



Product Information
Version 1.0

ZEISS Celldiscoverer 7

Your Automated Platform for Live Cell Imaging



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Often in life sciences research, the data you are after will only be revealed through multiple runs of experiments or complex assays. Automation and parallelization can be the only way to get there. Now, with Celldiscoverer 7, you can combine the easy-to-use automation of a boxed microscope with the image quality and flexibility of a classic inverted research microscope. Celldiscoverer 7 calibrates itself, then detects and focuses on your samples while the optics adjust themselves. Leaving you free to get on with other projects. Whether working with 2D or 3D cell cultures, tissue sections or small model organisms, you will acquire better data in shorter times with this reliable automated research platform. What's more, you can combine your Celldiscoverer 7 with rapid GPU deconvolution to get even more information from three-dimensional samples.

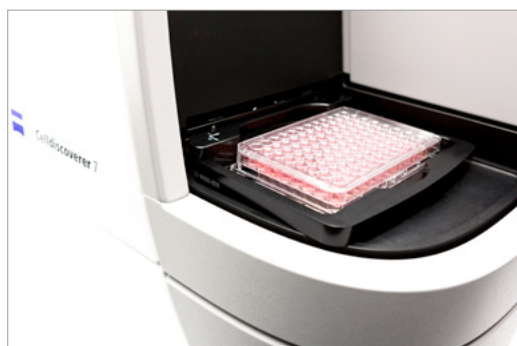


Simpler. More Intelligent. More Integrated.

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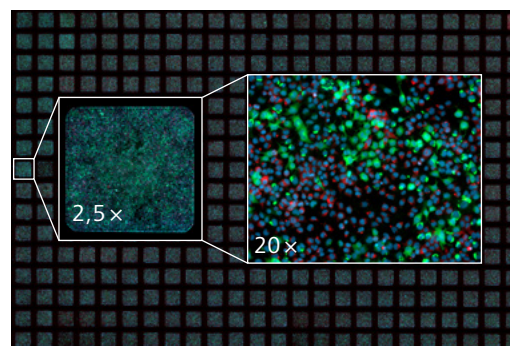
A Flexible Platform

Celldiscoverer 7 is a fully integrated high-end imaging system. It comes with various incubation and detection options so you can tailor the system to your applications. Go for fast, sensitive sCMOS or EMCCD cameras when performing your most demanding live cell experiments and rapid time-lapse recordings. For screening applications with high throughput, choose a high dynamic range camera with a large field of view. To get better data from three-dimensional samples, simply add fast deconvolution. Get all these benefits and more with the in-built flexibility of Celldiscoverer 7.



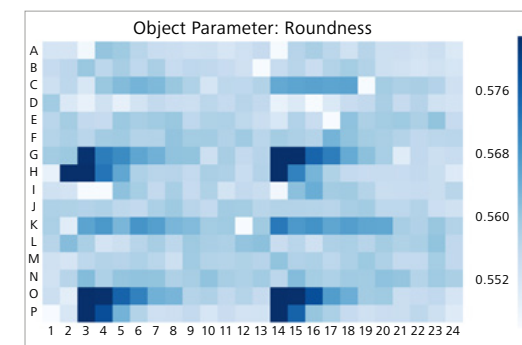
Top Quality Data from Your Samples

For demanding long-term, time-lapse imaging, Celldiscoverer 7 gives you the advantage of Auto-immersion and a hardware-based focus that finds and keeps the focus automatically after detecting the thickness and optical properties of the sample carrier. Autocorr objectives then correct spherical aberrations to deliver crisp contrast and high resolution every time. Get image quality like you've never seen before – no need to adjust manually. Keep your cells happy and they'll deliver unbiased data: Celldiscoverer 7 provides a range of integrated incubation options to create just the right environment. The improved optical design resolves more details in large fields of view.



Reproducible Results Made Easy

As soon as you start imaging, automatic calibration routines take over to ensure reproducible results. Check the current status and follow progress of your experiments on the touchscreen. With barcode recognition you can identify your sample, sample carrier and even the type of experiment. If you don't work with barcodes, an automatic preview scan will identify the sample carrier and calibrate it – whether you load the sample yourself or let the robotic plate loader do it for you.



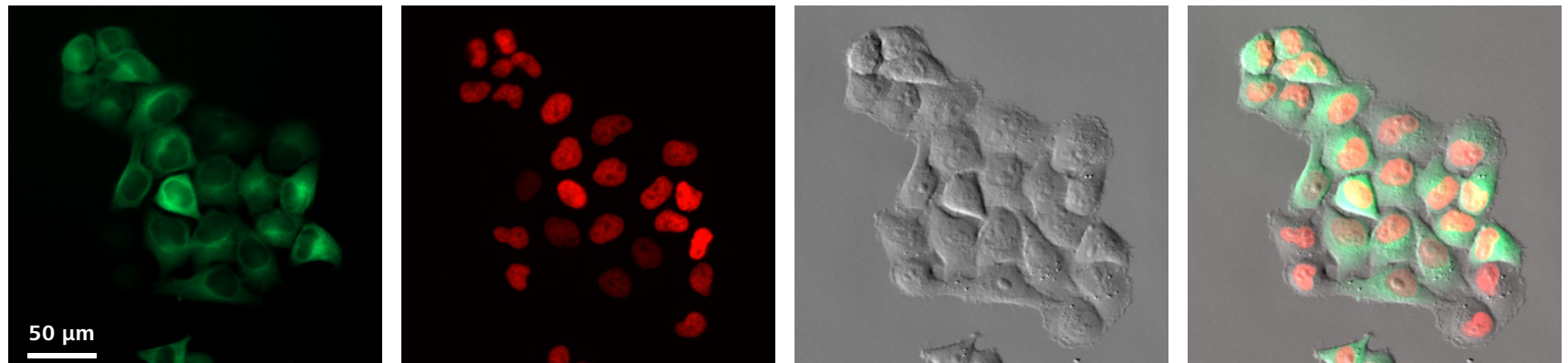
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An Integrated Boxed Microscope Protects Your Sample

Observing live samples over a number of days or imaging lots of multiwell plates really puts your microscope through its paces. To get reproducible, unbiased data, you must control environmental conditions such as light, temperature, CO₂ etc. That's why Celldiscoverer 7 brings you a unique combination of a stable box, darkroom and integrated inverted research microscope with optional incubation. It simplifies your laboratory setup and makes work more comfortable.

All Celldiscoverer 7 components are optimized for hassle-free automated imaging. New users and multi-user facilities especially will enjoy the in-built automation and usability features when setting up complex experiments. You'll systematically avoid accidental hardware changes that might lead to biased data or even damage your microscope. And Celldiscoverer 7 can make you more productive, too: expect better data in shorter times, with less training and maintenance. What's more, as your needs grow you can expand Celldiscoverer 7 with external cameras, deconvolution, additional environmental control, liquid handling, a robotic plate loader – whatever you need for the challenge of live cell observation.



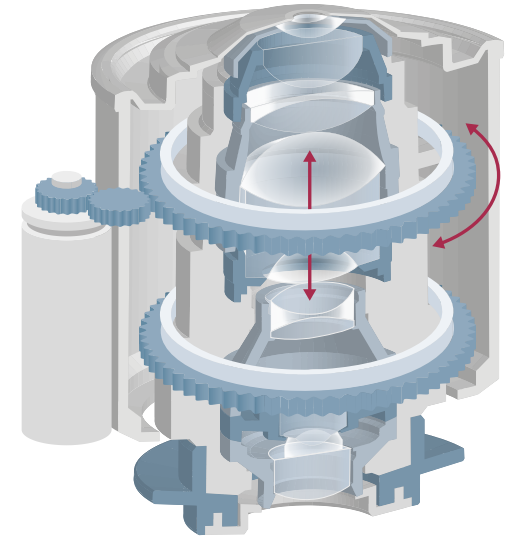
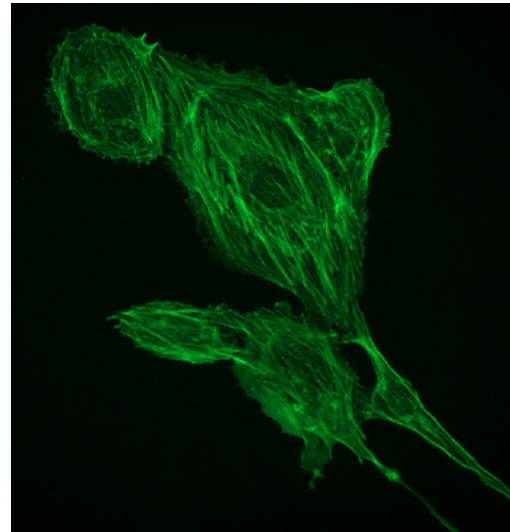
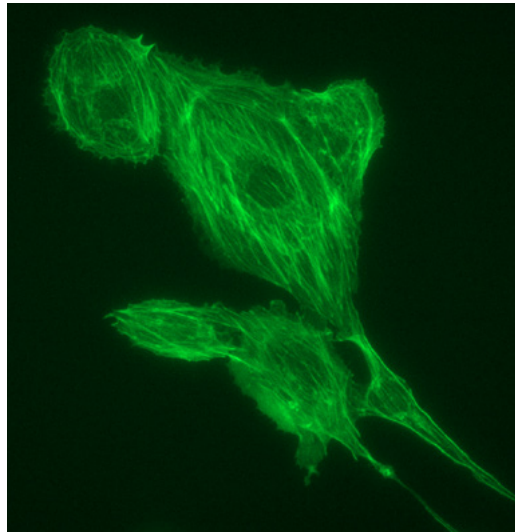
72 h cell growth assay using a waterimmersion objective. HeLa Kyoto cells expressing H2B-mCherry Tubulin eGFP (Neumann et al., Nature 2010 Apr.1.; 464(7289):721-7) imaged every 15 minutes for 72 hours using Autoimmersion; individual channels of the green (eGFP) and red (mCherry) fluorescence and the phase-gradient-contrast as well as an overlay. Sample courtesy of I. Charapitsa, Chemical Biology Core Facility, EMBL, Heidelberg, Germany

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ZEISS Celldiscoverer 7 Recognizes and Adapts Automatically to Your Samples

Live cell imaging requires objectives with high numerical apertures. Those objectives will only deliver high contrast and sensitivity if their optics can adapt to variations in bottom thickness or to the material of different sample carriers. With Celldiscoverer 7 you're now free to use Petri dishes, chamber slides, multiwell plates, plastic or glass, thin or thick vessel bottoms, low skirt or high skirt plates. Automatic sample recognition detects all relevant vessel features while loading your sample. Then Autocorr adjusts the correction ring of the objective to compensate for spherical aberrations. Find Focus automatically places your sample in focus and Definite Focus keeps it there. It's never been easier to get crisp images with low phototoxicity from deep inside your sample.



Left image shows spherical aberration due to unadjusted optics. Right image shows the same structure using an Autocorr objective. The correction results in increased contrast, resolution and intensity, providing low phototoxicity. The images show tubulin in FluoCell prepared slide #1. Sample courtesy of Invitrogen, Thermo Fisher Scientific Inc.

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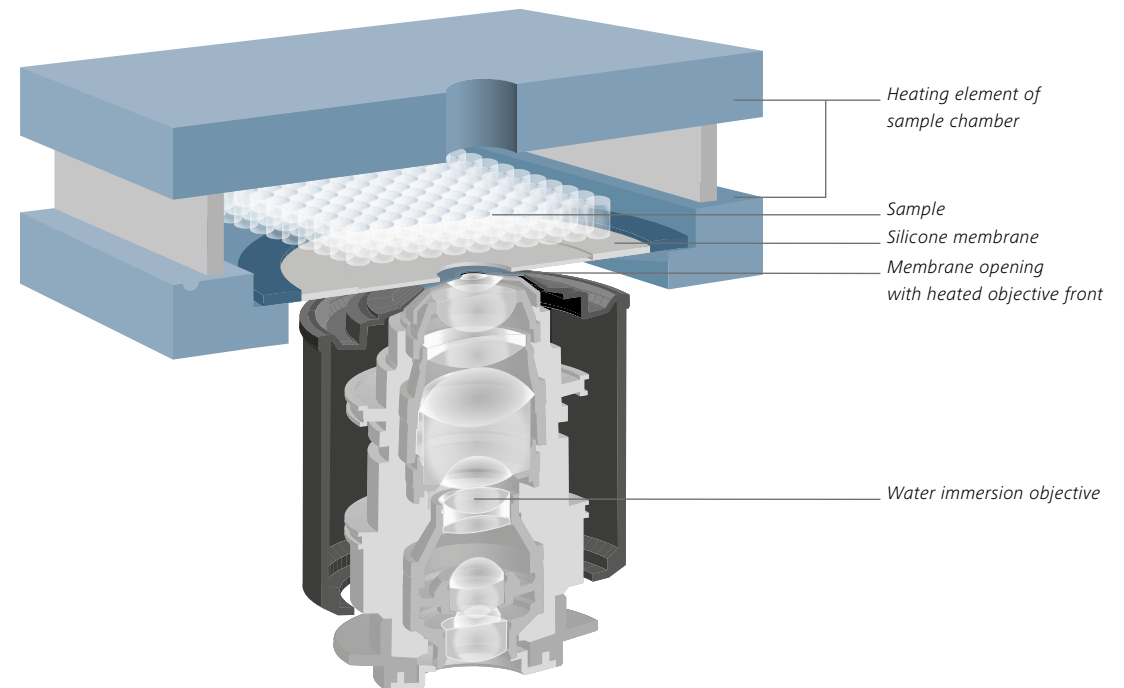
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There Is No Life Without Water ...

... and no live cell imaging without water immersion. In life sciences, cell biology or screening applications, your samples mostly consist of water and/or will be mounted in aqueous solutions. Celldiscoverer 7 combines an outstanding 50x water immersion objective with rapid automated immersion supply and removal.

A unique elastic silicon membrane fits perfectly between the objective and sample chamber. The silicon membrane simultaneously seals the sample chamber to avoid unnecessary airflow while protecting the system from potential liquid spillage. Just select the water immersion objective and water is supplied instantly to the front lens. Within seconds the immersion is building up and the lens is ready to use. When you switch back to one of Celldiscoverer 7's dry objectives, the immersion water is automatically removed. Until now, automated imaging systems often struggled as the immersion water quickly evaporated. Celldiscoverer 7 solves that problem by automatically monitoring the immersion and adding water in regular intervals, as needed. With Celldiscoverer 7 you can perform unbiased live cell experiments at 37°C over several days or carry out extensive scanning processes on multi-well plates.

By adapting the refractive index of your imaging system to the samples, you'll achieve more efficient light collection and increased sensitivity. And less phototoxicity significantly increases viability of even your most challenging living samples.



A silicone membrane allows automatic water immersion and seals the sample chamber.

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Get in Focus, Then Stay in Focus

Use the hardware-based Find Focus function to automatically focus your sample and find your region of interest quickly with just a single click. This significantly reduces the time to your first image and minimizes sample illumination. Then select Definite Focus to maintain the focal position throughout your experiments, whether it takes a few seconds or several days. Or combine both methods with the powerful content-based autofocus of ZEN imaging software. Celldiscoverer 7 can automatically create focus maps for multiple positions in long-term time-lapse experiments. Simply choose the best focus strategy for the experiment at hand.

Move to the Edge ...

... but not one step more, thanks to the Adaptive Lens Guard. High optical performance often compromises on the possible scanning area. Celldiscoverer 7 with its Adaptive Lens Guard protects the objective from collisions with your sample vessel or hardware components, automatically maximizing the available scanning area. Bottom thickness, skirt height and lateral dimensions are important geometrical features of the different sample carrier types – especially when

working with multiwell plates. Celldiscoverer 7 automatically detects these features and adapts accordingly. It also calculates the maximal possible scanning area automatically, depending on the individual sample carrier, objective and current focus position in your experiment. The available scanning area is always indicated on your monitor. Change your experimental parameters and the scanning area will adapt automatically, in real time.

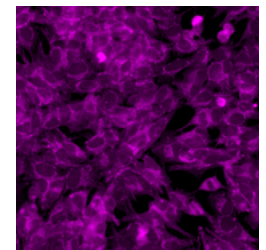
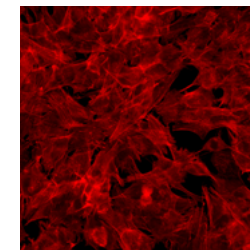
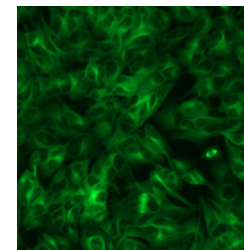
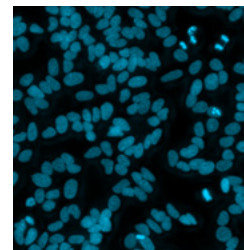
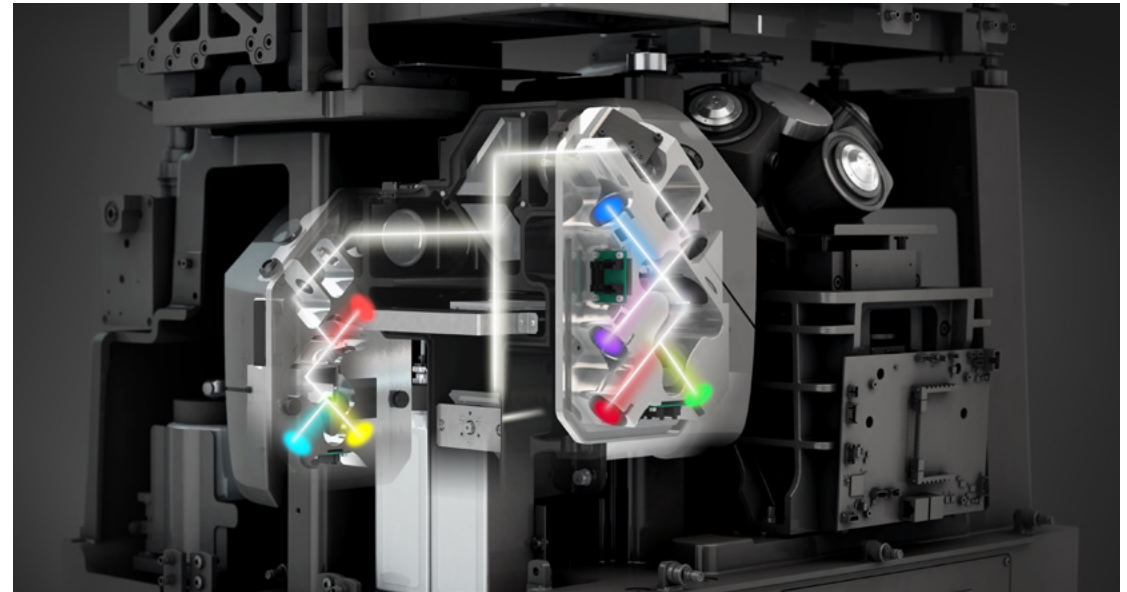


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Capitalize on LED-Technology for Live Cell Imaging

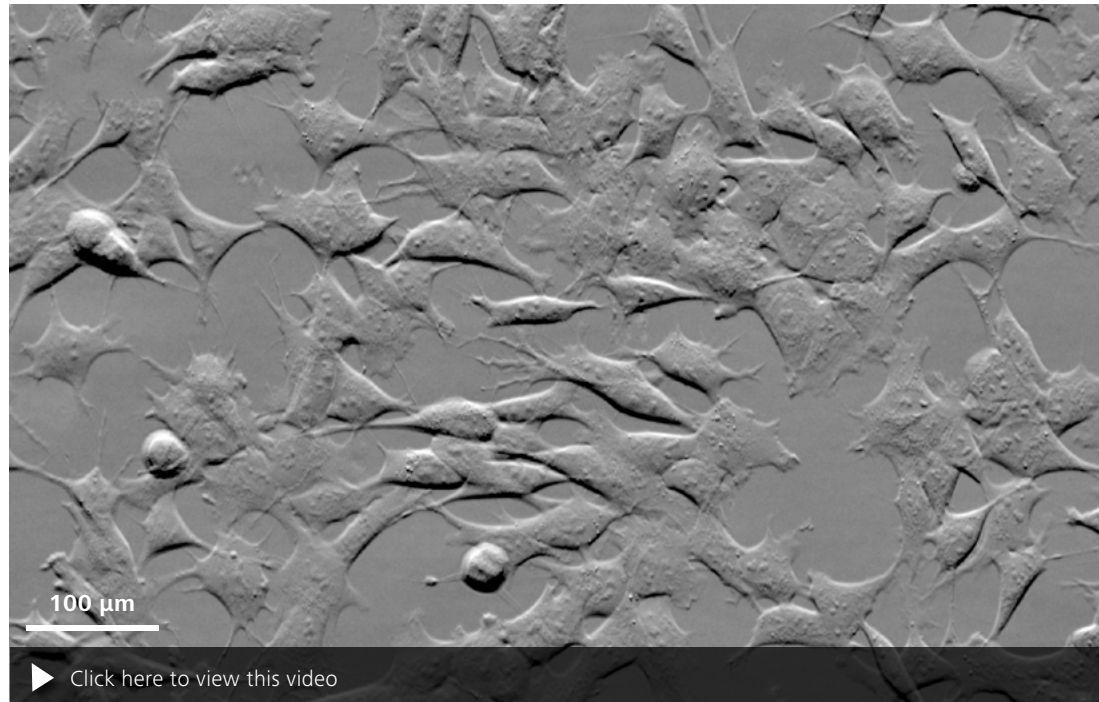
CellDiscoverer 7 brings you all the advantages of LED-technology for efficient illumination with low phototoxicity, fast switching times and long-term stability. That's what delivers gentle imaging, increased throughput and reproducible results. The fluorescence excitation unit combines up to seven LEDs for maximum flexibility in the choice of dyes – from deep blue to far red. All LEDs are hardware-triggered for precise, fast illumination. During sample navigation LEDs are tightly synchronized with camera frame rates. An automated rectangular excitation field stop illuminates only the active field of view, greatly reducing phototoxicity and fluorescence bleaching. Use high-efficiency multi-bandpass filter sets for fast acquisition of multiple fluorescent channels. CellDiscoverer 7 simply switches LEDs on/off – without moving any mechanical parts – so you get high-speed multi-channel imaging, even when combined with transmitted light.



SH-SY5Y cells cultured on a 384 microwell plate. Multichannel image at a single position using the 20x/0.95 objective. Extended depth of focus from Z-stack. Hoechst – Chromatin (blue), anti-alpha-tubulin antibody FITC for alphas tubulin (green), Phalloidine for actin (red), MitoTracker Deep Red for mitochondria (purple). Sample courtesy of P. Denner, Core Research Facilities, German Center of Neurodegenerative Diseases (DZNE), Bonn, Germany.

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Use a Novel Transmitted Light Contrast

With Celldiscoverer 7 you can use transmitted light brightfield and phase gradient contrast. This novel relief contrast adapts automatically to the sample carrier geometry, providing excellent contrast to the very edge of the vessel. It's fully compatible with all objectives, filter sets and sample carriers. This contrasting method stays robust, even against liquid meniscus or plastic lids. Use the far-red transmitted light LED for gentle

imaging at very high speeds. You can perform applications based on label-free assays or let the system automatically combine transmitted light with multiple fluorescence channels. All multi-bandpass filter sets support the combination of transmitted light and fluorescence, without reducing sensitivity or speed. On top of that, this unique motorized transmitted light unit allows dispensing directly on the optical axis, without

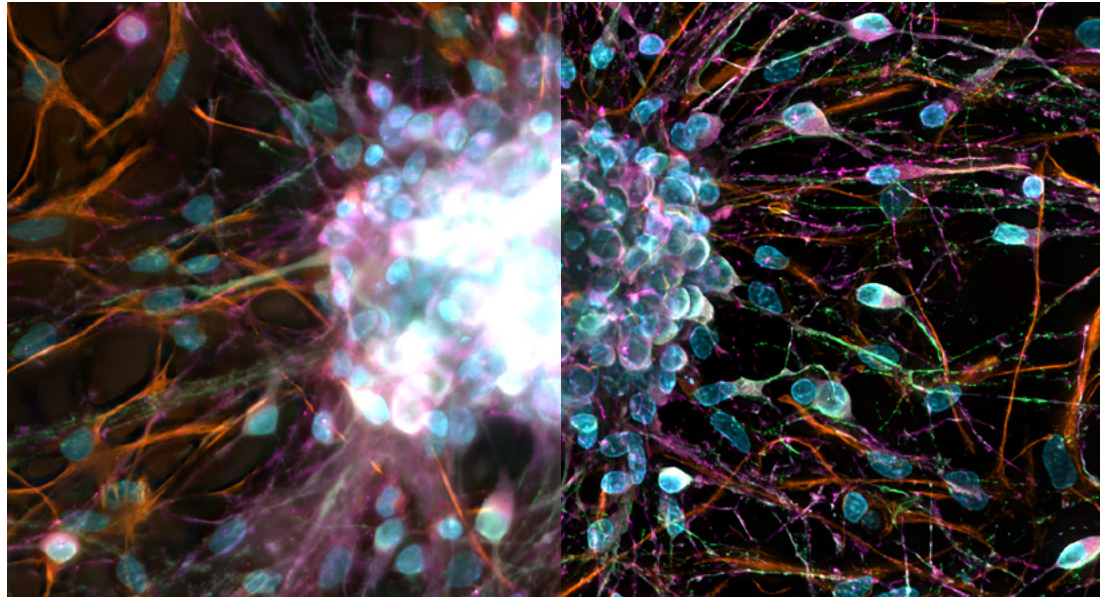


SH-SY5Y cells cultured on a 384 microwell plate. Timelapse has been acquired using 20x magnification and phase gradient contrast. Sample and assay courtesy of P. Denner, Core Research Facilities, German Center of Neurodegenerative Diseases (DZNE), Bonn, Germany.

disturbing the environmental conditions. The dispensing unit is always integrated. As soon as you open the hatch on top of your Celldiscoverer 7, the transmitted light unit will automatically change place with the dispensing unit. You now have direct on-axis access to the specimen for pipetting. You can add agents while maintaining continuous physiological conditions.

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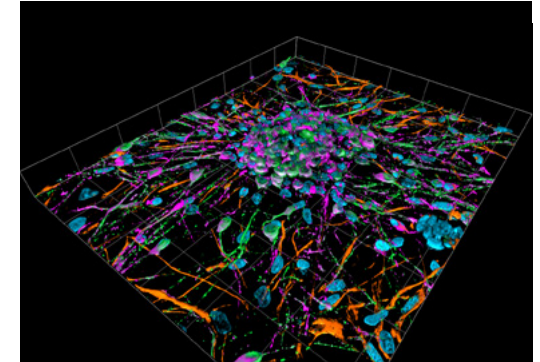


Comparison between widefield (left) and deconvolved (right) Z-stack projection using GPU-based Deconvolution.

Get More Details with Deconvolution

When imaging three-dimensional samples, out-of-focus light sometimes blurs your structure of interest. For these images, you need deconvolution – a combined optical and mathematical method – to increase contrast and improve the signal-to-noise ratio and resolution. With CellDiscoverer 7 it is easier than ever before to first acquire a Z-stack of your samples and then deconvolve the image

to reassign all detected photons to their origin. With ZEN imaging software you use advanced deconvolution algorithms, including a novel approach with depth variant point-spread-functions for deep imaging. Combine this with CellDiscoverer 7's unique Autocorr objectives and you will get excellent results from thicker samples, e.g. 3D-cell culture. And you will get



Rat cortical primary culture. Antibody staining of beta-tubulin (Cy2, green), Nestin (Cy3, red) and DCX (Cy5, purple), nuclei stained with DAPI (blue). 3D reconstruction of the deconvolved Z-stack (shadow projection). Sample courtesy of H. Braun, LSM Bioanalytik GmbH, Magdeburg, Germany.

them up to 30 times faster than with the traditional technology that works on your processing PC's RAM, thanks to CellDiscoverer 7's new GPU-accelerated, parallel CUDA processing. Use the increased speed to extract maximum information from the large datasets you acquired in those demanding long-term, time-lapse or multiwell screening applications.

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ZEISS Plan-APOCHROMAT 5x/0.35 Objective

This objective is your choice for efficient sample navigation. It creates impressive overview images by delivering an unparalleled information density in a single shot, especially in combination with the microscope camera AxioCam 512 mono. Many screening applications will strongly benefit from the high resolution on large fields. The objective easily handles thin and thick vessel bottom made of glass or plastic. In combination with the built-in magnification changer it combines the benefits of three different objectives into one: 2.5x/0.12, 5x/0.25 and 10x/0.35 – at a fixed working distance.

ZEISS Plan-APOCHROMAT 20x/0.7 Autocorr Objective

From thin to thick, from plastic to glass – this objective adapts automatically to every sample you load on your Celldiscoverer 7. It delivers an unparalleled numerical aperture of 0.7 through 1.2 mm plastic bottom without compromising image resolution and contrast. This tremendous flexibility will make the lens your multipurpose objective, especially if you would like to image cells, which can only grow on plastic bottom. In combination with the built-in magnification changer this objective combines the benefits of three different objectives into one: 10x/0.35, 20x/0.7 and a 40x/0.7 – at a fixed working distance.

ZEISS Plan-APOCHROMAT 20x/0.95 Autocorr Objective

This objective delivers high numerical apertures without applying immersion. It is optimized for thin vessel bottoms. No matter if your cells prefer glass or plastic – this objective will adapt to bottom material and thickness variations. With the increased sensitivity this objective is ideal to generate crisp images on large areas or multiple positions at high speed. In combination with the built-in magnification changer this objective combines the benefits of three different objectives into one: 10x/0.5, 20x/0.8 and 40x/0.95 – at a fixed working distance.

ZEISS Plan-APOCHROMAT 50x/1.2 W Autocorr and Autoimmersion Objective

This objective delivers high light collection efficiency and resolution. In combination with the Autoimmersion function it matches perfectly to samples in aqueous solution. Since it reduces phototoxicity to a minimum, it's your choice for your most demanding life cell imaging applications, e.g. long-term imaging of subcellular structures. Optimized for thin bottoms it adapts automatically to the bottom material and thickness. No matter which field of view you prefer, this objective will deliver a constant numerical aperture of 1.2 and combines the benefits of three different objectives into one: 25x/1.2, 50x/1.2 and 100x/1.2 – at a fixed working distance.

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Easily achieve stable environmental conditions for your demanding live-cell experiments. You can control the temperature with the optional heating unit or a Julabo cooling thermostat. In combination with a humidifier, optional CO₂ and/or O₂ module you control atmospheric conditions.



No matter if you choose a ZEISS Axiocam microscope or a third party camera – if you have to increase acquisition speed and sensitivity for special applications, CellDiscoverer's additional camera port provides the flexibility you need.



Increase your sample throughput with the optional robotic plate loader. Load multiwell plates or insert plates and enjoy maximum flexibility. The Plate Loader is controlled by ZEN imaging software to ensure easy and reliable operation.



Your CellDiscoverer 7 can load multiwell plates, dishes, chamber-slides or standard slides. All sample holders are optimized for large scanning areas, fully compatible with water immersion and autoclavable.



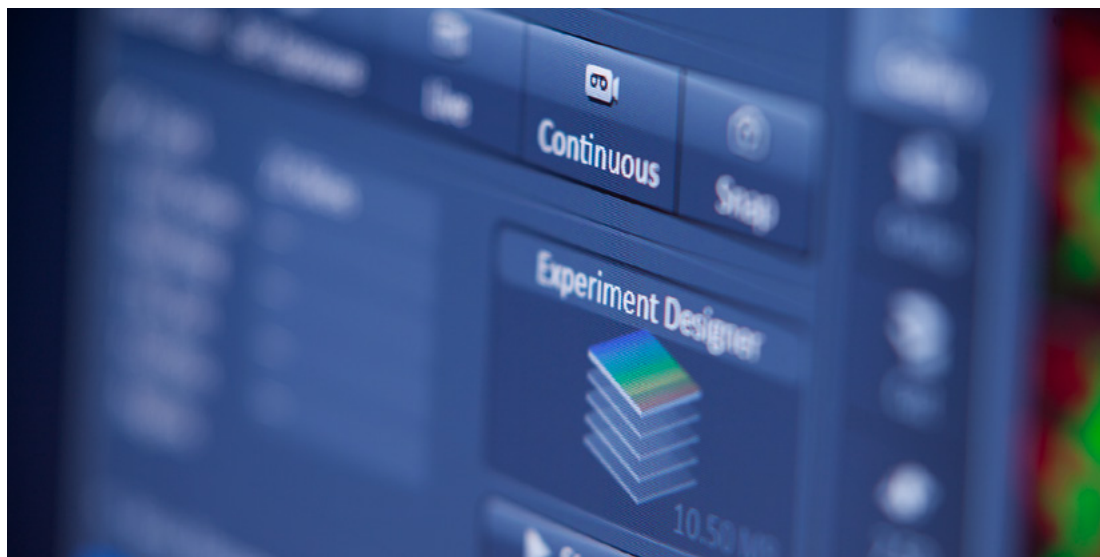
CellDiscoverer 7 offers an effective way to keep the sample chamber clean. You simply insert the UV disinfection unit instead of a standard mounting frame. It's automatically recognized by the system and you start the disinfection workflow via the touchscreen.



CellDiscoverer 7 offers a dedicated mounting frame for sample access. You can run perfusion experiments efficiently, while maintaining homogenous and stable environmental conditions.

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ZEN Imaging Software Shortens the Path to Your Goal

ZEN – ZEISS Efficient Navigation – is the single user interface you will see on all imaging systems from ZEISS. ZEN imaging software leads you simply and quickly to the result.

At all times you see which options the system is making available to you and which step is

appropriate to take next. ZEN makes it easy to operate every imaging system from ZEISS correctly and intuitively. As a result you save time, reduce training and support costs, and get faster answers to your questions.

With CellDiscoverer 7 you profit from advanced automation features:

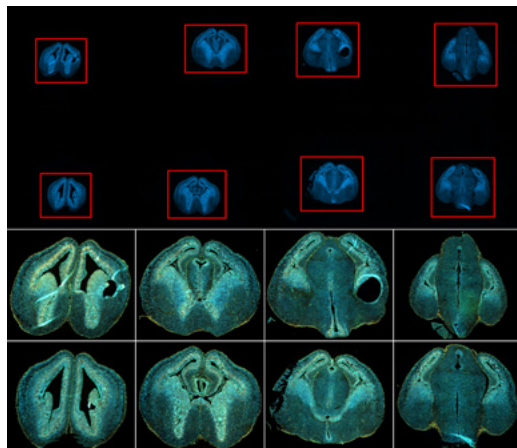
- Simple and intuitive carrier-based navigation via mouse and keyboard
- A dedicated automation wizard to create scan profiles for routine or reoccurring tasks
- A range of hardware- and software-based focus strategies to set up even complex multi-position experiments
- Fast overview images. Create an overview of your cells just once, then there's no need to expose them to unnecessary light doses during experiment setup.
- Cell viability put first with samples illuminated only as long as the camera acquires an image
- An optimized CZI file format for large datasets and seamless integration into existing image analysis workflows
- Open interfaces. Use your CZI dataset in all major software packages that use the BioFormats library, e.g., Fiji, Python, Matlab, Icy, Knime, Imaris, Arivis.

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OAD is Your Interface to ZEN Imaging Software

- Use Python scripts to customize and automate your workflows.
- Integrate external image analysis applications into your workflows.
- Exchange image data with external programs like ImageJ, Fiji, MATLAB, KNIME or Python.
- Use feedback for smart experiments.
- Get more reliable data in less time.
It's your choice.



The result of overview scan using low magnification (top panel) was used to automatically detect the brain slices via image analysis. The results (XYZ position and the height/width of detected objects) were used in a automated subsequent scan using a high NA objectives, where the system carried out an individual tile scan for every detected object in a complete automated fashion without any additional user interaction. Sample courtesy of P. Grigaravicius, FLI – Leibniz Institute on Aging, Jena, Germany.



OAD enables the analysis of data acquired with ZEN imaging software by other programs like ImageJ. Transfer your results back to ZEN for further analysis and display.

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Typical Applications	Task	ZEISS Celldiscoverer 7 Offers
Multiwell plates for Live Cell or fixed endpoint assays	Evaluate and document cell culture from multiwell plates.	Transmitted light – phase gradient contrast for high-resolution images through glass and plastic vessels Up to 7 LED excitation wavelengths Low magnification, large field of view – high numerical aperture lenses Automatic sample carrier detection and calibration
	Scan the maximum area of a multiwell plate at different magnifications and resolutions.	Adaptive Lens Guard and automatic sample carrier calibration ensure maximized scan area depending on the plate type 100% plate scanning from 2.5x to 100x is possible whole well – single shot
Label free assays	Perform label free growth curve assays over several days.	Transmitted light source: high-speed IR-LED (725 nm) offering low phototoxicity Stable Incubation with temperature (heating/cooling), CO ₂ and O ₂ control Simple and reproducible Hardware Autofocus for focus drift compensation Autoimmersion for water immersion lens
		Up to 7 LED excitation wavelengths Autocorr objectives for automated aberration correction Adaptive Lens Guard and automatic sample carrier calibration ensure maximized Scan area Barcode reader for easy sample identification Preview Scan Open Application Development for Python scripting – open access to third party analysis tools Fast Multibandpass Main Beam Splitter and Emmission Filter Wheels Large working distance enables higher/better 3D content screening
High-Content Screening	Acquire high resolution images of multi-labelled cell culture from multiwell plates quickly.	Option to add a plate loader
	Pharmacological or chemical or drug screening.	Transmitted light – phase gradient contrast for high-resolution images through glass and plastic vessels Stable Temperature and O ₂ /CO ₂ controlled enviroment Autoimmersion for water immersion lens
Transfected and non-modified Live Cell Cultures	Evaluate and document transfection rate and transfection stability using fluoescent markers.	Automatic measurement of sample carrier bottom thickness and Autocorr Objectives for enhanced contrast and resolution Adaptive Lens Guard and automatic sample carrier calibration ensure maximized scan area
	Work with different sample carriers.	

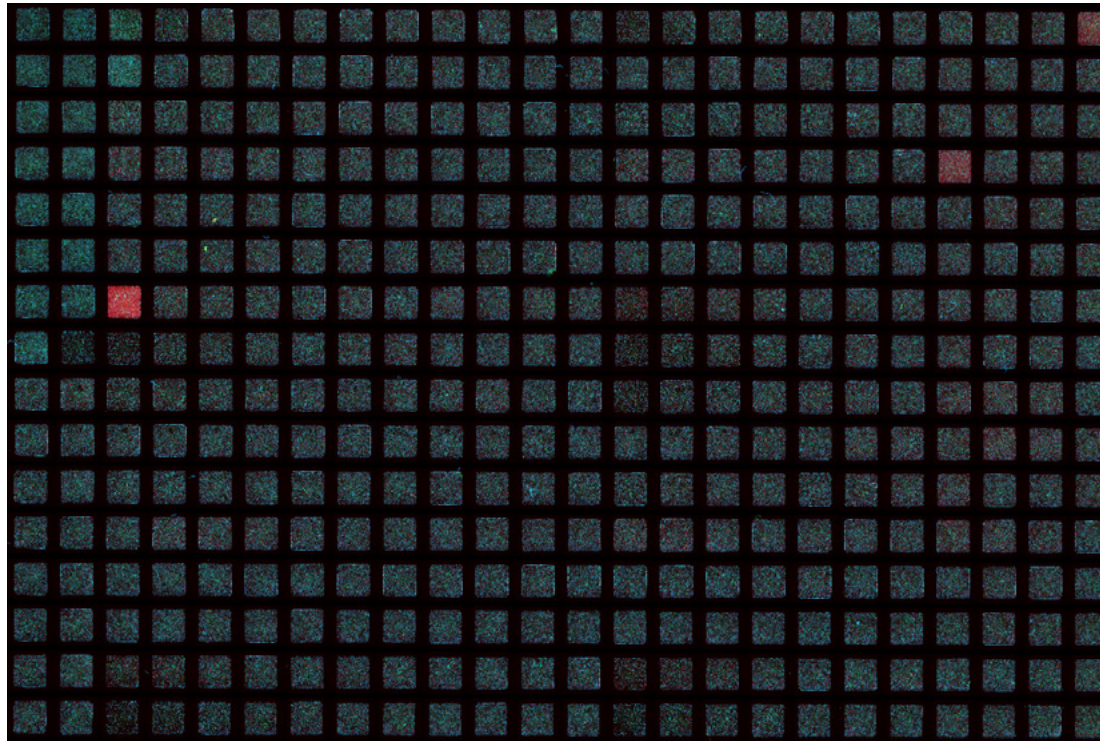
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Typical Applications	Task	ZEISS Celldiscoverer 7 Offers
Label-free fixed and thin tissue slices or small organisms	Document and evaluate cell and tissue morphology and growth state.	Transmitted light – phase gradient contrast for high-resolution images through glass and plastic vessels
	Change quickly between large overview scans and high resolution imaging.	Quick change of field of view using triple magnification changer Large working distances of 5x and 20x/0.7 objectives offer fast, high resolution and deep imaging
Fixed fluorescently labelled tissue, cell culture samples or small organisms	Identification, quantification and qualification of cell types, pathological and pharmacological pathways using cell-, tissue and protein markers in 2D and 3D samples.	Up to 7 LED excitation wavelengths
		GPU-accelerated 3D-Deconvolution Large working distances of 5x and 20x/0.7 objectives offer fast, high resolution and deep imaging
Multi-labelled living tissue section, organs, small organisms, organotypic-, spheroid or cell culture preparations	Short-term or long-term observation of physiological and morphological parameters in 2D/3D during growth, differentiation, motility and interaction.	Autoimmersion for water immersion lense
		Autocorr objectives for automated aberration correction
		Stable incubation with temperature (heating/cooling), CO ₂ and O ₂ control
		LED illumination unit with up to 7 excitation wavelengths
Stimulus-induced responses of cells, tissue or whole organisms	Observation of stimulus-induced responses of cells, tissue or organisms without disturbing the environmental control.	Experiment Feedback for adaptive experiments
		GPU-accelerated 3D-Deconvolution Large working distances of 5x and 20x/0.7 objectives offer fast, high resolution and deep imaging
Stimulus-induced responses of cells, tissue or whole organisms	Analyse the embryogenesis of small model organisms.	Large working distances of 5x and 20x/0.7 objectives offer fast, high resolution and deep imaging
		GPU-accelerated 3D-Deconvolution
Stimulus-induced responses of cells, tissue or whole organisms	Observation of stimulus-induced responses of cells, tissue or organisms without disturbing the environmental control.	Semi-automatic dispensing work flow
		Dispensing unit allows to add compounds into the field of view
		Option to install a perfusion chamber

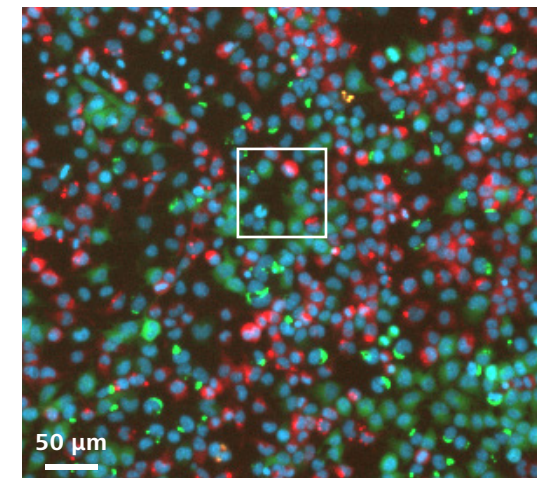
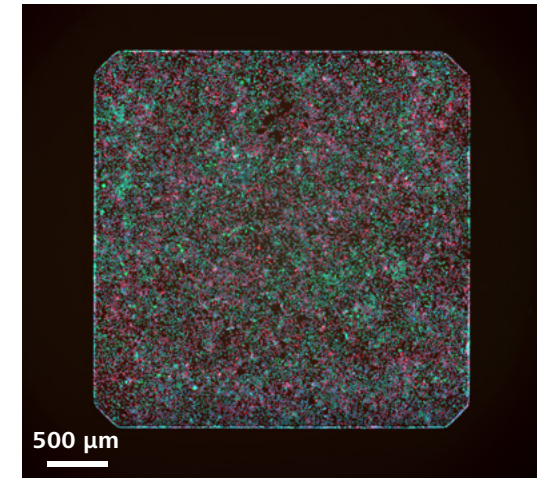
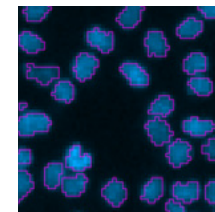
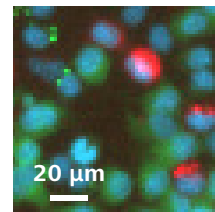
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Whole well, single shot.

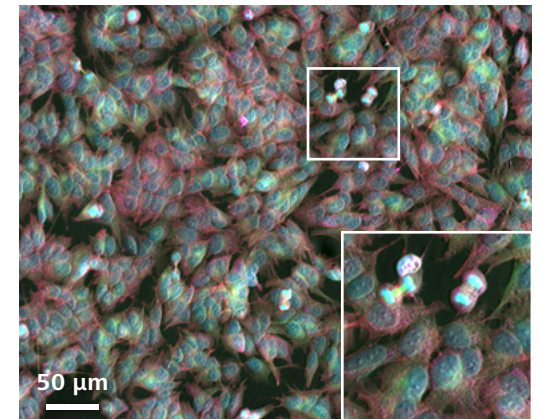
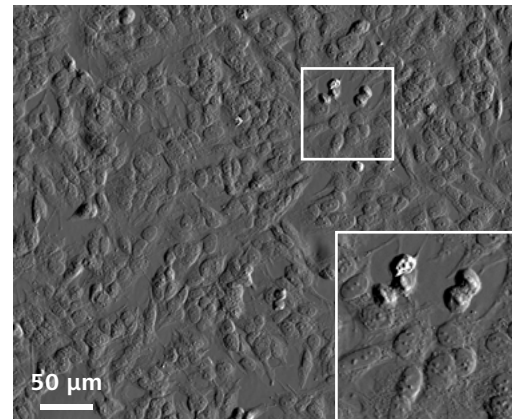
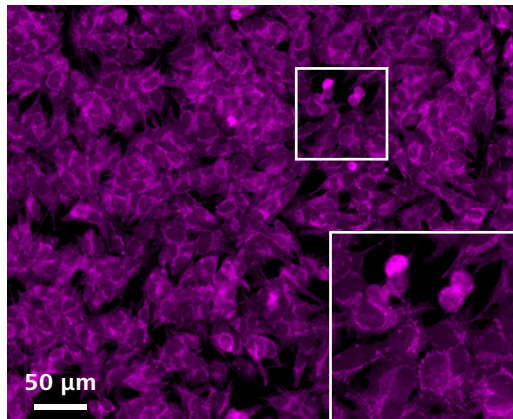
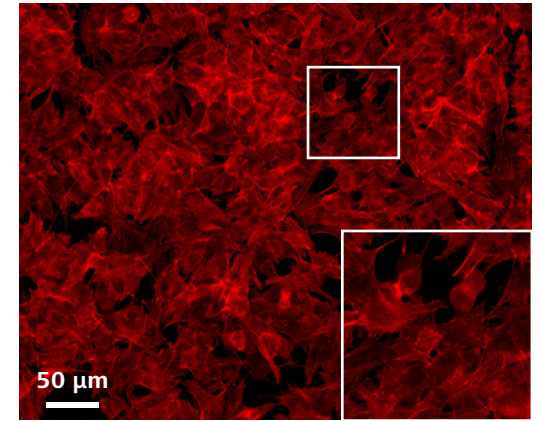
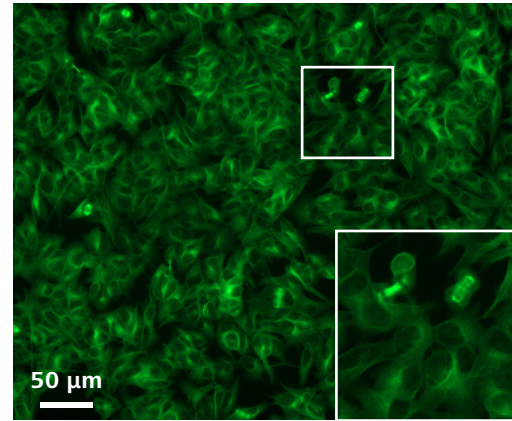
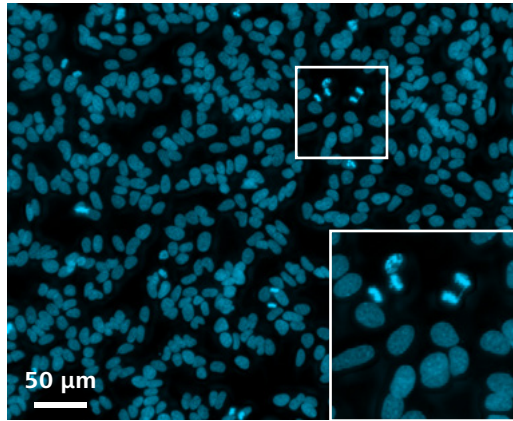
384 microwell plate imaged with 2.5x magnification in 3 channels. Each well fits into one single image. You avoid time-consuming scanning of wells and subsequent stitching and increase your throughput. The overall image quality and resolution allows e.g. segmentation of single cell nuclei and therefore counting of cells.



Sample courtesy of P. Denner, Core Research Facilities, German Center of Neurodegenerative Diseases (DZNE), Bonn, Germany.

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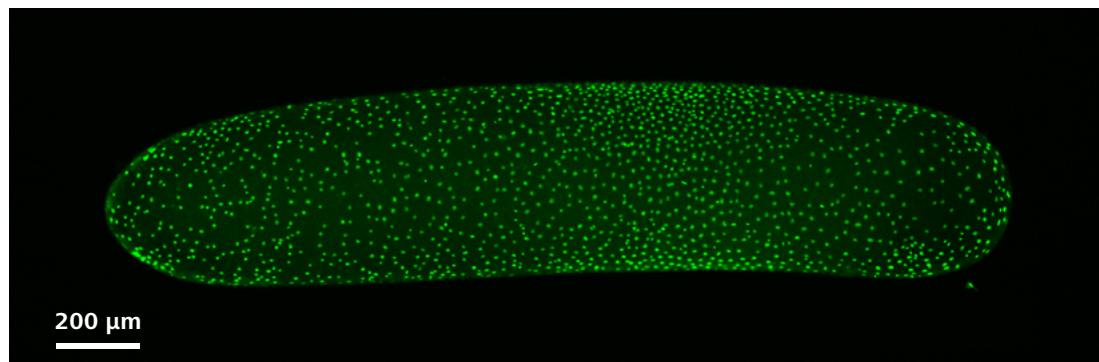
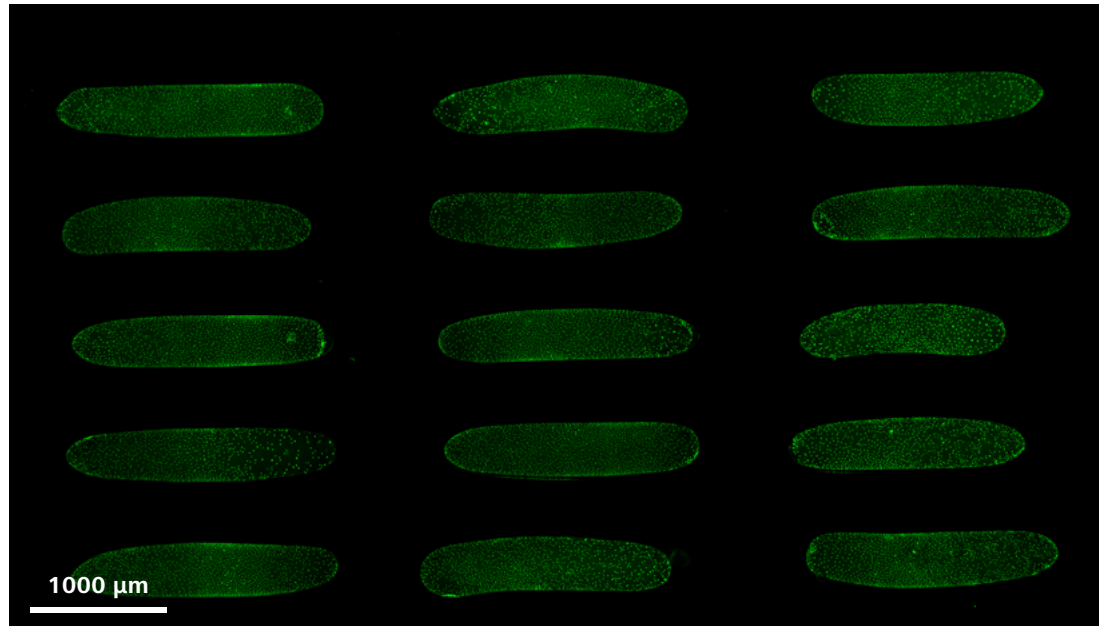
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SH-SY5Y cells cultured on a 384 microwell plate. Five channel image at a single position using Plan-APOCHROMAT 20x/0.95; EDF from Z-stack; Hoechst-Chromatin (blue), anti-alpha-tubulin antibody FITC for alpha tubulin (green), Phalloidine for actin (red), MitoTracker deepRed for mitochondria (purple), phase gradient contrast, overlay image. Sample courtesy of P. Denner, Core Research Facilities, German Center of Neurodegenerative Diseases (DZNE), Bonn, Germany.

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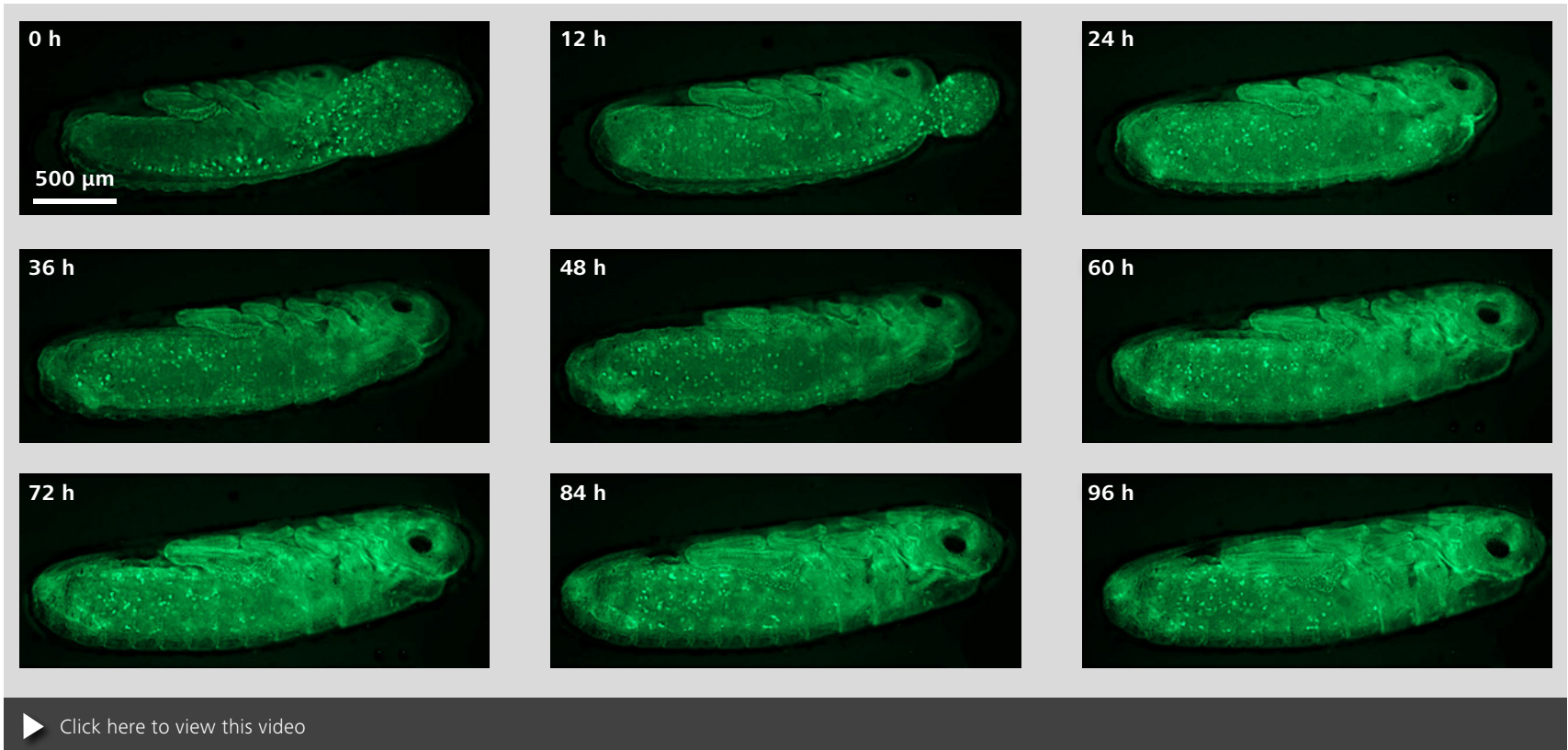


15 (out of 24) living cricket embryos mounted in low-melt agarose. Cells are expressing nuclear-localized GFP. The overview image shows a multi-position experiment. At each position two embryos fit into the field of view. Acquired within 30 seconds incl. Z-stacks of 17 images each (thickness 350 μm , 2.3 seconds). This enables imaging of multiple crickets in a synchronized way. The resulting spatio-temporal image resolution allows characterization of movement and division of single cells throughout the embryo during development. Magnification: 2.5x using short exposure times of 35 ms.

Sample courtesy of S. Donoughe, Biological Labs, Harvard University, Cambridge, USA

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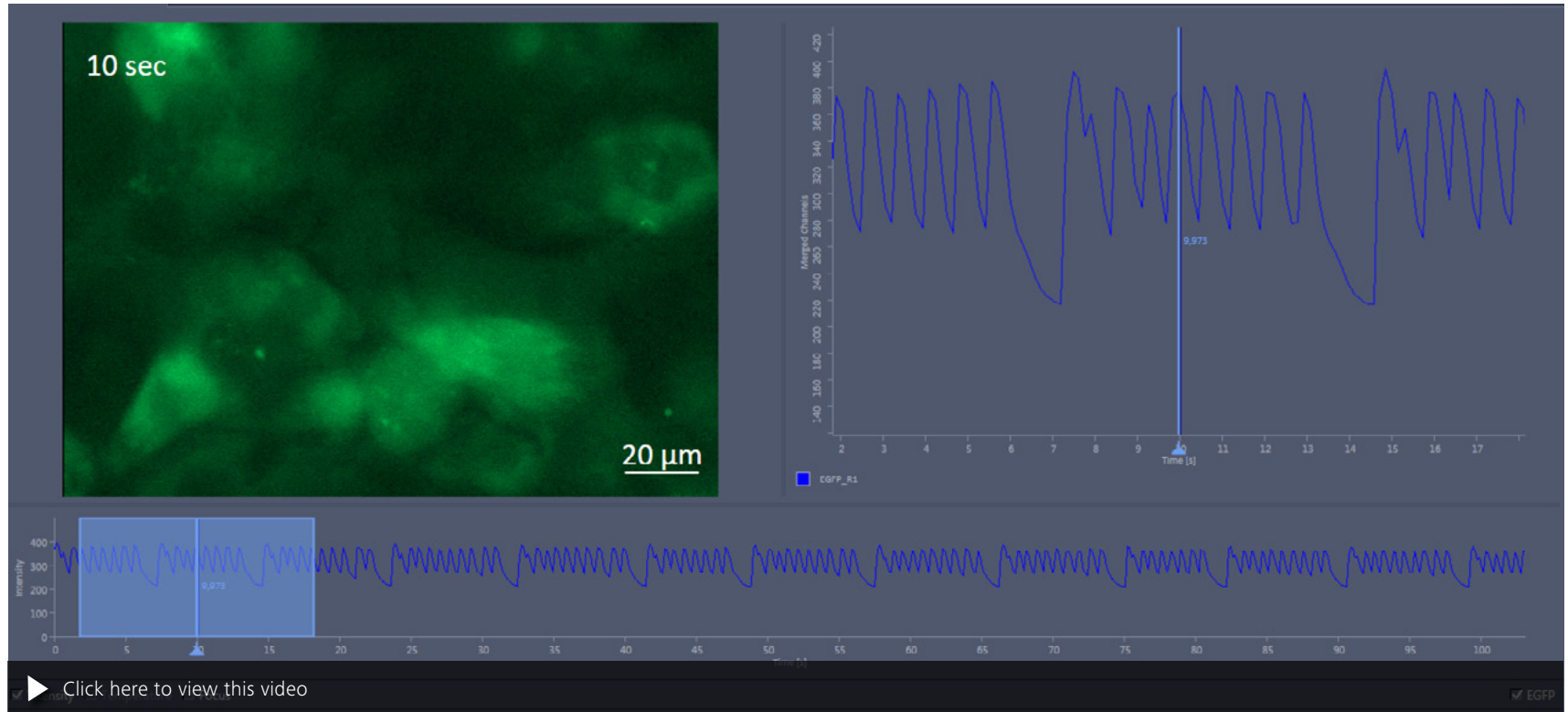
Five days long-term imaging of cricket embryogenesis. The development of an eGFP-expressing cricket embryo mounted in low-melt agarose was imaged every 5 minutes for a total length of 5 days. During the first day the retraction of the yolk and dorsal closure can be seen followed by further

growing of the embryo. EDF-images created from Z-stacks; acquired with 2.5x magnification using short exposure times of 35 ms. Z-stacks were 350 μm thick and were acquired within 2.3 seconds.

Sample courtesy of S. Donoughe, BioLabs Building 2087, Harvard University, Cambridge, USA

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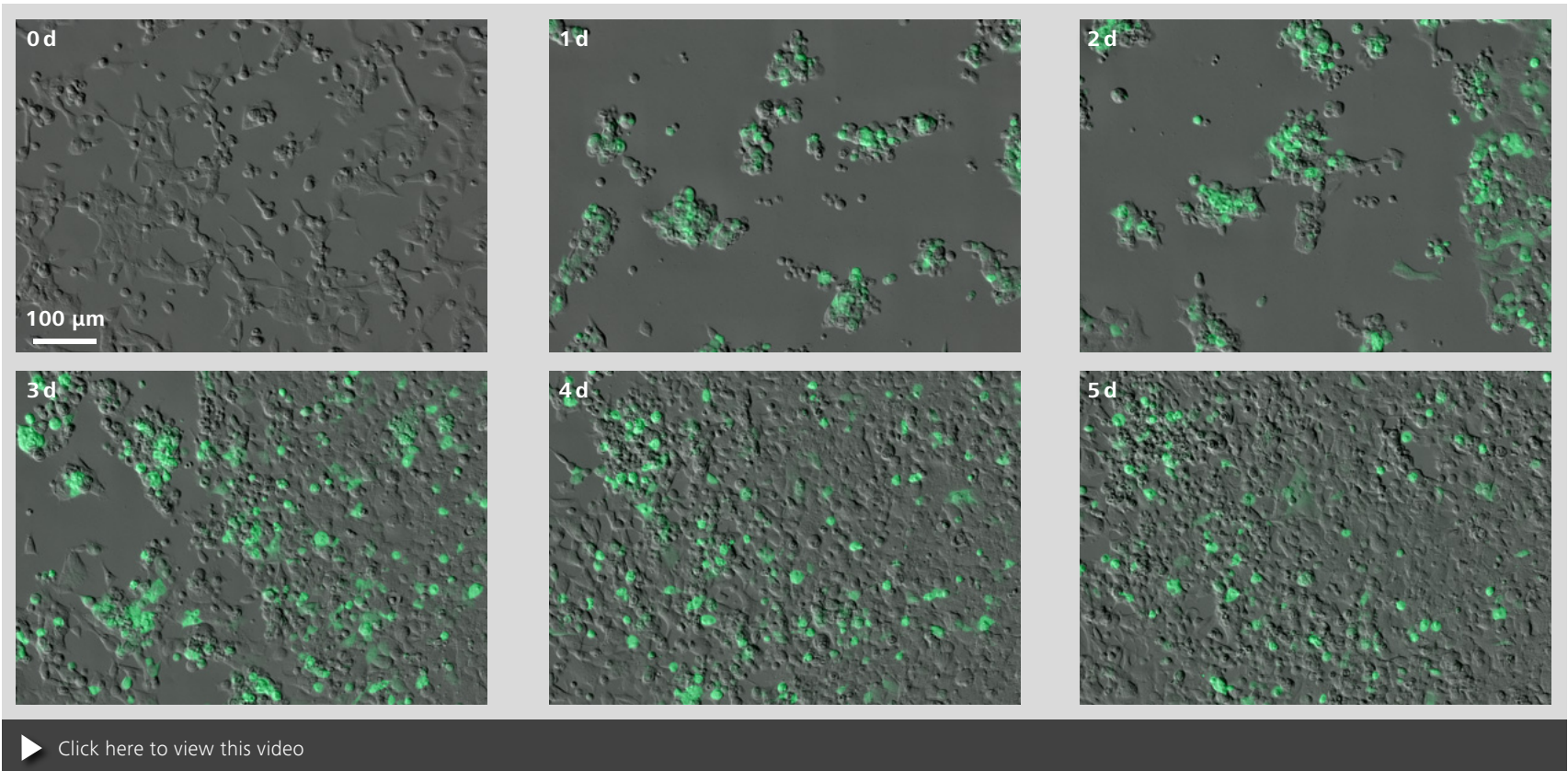


Calcium imaging in beating cardiomyocytes stained in green using a Calcium kit; imaging with 8 fps using Plan-APOCHROMAT 50x / 1.2 W with Autoimmersion; the green fluorescence changes intensity upon contraction of the cells; frequency of individual contractions analyzed with ZEN MeanROI tool; diagram shows delayed contraction in regular intervals caused by component given to the cells.

Sample courtesy of Sanofi-Aventis Deutschland GmbH, R&D IDD / in vitro Biology, Frankfurt, Germany

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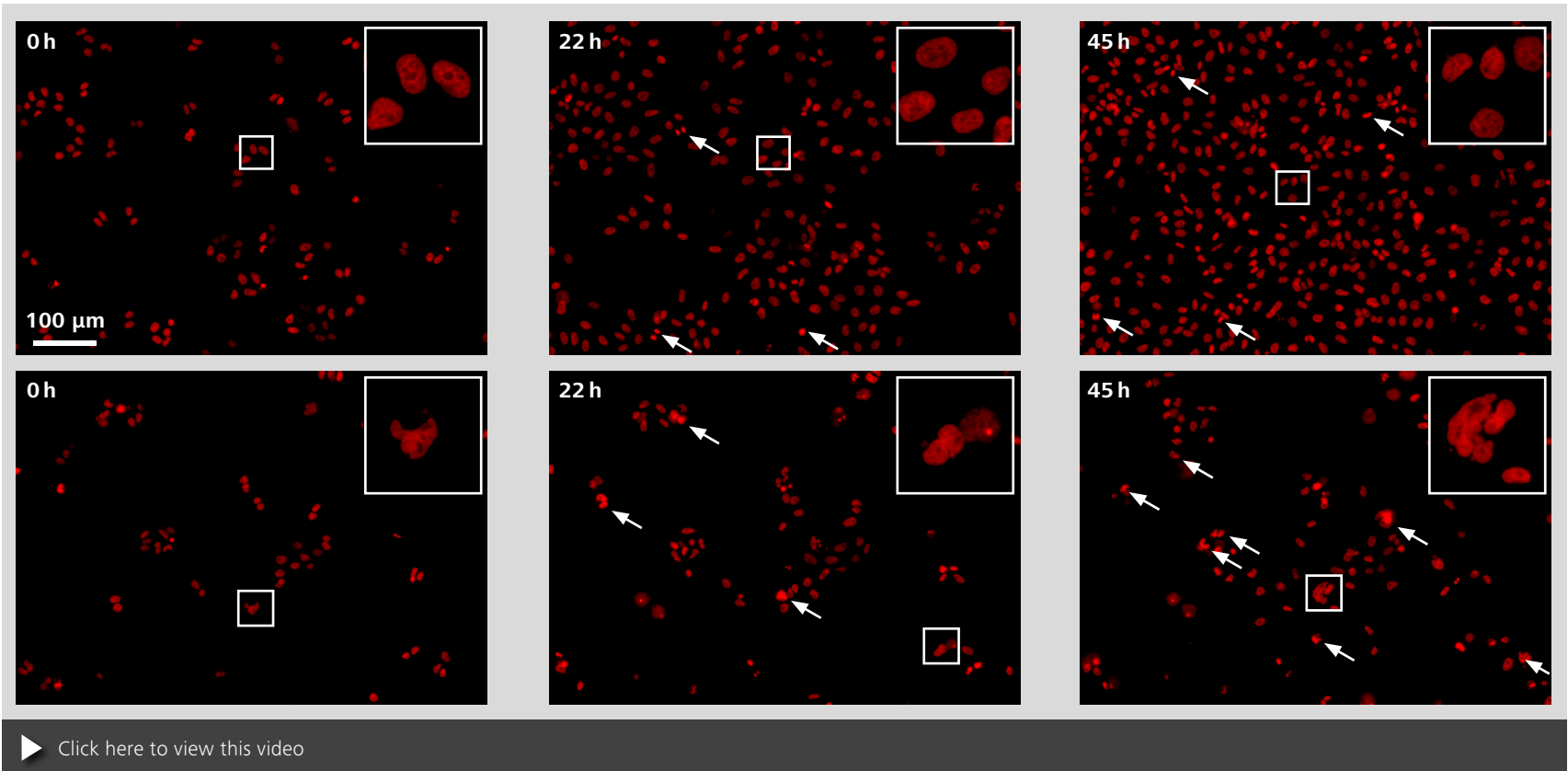
GFP HEK (Human Embryonic Kidney) cells, transiently expressing eGFP. Imaged through a 1 mm plastic bottom; images taken every 5 minutes for a total of 5 days; imaging started shortly after induction of the expression via Tetracyclin treatment. Overlay of phase gradient contrast and green (eGFP) fluorescence:

- After one day: cells are subconfluent and start to express eGFP. Due to the transient transfection and the Tetracyclin treatment some round and dead cells are visible.
- After two days: cells have recovered from the transfection and start to grow again.
- At the end of the time series: cells are confluent and bright green due to eGFP expression.

*Sample courtesy of Sanofi-Aventis Deutschland GmbH;
R&D IDD / in vitro Biology, Frankfurt, Germany*

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48 h Cell Proliferation Assay Control vs. AuroraB Kinase siRNA Knockdown

HeLa Kyoto cells (Neumann et. Al., Nature 2010 Apr.1.; 464(7289):721-7) expressing H2B-mCherry were imaged every 30 minutes for 48 hours in a 96 well plate using Plan-APOCHROMAT 10x/0.5.

Top row: A series of images showing untreated control cells. The lack of dead cells and the healthy shape of the nuclei (arrows indicate methodic cells) clearly demonstrates the stability and homogeneity of the incubation, the stable focus, low phototoxicity as well as virtually no photobleaching.

Bottom Row: A series of images showing cells treated 24 h before acquisition with a siRNA against AuroraB Kinase on the same plate as the control (top row). The slower proliferation and the misshaped nuclei (arrows and insets) demonstrate the mitotic defects caused by the knockdown.

Sample courtesy of S. Reither, Advanced Light Microscopy Facility, EMBL, Heidelberg, Germany

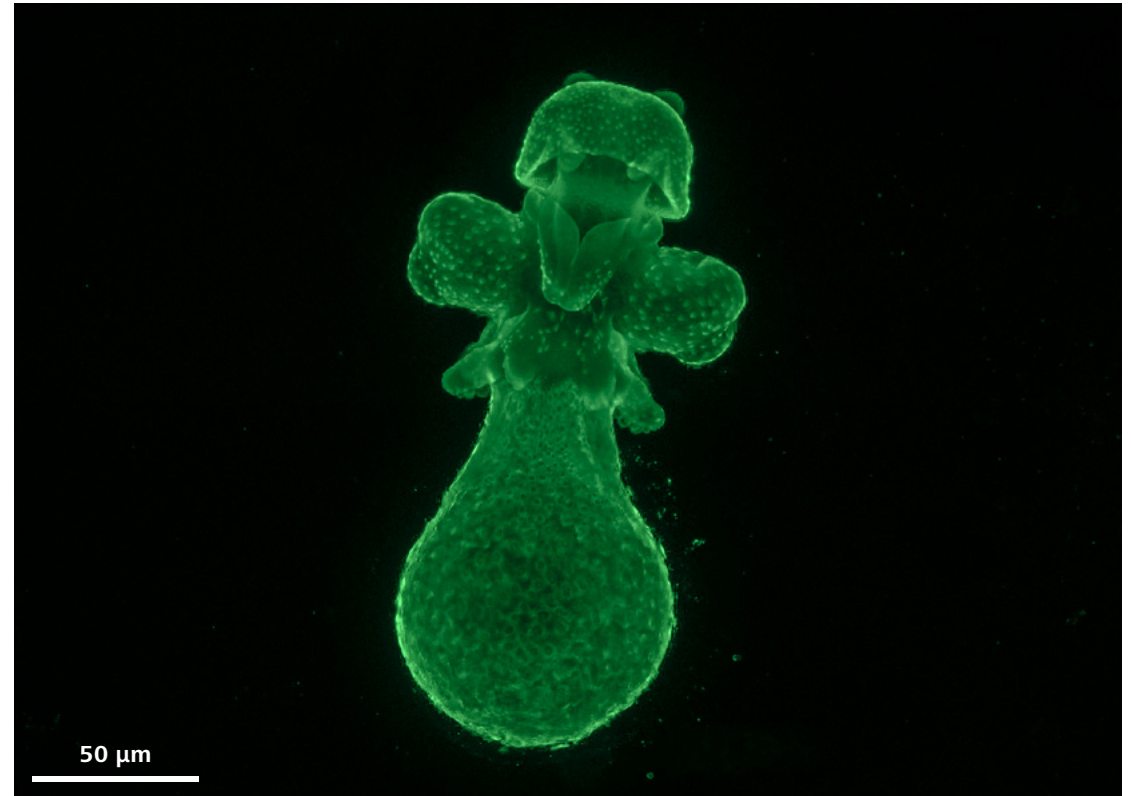
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Squid Embryo Stained with BODIPY Ceramide

Extended-depth-of-focus image created from a Z-stack acquired with 2.5 x magnification.

In order to study events and processes during embryonic development of squids, specimens were bathed in a BODIPY ceramide solution to visualize outer cellular membranes. Celldiscoverer 7 with long working distance objectives and the unique combination of high resolution in large fields of view proved to be an ideal instrument for this study.



Sample courtesy of K. Koenig, 365.10 Northwest Lab, Harvard University, Cambridge, USA

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Expansion Microscopy in Mouse Brain

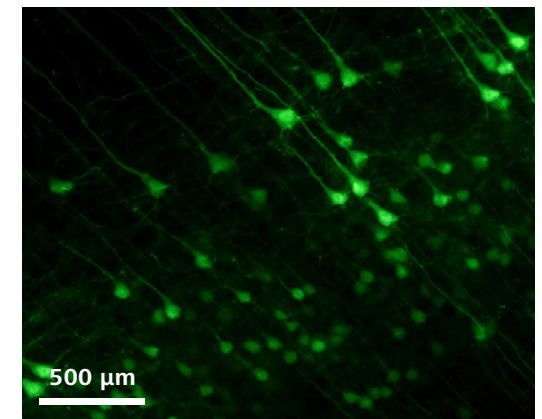
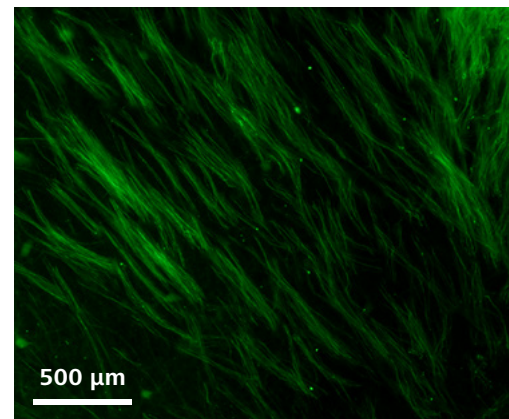
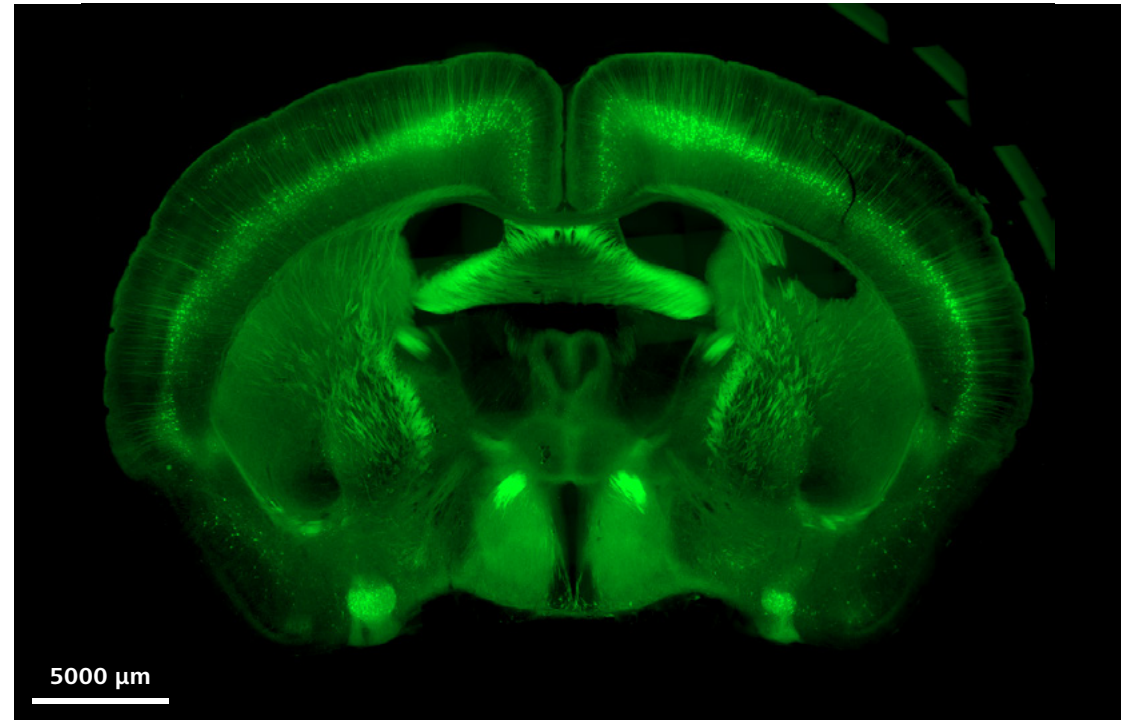
The goal of Expansion Microscopy is to make small structures visible that could otherwise not be observed with conventional or superresolution microscopy. Here, a protein-retention expansion technique was applied to expand the tissue. The sample is enlarged by a factor of 4.5 to 5 – up to several mm in X/Y dimensions and several hundred μm in the Z dimension. Especially the 5x/0.35 and the 20x/0.7 objectives of Celldiscoverer 7 are well suited to image such samples as they have a large field of view, high resolution and a large working distance.

Top: Whole brain

Bottom left: Axon bundles

Bottom right: Pyramidal cells

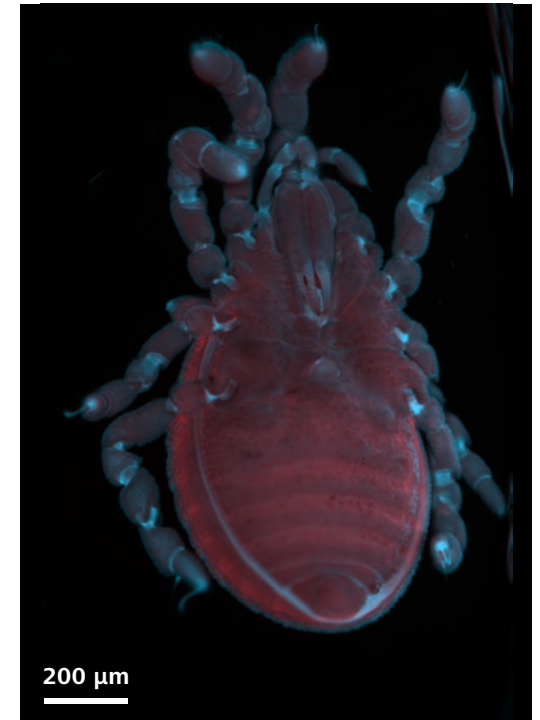
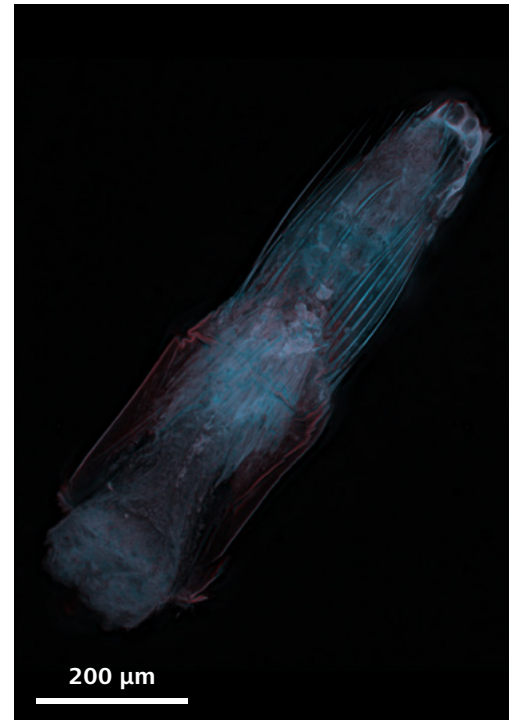
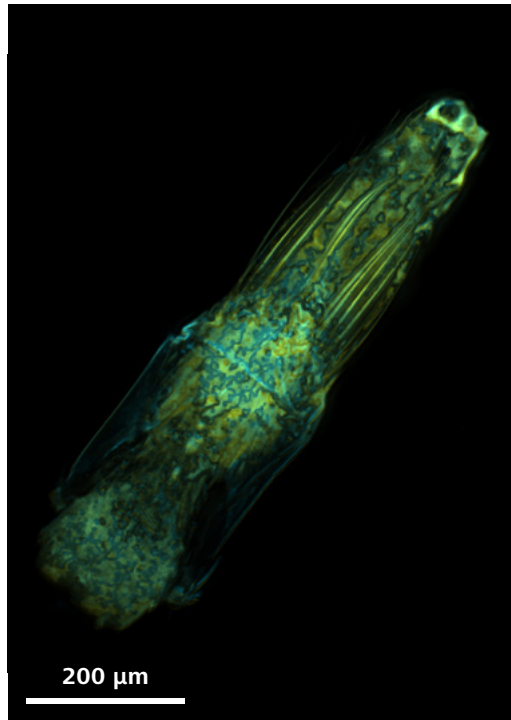
The images shown here are extended-depth-of-focus images created from Z-stacks acquired with a 2.5x magnification imaged through 1.2 mm of polystyrene. Staining: YFP expressing neurons.



Sample courtesy of S. Asano, Boyden lab, MIT, Cambridge, USA

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Autofluorescence Imaging of Arachnids

Small Arachnids were collected from tropical leaves in South America. Imaging with Celldiscoverer 7 saves time, since the low magnification objectives (5x/0.35 and 20x/0.7) deliver finest details in large fields of view.

A combination of several wavelengths was used to observe autofluorescence. The images shown here are extended-depth-of-focus images created from Z-stacks.

Left: Genital of the third leg of Huitaca sp. imaged with a 20x magnification.

Center: Same as before but excited with a different combination of wavelengths.

Right: *Microgavia oviformis* imaged with 2.5x magnification.

Sample courtesy of L. Benavides, Giribet Lab, Harvard University, Cambridge, USA

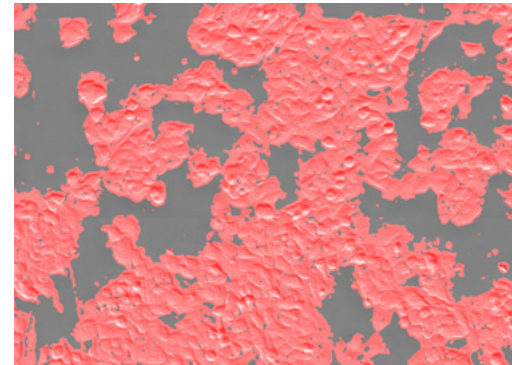
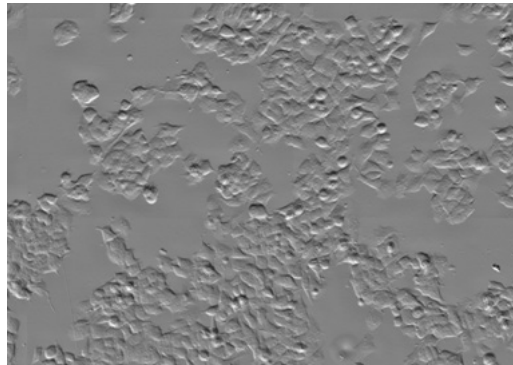
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Application for Label-Free Measurement of Cell Proliferation

The growth of cultured cells has been imaged in long-term time-lapse movies over 72 hours using phase gradient contrast (image 1).

To quantify proliferation, cell region (image 2, red overlay) was detected automatically using supervised machine learning (random forests) in each time frame.

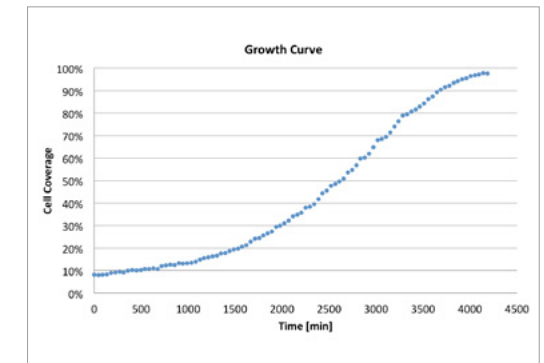


The growth curve (image 3) shows the relative cell coverage over time, averaged for all images in one well. The assay allows image based cell proliferation measurements.

By using label-free imaging in phase gradient contrast, cell growth is not affected by phototoxicity or any further sample processing.

This approach offers several advantages:

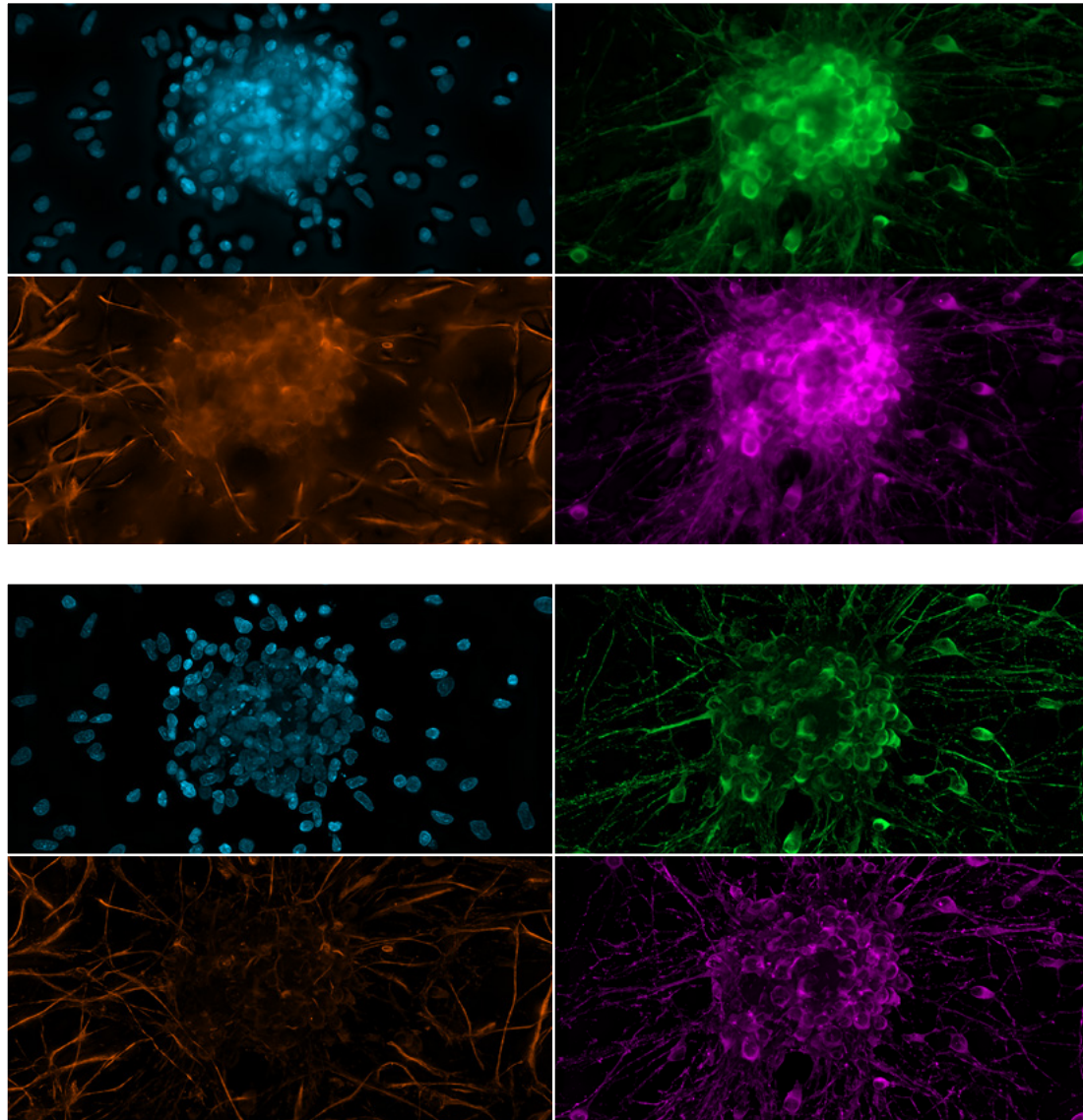
- Very low disturbance, non-invasive monitoring of cells
- Kinetic live cell data, no single end point.
- Compatible to standard micro-well plates (e.g. 96well or 384well).
- Applicable for screening cell-based applications.



Sample and assay courtesy of P. Denner, Core Research Facilities, German Center of Neurodegenerative Diseases (DZNE), Bonn, Germany.

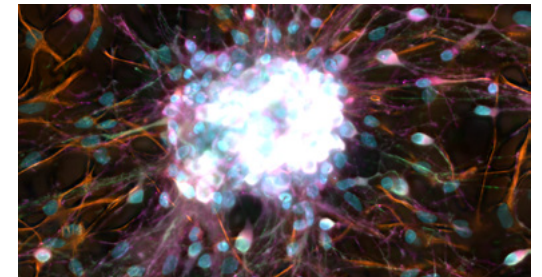
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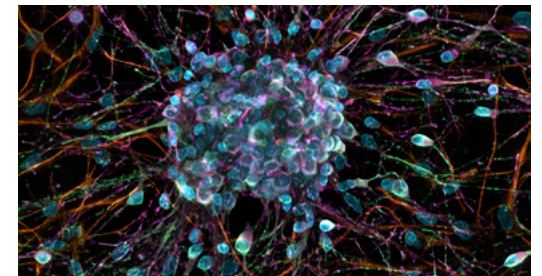
Rat cortical primary neuron culture. Antibody staining of bIII-tubulin (Cy2, green), Nestin (Cy3, red) and DCX (Cy5, purple), nuclei stained with DAPI (blue). Maximum intensity projection of a Z-stack.

Top row: Conventional widefield images.



Bottom row: Deconvolved images using GPU-based deconvolution. Deconvolution algorithm: constrained iterative using a depth variant point-spread function.

Sample courtesy of H. Braun, LSM Bioanalytik GmbH, Magdeburg, Germany.



Your Flexible Choice of Components

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1 Microscope

- ZEISS Celldiscoverer 7
- Automatic sample container recognition
- Barcode reader
- Focus stabilization
- Magnification changer 0.5x/ 1x/2x
- Achromatic FL beampath with adaptive field stop
- ZEISS Axiocam 506 mono
- Additional camera port
- On-axis access for dispensing
- UV-disinfection

2 Objectives

- Plan-APOCHROMAT 5x/0.35
- Plan-APOCHROMAT 20x/0.7 autocorr
- Plan-APOCHROMAT 20x/0.95 autocorr
- Plan-APOCHROMAT 50x/ 1.2 W autocorr autoimmersion

3 Illumination

- Transmitted light unit:
IR-LED (725 nm) brightfield, oblique illumination, phase gradient contrast
- Fluorescence:
LEDs 385, 420, 470, 520, 567, 590 and 625 nm
High-efficiency multibandpass filter sets
Additional user-accessible emission filter wheel

4 Accessories

- Temperature and atmospheric control (heating/cooling; CO₂, O₂)
- Mounting frames for microwell plates, incubations and perfusion
- Insert plates for dishes, multi-chamber slides and standard slides

- Additional recommended cameras
 - ZEISS Axiocam 512 mono
 - ZEISS Axiocam 702 mono
 - Photometrics EMCCD evolve 512 delta
 - Hamamatsu Orca Flash 4.0 V2

5 Software

- ZEN 2.3 celldiscoverer includes modules for multi-dimensional image acquisition, Tiles & Positions, Experiment Designer, advanced image processing and analysis tools
- Recommended additional modules:
 - GPU-based deconvolution (GPU-DCV)
 - 3Dxl Viewer – powered by arivis®
 - Open application development (OAD)

Your Flexible Choice of Components

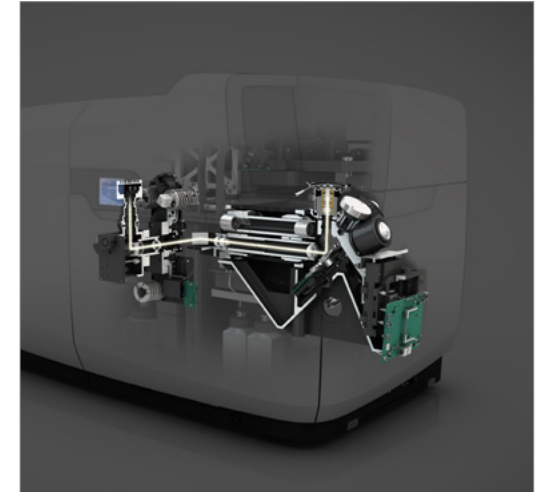
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A Dedicated Opto-Mechanical Concept for Live Cell Imaging

Celldiscoverer 7 is designed for your most demanding long-term live cell imaging and screening applications.

Unique hardware and software features make sure you get reproducible and unbiased data:

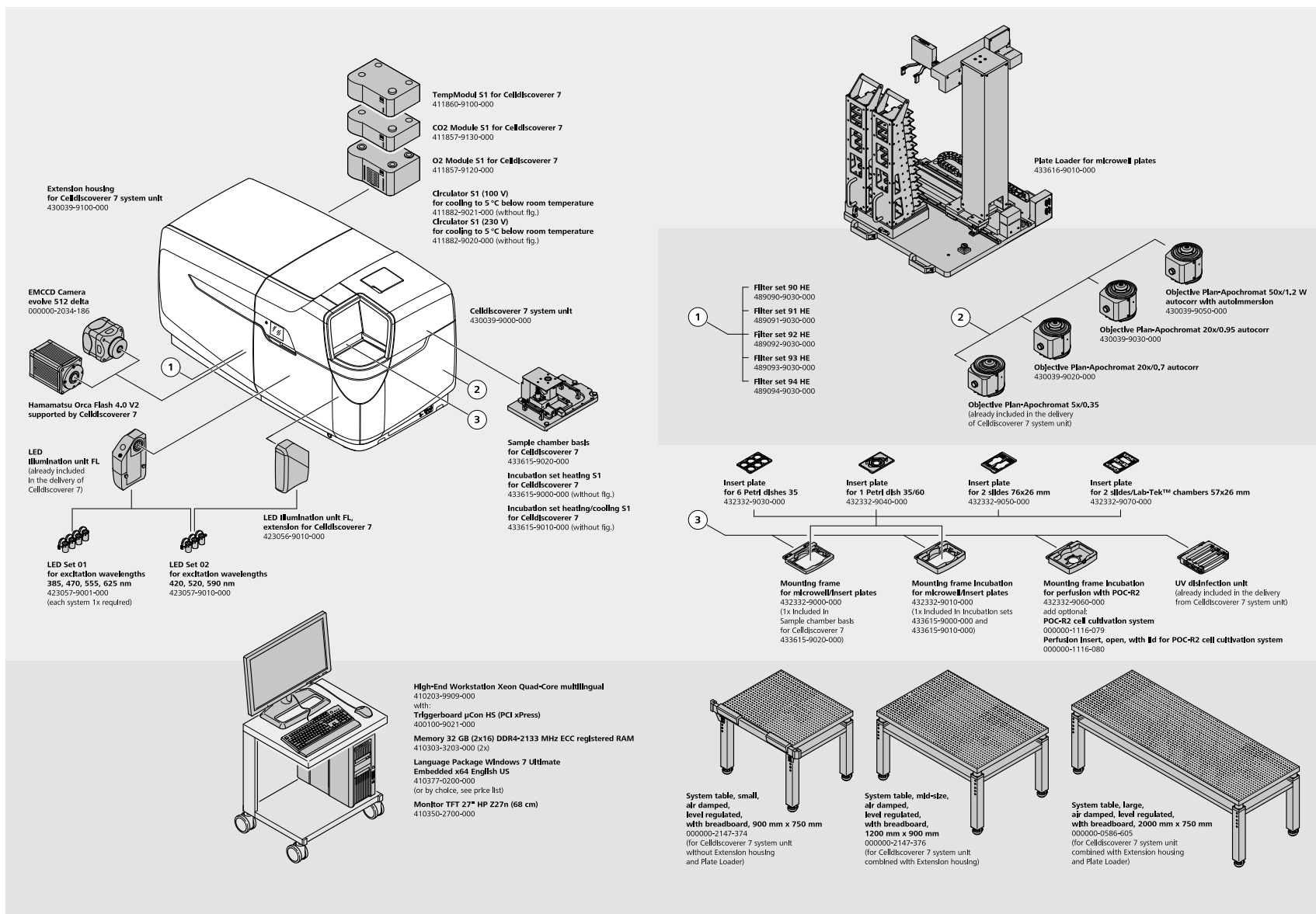
- Built-in sample recognition detects important parameters of your sample: Vessel type, skirt height, bottom thickness and material, on-board barcode reader for screening experiments.
- The hardware-based Find Focus function automatically finds and focusses your sample. Then Definite Focus keeps it in focus. You can combine both methods with a content-based software autofocus.
- Four objectives have been specifically engineered for flexibility in experiments. This new class of Autocorr objectives with long working distance will adapt their optics automatically to your sample carrier and imaging conditions. Autocorr, temperature control and high numerical apertures deliver exceptional image quality: high contrast, resolution and sensitivity.
- Activate the high-performance magnification changer with a mouse click. You get three different fields of view without moving the objective, always keeping your current working distance.
- Use Plan-APOCHROMAT 50x/1.2 W, the unique water objective, for rapid Autoimmersion. Water supply and removal are fully software-controlled.
- Adaptive Lens Guard technology automatically optimizes the scanning area to maximize sample throughput, while protecting the objectives from collisions with your sample vessel or other hardware components.
- The excellent beampath efficiency enables high numerical apertures and large working distances in large fields of view. Use the optional microscope camera Axiocam 512 mono to capture all available details with high sensitivity and 12 megapixels. You'll get images with highest information density.
- LEDs deliver bright fluorescence and transmitted light illumination. High efficiency multi-bandpass filter sets guarantee multichannel imaging with high speed and low phototoxicity.
- The novel transmitted light contrast does not influence fluorescence sensitivity. It's compatible with both glass and plastic, and adapts to vessel geometry.



Your Celldiscoverer 7 is packed with technology for gentle live cell imaging.

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Dimensions	Width (approx.)	Depth (approx.)	Height (approx.)	Weight (approx.)
Celldiscoverer 7	710 mm	640 mm	700 mm	136 kg
Footprint Celldiscoverer 7	585 mm	560 mm		
Incl. extension housing	1270 mm	640 mm	700 mm	187 kg
Footprint incl. extension housing	1170 mm	560 mm		
Plate Loader	700 mm	630 mm	890 mm	55 kg

Technical data		
Celldiscoverer 7 and extension housing	Noise emission	According to EN 55011 class A
	Noise immunity	According to DIN EN 61326-1
	Protection class	1
	Ingress protection rating	IP 20
	Radio interference suppression	To EN 55011 Class A
	Type of operating site	Closed room facility
	Electrical safety	To DIN EN 61010-1 (IEC 61010-1) conforming to CSA and UL regulations
	Degree of pollution	2
	Overvoltage category	II
Celldiscoverer 7	Line input voltage; max. current	100 V to 240 V ± 10%; 6A~
	Line frequency	50 Hz – 60 Hz
Extension housing	Input for connection of Celldiscoverer 7	100 V to 240 V ± 10%, 50 Hz – 60 Hz, max. 4.0 A~
	Output to internal 6 sockets	100 V to 240 V ± 10%, 50 Hz – 60 Hz
	Permissible total current on 6 internal sockets	Max. 4.0 A~
		The internal sockets can be connected via the software
	The extension housing is powered by Celldiscoverer 7	

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Environmental requirements		
Storage (in packaging)	Permissible ambient temperature	+5 °C to +40 °C
	Permissible relative air humidity (no condensation)	max. 75 % at +35 °C
Transport (in packaging)	Permissible ambient temperature	-40 °C to +70 °C
	Permissible relative air humidity (no condensation)	max. 75 % at +35 °C
Operation	Permissible ambient temperature	+15 °C to +35 °C
	Recommended ambient temperature (e.g. for incubation)	+18 °C to +25 °C, optimally +22 °C
	Warm-up time	1 h for standard imaging; ≥4 h for high-precision and/or long-term measurements
	Permissible relative air humidity	max. 65 % at 30 °C
	Atmospheric pressure	800 hPa to 1060 hPa

XYZ motorization

Motorized xy-scanning stage	Travelling range	300 mm x 140 mm
	● Reproducibility	± 1 µm
	Absolute precision	± 5 µm
	Resolution	0.1 µm
Motorized z-drive	● Reproducibility	± 0.025 µm
	Absolute precision	0.14 µm
	Resolution	± 0.01 µm

Optical specifications

Nosepiece	●	<ul style="list-style-type: none"> ■ 4x motorized nosepiece ■ in combination with the 3x magnification changer this offers the functionality of 12 objectives
Magnification changer, afocal	●	<ul style="list-style-type: none"> ■ 0.5x, 1x, 2x magnification, providing three different magnifications for each objective ■ depending on the objective configuration it offers a magnification range from 2.5x – 100x ■ switching between magnifications ~1 sec ■ enables constant working distances for each magnification

● Component always included ○ Component optionally available

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Optical specifications

		Magnification changer			Auto-correction	Auto-immersion	Temperature control	Thin & thick vessel bottom	Thin vessel bottom	Working distance
		0.5x	1x	2x				0.13–1.2 mm glass/COC ¹ /PS ²	0.13–0.21 mm glass/COC ¹	
Plan-Apochromat 5x/0.35	●	M = 2.5x NA = 0.12	M = 5x NA = 0.25	M = 10x NA = 0.35	–	–	●	●	●	5.10 mm
Plan-Apochromat 20x/0.7 autocorr	○	M = 10x NA = 0.35	M = 20x NA = 0.7	M = 40x NA = 0.7	●	–	●	●	●	2.20 mm
Plan-Apochromat 20x/0.95 autocorr	○	M = 10x NA = 0.5	M = 20x NA = 0.8	M = 40x NA = 0.95	●	–	●	–	●	0.76 mm
Plan-Apochromat 50x/1.2 W autocorr, autoimm.	○	M = 25x NA = 1.2	M = 50x NA = 1.2	M = 100x NA = 1.2	●	●	●	–	●	0.84 mm

Adaptive Lens Guard

- - automatically maximizes scanning area, while protecting the objectives from collisions with other hardware or sample vessels
 - scanning range is indicated and updated automatically via control software

Temperature control

- - all objectives are equipped with heating elements for temperature control
 - in combination with the optional heating unit, objective temperature is adjusted automatically, depending on the user-defined sample temperature
 - enables stable and homogeneous temperature within the sample chamber

Adaptive Autocorr

- - automatic correction of aberrations (for high magnification objectives)
 - adapts objectives automatically to vessel bottom material and thickness
 - enables correction of aberration due to high penetration depths and refractive index mismatch of the sample (5x objective is not sensitive to variations of bottom thickness and material and does not require a correction)

Autoimmersion, water

- - comes along with the Plan-Apochromat 50x/1.2 W objective
 - enables automatic supply and removal of water immersion
 - water level is automatically indicated in the control software and on the display
 - upgradable in the field

● Component always included

○ Component optionally available

¹ Cycloolefincopolymer

² Polystyrene

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Focus	
Hardware-based focus finder	<ul style="list-style-type: none"> ● <ul style="list-style-type: none"> ■ automatically focusses on the sample (lower side of sample) ■ a user-defined offset can be used to change the default position ● <ul style="list-style-type: none"> ■ enables automatic generation of focus maps for microwell plates ■ compatible with every objective and filter set ■ can be combined with focus stabilization and ZEN blue software autofocus
Hardware-based focus stabilization	<ul style="list-style-type: none"> ● <ul style="list-style-type: none"> ■ focus stabilization system maintains focus position over long-term ■ compatible with every objective and filter set ■ hardware and software support for multi-position and multi-offset stabilization ■ can be combined with focus finder and ZEN blue software autofocus
Software-based autofocus	<ul style="list-style-type: none"> ● <ul style="list-style-type: none"> ■ focusses automatically on user-defined structures and regions of interest based on the image content ■ can be combined with focus finder and focus stabilization
Transmitted light and contrasting techniques	
Transmitted light unit	<ul style="list-style-type: none"> ● <ul style="list-style-type: none"> ■ fully compatible with fluorescent applications, environmental control, dispensing and perfusion option ■ enables label-free imaging or provides additional information in combination with fluorescent applications
Lightsource	<ul style="list-style-type: none"> ● <ul style="list-style-type: none"> ■ high-speed IR-LED (725 nm) offering low phototoxicity
Contrast techniques	<ul style="list-style-type: none"> ● <ul style="list-style-type: none"> ■ brightfield ■ oblique illumination ● <ul style="list-style-type: none"> ■ adaptive phase gradient: adapts automatically to vessel geometry providing excellent contrast to the edges of the vessels ■ all contrast techniques are compatible with all objectives, filter sets and sample vessels, i.e. plastic and glass incl. lids

● Component always included ○ Component optionally available

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Fluorescence illumination

Fluorescence illumination unit	<ul style="list-style-type: none"> ● apochromatic excitation beampath incl. adaptive field stop ■ up to seven LEDs (385 / 420 / 470 / 520 / 567 / 590 / 625 nm) ■ life time of LEDs >10,000 h ■ switching between LEDs <1 ms
LEDs are synchronized with image acquisition	<ul style="list-style-type: none"> ● Sample is only exposed during image acquisition (acquisition trigger mode) thus reducing phototoxicity.
LEDs are synchronized with the live-window	<ul style="list-style-type: none"> ● Sample is only exposed during live-window update (live-window trigger mode), significantly reducing phototoxicity during sample navigation.
Automated excitation field stop	<ul style="list-style-type: none"> ● A motorized field stop adapts automatically to the current field of view thus reducing phototoxicity effectively.
Switching time between FL channels	<ul style="list-style-type: none"> ■ switching between fluorescence channels using high-efficient multi-bandpass filter sets <1 ms ■ switching 5-position beamsplitter wheel <80 ms
5-position beamsplitter wheel	<ul style="list-style-type: none"> ● <ul style="list-style-type: none"> ■ 5x position beamsplitter wheel ■ switching time <80ms
Emission filter wheel	<ul style="list-style-type: none"> ● <ul style="list-style-type: none"> ■ 7x motorized emission filter wheel ■ user accessible ■ fits 25 mm emission filters ■ switching emission filter wheel <80 ms
Filter sets	<ul style="list-style-type: none"> ○ Filter set 90 HE <ul style="list-style-type: none"> ■ quad-band filter set for 385 nm, 470 nm, 555 nm, 625 nm LED and IR-TL LED ■ beamsplitter RQFT 405+493+575+653; emission filter QBP 425/30+514/30+592/25+709/100 ■ additional band for transmitted light ○ Filter set 91 HE <ul style="list-style-type: none"> ■ triple-band filter set for 420 nm, 520 nm, 590 nm LED and IR-TL LED ■ beamsplitter RTFT 450+538+610; emission filter TBP 467/24+555/25+687/145 ■ additional band for transmitted light ○ Filter set 92 HE <ul style="list-style-type: none"> ■ triple filter set for 385 nm, 470 nm, 590 nm LED and IR-TL LED ■ beamsplitter RTFT 405+493+610; emission filter TBP 425/30+524/50+688/145 ■ additional band for transmitted light ○ Filter set 93 HE <ul style="list-style-type: none"> ■ double bandpass for 470 nm, 555 nm and IR-TL LED ■ beamsplitter RDFT 493+575; emission filter TBP 514/32+605/50+730/60 ■ additional band for transmitted light ○ Filter set 94 HE <ul style="list-style-type: none"> ■ double filter set for 385 nm, 520 nm and IR-TL LED ■ beamsplitter RDFT 405+538; emission filter TBP 444/69+581/77+730/60 ■ additional band for transmitted light

● Component always included ○ Component optionally available

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Fluorescence illumination							
	Filter sets LEDs [nm]	90 HE quad	91 HE triple	92 HE triple	93 HE dual	94 HE dual	
LED Set 1	LED 385 BP 385/30	×		×		×	DAPI, Hoechst 33342 & 33258, Alexa 350 & 405, ATTO 390, True Blue, EBFP, T-Sapphire, CellTracker Blue, LysoTracker Blue, wtGFP (uv), Aminocoumarin, Cascade Yellow
	LED 470 BP 469/38	×		×	×		Alexa 488, Fluorescein, eGFP, Calcein, Fluo-4, Fluo-8, JC-1, mKaede, NBD, TagGFP, LysoTracker Green, ATTO 465, ATTO 490, Oregon Green Bapta, BOBO-1, Cytex Green, MitoTracker Green, YoYo-1, YoPro-1
	LED 567 BP 555/30	×			×		Cy3, Bodipy TMR, mBanana, mOrange, TurboRFP, tdTomato, TagRFP, DsRed2 ("RFP"), TRITC, PAmCherry, PAtagRFP, Alexa Fluor 555 & 546, DsRed monomer, SNARF, PO-PRO-3, Magnesium Orange, SYTO 82
	LED 625 BP 631/33	×					Cy5, Alexa Fluor 610, 633, 635 & 647, ATTO 610 to 647N, ATTO Oxa12, ATTO Rho14, Bodipy 630/650-X, Bodipy 650/665-X, CF™ 620R, CF™ 633, CF™ 640R, DyLight 633, DyLight 649, PSmOrange (red), iRFP670
LED Set 2	LED 420 BP 423/44		×				Alexa Fluor 430, ECFP, ATTO 425, ATTO 430LS, SpectrumAqua, Cerulean, mCFP, CyPet, Y66W, mKeima-Red, LysoSensor™ Green DND-153, SYTOX Blue, Chromomycin A3, POPO-1, PO-PRO-1, SYTO 40, SYTO 41, SYTO 42, SYTO 43
	LED 520 BP 511/44		×			×	Alexa 514 & 532, eYFP, Calcein, Fluo-4, Fluo-8, Bodipy 515, YoPro-1, YoYo-1, Calcium Green, Syto 23, Thiazole Orange, LysoTracker® Green DND-26, mEos3.2 (green), mEOS2.0, mCitrine, mVenus, Topaz
	LED 590 BP 591/27		×	×			Alexa Fluor 594, Cy3.5, mPlum, mRaspberry, mNeptune, mCherry, pa-mRFP1, KFP1, mEos2 (red), mEos3.2 (red), LipidTOX™ Red, Calcein red-orange, CellTracker Red, ER-Tracker Red, CellTrace BODIPY® TR
TL IR Channel	IR LED 725/50	×	×	×	×	×	All filter sets offer an IR transmitted light bandpass. This bandpass enables IR-brightfield contrast without switching any filter components and without affecting FL-efficiency.

× Component compatible ○ Component optionally available

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Sample mounting		
Mounting frame for microwell/insert plates	<input type="radio"/> *	<ul style="list-style-type: none"> ■ for mounting of microwell plates according to SBS standard ■ for mounting of insert plates, autoclavable
Mounting frame incubation for microwell/insert plates	<input type="radio"/>	<ul style="list-style-type: none"> ■ for mounting and incubation of microwell plates according to SBS standard ■ for mounting and incubation of insert plates, autoclavable
Insert plate for 1 Petri dish 35 / 60	<input type="radio"/>	<ul style="list-style-type: none"> ■ for mounting of Petri dishes using mounting frame "standard" or "incubation" ■ fits one Petri dish d = 35 mm or d = 60 mm, autoclavable
Insert plate for 6 Petri dishes 35	<input type="radio"/>	<ul style="list-style-type: none"> ■ for mounting of Petri dishes using mounting frame "standard" or "incubation" ■ fits six Petri dishes d = 35 mm, autoclavable
Insert plate for 2 slides 76 x 26 mm	<input type="radio"/>	<ul style="list-style-type: none"> ■ for mounting of slides using mounting frame "standard" or "incubation" ■ fits two slides 76 x 26 mm, autoclavable
Insert plate for 2 slides/Lab-Tek™ chambers 57 x 26 mm	<input type="radio"/>	<ul style="list-style-type: none"> ■ fits two Lab-Tek™ chambers 57 x 26 mm, autoclavable
Plate Loader	<input type="radio"/>	Plate Loader: <ul style="list-style-type: none"> ■ for microwell plates according to SBS standard and insert plates ■ incl. two magazines for a total capacity of up to 24 plates (12 each) ■ integrated and driven by ZEN blue control software
Detection options		
Internal camera	<input checked="" type="radio"/>	Axiocam 506 mono
External camera port	<input checked="" type="radio"/>	<ul style="list-style-type: none"> ■ external, user accessible camera port to mount additional cameras ■ motorized switching between internal and external camera <200 ms
Additional/optional cameras	<input type="radio"/>	Axiocam 512 mono
	<input type="radio"/>	Axiocam 702 mono
	<input type="radio"/>	Photometrics EMCCD evolve 512 delta
	<input type="radio"/>	Hamamatsu Orca Flash 4.0 V2

● Component always included ○ Component optionally available * Part of sample chamber basis

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Resolution and speed (examples)

Pixel resolution	<ul style="list-style-type: none"> ■ depending on the magnification and camera: ■ 1.82 μm @ 2.5x using Axiocam 506 ■ 0.23 μm @ 20x with Axiocam 506 ■ 1.24 μm @ 2.5x using Axiocam 512 ■ 0.03 μm @ 100x using Axiocam 512
Typical scan speeds	<ul style="list-style-type: none"> ■ 96 well plate, four channels, exposure 50 ms per channel, full resolution, one position per well: <4 min ■ 384 well plate, single channel, exposure 100 ms, full resolution, 1 position per well (e.g. whole well single shot): < 6 min ■ 384er well plate, whole well using a high resolution 20x objective, four channels, exposure 50 ms per channel, full resolution: <2,5 min

Automatic sample recognition

Pre-scan unit (incl. barcode reader)

- automatically detects vessel types before final mounting:
 - slides
 - Petri dishes (35/60mm)
 - LabTek-chamber slides (incl. number of wells)
 - microwell plates incl. plate type, i.e. number of wells
- The following 1D barcodes are detected on slides and wellplates:
 - Code 39 (3of9 und W/MOD43)
 - Code128 Auto, Code128 A, Code128 B, Code128 C
 - Interleaved 2of5
 - UPC A und UPC E
 - EAN 8 und EAN 13
 - Codebar
 - UCC/EAN 128
- on slides the following 2D barcodes are detected:
 - DataMatrix
 - QR-Code

Automatic vessel bottom recognition

- automatic detection of vessel bottom material (glass/COC¹ and PS²)
- automatically adjusts autocorr objectives to the material
- automatic detection of vessel bottom thickness
- automatically adjusts autocorr objectives to the thickness
- automatically measures vessel skirt height, e.g. the distance between the support area and the actual sample bottom
- delivers the skirt height to the Adaptive Lens Guard to update the scanning area

Automatic plate calibration

- automatically calibrates individual plates, i.e. well diameter and distance, plate length, height and rotation

● Component always included ○ Component optionally available ¹ Cycloolefincopolymer ² Polystyrene

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Environmental control	
TempModule S1	<ul style="list-style-type: none"> ○ <ul style="list-style-type: none"> ■ controls temperature of bottom and top plate of sample chamber ■ temperature range within sample chamber: 28 – 45°C ■ temperature homogeneity across a whole microwell plate: ± 0.6 @ 37°C ■ operated by ZEN blue control software
CO ₂ Module S1	<ul style="list-style-type: none"> ○ <ul style="list-style-type: none"> ■ generates a stable, user defined CO₂ concentration within the sample chamber ■ ensures an optimal and stable pH value in cell culture media over long term ■ a built-in CO₂ sensor permanently monitors the CO₂ concentration ■ operated by ZEN blue control software
O ₂ Module S1	<ul style="list-style-type: none"> ○ <ul style="list-style-type: none"> ■ O₂-control device to achieve a stable, controlled decrease of the O₂ concentration by displacement with N₂ within the sample chamber ■ a built-in O₂ sensor permanently monitors the O₂ concentration. ■ operated by ZEN blue control software
Humidifier unit	<ul style="list-style-type: none"> ○ <ul style="list-style-type: none"> ■ prevents evaporation of culture medium during long-term experiments ■ liquid level is indicated automatically
Circulator S1	<ul style="list-style-type: none"> ○ <ul style="list-style-type: none"> ■ cooling unit controls temperature of top plate of sample chamber ■ temperature range = 14 – 28°C ■ temperature homogeneity (microwell plate) = ± 2°C
Mounting frame incubation for perfusion with POC-R2	<ul style="list-style-type: none"> ○ <ul style="list-style-type: none"> ■ mounting frame for perfusion with POC-R2 cellcultivation system ■ with openings for gas mixture output and access for perfusion tubes ■ mounting frame autoclavable ■ aperture d = 42 mm
Dispensing unit	<ul style="list-style-type: none"> ● <ul style="list-style-type: none"> ■ offers on-axis access to specimen ■ enables pipetting without disturbing environmental conditions ■ allows sequential, semi-automatic pipetting of multi-positions
UV disinfection unit	<ul style="list-style-type: none"> ● <ul style="list-style-type: none"> ■ incl. four UV bulbs, 4W each ■ emitting 254 nm ■ fully automated disinfection process takes 18 min ■ can be used on-demand or for preventive maintenance

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Count on Service in the True Sense of the Word

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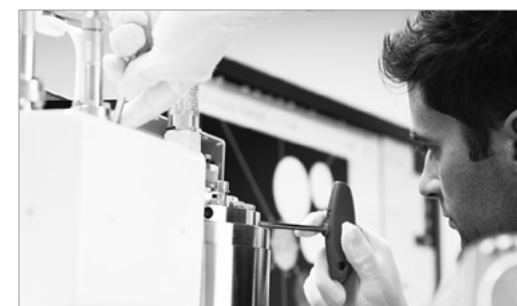
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