Leica AF6000 E – AF7000

Advanced Widefield Systems

Living up to Life

Leica
MICROSYSTEMS

Live Cell Imaging Solutions That Grow with Research Needs

Flexibility and Modularity

- Individually optimized system configurations
- Available for upright, inverted and stereo microscopes
- A range of application wizards, process and quantification tools
- A wide choice of hardware components

Upgradability

- Systems that grow with changing research needs
- From entry-level systems to high-end workstations for real-time studies
- Convenient, on site upgrade process

Integration

- Perfect harmony between hardware and software
- Maximum system reliability
- Easy user handling

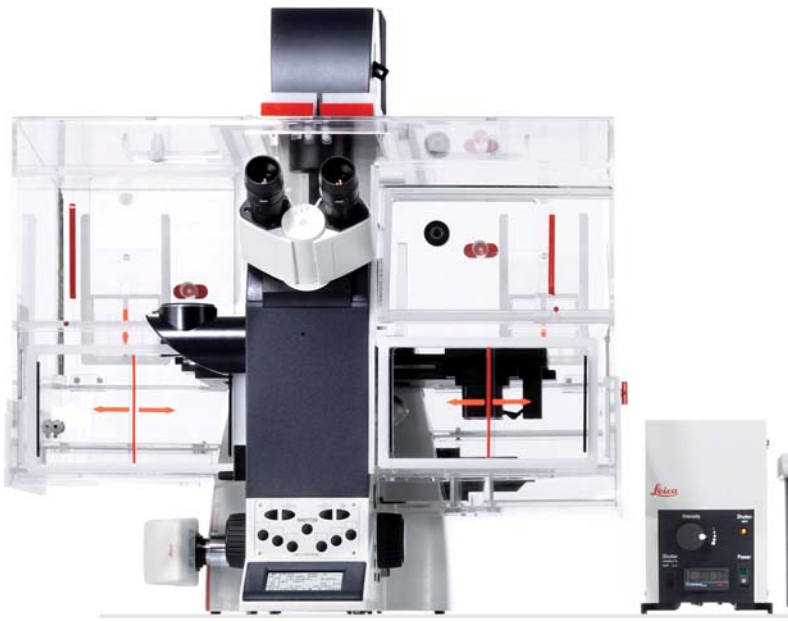
One Platform

- One software platform for all widefield research and confocal microscope systems
- Ideal for imaging centers and multi-user facilities
- Minimum training required

Biological and medical researchers are probing deeper into the secrets of life, and widefield fluorescence microscopy is a key technology for imaging the living cell. The developmental and molecular processes of the cell can be visualized directly by widefield fluorescence techniques to shed new light on the mysteries of life. Leica Microsystems' new Advanced Widefield Systems provide the leading innovations to advance your own research quest and unlock the secrets of life.

Users all over the world have benefited from the speed, reliability, brilliant image quality and ease of use of the fluorescence research systems from Leica Microsystems for many years. Together with leading scientists, Leica Microsystems has further developed its successful fluorescence solutions into a modular Leica Advanced Widefield System line that can be customized to suit all live cell imaging requirements.

The Leica Advanced Widefield System Series offers the right tool for your research; from routine imaging and documentation to live cell imaging workstations for complex real-time experiments. Regardless of the application, all Leica Advanced Widefield Systems utilize the same easy-to-use software platform, which is shared with the Leica Microsystems confocal systems.



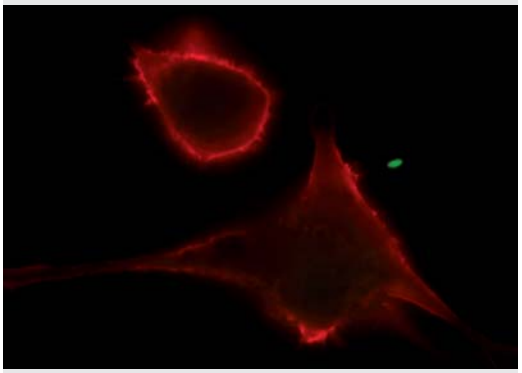
The Leica Advanced Widefield System Line consists of four modular product solutions, which can be customized for different levels of application. The modular design affords you the freedom to grow the system and to choose hardware and software components as needed.

Leica AF6000 E – The entry-level software solution for high-quality fluorescence imaging and documentation. Compatible with a wide range of manual and automated microscopes and cameras from Leica Microsystems.

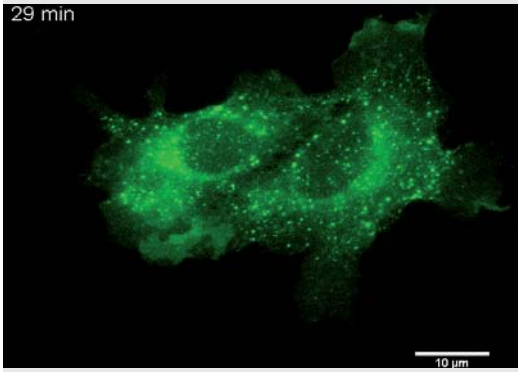
Leica AF6000 – The flexible system for a variety of applications in fluorescence microscopy and image analysis including time-lapse experiments, multi-positioning, z-stacking and deconvolution.

Leica AF6500 – The high-speed fluorescence system with all the functionality of the Leica AF6000 plus real-time controlled image acquisition for ultra fast 2D time-lapse experiments, ratio imaging, and triggering of peripheral hardware components.

Leica AF7000 – The premium solution for highly demanding applications which offers full real-time control for fast 3D time-lapse experiments, TIRF, Fura2, FRET SE, deconvolution and peripheral triggering.



Dendritic cells infected with bacteria
Green: GFP expressing enteropathogenic E. coli
Red membrane staining: cy3 labeled anti cd44 antibody
Courtesy of: Nadzeya Kramko, ZMBE, Infectiology Institute, University of Muenster and Ivan Liashkovich Institute for Physiology II, University of Muenster



EGF stimulated endocytosis
Green: GFP tagged EGF-receptor
Courtesy of: Vibor Laketa, Cell Biology and Biophysics Unit, EMBL Heidelberg

5-day-old transgenic zebrafish larva
Green: GFP – actin
Courtesy of: Prof. Dr. Stephan C. F. Neuhauss, Institute for Brain Research, ETH Zurich

A System as Dynamic as Modern Research

"I need to perform high-resolution 3D-deconvolution microscopy in time while keeping the cells in optimal conditions. Leica Microsystems provides the right tool for my live cell research."

Dr. Eef Parthoens
Department for Molecular Biomedical Research (DMBR), VIB - Ghent University, Ghent, Belgium

The new Leica Advanced Widefield Systems offer full flexibility to adapt to your changing needs. No matter which modules and components you select to configure an individual system, you will benefit from the utmost reliability and convenience. As many of the system components are designed and developed by Leica Microsystems, we offer unparalleled automation control due to complete integration of our hardware within the software platform.

The basic Leica AF6000 E system can be upgraded with a software package to create a Leica AF6000 fluorescence and imaging analysis system. Add a control unit to convert the system into a high-end Leica AF7000 live cell workstation with full real-time control.

Due to the many different fluorescence applications, all systems from the Leica AF6000 upward work exclusively with semi- or fully automated microscopes. Leica Microsystems technical experts perform the upgrade on site at your facility, which minimizes the inconvenience of system down-time.

Upgrade Options from Entry-Level to High-End Solutions

	Leica AF6000 E	Leica AF6000	Leica AF6500	Leica AF7000
Main Characteristics	Entry-level fluorescence acquisition system, 2D time-lapse, multi-channel overlay	Fluorescence imaging and analysis system, high flexibility (without real-time control)	High-speed fluorescence system, real-time control of camera and one filter wheel	Dedicated live cell system, full real-time control
Applications	Fluorescence imaging and documentation	General fluorescence imaging, 3D time-lapse experiments, multi-positioning, deconvolution	Functionality of AF6000, plus fast 2D time-lapse and fast ratio imaging, peripheral triggering	TIRF, fast 3D time-lapse, Fura2, FRET, deconvolution, peripheral triggering
Includes	AF6000 E SW + PC	AF6000 SW + PC	AF6000 SW + PC + CTR6500 HS	AF6000 SW + PC + CTR7000 HS
Leica DM1000 Ergonomic system microscope	●			
Leica DM2000 Advanced system microscope	●			
Leica DM2500 Advanced system microscope, 100 W	●			
Leica DM3000 Advanced system microscope, motorized	●			
Leica DM4000 B Automated upright microscope for biological laboratory and research applications	●			
Leica DM5000 B Automated upright microscope for demanding research applications	●	●	●	●
Leica DM5500 B Automated upright microscope for high-end research applications with motorized focus	●	●	●	●
Leica DM6000 B Fully automated upright microscope for cutting edge biomedical research	●	●	●	●
Leica DMI3000 B Manual inverted research microscope	●			
Leica DMI4000 B Automated inverted research microscope	●	●	●	●
Leica DMI6000 B Fully automated inverted research microscope	●	●	●	●
Leica DMI6000 B with AFC Research microscope for live cell imaging		●	●	●
Leica M205 FA High-end stereomicroscope for fluorescence imaging	●	●		
Leica MacroFluo High-end macroscope	●	●		

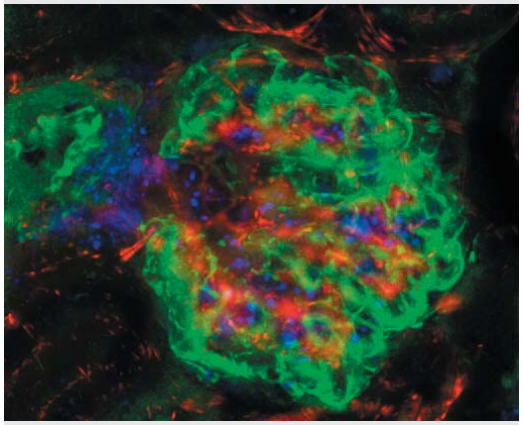
Leica AF6000 E – Flexibility Comes First

- **Entry-level image acquisition system**
- **Document your research**
- **Combine with a wide range of Leica cameras and microscopes**
- **2D time-lapse and multi-channel overlay**

The Leica AF6000 E is the ideal entry-level solution for widefield fluorescence microscopy. It is particularly suited to general fluorescence imaging applications such as biological and cytomorphological examinations and for professional documentation of research results.

The system is truly flexible, as it can be teamed with both manual and automated Leica Microsystems microscopes. In addition, the Leica AF6000 E can be configured with the motorized Leica MacroFluo and the M205 FA automated stereo fluorescence microscope. The system is compatible with many cameras in the Leica Microsystems range, which benefit from full integration with the software.

As with all systems in the Leica Advanced Widefield System Line, the Leica AF6000 E features an intuitive user interface and intelligent workflow guidance.



Mouse kidney section
Glomerulus
Blue: DNA, DAPI
Green: Alexa 488 WGA
Red: Actin, Alexa 568 Phalloidin

Image by:
Dr. M. Beynon, Leica Microsystems, Milton Keynes, UK

Leica AF6000 E with DM2500 upright microscope and Leica EL6000 external light source

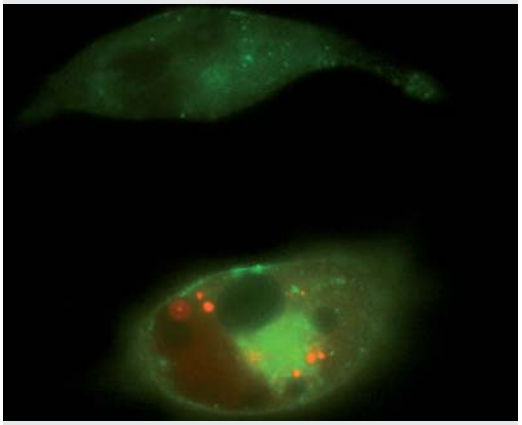
Leica AF6000 – Truly Flexible for Fluorescence

The Leica AF6000 provides all the necessary facilities for demanding fluorescence applications. This flexible, fully integrated system can be equipped with a large number of application packages and software modules.

The Leica AF6000 application spectrum ranges from general fluorescence work via multi-channel imaging to time-lapse experiments, multi-positioning and z-stacking. The system incorporates a wealth of standard features for image documentation, processing, quantification and analysis.

Optional modules for FRET, advanced time-lapse, channel unmixing, colocalization, well plate acquisition and various 2D and 3D deconvolution techniques will extend the analysis capability.

- **Multi-dimensional 3D imaging**
- **Live cell experiments**
- **A range of application packages and software modules for further analysis**

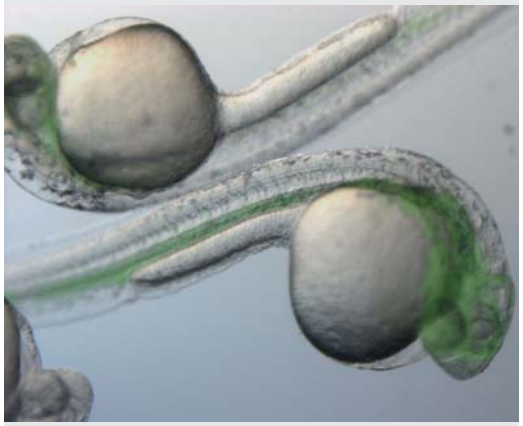


COS1 cell culture
Red: Galectin3-YFP
Green: Caveolin1-CFP

Courtesy of: Prof. Dr. R. Jacob, University of Marburg, Department of Clinical Cytobiology and Cytopathology, Marburg, Germany

Leica AF6000 with DM6000 B upright microscope and climate chamber

Leica AF6000 – for Upright, Inverted and Stereo Microscopes



Vascular anatomy of a zebrafish embryo as revealed by GFP expression driven by the Fli-1 promoter.

Courtesy of: Dr. Brant Weinstein,
National Institutes of Health, Bethesda, MD

Flexibility for a wide range of applications

The Leica AF6000 is compatible with automated upright and inverted microscopes from Leica Microsystems. In addition, the Leica MacroFluo and the M205 FA fluorescence stereomicroscope with FusionOptics™ are perfect partners for the Leica AF6000, with applications in timelapse and 3D image capture in the world of developmental biology.

The use of a motorized stage also enables documentation of images on several selected areas of interest in the specimens.

The Leica AF6000 can be combined with monochrome and color cameras as well as EMCCD cameras. The camera of choice for high-resolution fluorescence imaging is the Leica DFC360 FX.

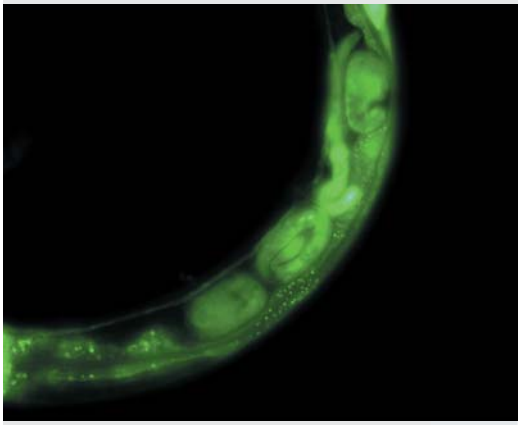
Leica AF6000 with M205 FA stereomicroscope and Leica EL6000 external light source

Leica AF6500 – Ultrafast 2D Time-lapse

The Leica AF6500 is a high-speed fluorescence system that allows real-time control of a camera and a filter wheel as required for fast 2D time-lapse studies. Automated research microscopes, both upright and inverted, from Leica Microsystems are the ideal platforms for a Leica AF6500. Each Leica AF6500 already comes with a high-speed software autofocus, allowing automated focusing in time-lapse and multi-positioning experiments. The high-speed autofocus works in fluorescence and transmitted light mode on microscopes with motorized z-drive.

Use the ratio imaging function to measure concentrations of second messenger substances such as Ca^{2+} at high resolution over long periods of time. The system is also ideal for examinations of a wide variety of cellular processes such as exocytosis, transport processes within the cytoskeleton and membrane fusions.

- **Real-time 2D time-lapse experiments**
- **Multi-dimensional 3D imaging**
- **High-speed ratio imaging**
- **Peripheral triggering**



C. elegans
GFP expression

Image by:
Dr. Werner Wittke, Leica Microsystems, Wetzlar, Germany

Leica AF6500 with DM6000 B upright microscope, EMCCD camera and Leica EL6000 external light source

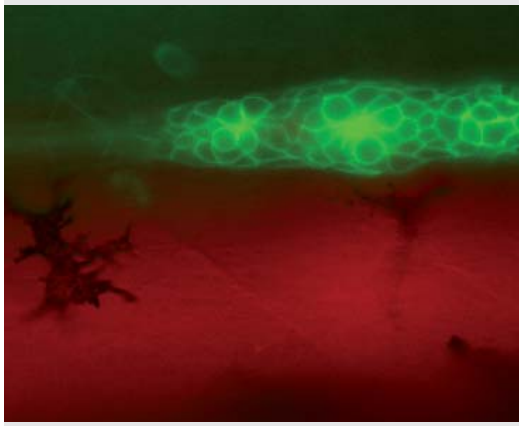
Leica AF7000 – Real-time 3D Time-lapse Applications

- **Real-time 3D time-lapse experiments**
- **High-speed FRET SE experiments**
- **TIRF experiments**

The Leica AF7000 leaves nothing to be desired in widefield fluorescence imaging. This system combines the ultimate in speed, reliability, scope for experiment design, analysis facilities and operational convenience. Achieve excellent results – fast!

This extremely versatile and fully integrated system allows real-time control of all necessary hardware components for complex live cell studies, such as the camera, fine focus devices and up to four external filter wheels. In addition, it offers the possibility to observe live cells using TIRF. The integrated high-speed software autofocus is working as well in TIRF mode. With the Leica AF7000 you are expertly equipped for the research tasks of today and tomorrow.

The Leica AF7000 effortlessly performs fast 3D time-lapse experiments. It is also fully capable of performing FRET SE, TIRF, as well as fast Fura2 measurements. Trigger signals can be transmitted to peripheral components via four channels. Vice versa, trigger signals can be received in up to four channels from external components and used to start experiments.

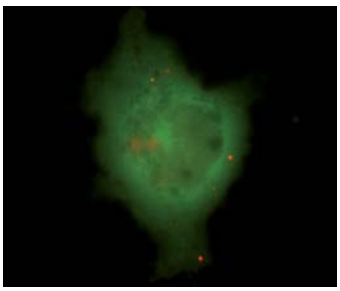


Co-migration of the zebrafish mechanosensory lateral line placode (green) and innervating axons (red) at 36 hours post fertilization. Live embryo is a double transgenic carrying neuronal-specific and placode-specific constructs (NBT:dsRedExpress and claudinB:mGFP, respectively). z-stack 200 slices/80 µm. Processing steps: dye separation and deconvolution.

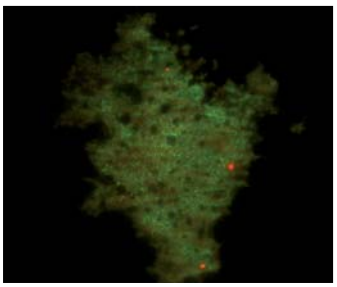
Courtesy of: Dr. Darren Gilmour, EMBL, Heidelberg, Germany

Leica AF7000 with DMI6000 B inverted microscope, climate chamber, CO_2 controller and SuperZ Galvo focus

TIRF (Total Internal Reflection Fluorescence) is the ideal technique for the study of cellular membranes and their environments. With automatic laser adjustment to maintain constant TIRF penetration depth, the Leica AM TIRF MC offers maximum flexibility for TIRF applications with multiple fluorophores at wavelengths of 405 nm, 488 nm, 561 nm and 635 nm for multi-color applications. The individual laser lines are coupled and controlled quickly and precisely via AOTF (Acousto-Optical Tunable Filters), achieving a switching time of only 1 ms. The Leica AF7000 is the base workstation from which to upgrade to the Leica AM TIRF MC at a later date.



COS1 cell culture, Widefield
Red: Galectin3-YFP
Green: Clathrin-CFP



COS1 cell culture, TIRF
Red: Galectin3-YFP
Green: Clathrin-CFP

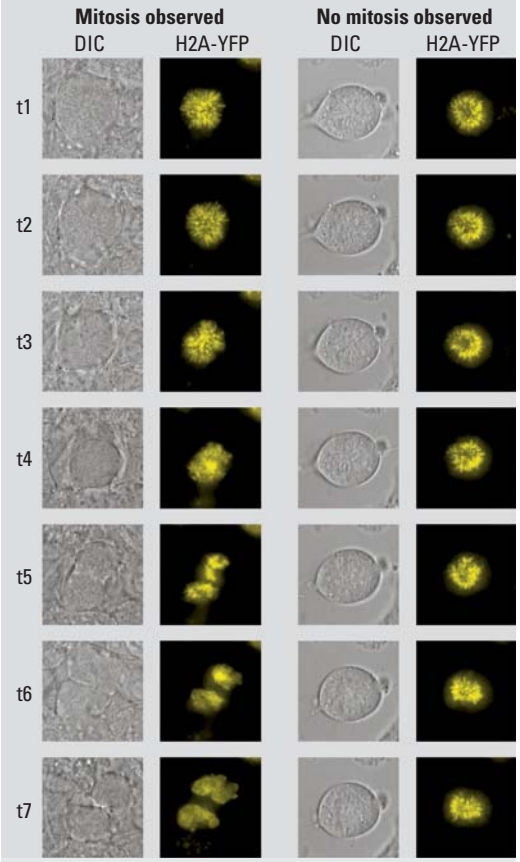
Courtesy of: Prof. Dr. R. Jacob, University of Marburg,
Department of Clinical Cytobiology and Cytopathology, Marburg, Germany

"Cell Biology is a fascinating field of research with a wide range of applications. My equipment needs to grow with the increasing number of demanding applications – just like the Leica Microsystems imaging solutions."

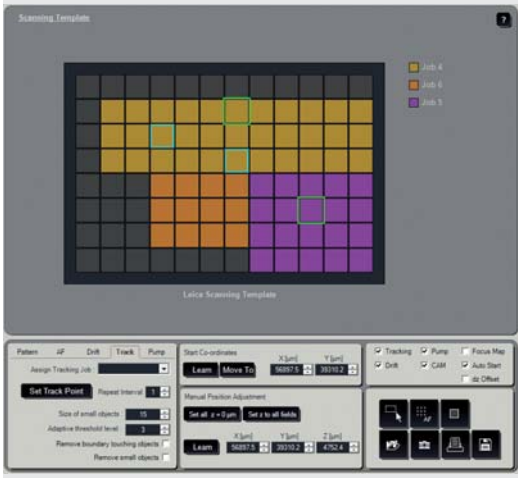
Prof. Dr. R. Jacob
University of Marburg, Department of Clinical Cytobiology and Cytopathology,
Marburg, Germany

Leica AM TIRF MC – visualize life's secrets with true multi-color TIRF

Design Your Experiment – with Intelligent Modules



NIH 3T3 mouse fibroblast cells expressing H2A-YFP.
Two positions of a Mark and Find experiment.
Courtesy of: Dr. Constantin Kappel, DKFZ, Heidelberg, Germany



Matrix M3 user interface for High Content Screening

Common to all Leica Advanced Widefield Systems, Leica Microsystems has developed an easy-to-use, intuitive software interface that guides you through every step of the work process. Incorporating the latest findings in ergonomic design and efficiency research, the software enables you to define experiments and analysis swiftly and effortlessly.

From the simple control of the microscope functions to the highly complex confocal systems, all the fluorescence research systems are built on the same software platform. This saves time when you first start to work, getting your results fast.

All settings are stored so experiments can easily be repeated. Log files and image parameters give detailed information on all actions performed during an experiment.

A context-sensitive help function is available whenever needed. Support for complex analysis procedures comes in the form of specific wizards. For example, FRET SE offers application-oriented help and explanations.

AF6000, AF6500 and AF7000 can also be upgraded to a powerful High Content Screening system with the Matrix M3 wizard.

Mark and Find
- Activation of the live image during the experiment
- Change the cell positions while the experiment is in progress

Live Data Mode
- Change the course of an experiment “on the fly”
- Online generation and graphical display of measurements
- Flexible definition and combination of various experimental routines
- Peripheral in/out triggering of experiments; control of manipulators or peristaltic pumps

3D Visualization
- 3D rendering and dynamic user interaction of volume
- Compile multi-channel 3D movies

Colocalization
- Visualization and quantification of colocalized fluorochromes
- Statistic determination of the degree of colocalization

Dye Finder
- Elimination of cross-talk between fluorochromes with a proprietary unmixing algorithm
- Differentiation between dyes with overlapping spectra

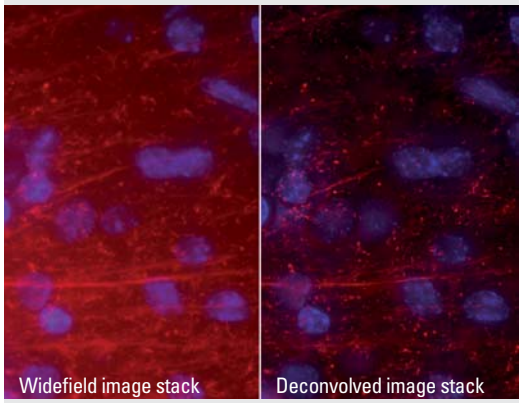
Deconvolution
- 2D deconvolution offering no-neighbor and nearest-neighbor algorithm
- 3D deconvolution with several algorithms using adaptive, calculated or supplied PSF
- Batch deconvolution for automated processing of multiple data stacks
- Removal of haze and blur by reassigning scattered light

FRET SE
- Application module for the acquisition and analysis of FRET specimens
- Correction of cross-talk
- Online display of FRET image and FRET graph
- FRET Sensitized Emission and FRET ratio

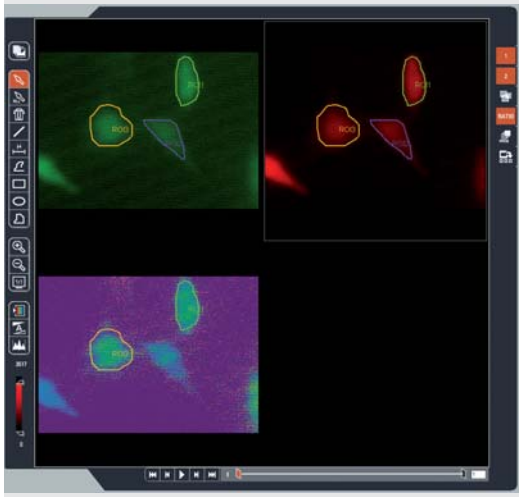
Fura2
- Determination of Ca^{2+} concentrations for intracellular signal processing and transport processes
- Ca^{2+} quantification according to Grynkiewicz formula
- Online generation of measurement curves and cleaning of background fluorescence

Well Plate Acquisition
- Predefined patterns for 6, 12, 24 and 96 microplates
- User-definable patterns
- Combination with time-lapse, z-stacking and tile scan

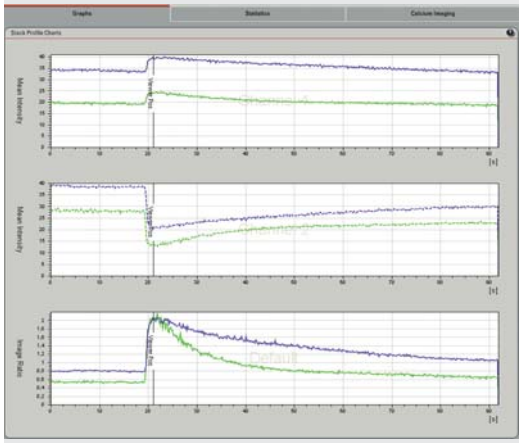
Matrix M3 High Content Screening
- Wizard for fully automated high content screening experiments
- Define flexible scanning templates for microplates, chambered coverslips, spotted arrays, Tissue Micro Arrays, lab on a chip, slides, petri dishes
- Combine different jobs and macros with multiple positions
- User defined drift compensation and water pump positions
- On the fly data export to any location connected via LAN (TIFF and OME format)
- Change a running screening experiment depending on analysis results
- Stage follows cell movement via object tracking



Cerebellum (nervous system), fixed sample, 40 µm thickness
Courtesy of: Dr. Fulvio Florenzano, S. Lucia Foundation, Rome



Fura2 software module: increasing Ca^{++} concentration in the cell by adding Bradykinin



Ratio intensity chart of Fura2 time-lapse experiment

Optimum Conditions for Live Cells

Live cell experiments need optimized hardware components. Key requirements include fast or real-time image recording, temperature stability, minimum exposure of specimens to light and highly sensitive recording techniques for weak fluorescence. For successful studies and high-quality results, all parameters have to be optimized for the specimens being analyzed and the experimental conditions.

Leica Microsystems offers a wide choice of hardware components and accessories for individual configuration of your research system. The modules can be combined in many different ways. The full integration of all automated functions with the software ensures perfect interaction of components in everyday use.

Explore life in all dimensions with the new Leica Adaptive Focus Control. The inverted Leica DMI6000 B microscope, with its intrinsic temperature drift stability, is ideally suited for live cell imaging. But even the most stable of microscopes can find this a challenge when subjected to drastic temperature changes. During such experiments, the new Leica AFC actively holds the focus over time – even in the most demanding environmental conditions. Its working principle is based on the reflection at the surface of the glass bottom of the Petri dish. AFC is effective for all contrasting methods and actively works to protect cells from photobleaching.

The user benefits from AFC's smart integration in all manner of live cell experiments such as time-lapse recordings, Mark- & Find- and z-stacking.

Fast external filter wheels and filter sets from Leica Microsystems with extremely short switching times.

Leica EL6000 external light source with high-speed shutter for minimum light exposure.

Leica TIRF objective for high spatial and temporal resolution in studies of dynamic processes inside or close to the cell membrane.

SuperZ focus for ultra-fast and highly precise z-stacking.

Wide choice of cameras from Leica Microsystems, supplemented by highly sensitive EMCCD cameras. The Leica DFC360 FX is the premier high-resolution, high-performance fluorescence camera recommended for the majority of Leica AF7000 applications. Switch easily between cameras within the software, e.g. between fluorescence and color cameras.

Extensive range of accessories for live cell examinations including climate chamber, cell chamber, various manipulators, CO_2 controller, incubators.

High-Speed Components for the Leica Advanced Widefield System Line

	Leica AF6000 E	Leica AF6000	Leica AF6500	Leica AF7000
Time-lapse	●	●	●●	●●
Multi-channel overlay	●	●	●●	●●
Camera control	●	●	●●	●●
Z stack	○	●	●	●●
Motorized XY stage	○	●	●	●
Deconvolution	○	●	●	●
External filter wheels	● 1 FW*	● 1 FW*	●● 1 FW	●● 4 FW
Peripheral triggering	○	○	●● 2 In, 1 Out	●● 4 In, 4 Out
SuperZ Galvo fine focus	○	○	○	●●
Pifoc fine focus	○	○	○	●●
TIRF	○	○	○	●●

●● available, high-speed ● available, non high-speed ○ not available *Leica CTR5500/6000/6500 required

Leica External Fast Filter Wheel for high-speed excitation, attenuation and emission control.

Leica SFL7000* – five different LED modules provide unlimited flexibility. Fully software integrated. Can be combined with Leica EL6000.

*Not available in the US

Leica DFC360 FX high-resolution camera for fast fluorescence imaging.

Water Immersion Micro Dispenser – Automatic supply of water immersion during experiments

Leica HCX Plan Apo objective with 1.46 numerical aperture for TIRF applications.

SuperZ Galvo focus for ultra-fast and highly precise z-stacking.

*Not available in the US

“With the user, for the user”
Leica Microsystems

Leica Microsystems operates globally in four divisions, where we rank with the market leaders.

• Life Science Division

The Leica Microsystems Life Science Division supports the imaging needs of the scientific community with advanced innovation and technical expertise for the visualization, measurement, and analysis of microstructures. Our strong focus on understanding scientific applications puts Leica Microsystems’ customers at the leading edge of science.

• Industry Division

The Leica Microsystems Industry Division’s focus is to support customers’ pursuit of the highest quality end result. Leica Microsystems provide the best and most innovative imaging systems to see, measure, and analyze the microstructures in routine and research industrial applications, materials science, quality control, forensic science investigation, and educational applications.

• Biosystems Division

The Leica Microsystems Biosystems Division brings histopathology labs and researchers the highest-quality, most comprehensive product range. From patient to pathologist, the range includes the ideal product for each histology step and high-productivity workflow solutions for the entire lab. With complete histology systems featuring innovative automation and Novocastra™ reagents, Leica Microsystems creates better patient care through rapid turnaround, diagnostic confidence, and close customer collaboration.

• Medical Division

The Leica Microsystems Medical Division’s focus is to partner with and support surgeons and their care of patients with the highest-quality, most innovative surgical microscope technology today and into the future.

The statement by Ernst Leitz in 1907, “with the user, for the user,” describes the fruitful collaboration with end users and driving force of innovation at Leica Microsystems. We have developed five brand values to live up to this tradition: Pioneering, High-end Quality, Team Spirit, Dedication to Science, and Continuous Improvement. For us, living up to these values means: **Living up to Life**.

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Austria:	Vienna	Tel. +43 1 486 80 50 0	Fax +43 1 486 80 50 30
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Canada:	Richmond Hill/Ontario	Tel. +1 905 762 2000	Fax +1 905 762 8937
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