Miltenyi Biotec

MACSima™ Imaging Platform

The easy way to ultrahigh-content imaging

UNDERSTAND
NATURE'S
COMPLEXITY

MACSima™ Imaging

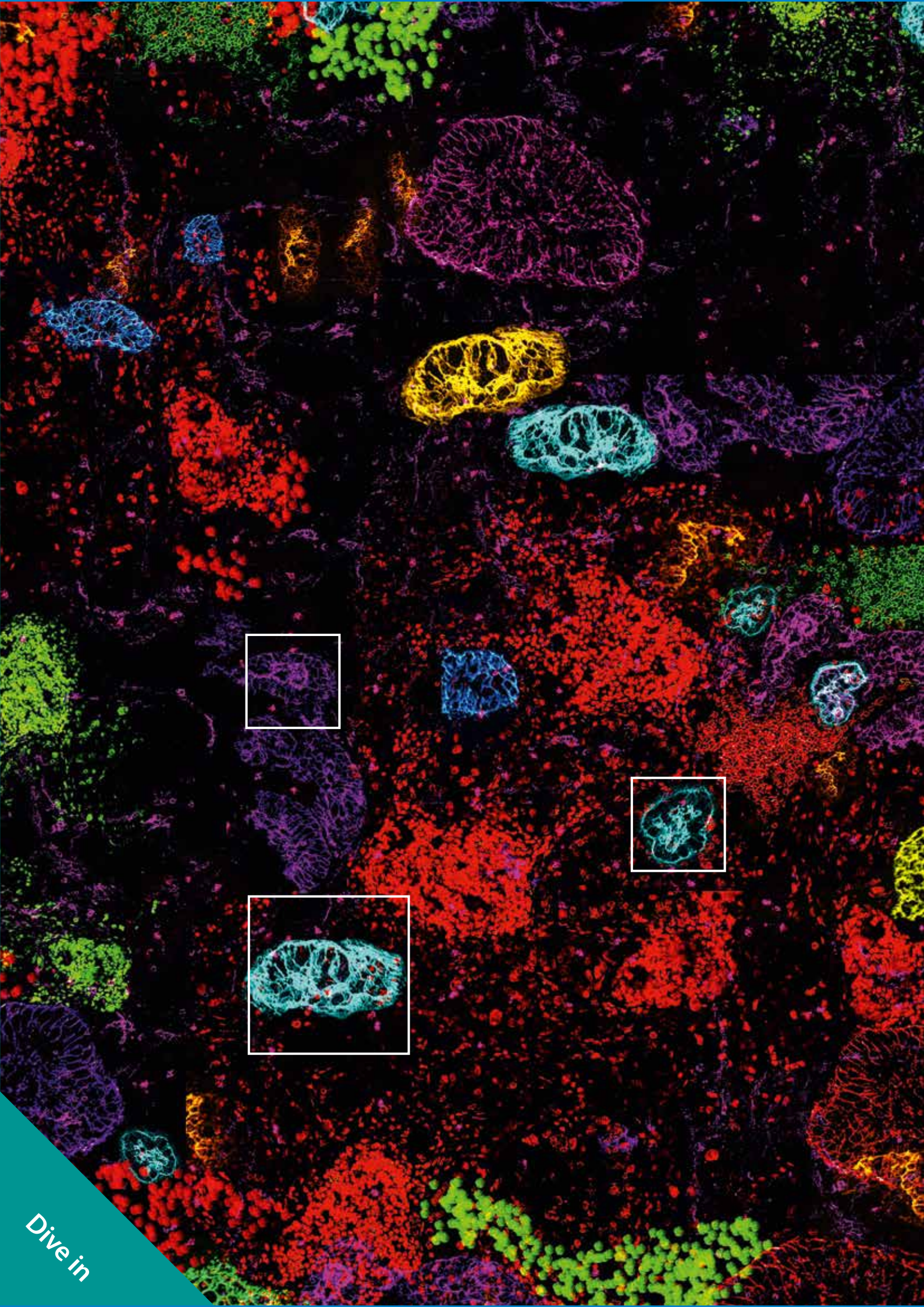
A new platform for fully automated, ultrahigh-content imaging

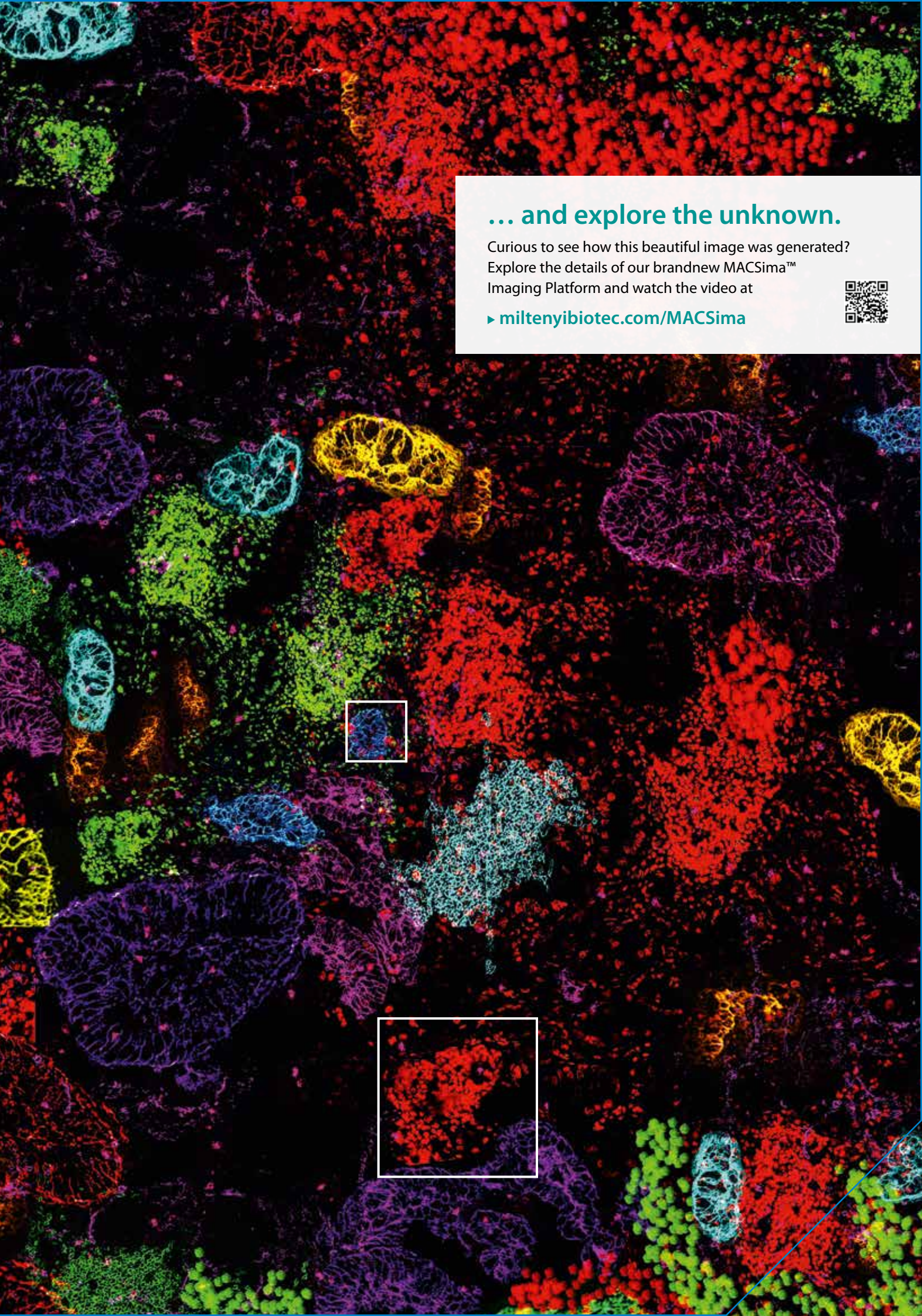
Biological systems and cellular processes are inherently complex due to the interaction of thousands of proteins involved in proper functioning of the entire organism. Thus, an in-depth analysis of biological systems requires the examination of a plethora of parameters in order to decipher the underlying principles. Currently available techniques can provide only a very limited perspective on the complexity of biological systems.

Miltenyi Biotec's new MICS (multiparameter imaging cell screen) technology impressively overcomes these limits as it allows the microscopic analysis of an unprecedented number of proteins or other antigens on a single sample.

Based on this technology, Miltenyi Biotec developed the MACSima™ Imaging Platform which enables fully automated high-content imaging. The possibility of evaluating localization, expression, and potential interaction of a multitude of different proteins allows scientists to explore new horizons in basic and biomedical research.

One sample, hundreds of markers

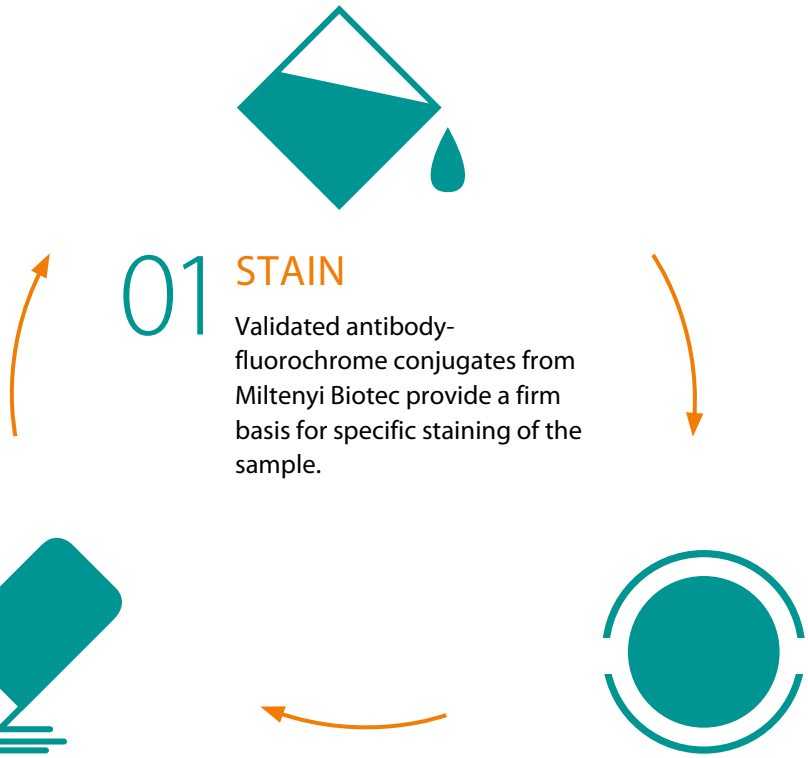

Dive in


… and explore the unknown.
Curious to see how this beautiful image was generated?
Explore the details of our brandnew MACSima™
Imaging Platform and watch the video at
▸ miltenyibiotec.com/MACSima

MICS technology – the basic principle

Miltenyi Biotec's MICS technology enables the simultaneous analysis of hundreds of markers on a single sample based on fluorescence microscopy. It uses the principle of iterative staining with different fluorochrome-conjugated antibodies to acquire microscopy data for a multitude of parameters without harming the sample. The iterative process comprises three main steps: fluorescent staining, image acquisition, and erasure of the fluorescence signal, all of which are conducted by the MACSima™ Imaging System in a fully automated manner.

The resulting stack of potentially hundreds of marker images provides an unprecedented insight into the physiological or pathological characteristics of the sample. Due to on-the-fly processing, data analysis can start at any time, even when the iterative process is still running.



01 STAIN

Validated antibody-fluorochrome conjugates from Miltenyi Biotec provide a firm basis for specific staining of the sample.

02 IMAGE

The MACSima Imaging System automatically acquires and processes highly conclusive epifluorescence images of the desired sample areas.

03 ERASE

To complete the cycle, the fluorescence signal is erased, and the process restarts automatically.

Simplicity demystifies complexity

With its automated processes and optimized components, the MACSima™ Imaging Platform reduces the effort for the generation of complex high-content microscopy data to the basic essentials. The benefits speak for themselves.

Hundreds of markers on one sample

Obtain high-content microscopy data to analyze hundreds of proteins and other antigens on a single sample.

Automated sample processing and imaging

Plan your experiment and leave the execution to the MACSima Imaging System.

Analyze any kind of fixed sample

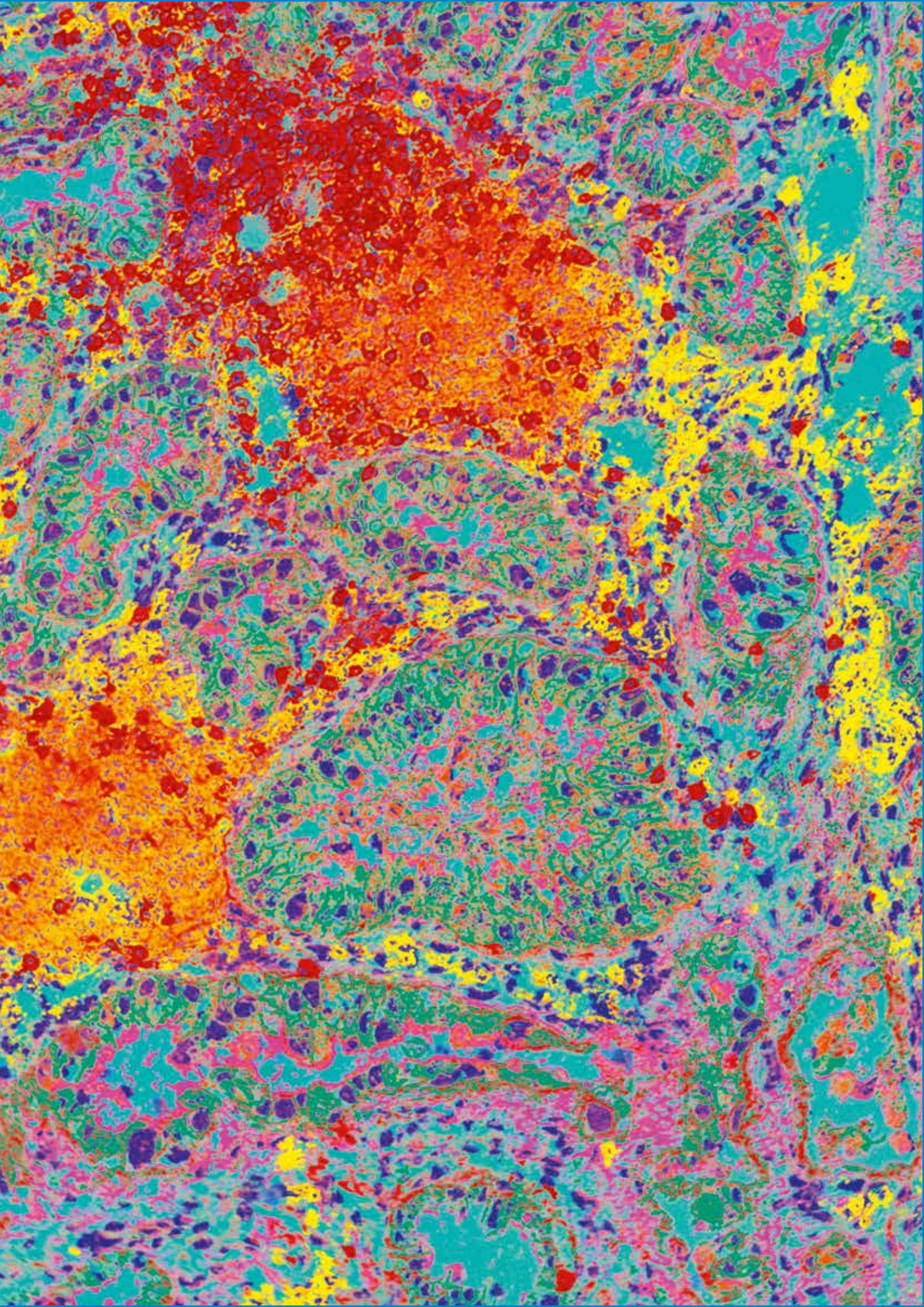
Image all types of fixed samples, whether tissue or single cells, and perform any analysis imaginable.

Complete imaging system

Count on the MACSima Imaging Platform which provides a complete, harmonized system including instrument, optimized sample carriers, validated antibodies, and intuitive software that allows on-the-fly data processing.

Effortless experiment preparation

Benefit from ready-to-use reagent plates containing pre-defined sets of antibodies from Miltenyi Biotec for an effortless yet comprehensive analysis.



The easy way to ultrahigh-content microscopy data

1

Setup experiment

Prepare your sample and antibody panel taking your preferred fixation method into account.

2

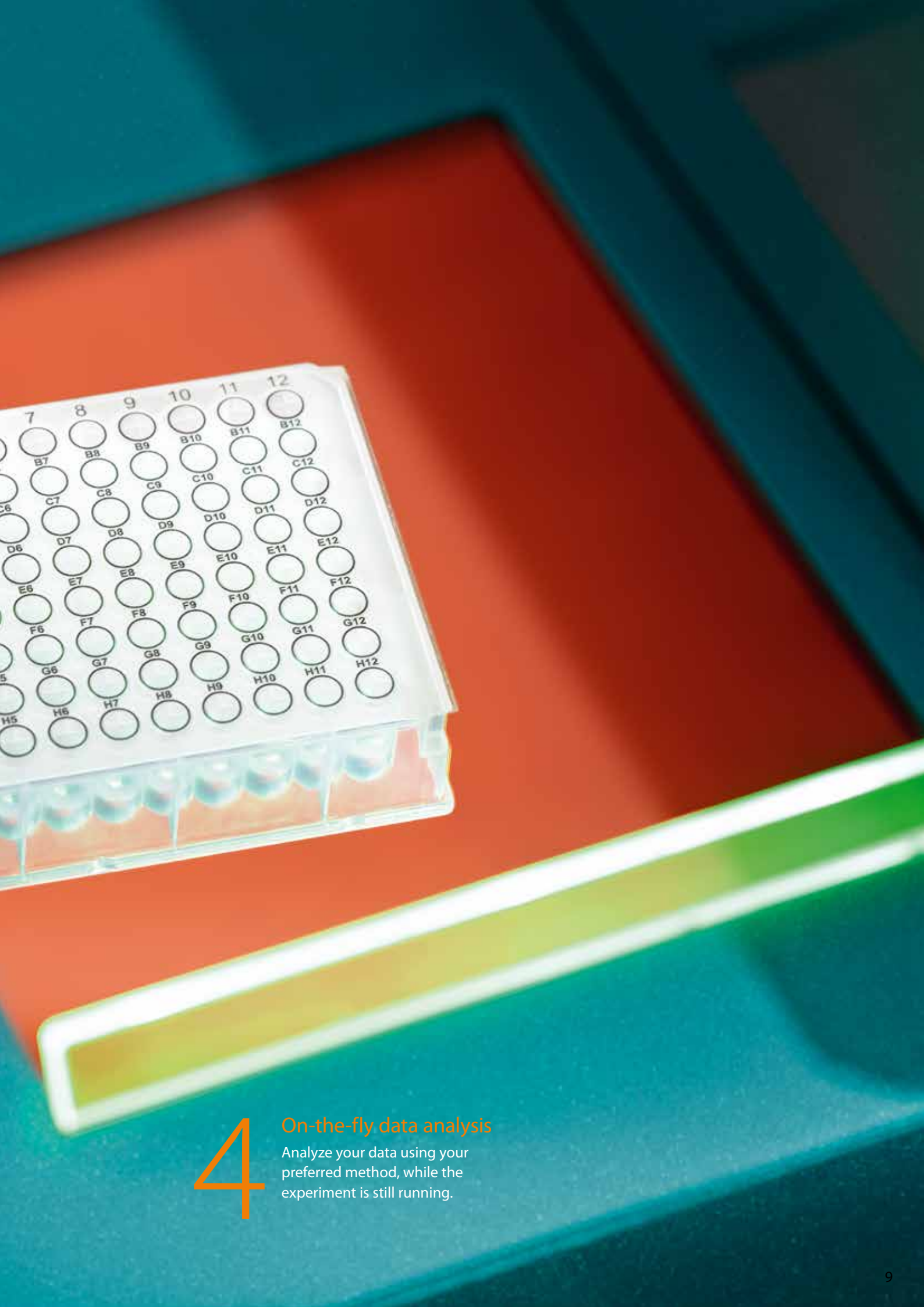
Experiment start

Place your sample and reagent plate in the MACSima™ Imaging System, define your preferred imaging area, and start the experiment.

3

Fully automated process

The MACSima Imaging System performs the iterative staining, imaging, and erasing process without further input or handling by the operator.



4 On-the-fly data analysis

Analyze your data using your preferred method, while the experiment is still running.

Unlimited options

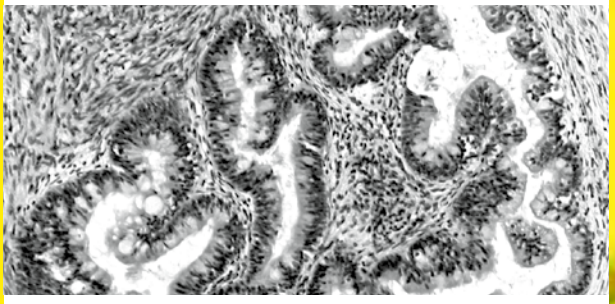
Analyze any kind of fixed sample

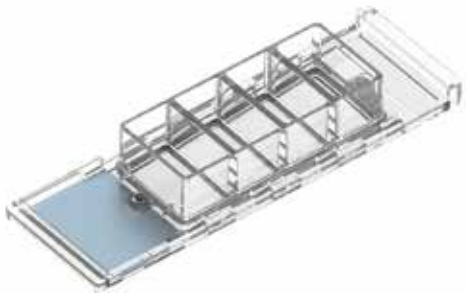
To answer complex scientific questions one cannot afford to be restricted by technical limitations. To give you complete flexibility in the type of fixed sample you want to analyze with the MACSima™ Imaging System, we have developed the MACSwell Sample Carriers. To support either tissue, adherent or suspension cells, we have designed three different types of carriers, MACSwell One, Two, and Four Imaging Frames, MACSwell 24 Imaging Plates, and MACSwell Micro Slides. Each of them contains a well-defined reaction cavity to perform iterative staining easily and safely and give you the ease of failure-free experimentation.

VALIDATED FIXATION METHODS

- ✓ Formalin-fixed paraffin-embedded (FFPE)
- ✓ Paraformaldehyde (PFA)
- ✓ Acetone

TISSUE

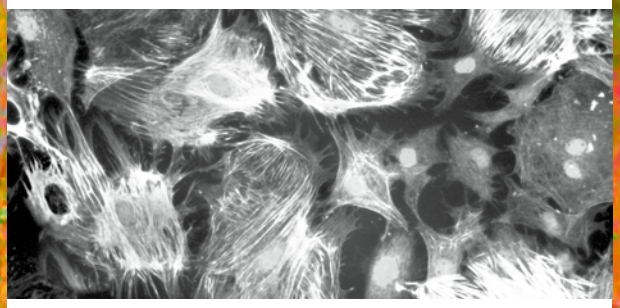


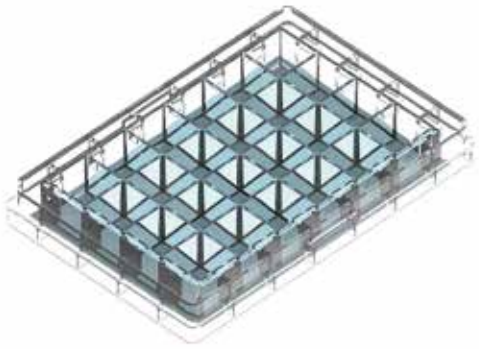


MACSwell One, Two, and Four Imaging Frames

can be mounted around any standard microscope slide and provide the reaction cavity needed for a MACSima Imaging experiment. MACSwell Imaging Frames are provided in three different sizes of reaction cavities to perfectly fit the size of your tissue sample.

ADHERENT CELLS

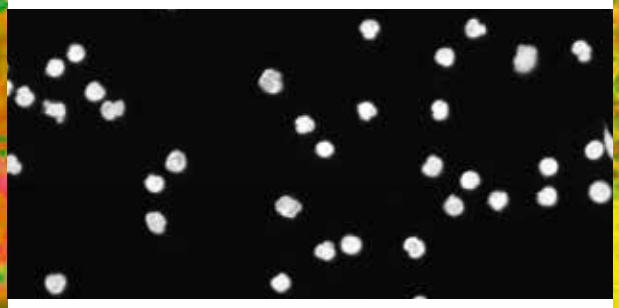


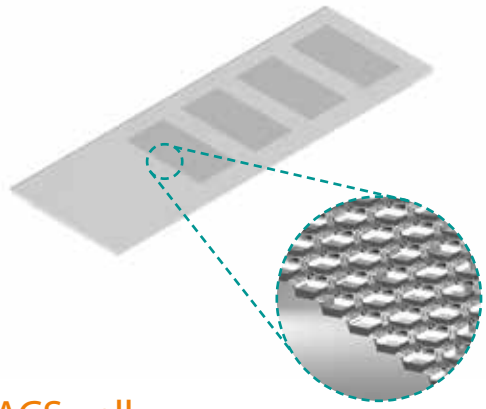


MACSwell 24 Imaging Plates

are pre-assembled and contain 24 rectangular wells with a clear 170 µm thick cover glass bottom. Simply pipet your cell suspension onto the plate, culture as usual and fix the sample according to your standard protocol directly on the plate.

SUSPENSION CELLS





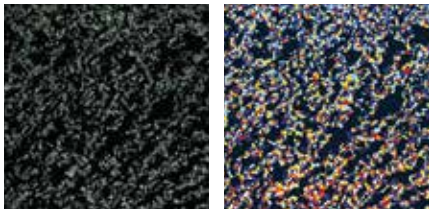
MACSwell Micro Slides

contain over 1.5 million hexagonal microcavities with a diameter of 20 µm and are therefore perfectly sized to fit exactly one cell. Simply mount your choice of MACSwell Imaging Frame around the slide and pipet your suspension cells in the resulting reaction cavity.

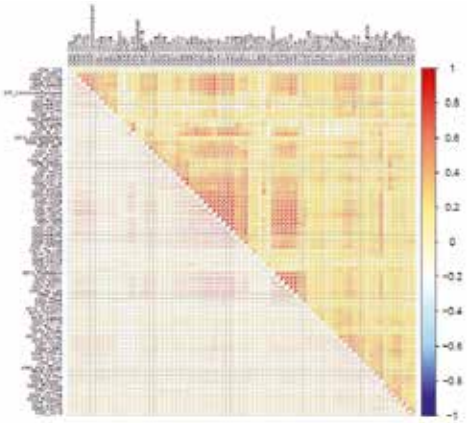
One experiment. Multiple readouts.

Glioblastoma multiforme is a highly malignant, thus far incurable type of brain tumor. To identify novel types of therapy, classification schemes have been developed that allow the categorization of several distinct subtypes of the disease. The high-content data generated by the MACSima™ Imaging Platform is perfectly suited to apply these classification schemes and subsequently identify novel glioblastoma-specific markers that might be promising for future CAR T cell–based therapies.

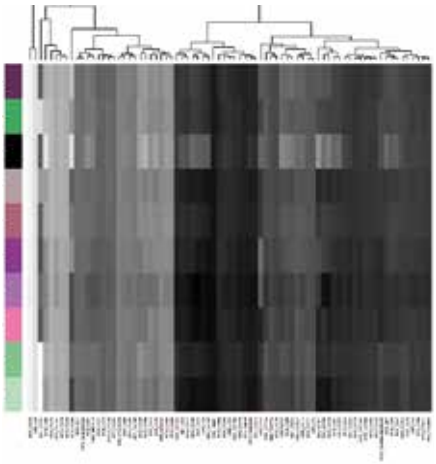
01 IMAGE ACQUISITION



02 SEGMENTATION



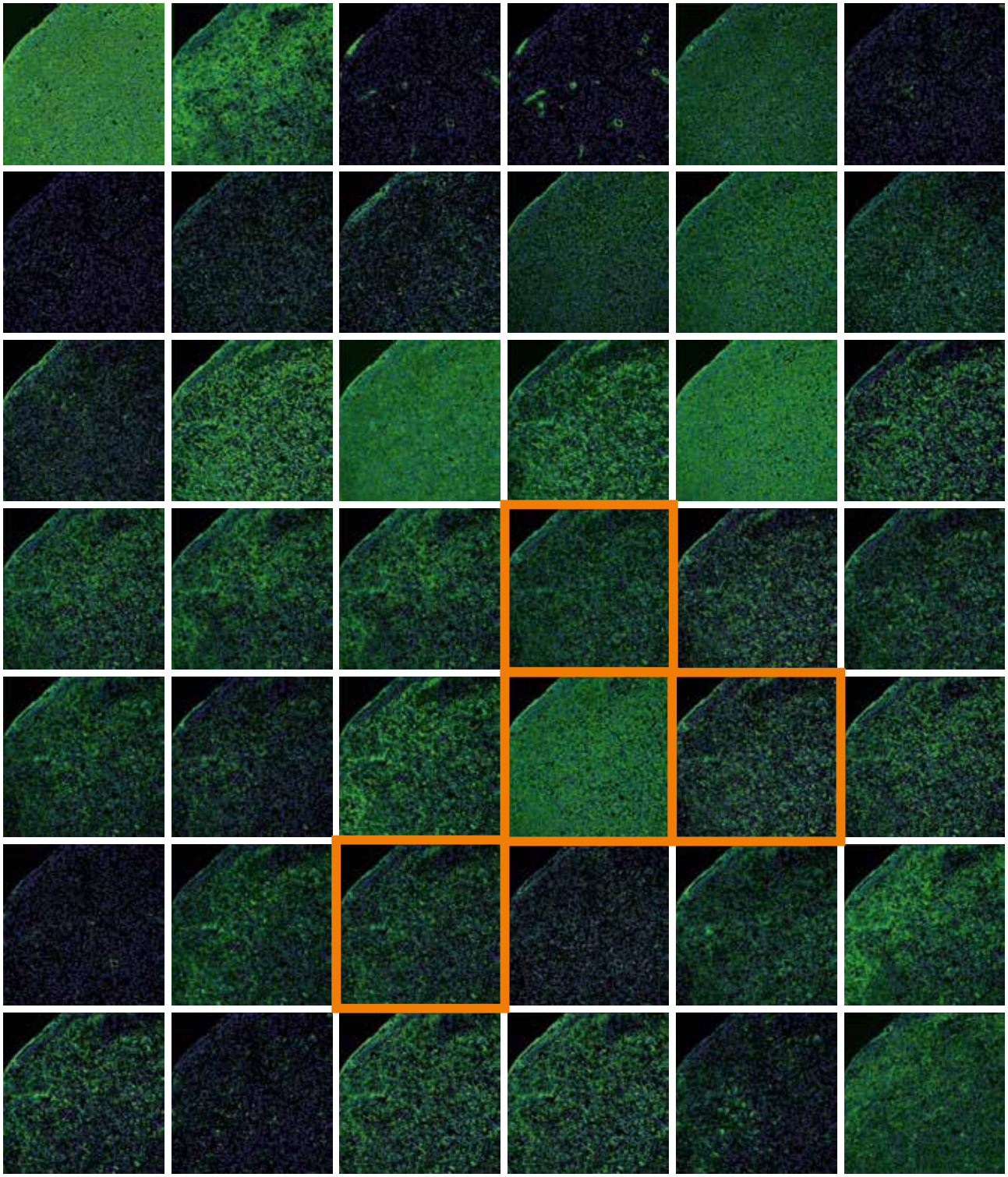
03 CORRELATION



04 CLUSTERING

Deep phenotyping of glioblastoma subtypes

2D-image stacks were obtained by the MACSima Imaging System and analyzed in a pixel- and segmentation-based approach. The resulting expression profile and pattern recognition data were used for in-depth classification of different glioblastoma specimen.



Identification of novel glioblastoma marker candidates

Selection of immunofluorescence images of 96 antibodies that were used with the MACSima Imaging System. Clustering and correlation analysis were performed to identify novel glioblastoma-specific markers. For more information visit **www.miltenyibiotec.com/MACSima**

Integrated system allows for effortless and reliable processing

MICS technology is based on the well-established and straightforward technique of immunofluorescence staining. However, to translate this technique into comprehensive and effortless multiparameter imaging a functional, well-orchestrated system is a prerequisite. The MACSima™ Imaging Platform relies on four essential pillars that are combined seamlessly to ensure the easy generation of conclusive high-content microscopy data.

MACSima™ IMAGING SYSTEM

At the heart of the system is the MACSima™ Imaging System, a benchtop device that performs the iterative staining cycle and data processing in a fully automated fashion.

MILTENYI BIOTEC ANTIBODIES

A broad and continuously growing portfolio of validated antibodies from Miltenyi Biotec, including REAfinity™ Recombinant Antibodies, ensures specific staining, and thus the reliable analysis of hundreds of parameters.

MAC
Imaging

Sima™
Platform

SAMPLE CARRIERS

Specially designed sample carriers from Miltenyi Biotec ensure a failure-free, automated MICS staining process and offer the flexibility to use various sample types.

MACSima™ SOFTWARE

The MACSima™ Software dependably controls the automated procedure including sample handling and data processing, for your complete peace of mind.

All you need for your ultrahigh-content experiment

MACSima™ Instrument specifications	
Instrument type	Epifluorescence microscope
Camera	Latest sCMOS technology with high-resolution, thermoelectrically cooled sensor
Filters	5 different emission filters
Autofocus	Dual approach of hardware and image-based autofocus mechanism
Illumination	6 different excitation LEDs
Objectives	Set of 3 lenses from overview to resolution, optimized for all supported sample carriers
Liquid handling	• Washable stainless-steel needle with minimized spill-over • Syringe pump drive for accurate volumetric staining of samples
Automation	• Fully automated liquid handling • Fluorescent staining, image acquisition, and erasing • 1.5 L fluid containers for automatic operation over several days without the need to exchange containers
Stage	• 100 nm resolution • Convenient loading and clamping of all supported sample carriers
Sample carriers	• Miltenyi Biotec's MACSwell Sample Carriers for slide-based and plate-based sample handling
Computer	• Integrated redundant storage for multiple experiments • Tiltable integrated touch display (Full HD) • Trackball keyboard
Operating conditions	Non-condensing humidity, air-conditioned laboratory
Software	Software package allowing for experiment planning, execution and analysis of high dimensional data sets
Weight	~165 kg
Dimensions	1,210 mm × 750 mm × 650 mm (L×W×H)

Product type	Order no.
Instrument	
MACSima Instrument	130-121-164
Antibodies	
REAscreen, MAX, human, FFPE, version 01	130-124-376
REAscreen, MAX, human, PFA, version 01	130-124-377
REAscreen, MAX, human, Acetone, version 01	130-124-378
REAscreen, MAX, mouse, PFA, version 01	130-124-379
REAscreen, MAX, mouse, Acetone, version 01	130-124-380
REAfinity® Recombinant Antibodies	*
REAlease® Releasable Antibodies	*
MACS® Antibodies	*
Sample carriers	
MACSwell One Imaging Frame	130-124-673
MACSwell Two Imaging Frame	130-124-675
MACSwell Four Imaging Frame	130-124-676
MACSwell 24 Imaging Plate	130-124-677
MACSwell Micro Slide	130-124-678
Buffers	
MACSima Running Buffer 1×1.5 L	130-121-564
MACSima Running Buffer 6×1.5 L	130-121-565
MACSima System Buffer 1×1.5 L	130-122-183
MACSQuant®/MACSima Storage Solution 6×1.5 L	130-092-748

* For details on the wide range of Miltenyi Biotec antibodies, visit **www.miltenyibiotec.com/antibodies**

Miltenyi Biotec provides a wealth of antibodies validated for imaging, including REAfinity™ Recombinant Antibodies and REAlease® Releasable Antibodies, which ensure specific staining and highly reproducible results.

For more information visit **www.miltenyibiotec.com/antibodies**

REAfinity Recombinant Antibodies

REAlease

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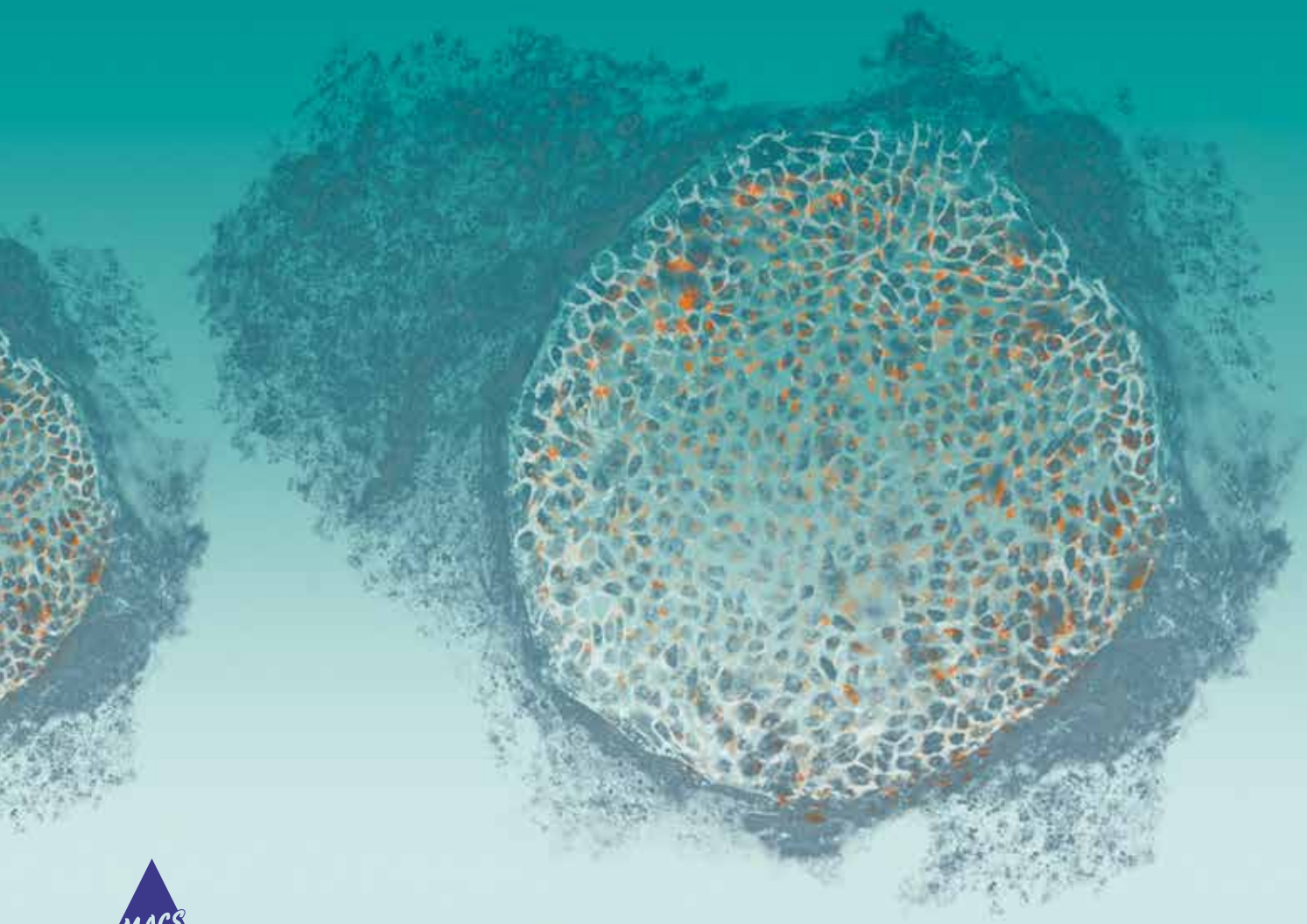

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