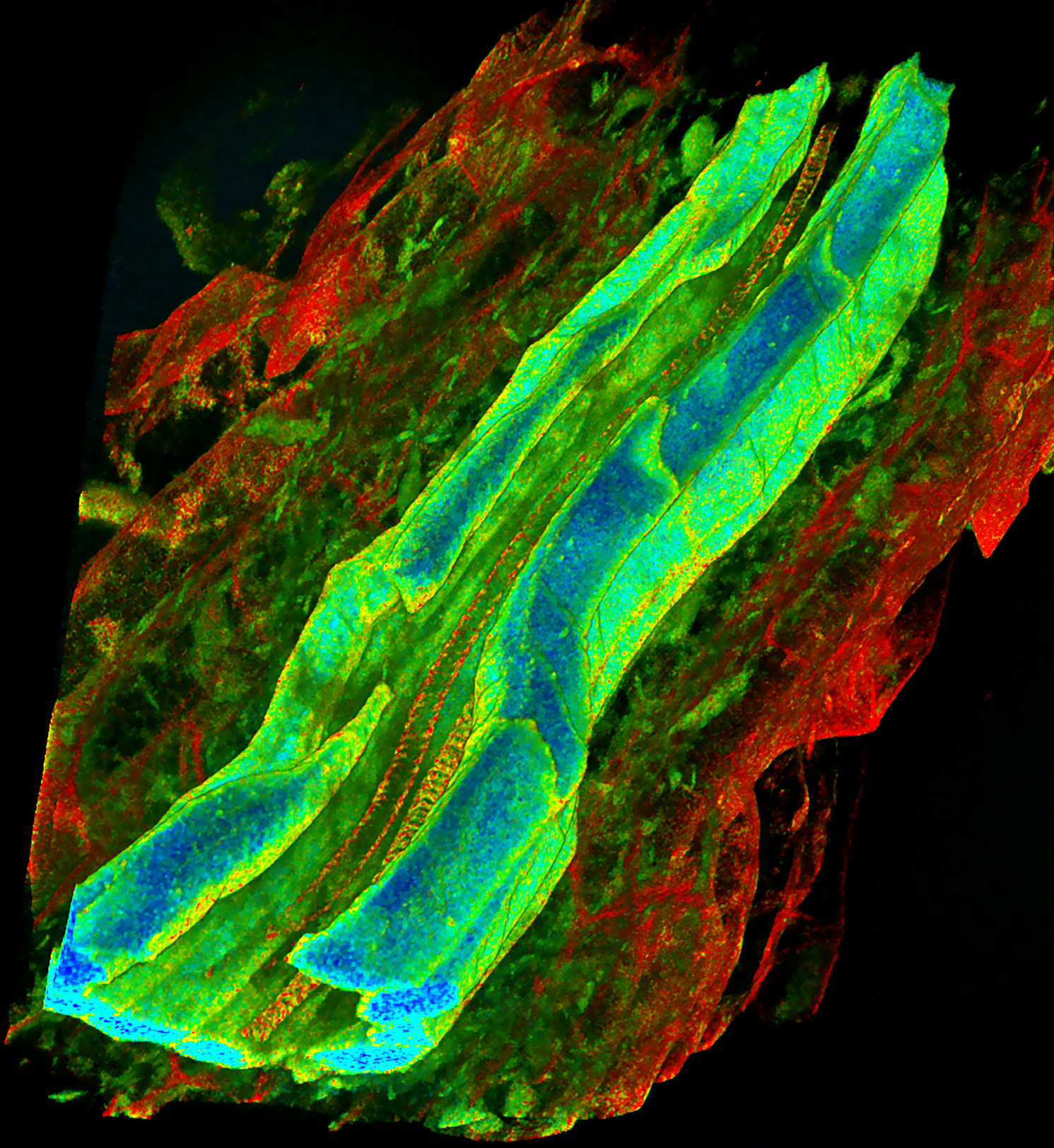
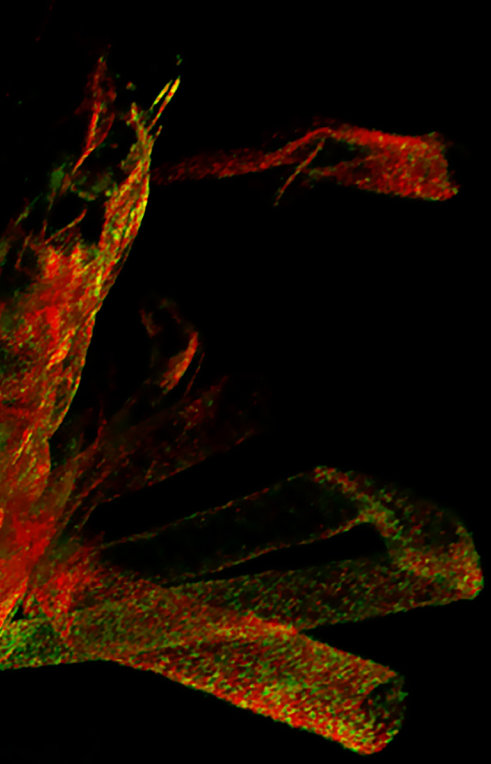
Leica
MICROSYSTEMS

STELLARIS
NEXT GENERATION

YOUR FAST TRACK TO REWARDING RESEARCH





SEE ALL DIMENSIONS OF LIFE

Nature is multi-dimensional. To truly comprehend its complexity, we need to look in multiple dimensions. This detailed multicolor image of a cleared *Arabadopsis* thaliana root was obtained with just one click and one detector. With conventional confocal microscopy, it would be black and white. With STELLARIS what we see is transformed by an extra dimension of lifetime information.

The *Arabidopsis* root consists of multiple cell types that are arranged as concentric layers around the central axis. Many of these layers can be distinguished according to fluorescence lifetimes. In this image, cell walls of the epidermal layer (outermost layer), including root hairs protruding from some epidermal cells, appear red as they have long lifetimes. The endodermis, that constitutes a diffusion barrier, is impregnated with lignin and suberin appears blue (short lifetimes). The red laddered structures in the center are xylem vessels, which constitute the highly lignified vascular system for water transportation.

Average Arrival Time Image (TauContrast) of cleared *Arabidopsis thaliana* root sample. Courtesy: W. Busch, Salk Institute, La Jolla, CA, USA.

YOUR FAST TRACK TO REWARDING RESEARCH

EXPLORING NEW DIMENSIONS IS THE NATURE OF DISCOVERY

Next Generation STELLARIS enables you to advance your research pushing live, high-plex, gentle imaging to unprecedented levels. With Next Generation STELLARIS, you can now see more, discover more, and do more than ever before.

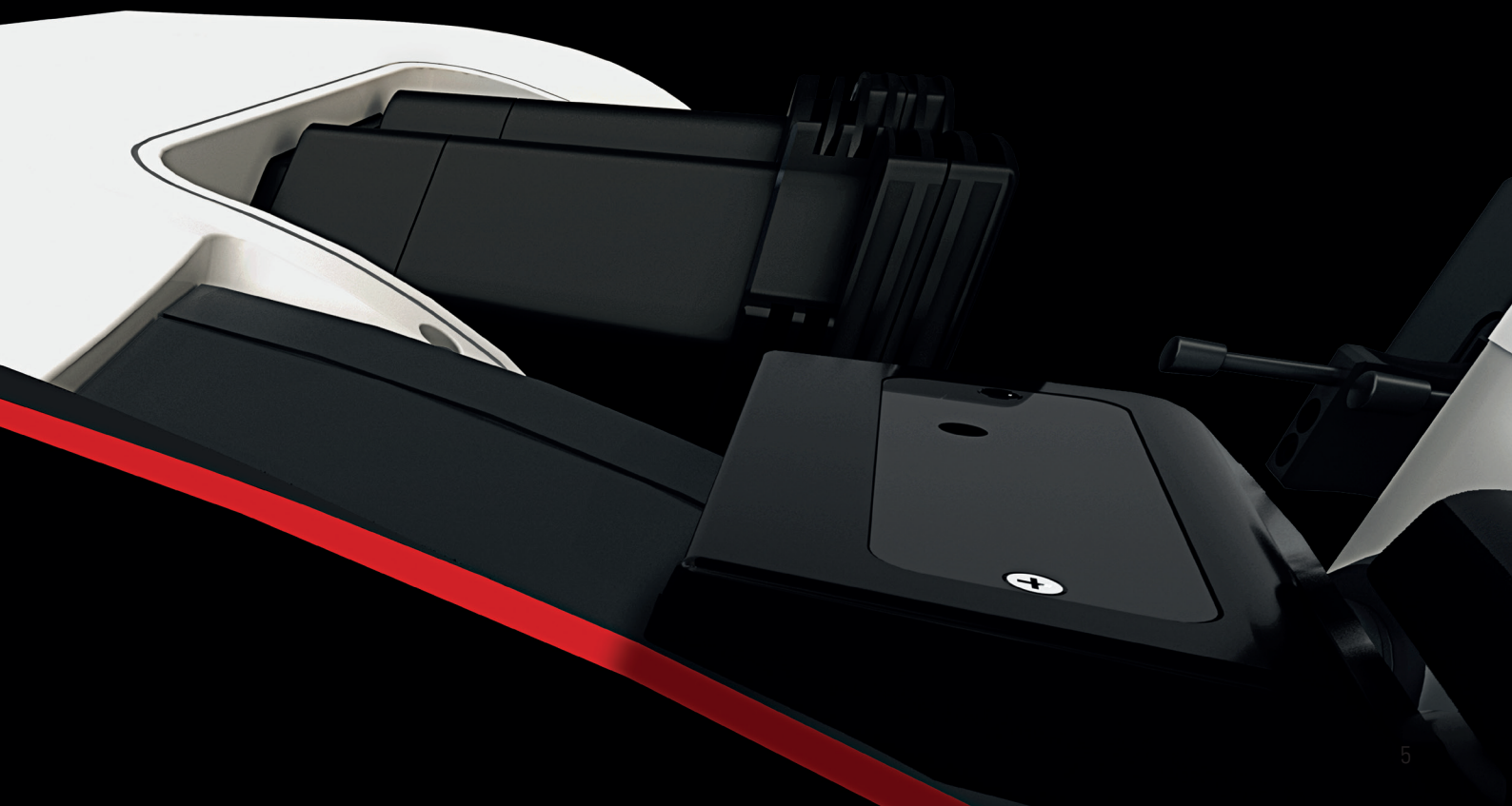
STELLARIS

NEXT GENERATION STELLARIS

POWER to see more: Imagine the power to observe finer details in every sample, capture the faintest signals, gather more precise data across the spectrum and push your spatial discoveries with high multiplexing.

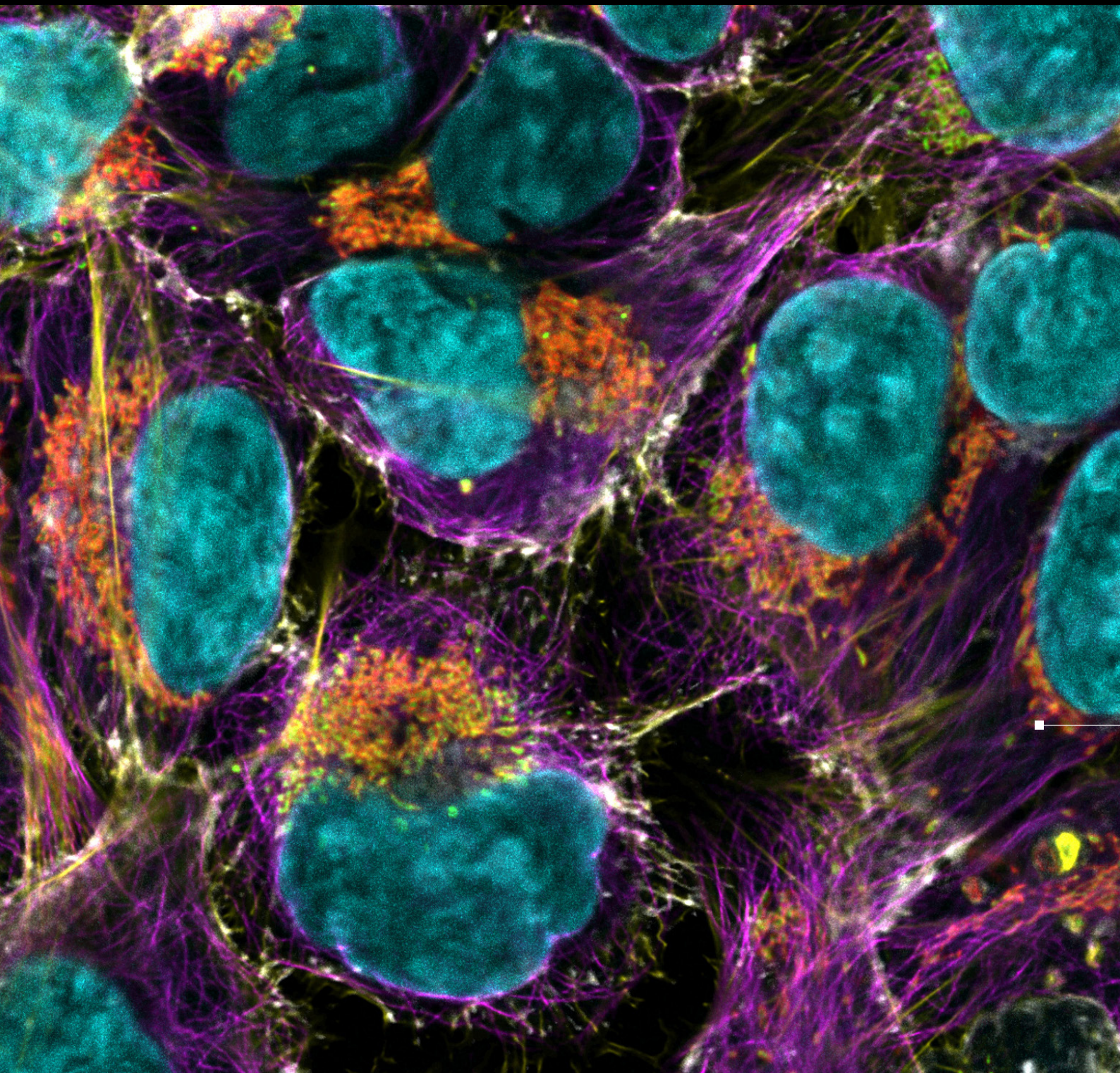
POTENTIAL to discover more: Envision the potential to make groundbreaking research by incorporating an extra dimension into your experiments with fluorescence lifetime information.

PRODUCTIVITY to do more: Consider the enhanced productivity that comes with simplified setup and navigation, allowing you to acquire images from complex samples with just a few clicks and focus on data that matter with Autonomous Microscopy Powered by Aivia.



POWER
SEE MORE

The perfect synergy between our newly designed family of Power HyD detectors, fully optimized beam path, and next-generation White Light Lasers delivers exceptional imaging performance. Your results are clearer, with greater detail derived from brighter signals, more contrast, and increased sensitivity – even when imaging low-abundance labels and events.



High sensitivity, broad spectral coverage and a wide dynamic range are essential to take full advantage of today's ever-expanding range of fluorescent probes, multi-label experiments and diverse applications. Our Power HyD detector family has been designed for high performance in terms of spectral coverage, sensitivity and dynamic range. Taking advantage of the latest innovations in detection technology, this powerful new family delivers uncompromising image quality across a wide range of conditions—from dim samples to fast dynamic acquisition. With their single-photon counting capabilities, Power HyD detectors also enable a unique set of fluorescence-lifetime-based imaging applications.

PUSH THE LIMITS OF YOUR RESEARCH WITH ADVANCED DETECTION CAPABILITIES

Introducing the new generation Power HyD detector family

To ensure you get the most out of your confocal applications, we have developed three types of detectors for STELLARIS. **Power HyD S detectors** have the highest dynamic range and the broadest spectral coverage of the family, making it an all-round detector for general confocal applications. **Power HyD R detectors** enable enhanced detection in the near infrared (NIR) range of the spectrum, getting the most out of the white light laser extended red spectral range on STELLARIS. **Power HyD X detectors** are specially optimized for fast lifetime imaging applications.

Power HyD S: a new breed of detector

Power HyD S detectors are the new core of STELLARIS. These silicon-based Multi-Pixel Photon Counter (MPPC) detectors use a multi-cell architecture and avalanche diodes to suppress dark noise and improve efficiency of photon collection, providing outstanding image quality. The ability to switch between analog detection and photon counting mode makes them exceptionally versatile for a wide range of applications. In photon counting mode, individual photons are resolved and counted with high fidelity, producing highly accurate and quantitative data. In analog mode, fluorescent signal is integrated over time, which produces crisp images with an exceptionally high dynamic range.

Uncovering hidden connections between cellular organelles.

Unravelling the interplay between cellular organelles can provide insight for new discoveries in cellular biology. This requires imaging multiple biological markers in the same sample simultaneously. This image faithfully captures six different organelles (membranes, nuclei, mitochondria, mitochondrial outer membrane, actin and tubulin) in mammalian cells, showing the relative position and structure.
The power of STELLARIS to distinguish fluorescent labels that have closely overlapping spectra was essential for this 6-color experiment, taking multiplexing capability beyond ordinary limits.

This image shows mammalian cells labeled with 6 fluorescent markers: membranes (white, CF405S, WGA), nuclei cyan, SPY505 DNA), mitochondria (green, MitoTracker Red), mitochondrial outer membrane (red, AF750), tubulin (magenta, AF555), actin filaments (yellow, SiR700).

DETECTION TECHNOLOGY IN FOCUS

New technology: introducing Power Counting, a novel photon counting approach to improve the precision of your results

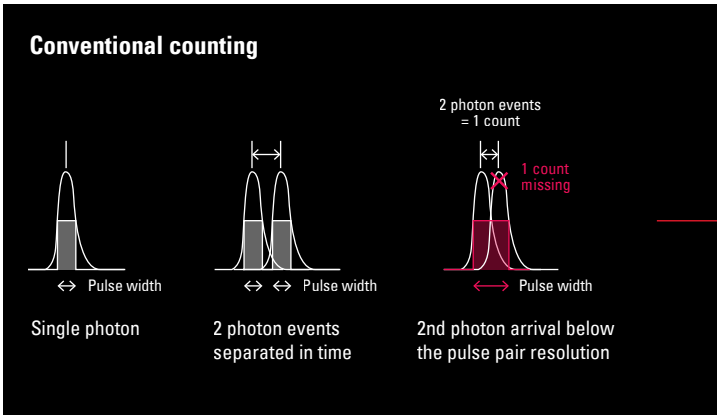
STELLARIS breaks new ground with Power Counting, its innovative photon counting approach. Traditional photon counting, based on thresholding of detector signals, is unable to distinguish a single photon from two or more photons arriving at the same time. This means valuable information is lost from your experiments. Power HyD detectors overcome this limitation by using accurate pulse width measurements to identify and count overlapping photons. As a result, more photons can be detected without saturating the detector. This significantly enhances the fidelity and dynamic range of confocal images and improves quantitative accuracy of your results. The entire Power HyD detector family is equipped with this new approach.

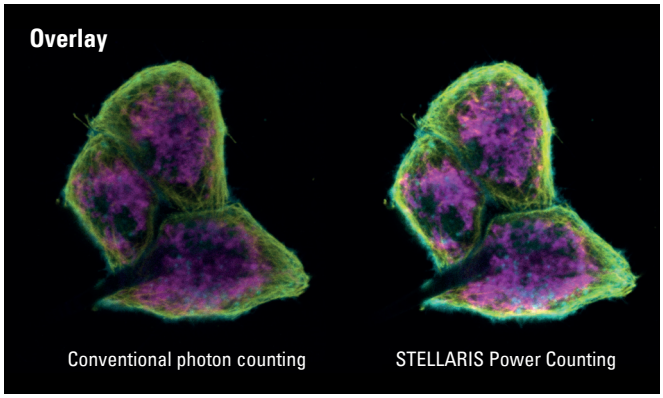
Power counting at work: more detail in every image

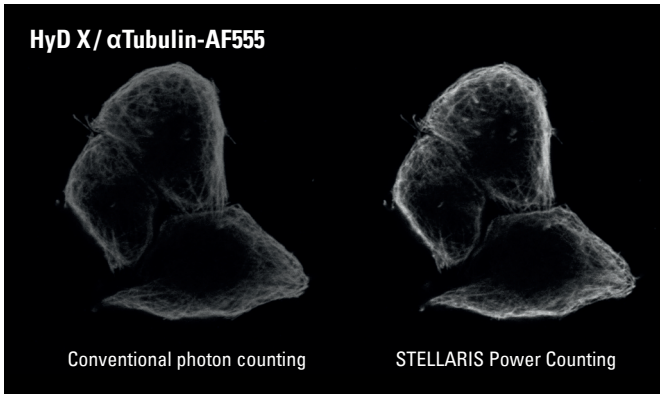
The dynamic range of the detector determines how many different levels of intensity you can distinguish within your images. A high dynamic range is essential to cope with the heterogeneous signal intensities and large fluctuations of target molecules common in biological samples. Our Power HyD S technology, in combination with Power Counting, delivers more than twice the dynamic range* of classical photon counting methods. This enhanced capacity to count photons improves image contrast, especially at high signal intensities where the likelihood of having overlapping photons is much greater.

* Comparison of linear range of STELLARIS HyD S versus SP8 HyD in counting mode (CW)

Traditional photon counting methods miss a count when two photons reach the detector in very close succession (frequency of occurrence above pulse pair resolution, grey bar). By accurately measuring and analyzing pulse widths, Power Counting resolves and correctly counts

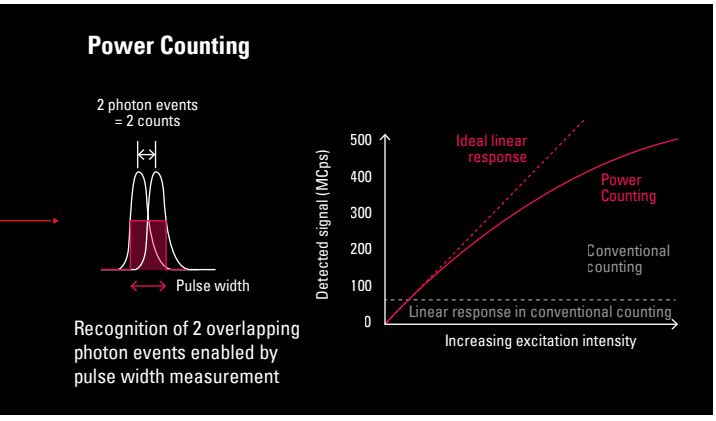


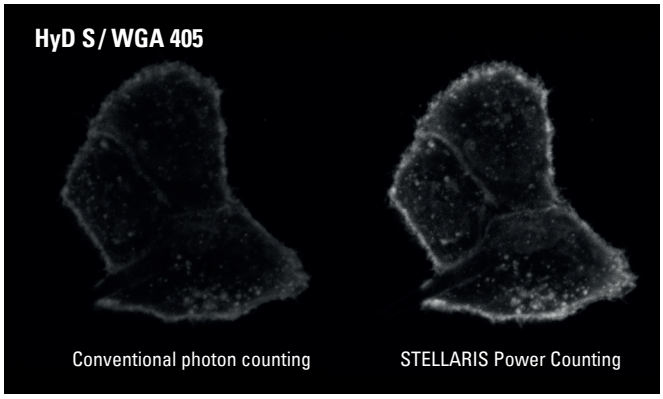


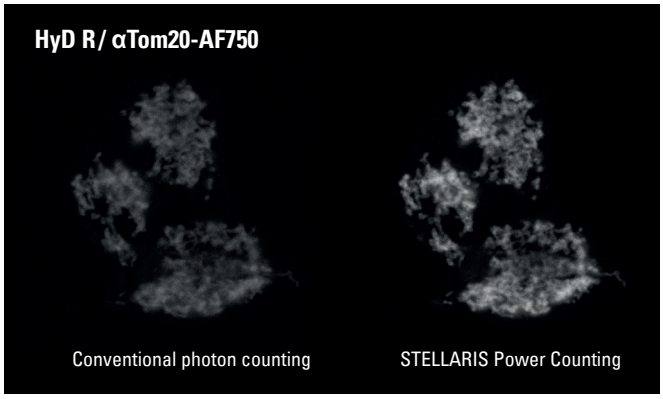


HeLa cells, fixed, imaged on STELLARIS, labelled with WGA-405 (HyD S), αTubulin-AF555 (HyDX) and αTom20-AF750 (HyD R).

them as two individual photons. As a result, the dynamic range is higher, contrast between bright and dim features is more faithfully represented in the image, and quantitative accuracy is significantly improved.





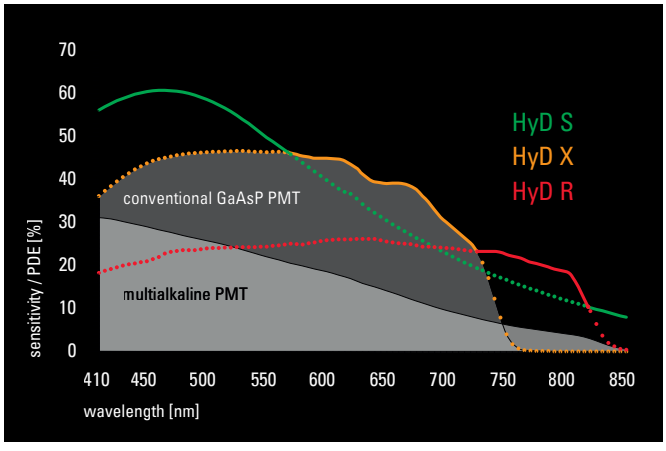


Enhanced performance across the spectrum

Whatever your preferred fluorescent labels are, detector sensitivity can be critical to avoid photobleaching and to capture maximum signal, especially when working with low-abundance targets or events. For live-cell imaging, high sensitivity becomes even more critical to ensure physiological behaviors and functions are not altered or disrupted, thus obscuring the true nature of your sample.

With three detector types in the Power HyD family, STELLARIS is able to offer enhanced detection capability across the spectrum. The Power HyD S detectors provide exceptionally high sensitivity in the blue-green range, with a Photon Detection Efficiency (PDE) of up to 56%—more than double that of conventional multi-alkali photomultiplier tube (PMT) detectors. This ultra-sensitive detection comes in the range where many commonly used live-cell probes such as CFP or GFP emit. Power HyD S detectors also provide good sensitivity into the red and even the near infrared spectral ranges.

With the STELLARIS, you can configure your system with any combination of Power HyD S, HyD R and HyD X detector and enabling a wide range of applications.



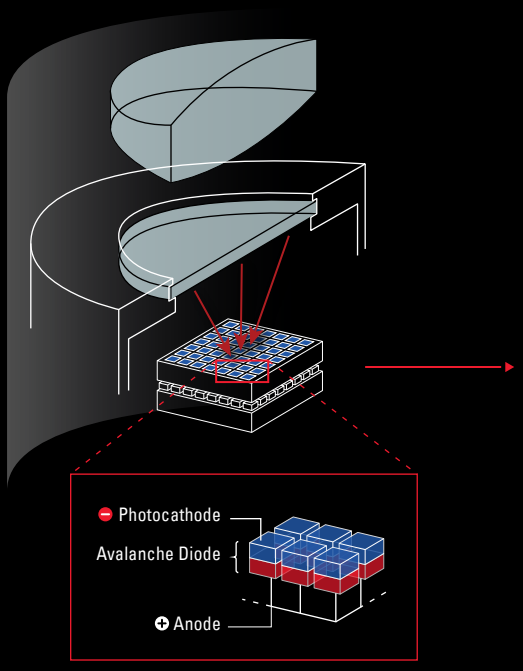
Relative sensitivity (%PDE) of the Power HyD family of detectors compared to conventional PMT detectors.

DETECTION TECHNOLOGY IN FOCUS

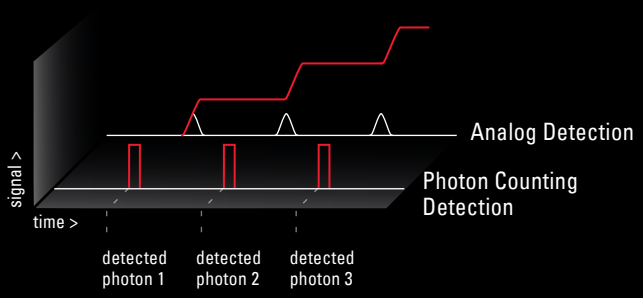
Overview of Power HyD detector family technology

Top: Power HyD S detectors deliver analog and photon counting detection. Bottom: Power HyD X and HyD R detectors are based on hybrid detector technology, allowing for ultra-low dark noise and high sensitivity.

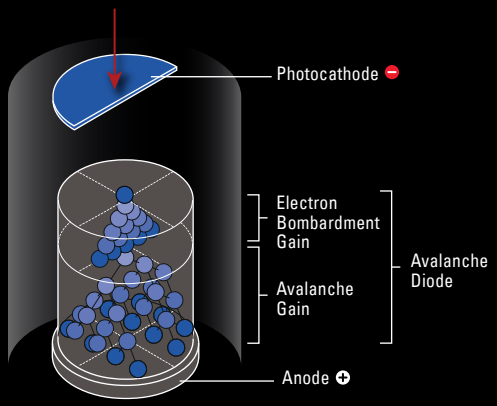
Power HyD S multi-cell architecture

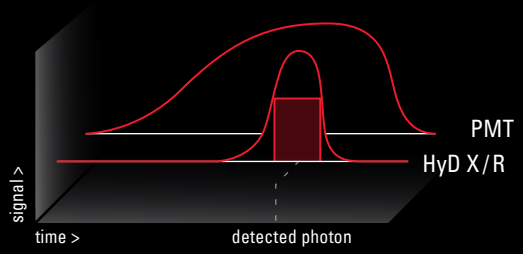


Processing of detector signals in the two available operating modes.



Hybrid detection principle in Power HyD X and HyD R detectors





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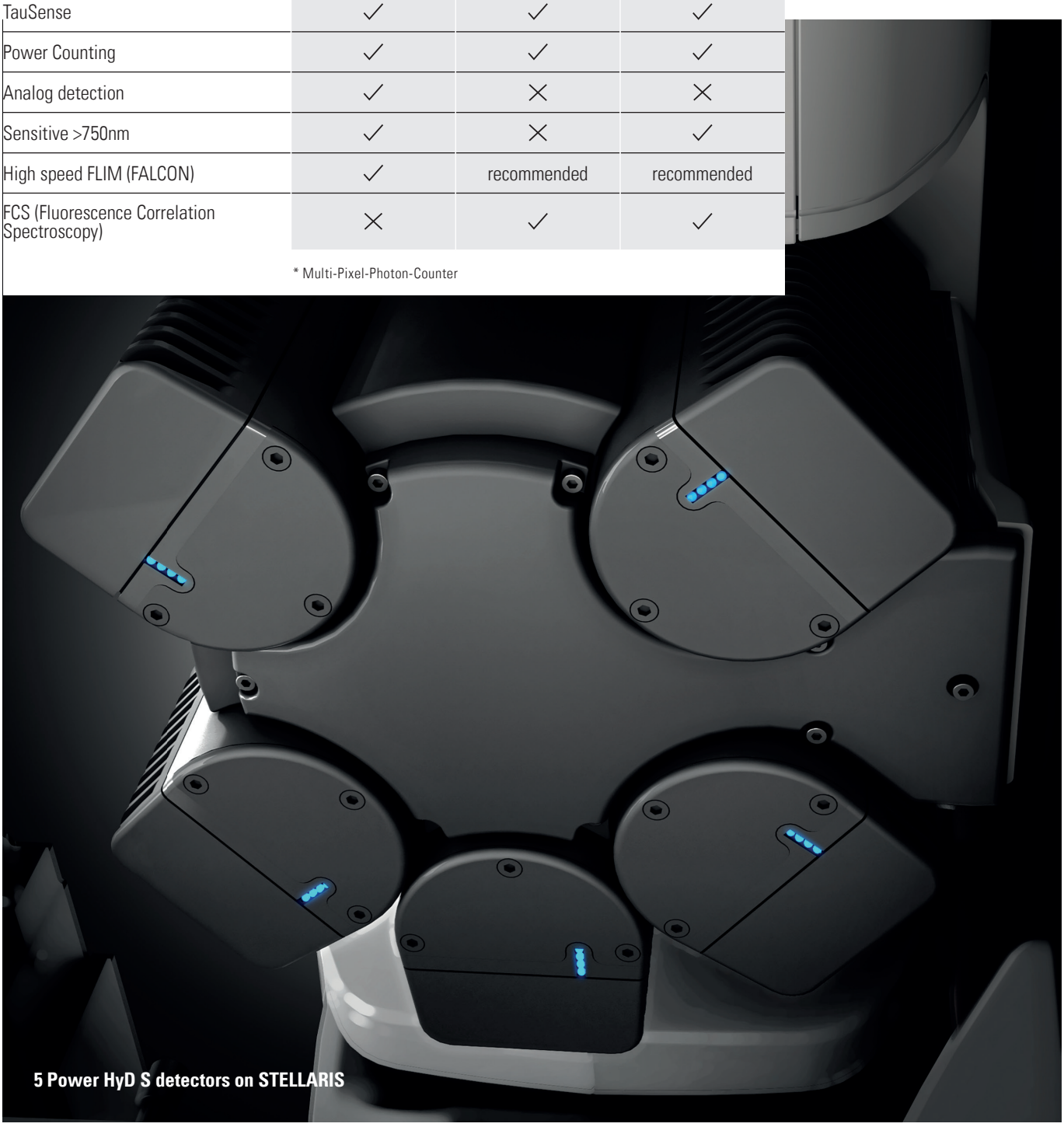
Power HyD family at a glance	HyD S	HyD X	HyD R
Technology	Silicon MPPC*	GaAsP Hybrid	Extended red GaAsP Hybrid
TauSense	✓	✓	✓
Power Counting	✓	✓	✓
Analog detection	✓	×	×
Sensitive >750nm	✓	×	✓
High speed FLIM (FALCON)	✓	recommended	recommended
FCS (Fluorescence Correlation Spectroscopy)	×	✓	✓

* Multi-Pixel-Photon-Counter



5 Power HyD S detectors on STELLARIS

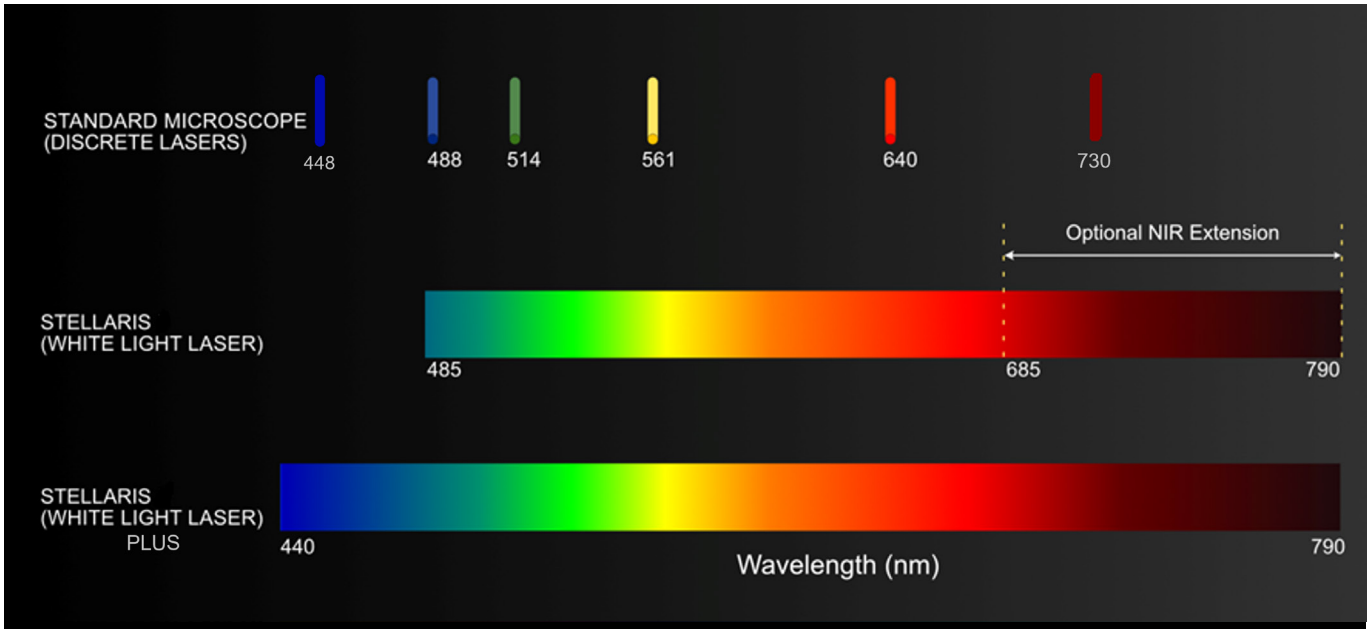
WHITE LIGHT LASER TECHNOLOGY IN FOCUS

Harnessing the rainbow: White Light Laser technology brings more color and more possibility into your experiments

Due to today's complex research questions, traditional confocal systems leave researchers wanting more: more choice in the fluorescent labels that can be used, more opportunities to multiplex, and more available wavelengths. With an ever-expanding toolbox of fluorescent probes, it is time for a microscope that can give you more flexibility to optimally excite your preferred labels and see more colors in a single image. Discrete lasers limit your flexibility when it comes to choosing fluorophores. The next generation White Light Laser (WLL) technology, coupled with the Power HyD detector family, allows you to optimally image virtually any fluorophore within the available spectral range and use up to 8 fully tunable laser lines simultaneously. This complete spectral freedom on STELLARIS makes it possible to work with more fluorescent labels and more fluorophore combinations than on any other confocal platform.

Use more of the spectrum, from blue to near infrared

STELLARIS gives you a broad spectral range of 485-685 nm. In STELLARIS WLL Plus, the WLL range is extended even further going down to 440 nm giving you more excitation options in the blue region. The STELLARIS WLL Plus also features a significantly extended red emission, reaching out to 790 nm, that is an option for STELLARIS WLL. In combination with the Power HyD R detector, this allows for imaging of fluorophores emitting all the way up to 850 nm. This enables you to add up to 3 additional red labels to your experiment and gives you the ability to work optimally with key NIR fluorophores such as AF750, AF790, CF 700, CF 750, and CF 770.



Compared to the limited selection of discrete laser lines available in standard confocal microscopy setups, the STELLARIS WLLs vastly extend the spectral options.

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APPLICATIONS: THE POWER OF SPATIAL DISCOVERIES

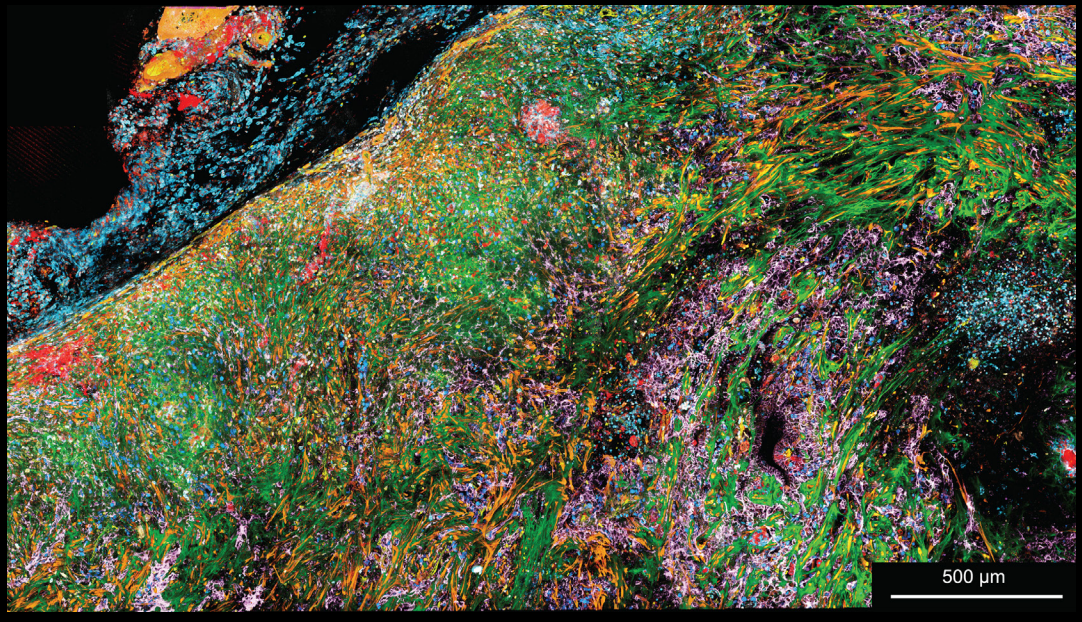
3D Multiplexing Imaging in Cancer Immunology with SpectraPlex - Your path to spatial discoveries

Advancing Cancer Immunology with High-Multiplex Imaging

In cancer immunology research, understanding tissue changes and cell interactions is crucial for identifying specific cell types, assessing immune cell activation, and characterizing the tumor microenvironment. Spatial Biology, which integrates imaging and omics approaches, offers significant insights by providing a three-dimensional context to these complex interactions. Traditional fluorescence microscopy methods involve sequential rounds of staining, imaging, and destaining, making high-multiplex experiments challenging due to the limited number of markers visible at any given time. This iterative process complicates experimental design and limits real-time adaptability, often requiring multi-image registration to align images from different rounds.

One-Shot, 3D High-Multiplex Imaging with SpectraPlex

To overcome these challenges, the STELLARIS confocal platform coupled with SpectraPlex functionality enables one-shot, 3D high-multiplex imaging. This approach allows simultaneous evaluation of multiple markers, preserving sample integrity and providing straightforward 3D data interpretation. For example, a 15-plex experiment on mouse tumor tissue utilized SpectraPlex to design panels, optimize imaging settings, and generate unmixing matrices for accurate signal separation. This method revealed detailed spatial distribution patterns of immune and cancer cells within the tumor microenvironment, showcasing the potential for advanced cancer research. The one-shot approach facilitates quicker evaluation, better characterization of cell types and interactions, and the ability to explore regions of interest more thoroughly, enhancing the understanding of cancer biology and treatment responses.

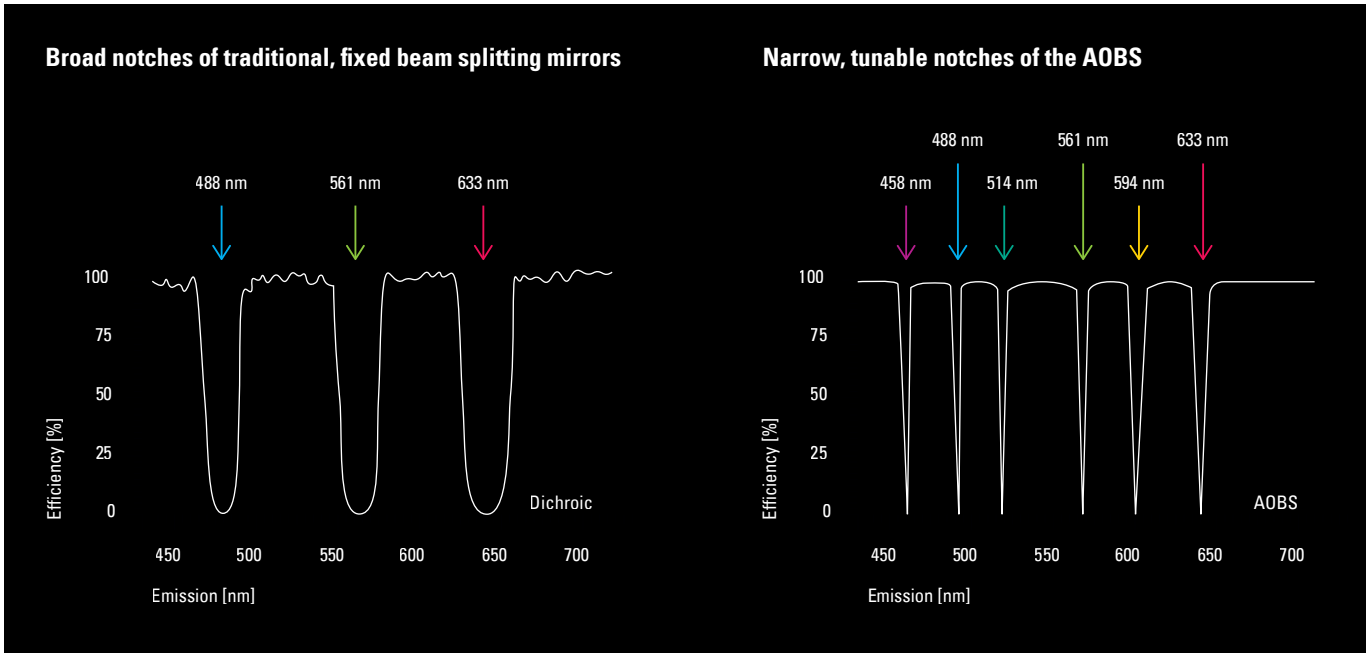


3D high-plex imaging in Cancer Immunology. Overview of a pancreatic tumor section (3x1.6 mm) in mouse model, labeled with 15 markers and imaged in one pass using STELLARIS with SpectraPlex. 3D high-multiplex imaging in cancer immunology. Kunz L., Speziale D., et al., Nat. Methods (2024). https://www.nature.com/articles/d42473-024-00260-7

WHITE LIGHT LASER TECHNOLOGY IN FOCUS

Acousto-optic technology gives you power to see more of the signal from your sample

Traditional beam splitting mirrors were designed with discrete lasers in mind, having high transmission for a fixed set of wavelengths. To fully utilize the White Light Laser, STELLARIS is outfitted with an Acousto Optical Beam Splitter (AOBS). The AOBS connects the STELLARIS White Light Laser to the fully spectral detection, equipped with Power HyD detectors. Because the AOBS can be precisely tuned for efficient transmission of any wavelength that is produced by the White Light Laser, fluorescent labels in your sample are excited more efficiently. In addition, the AOBS excitation notches used to separate excitation light from emitted signal are much narrower compared to traditional mirrors. This means that less emission signal is prevented from reaching the detector. With more control and efficiency of both excitation and emission paths, this uniquely designed optical system provides the ideal solution for advanced multichannel confocal microscopy.



The synergistic design of STELLARIS allows for more gentle and efficient live-cell imaging

Lasers can bleach fluorescent labels, disrupt biological processes and burn delicate tissues. Live cell imaging experiments are all too often cut short, or undesirable trade-offs are made in the acquisition parameters, to avoid these damaging effects. STELLARIS uses the power of tunable acousto-optic technology and perfectly matched spectral detection to take full advantage of the white light laser and let more fluorescent signal through to the detectors. This means that the laser power can be turned right down to preserve your precious samples and enable you to image your samples for longer periods of time.

MORE POWER FROM YOUR CONFOCAL PLATFORM

POWER
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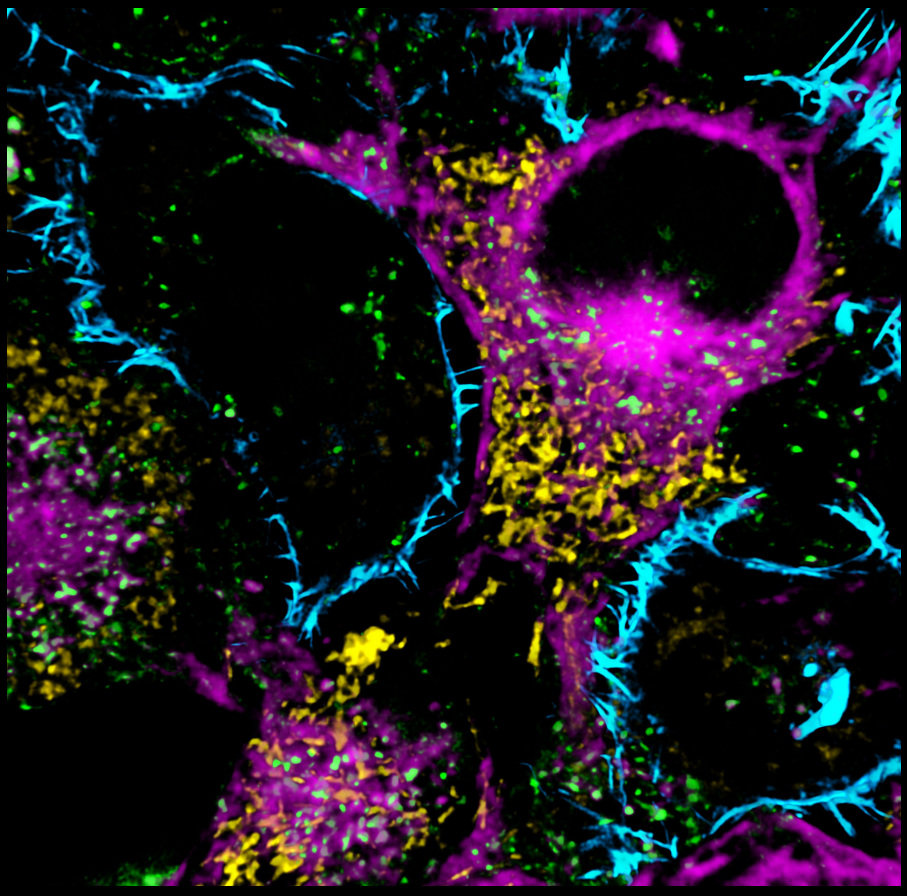
APPLICATIONS: LIVE CELL IMAGING

Getting the most from live-cell experiments: fewer exposures, more information

When using traditional confocal microscopy to image several different fluorescent labels in the same sample, sequential imaging of each color channel is often needed to avoid spectral bleed-through, which can degrade image quality. In the case of a kinetic experiment, that means you may miss rapid dynamic events due to the increased time it takes to acquire each time point. In addition, your sample remains on the stage for longer, making it more challenging to maintain cell health for the duration of the experiment. The image below was captured from live mammalian cells labeled with 4 different fluorophores to identify mitochondria, actin, microtubuli and endosomes. With STELLARIS, it was possible to collect all 4 channels simultaneously, rather than having to image the cells 4 times in succession.



Live cell imaging, 4 colors: Mitochondria (MitoView Green, yellow) and actin (mNeonGreen, cyan) microtubuli (SIR-tubulin, magenta), endosomes (NIR750, green). Processed with DSE and DSE powered by Aivia.

With STELLARIS you get powerful features that are optimized to work in perfect harmony and bring you the best performance. The combination of the Power HyD detector family, the AOBS and the next-generation White Light Laser makes every photon count and gives you exciting new ways to design your experiments and generate new discoveries.

POTENTIAL
DISCOVER MORE

STELLARIS has re-imagined confocal microscopy by providing you an extra dimension of information in every experiment. With TauSense, we put revolutionary new lifetime-based tools at your fingertips.

With just a few clicks, you can remove unwanted signal to reveal more detail in your images, multiplex more labels in a single experiment, separate fluorophores that have overlapping spectra, and apply the power of lifetime-based information to explore localized functional and micro-environmental changes. With TauSense, STELLARIS opens up a world of new possibilities for your research.

The vast majority of imaging experiments measure fluorescence intensity to study targets of interest, but fluorescence has another property that is always present, but not always measured: **fluorescence lifetime.** STELLARIS TauSense technology gives you the potential to exploit fluorescence lifetime-based information to gain new functional insights, study more targets simultaneously, or simply improve signal-to-noise by removing unwanted signal.

TauSense is a revolutionary set of imaging tools fully integrated into STELLARIS: TauContrast, TauGating, TauScan, TauSeparation and TauInteraction. Each of these tools takes advantage of fluorescence lifetime to bring unique benefits to your research.

EXPLORE A NEW DIMENSION OF INFORMATION WITH THE UNIQUE TAUSENSE TECHNOLOGY

TauContrast

Gain immediate access to informative functional and physiological parameters such as pH, temperature and ion concentration changes. In addition to capturing fluorescence intensity information, each pixel contains details about photon average arrival times (a function of fluorescence lifetime), which can change depending on shifts in micro-environment. Using TauContrast, such changes can be mapped and visualized in the image. For example, differences in the pH values of intracellular vesicles (arrows) are not apparent by fluorescence intensity alone. With TauContrast, these differences are revealed because the lifetime of the chosen fluorophore varies depending on the local pH.

TauGating

TauGating can be used to remove unwanted signal based on the photon arrival times. For example, the intensity images of basal membrane in live cells often contain a reflection contribution that can mask the signal from your label of interest. Because reflected photons have a much shorter arrival time compared to the fluorescence signal, they can be distinguished and removed by TauGating.

TauScan and TauSeparation

TauScan and TauSeparation make use of fluorescence lifetime-based information to distinguish fluorophores that could not be separated with spectral tools. By exploiting differences in photon arrival times, signals from LifeAct-GFP and MitoTracker Green (magenta) are clearly separated, even though the two fluorophores have significant spectral overlap. This expands the potential number and combinations of fluorescent labels you can use in a single experiment.

TauInteraction

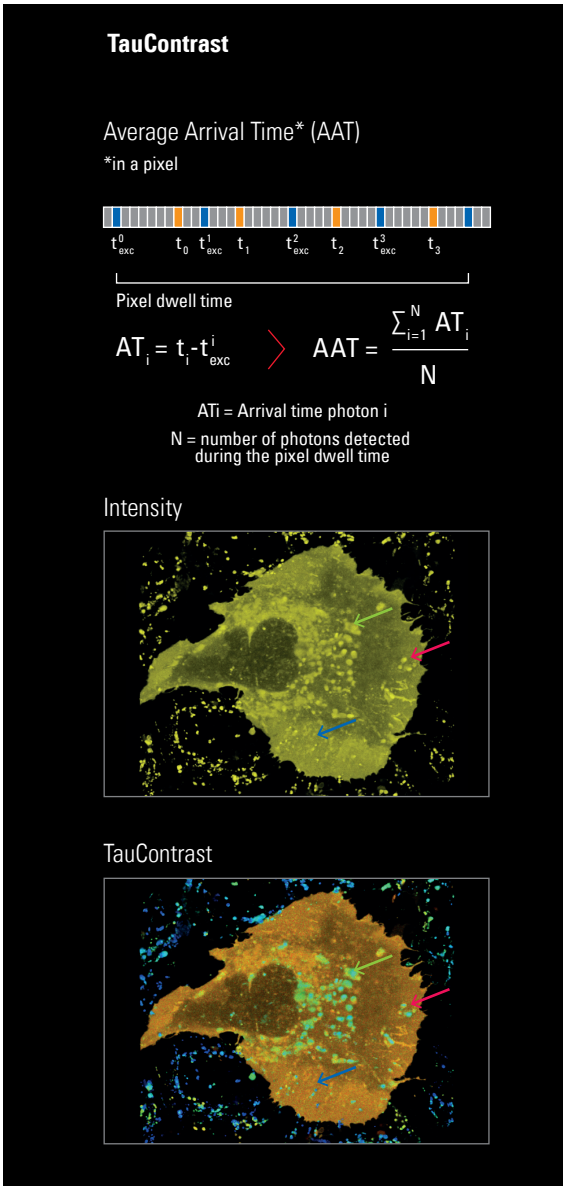
TauInteraction simplifies FRET analysis, the gold standard for measuring molecular interaction, by focusing on the minimal fraction of donor molecules (mfD) involved in interactions. This tool provides minimal fraction of donor during acquisition and visualizes molecular interaction in real time.

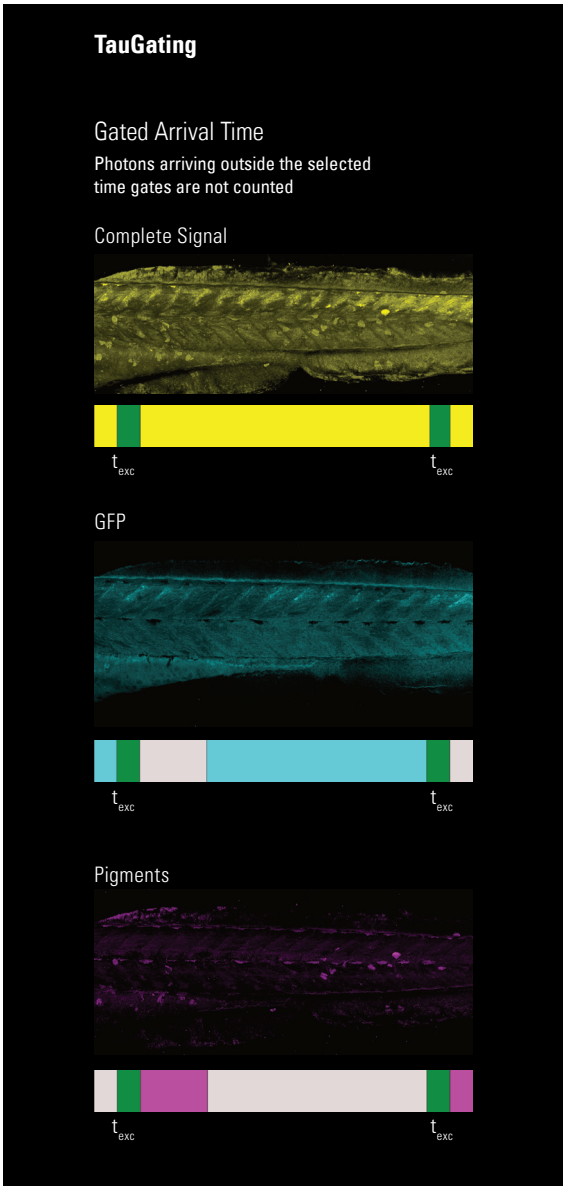
Gaining valuable insights from your sample.

Cells and tissues are fluorescent by nature. This endogenous fluorescence (autofluorescence) is often seen as a problem to be overcome in confocal microscopy, because it can interfere with the spectrum of specific fluorescent markers. But instead of getting rid of it, what if we could use autofluorescence as an additional informative parameter in imaging experiments? With the lifetime-based TauContrast functionality on STELLARIS, fluorescence signals can be discriminated by their average photon arrival times, as in this image of *Bellis* plant.

This image shows different average arrival times between autofluorescence components of *Bellis* plant. STELLARIS gathered all this information from a single detector, leaving the remaining detectors free for additional labels.

TAUSENSE TECHNOLOGY IN FOCUS





TauContrast. The contrast in each pixel is given by the average arrival times (AAT) of the photons detected during the pixel dwell time. Images show a mammalian cell labeled with near infrared membrane stain. Arrows indicate vesicles with differing pH values (red higher, blue lower, green intermediate). Intensity image: punctate vesicles show higher intensity than the surrounding cytoplasm. TauContrast image: look-up table (LUT) of the color overlay corresponds to AAT (0-1 ns); changes in vesicular pH during internalization are more apparent than in the intensity image. **TauGating** enables splitting photons arriving at different times. Zebrafish (labelled with the transgenic construct 4xGTIIC:d2GFP) exhibiting native pigments. GFP fluorescence provides a read-out of Yap1/Taz-Tead activity (Link & Miesfeld 2014, Mech. Dev). Using TauGating, the signal of interest (cyan, long arrival times) is singled-out from endogenous pigment contributions (magenta, short arrival times). Sample courtesy: Julien Vermot, IGBMC, Strasbourg, France.

POTENTIAL
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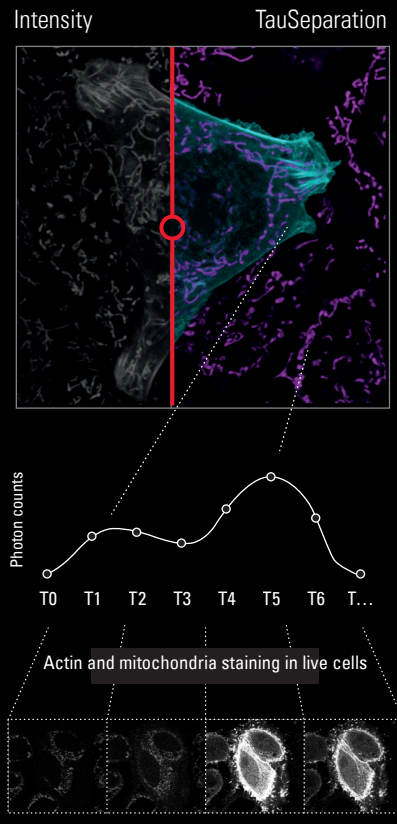
TauScan and TauSeparation

Gate based multi-exponential components distribution

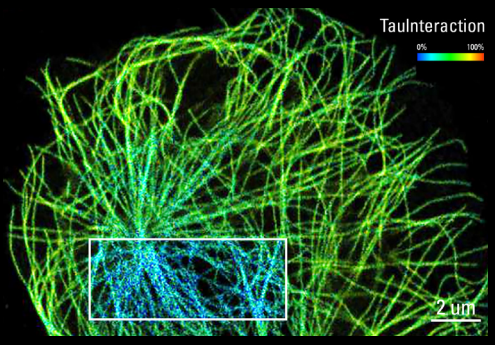


TauInteraction

Minimal Fraction of Donor for real-time insights into molecular interactions

$$TauInteraction\ (mf_D) = \frac{1-\langle\tau\rangle/\tau_D}{\left(\frac{\langle\tau\rangle}{(2\tau_D)} - 1\right)^2}$$

Average Arrival Time (AAT) of Donor alone (τ_D), and AAT of Donor with Acceptor ($<\tau>$)

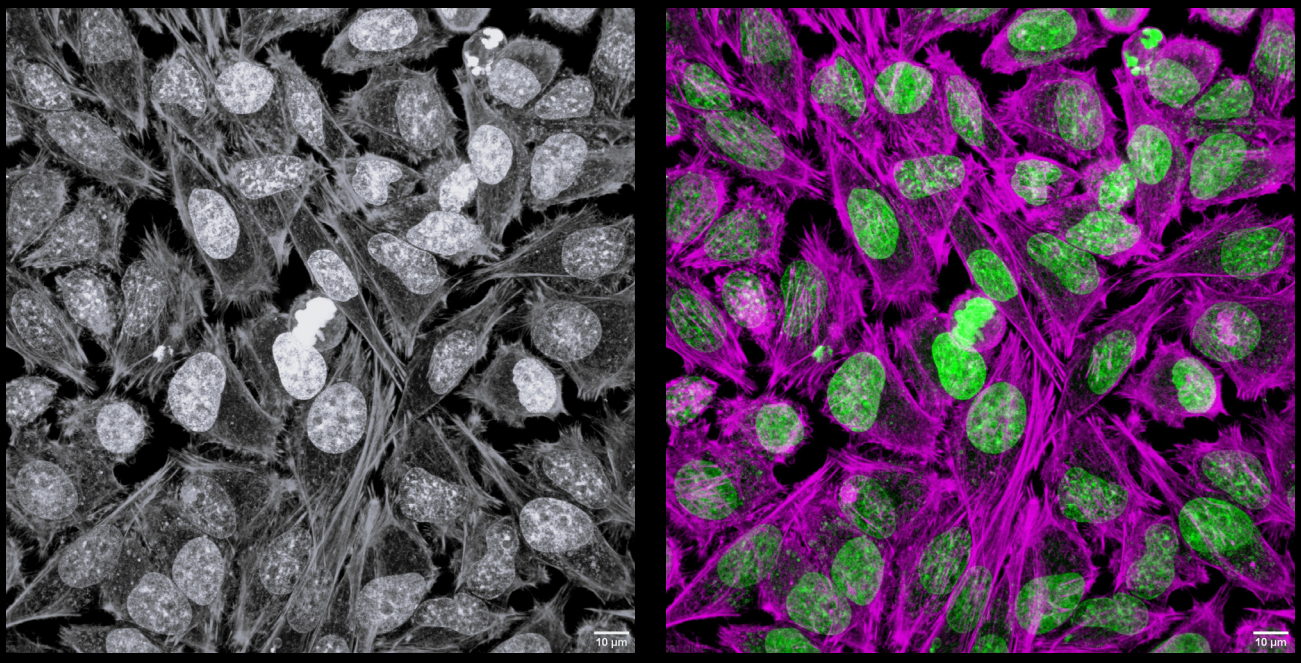


TauScan and TauSeparation. TauScan and TauSeparation of mammalian cells expressing LifeAct-GFP (manufactured by ibidi GmbH) and labeled with a green mitochondrial stain. Schematic shows the distribution of lifetime components. **TauInteraction.** TauInteraction of a mammalian cell labeled with AF488-Tubulin and AF555-Tubulin, being donor and acceptor. The acceptor (AF555) was bleached in the highlighted squared region and it shows 0% of interacting donor.

APPLICATIONS: UNLOCKING THE POTENTIAL OF FLUORESCENCE

Multiplex spectrally overlapping fluorophores with lifetime-based information

In the past, it was difficult, if not impossible, to distinguish two fluorophore species that had closely overlapping spectra. In the lab, this severely restricted researchers in the number and combinations of fluorescent probes they could combine in a single experiment.
The TauSense imaging toolbox can remove these restrictions by exploiting fluorescence lifetime-based information, allowing you to unmix even fully overlapping fluorophores. Because more than one label can be distinguished in a single channel with lifetime information, this effectively expands the number of targets of interest that can be studied simultaneously. Where traditional confocal microscopy shows you one color, STELLARIS adds lifetime information to give you the possibility to measure two.



Cells labelled with SiR-Actin and NucRed. Intensity image cannot differenciate the two dyes (left image), exploiting lifetime based information TauSeparation can clearly distinguish the two structures (Actin red, nuclei green). Courtesy: Ralf Palmisano and Zoltàn Winter, Optical Imaging Center, Erlangen, Germany.

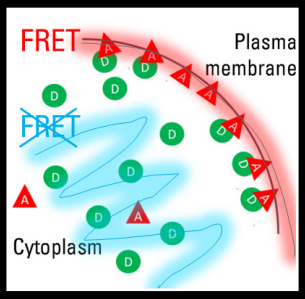
POTENTIAL
DISCOVER MORE

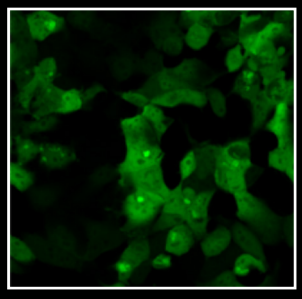
LIFETIME-BASED INFORMATION

TauInteraction

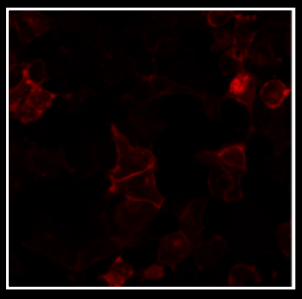
Unlock the potential of your research with Leica Microsystems' TauSense technology, an advanced solution for studying molecular interactions with unparalleled precision. TauSense, integrated into our cutting-edge confocal microscopy systems, offers researchers the ability to visualize and quantify molecular interactions in real-time. By leveraging fluorescence lifetime imaging (FLIM) and innovative data analysis tools, TauSense provides detailed insights into the dynamics of biological processes at the molecular level. Whether you are investigating protein-protein interactions, cellular signaling pathways, or the intricate behavior of biomolecules, TauSense empowers your research with robust, reliable data and intuitive workflows. Experience the future of molecular interaction studies with the STELLARIS confocal platform and take your scientific discoveries to new heights.

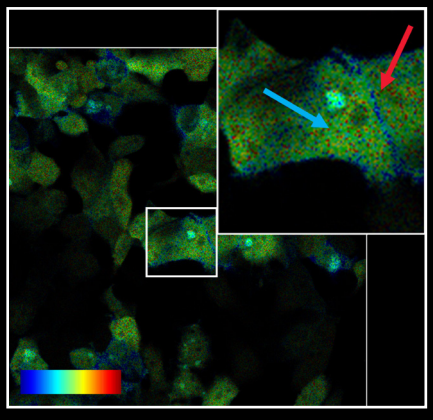
Traditional Confocal

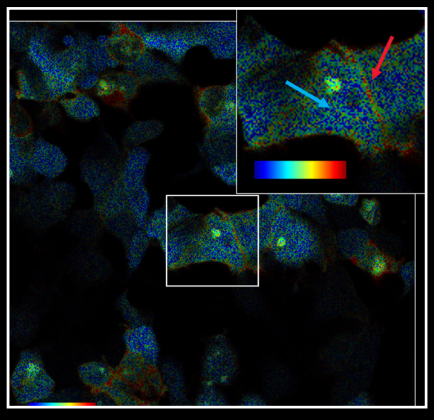




STELLARIS





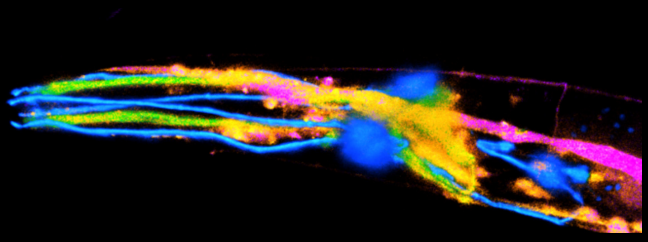


HEK cells expressing EGFP (cytosol, FRET donor) and mRFP (plasma membrane, FRET acceptor). Dimerization induced with rapamycin. TauContrast from EGFP, and TauInteraction showing up to 50% interaction at the plasma membrane.

STELLARIS FALCON: UNLOCKING THE POTENTIAL OF FLUORESCENCE L

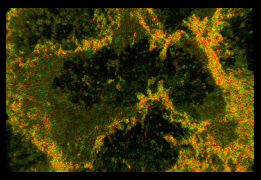
STELLARIS FALCON: the contrast is clear, lifetime imaging in an instant

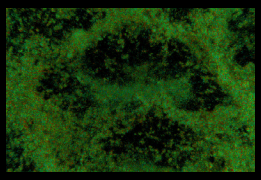
STELLARIS FALCON enables accurate lifetime measurements at high photon flux, thanks to fast electronics, hybrid detectors and optimized software for acquisition and analysis.
Multiplexing: fluorescence lifetime provides an extra dimension and allows you to , for example, separate 4 spectrally overlapping fluorescent proteins (TagRFP, mCherry, mScarlet, mRuby).

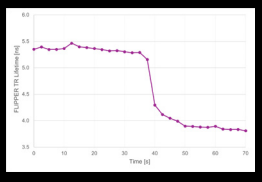


Differences in the fluorescence lifetime correspond to the different fluorescent proteins used to visualise the 4 neuronal types in C.elegans line designed by prof. Stefan Eimer, Goethe Universität Frankfurt.

Biosensing: fluorescence lifetime depends on the microenviroment of the fluorophores. In cells labelled with FLIPPER TR, it is possible to follow membrane tension during osmotic pressure.







Mammalian cells labeled with FLIPPER TR were imaged during an osmotic pressure stress experiment.

FLIM FRET: when FRET (Förster Resonance Energy Transfer) occurs, the fluorescence lifetime of the donor decreases, giving a way to observe molecular interaction.

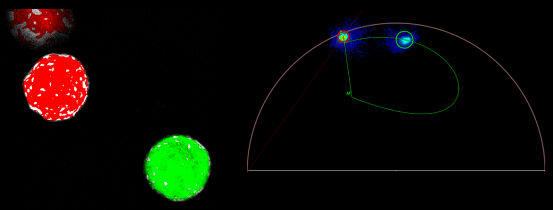


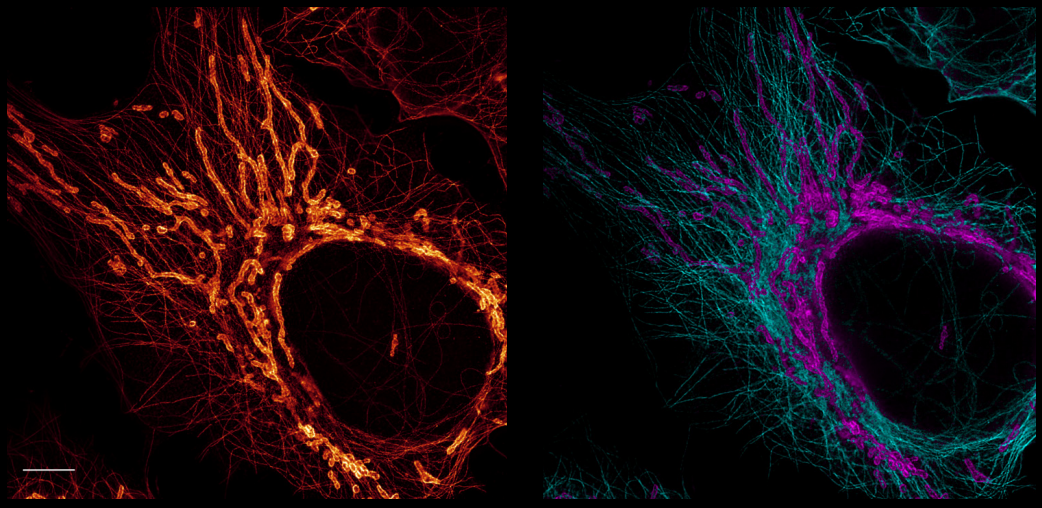
Image of cells expressing mTurquoise2 (in Red) and mTurquoise2 bound to Citrin (in Green, showing FRET). Phasor plot showing the pixels of the cells and the FRET trajectory (green line).

MORE POTENTIAL AT YOUR FINGERTIPS

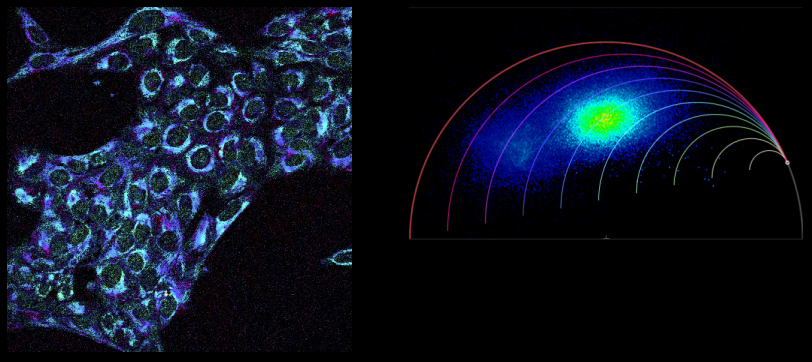
POTENTIAL
DISCOVER MORE

STELLARIS FALCON synergies with STED and multiphoton imaging

STELLARIS FALCON works synergistically with STELLARIS STED and STELLARIS DIVE, enhancing resolution with reduced depletion power for STED and providing metabolic information through multiphoton imaging.



Dual color STED 775 with spectrally overlapping fluorophores. a) Dual color STED imaging of AF 647-tubulin and ATTO 647N-TOM20 (glow) in U2OS cells, intensity-based signals are indistinct. b) Signals clearly distinguished after STED separation, AF 647-tubulin (cyan), ATTO 647N-TOM20 (magenta).

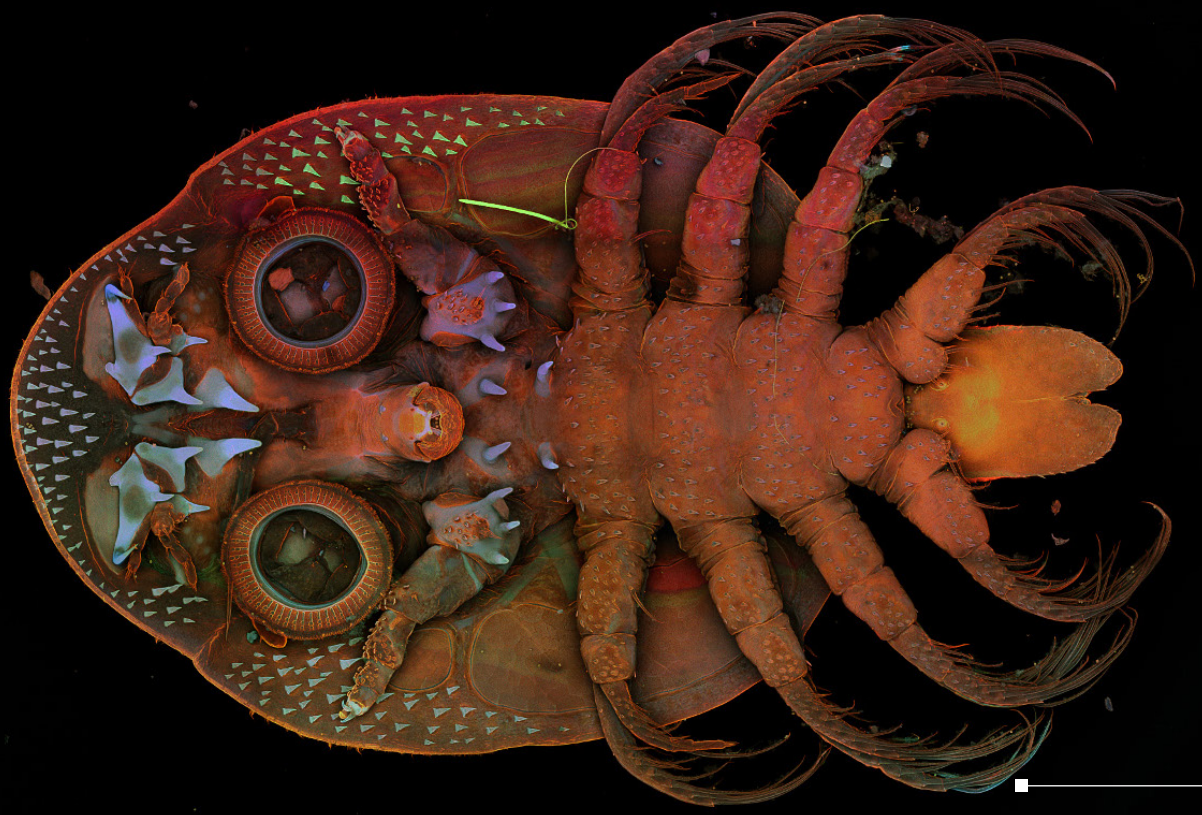


Label free image of NADH in live mammalian cells with STELLARIS DIVE FALCON. Fluorescence lifetime information of NADH provides insight into the metabolic status of the cell. The phasor-FLIM approach and the color-coded metabolic trajectory give immediate visualization of the oxidative phosphorylation (red, longer lifetime, NADH bound) and glycolytic (yellow, shorter lifetime, NADH free) status of the cells.

With fluorescence lifetime information at your fingertips, you can instantly add an extra dimension to your experiments. The entire suite of TauSense tools is available with the click of a button, and is fully integrated into the STELLARIS platform. This frees you to imagine cutting-edge experiments and unlocks new potential to explore your samples in more detail than ever before.

PRODUCTIVITY
DO MORE

Today's imaging experiments are more demanding than ever, requiring the capture of thousands of images and the ability to monitor rapid dynamic changes in context and real time. STELLARIS takes advanced new technologies for confocal imaging and packages them in a way that is simple, adaptable, and scalable. With a re-imagined software interface that seamlessly integrates cutting edge imaging tools, you can break free from traditional equipment and technology limitations to increase your productivity like never before. STELLARIS gives you the freedom to perform the experiments you've always dreamed of doing.



FAST AND EASY SETUP OF CONFOCAL MULTICOLOR EXPERIMENTS WITH IMAGECOMPASS

Too often, software gets in the way of your confocal microscopy experiments, complicating the setup process and wasting valuable time. STELLARIS redefines the image acquisition workflow with ImageCompass, its smart user interface. Drag-and-drop tools make it easy to match each fluorophore to the appropriate detector and set up complex multicolor experiments correctly— every time. ImageCompass automatically adjusts the excitation and detection parameters for each channel to enable optimal results. With its intuitive interface, ImageCompass readily adapts the system configuration to your unique sample requirements and chosen fluorophore combination. The display lets you see your entire experiment configuration at a glance, so that you can achieve an optimal setup quickly, and easily maintain control over your experiment during image acquisition—all without a steep learning curve. With less time spent on training and setup, you'll have more time to focus on your experiments and gain the productivity to do more.

ImageCompass smart user interface. Set up of a 6-color experiment.

See the bigger picture in high resolution

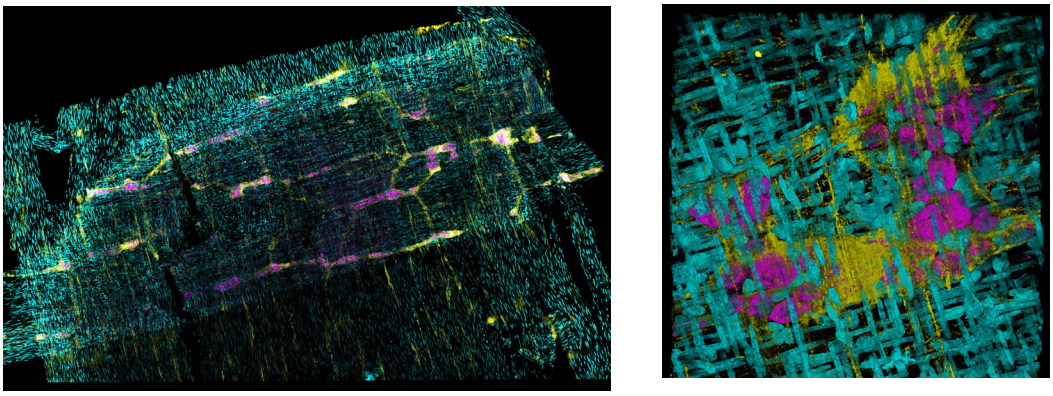
Advances in confocal techniques allow you to see the smallest structural details of your samples. However, the deeper we delve into our sample preparations, the more we risk missing out on the "bigger picture" and how these small-scale interactions affect the overall structure and physiology. The LAS X Navigator lets you zoom in and out of your sample as seamlessly as if you were looking for places to visit on your smartphone. Here we see the whole picture of a carp louse *Argulus* with all the fine details preserved in high resolution. Thanks to integration with ImageCompass, you can quickly assess and optimize the imaging parameters across the entire sample. Once the image has been captured, you can quickly zoom in on regions of interest, without losing the context of the overall view, to truly understand the nature of your sample.

Whole *Argulus* autofluorescence image Courtesy: Thomas Frase, Universität Rostock, IfBi, ASZ, Germany.

NAVIGATION SOFTWARE IN FOCUS

LAS X Navigator – a GPS for your experiments

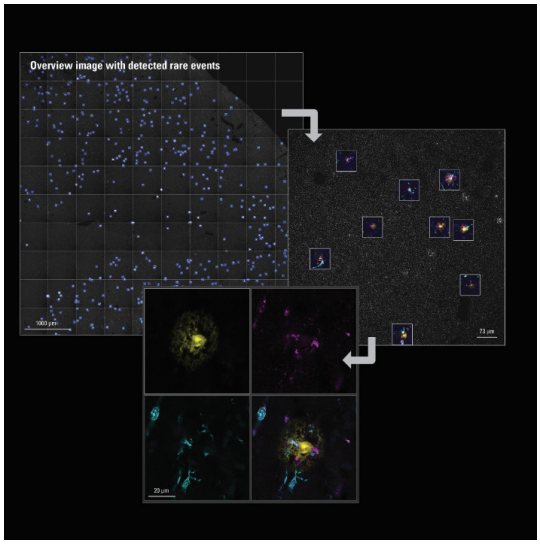
Intuitive sample navigation tools are essential to assure optimal setup of complex multicolor experiments and enable efficient exploration of large specimens. The LAS X Navigator is like a GPS for your experiment, helping you to quickly switch from searching image-by-image to seeing a full overview of your sample. With easy access to both the high-level overview and the minute details, the LAS X Navigator ensures that you always have a clear path to high-quality data.



Overview image of rat myenteric-plexus, showing nuclei (DAPI, cyan), HABP (yellow, FITC), Huc/D (magenta, Cy3) acquired with LAS X Navigator and zoom in a region of interest. Courtesy Cristina Giaroni, University of Insubria Varese, Italy.

Autonomous Microscopy Powered by Aivia: access data that matter

Autonomous Microscopy Powered by Aivia for STELLARIS is a rare event detection workflow based on AI that automates the detection of rare events. It allows highly economical operation for daily laboratory work that includes performing advanced experiments that would not be possible without automated procedures or considerable manual effort. In the workflow, it follows defined objects of interest that will trigger the rare event scan. Automatic detection allows you to find up to 90% of rare events during an experiment. By focusing on relevant data during the acquisition process, time to result can be reduced by up to 70%. The Aivia-powered workflow reduces time spent at the microscope by up to 75%, leading to increased productivity.



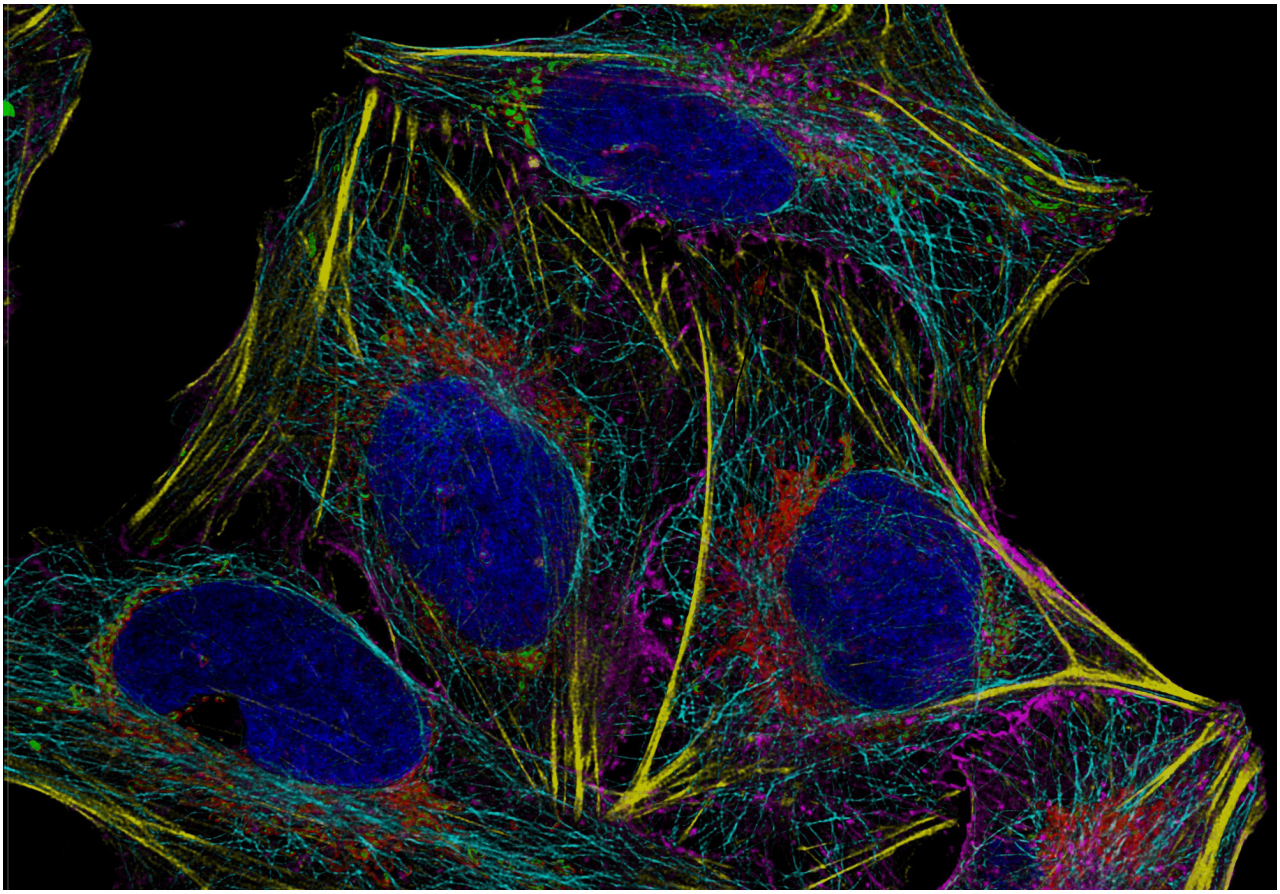
Images of 50-µm-thick human-brain sections (Alzheimer disease donors) taken with automated image acquisition over ~5h with marked objects of interest showing 3D high-resolution image stacks of 516 detected rare events. Sample courtesy of Jochen Herms, Center for Neuropathology and Brain Research, Ludwig-Maximilians-University Munich, Germany.

INFORMATION EXTRACTION IN FOCUS

PRODUCTIVITY
DO MORE

Discover at the speed of LIGHTNING

Confocal images obtained with STELLARIS contain more information than you see at first glance. The LIGHTNING detection concept helps to uncover this hidden information from your specimen. Fully automated via single click, LIGHTNING extends the resolution of STELLARIS into super-resolution territory: resolve fine structures and details, as small as 120 nm lateral resolution, which are usually simply not visible. Thanks to its deep integration and optimized GPU processing, LIGHTNING allows for the (near) real-time acquisition of super-resolution images with up to five color channels and a large field of view. Due to this flexibility, LIGHTNING works for any type of specimen and experiment.

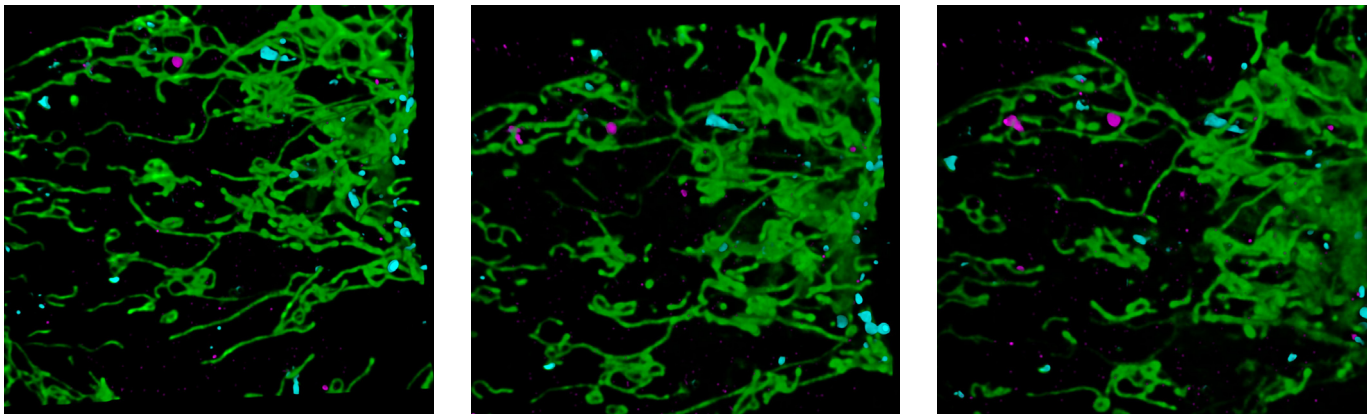


6 color U2OS fixed cells, overlay shows LIGHTNING data set labelled with CF405S WGA (membranes, white), 488 SytoxG (DNA blue), AF555(tubulin, cyan), MitoTracker Red (Lumen of Mitochondria, green) Sir (Actin, yellow), AF750 (Tomm20, Mitochondria Red).

LIVE CELL IMAGING IN FOCUS

When your samples move fast, so does STELLARIS

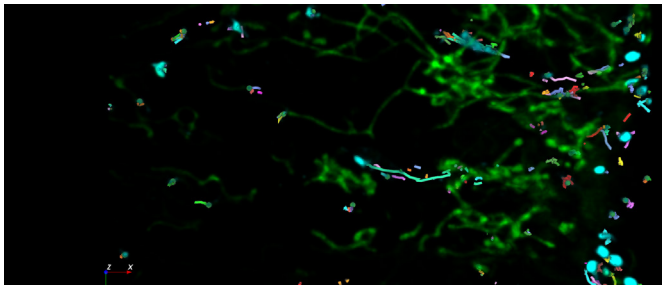
Capturing dynamic processes inside living cells is difficult using traditional confocal microscopy, often requiring trade-offs that reduce the quality of the data that can be collected. With STELLARIS Dynamic Signal Enhancement (DSE), you can capture biological events in detail while the structures and objects in your sample move, develop, and change. DSE acts like a rolling average, using information from neighboring frames to remove noise while preserving a high temporal resolution. This powerful digital tool can be applied in real-time or post acquisition, giving you more flexibility in how you set up your experiments.



Follow the dynamics of life: fast and gentle 3D live cell imaging for more than 7 minutes of mitochondria (Mitoview, green),lysosomes (SiR, cyan), cellular and vesicle membrane (CellBrite NIR 750, magenta). Each volume was acquired in 3s, processed with DSE and LIGHTNING.

Get more insights with Aivia

Tracking lysosomes with Aivia enables an in depth analysis of trajectories. Aivia simplifies key steps in image analysis and provides you with solutions tailored to your data. Unleash the value of your data with powerful and fast 2-5D visualization.



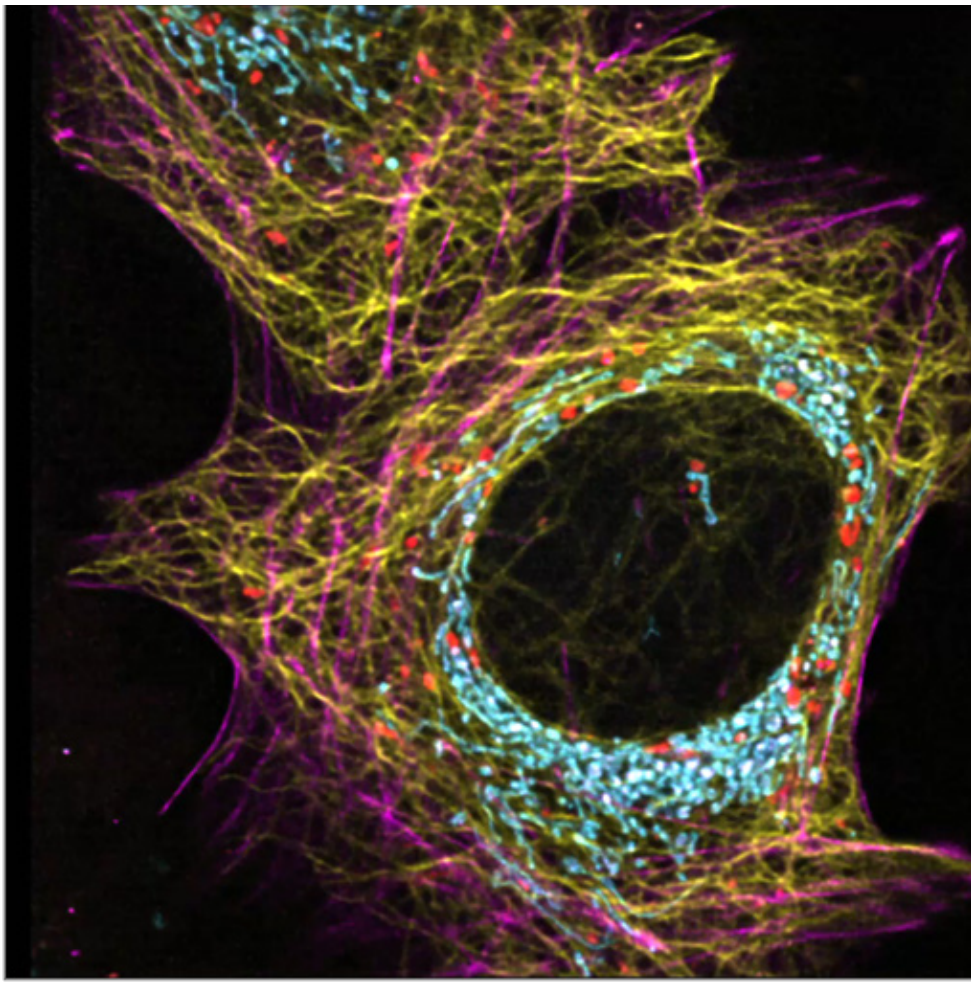
Trajectories of lysosomes in live cells analyzed by Aivia.

PRODUCTIVITY TO MEET YOUR DEMANDS

PRODUCTIVITY
DO MORE

Dynamic Signal Enhancement powered by Aivia: Better temporal dynamics and better signal-to-noise ratio at the same time

Dynamic Signal Enhancement (DSE) powered by Aivia is a new option which uses AI to interpolate frames between acquired raw data in a time series. Using the additional information from these frames for rolling average calculation, DSE can now reach a higher signal-to-noise ratio (SNR) and better temporal dynamics at the same time.



Mammalian cell stained with MitoView Green, SPY555-actin, SiR Tubulin and NIR750.Simultaneous multi-color imaging on STELLARIS using the FOV scanner. Image series further enhanced by Dynamic Signal Enhancement, DSE powered by Aivia, and LIGHTNING.

With STELLARIS, you know that every time you sit at the microscope you will be able to get more done. The software tools ImageCompass and LAS X Navigator give you full control of your experiments allowing you to truly break free of traditional equipment limitations and imagine new ways to see your samples. The DSE, DSE powered by Aivia, and LIGHTNING technologies enable you to capture your samples with high temporal and spatial resolution, either on the fly or after the images have been acquired.

SELECT THE BEST STELLARIS FOR YOUR RESEARCH

Next generation STELLARIS

With the next generation STELLARIS confocal platform you can configure your own microscope as your research changes. You can choose the most suited detector from the Power HyD detector family, fast resonant scanners and add the modalities you need to do more.

STELLARIS

STELLARIS WITH WLL

Modalities	STELLARIS	STELLARIS with WLL
STED	X	✓
DIVE *	✓	✓
FALCON	With DIVE	✓
SpectraPlex	X	✓
DLS	✓	✓
CRS *	✓	✓
Cryo	✓	✓

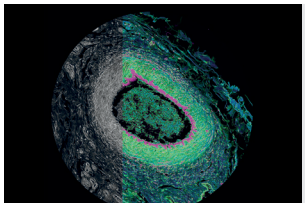
X = feature not available ✓ = feature available as option *VISIR Scan optics required

Applications		
Gentle confocal live cell imaging	+	++
Integrated super resolution imaging in real time	++	++
Monitor lifetime-based changes	With DIVE	++
Spectral or lifetime-based species separation to accommodate difficult dye combinations	With DIVE	++
Flexibility for multicolor confocal experiments	+	++
2D and 3D multicolor STED Super-Resolution to study molecular relationships and structure well beyond the diffraction limit #	n.a.	++
High-speed lightsheet imaging for live and cleared samples #	+	++
Fluorescent Lifetime Microscopy (FLIM) to quantitativly study molecular interactions #	With DIVE.	++
Support of stage applications in multiwells, slide scans, and multi-position experiments	++	++
Information of molecular dynamics (FCS) #	++	++
Multiphoton deep tissue In Vivo multicolor imaging #	++	++
FRET and FRAP	++	++
Complex experimental set-up (Live Data Mode)	++	++
Superresolution	++	++

+ Good fit ++ Excellent fit … to your application. #Option

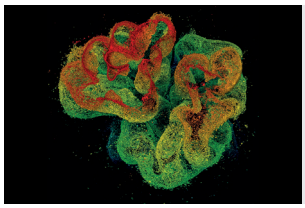
EXPAND YOUR RESEARCH

With our modular concept, you can tailor your confocal microscope to your current needs and upgrade with additional functionalities at any time.



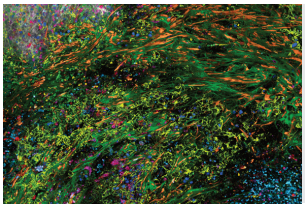
FALCON – FAst Lifetime CONtrast

Lifetime imaging in an instant. STELLARIS FALCON (FAst Lifetime CONtrast) is the future of functional imaging. Harness the power of fluorescence lifetime to investigate cellular physiology and explore dynamics in living cells.



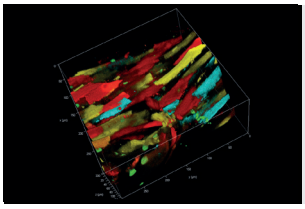
STED Optical Super-Resolution

STED (STimulated Emission Depletion) delivers powerful and cutting edge multicolor, deep, and live-cell nanoscopy, for 2D and 3D applications. STED enables you to characterize details in your sample and unveil molecular relationships at the nanoscale level.



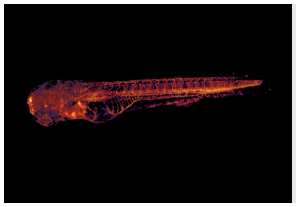
SpectraPlex High-plex 3D imaging

SpectraPlex is a comprehensive toolbox for high-plex 3D imaging in Spatial Biology. It offers a streamlined workflow to simplify panel creation, automate acquisition settings, and acquire data through advanced unmixing algorithms.



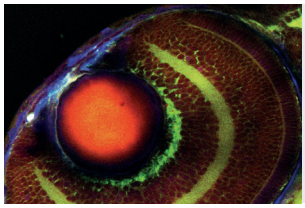
DIVE – Deep In Vivo Explorer

DIVE (Deep In Vivo Explorer) is the first multiphoton microscope with spectrally tunable detection. Equipped with 4Tune, a tunable, non-descanned detection unit, DIVE offers you unlimited flexibility and enables you to develop new multicolor deep in vivo experiments.



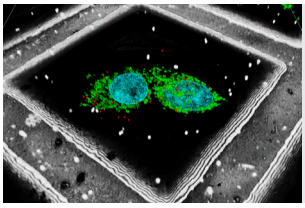
DLS – Light Sheet Imaging

With STELLARIS DLS you can benefit from two imaging systems in one: a full confocal and an easy-to-use light-sheet microscope with single plane illumination, making your research more versatile.



CRS – Label Free Imaging

The CRS (Coherent Raman Scattering) technology exploits image contrast arising from characteristic vibrational states of different molecules within a specimen. As no labeling is required, the specimen remains almost unaffected by preparation and imaging.



Cryo

The STELLARIS Cryo is a confocal light microscope system that helps you to target your area of interest for cryo-electron tomography (CryoET). The STELLARIS Cryo gives you the precision to target reliably, while still offering superior performance you can count on and improved productivity for your experiments.

Leica
MICROSYSTEMS

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

danaher

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