



Představení nového produktu od Leica Microsystems — **Leica Mica**

Martin Kopecký 
vedoucí divize mikroskopie
Pragolab s.r.o.

Introduction of all divisions **All your needs?**



Organic analysis
and
separation techniques



**Microscopy
and
sample preparation**



Physical
and
material analysis

Microscopy workflow

NEW Leica MICA Imaging HUB



Basic and routine microscopy



Real Holographic microscopy Q-Phase, quantitative. LiveCODIM SR module



TEM Electron microscopes from Delong Instruments, Bench top



New software analysis AIVIA with AI



High End Widefield microscopy, THUNDER systems

Large portfolio, solutions for your research



Top Confocal microscopy STELLARIS platform



Sample preparation cooperation with Specion s.r.o.



CryoCLEM, THUNDER, STELLARIS solution with transfer



CELL Dive Multiplex from Cytiva multiplex imaging



What if every scientist could access spatial Information?

Meet Mica

The world's first Microhub



Access
for all



No
constraints



Radically simplified
workflows



Step into the era of **Access for all**

*Everyone can now leverage
microscopy to make more
discoveries*

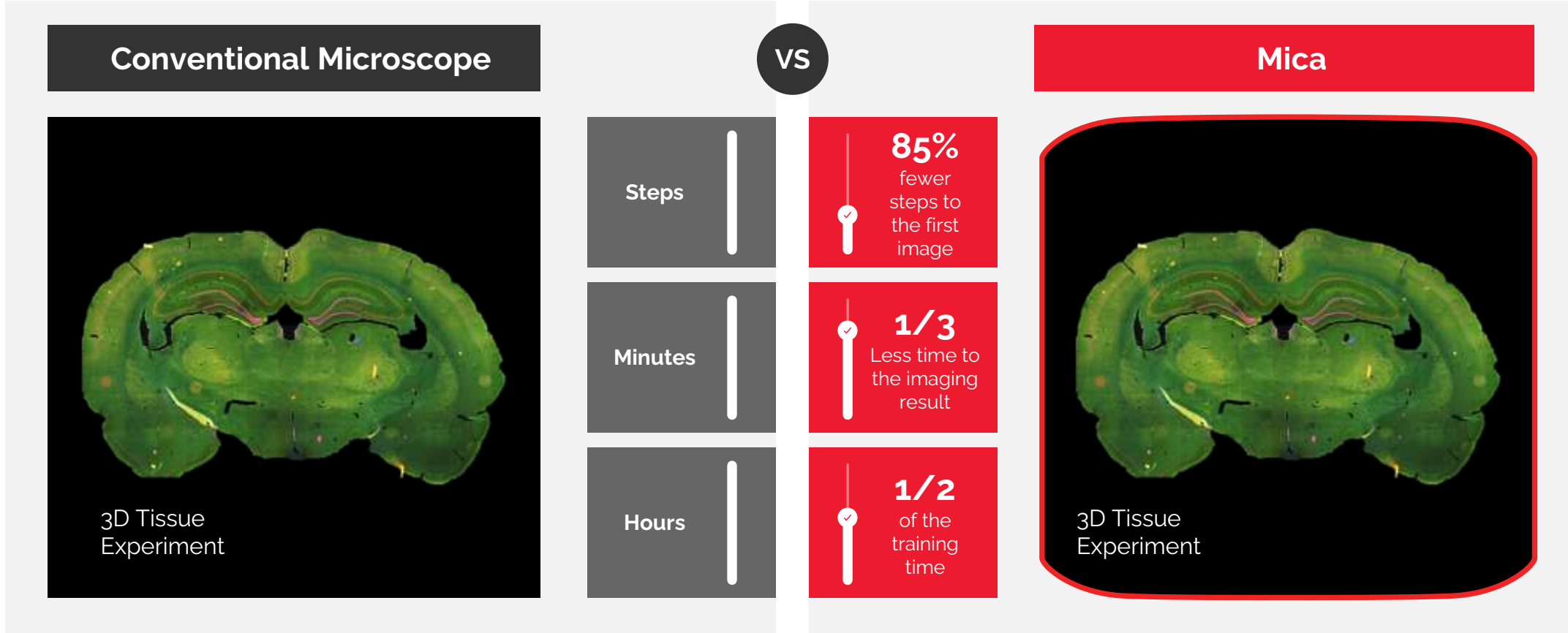


Eliminate over

85%

of tedious setup steps
that require special
expertise

Everyone can now leverage microscopy to make more discoveries



Powered by:



Intelligent automation



Intelligent Imaging

Tissue slice from the rat brain. Nuclei are stained with DAPI (blue), STL with FITC (green), astrocytes (GFAP) with Cy3 (yellow), and newborn neurons (NeuN) with Cy5 (red). 10x widefield tile scan, all 4 labels acquired simultaneously.

Step into the era of **No constraints**

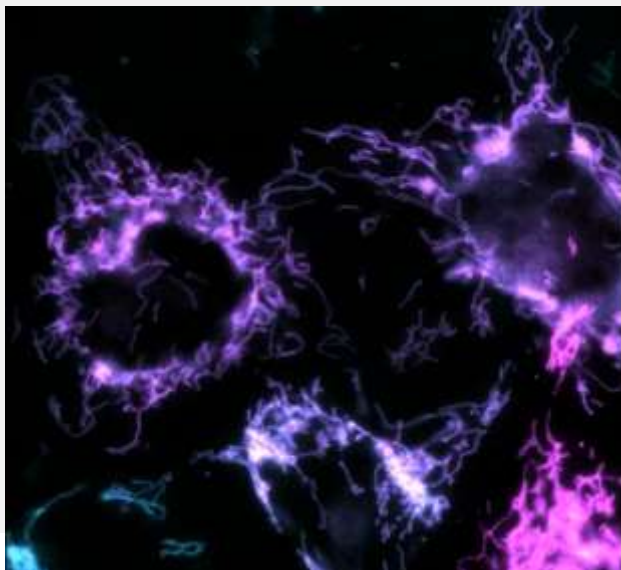
*Everything you need to enable
discoveries, unified in one easy-
to-use system*



4X More
data with
100%
correlation

Access key contextual information with absolute spatiotemporal correlation

Conventional Microscope Sequential Acquisition



Mica Simultaneous Acquisition



Mica delivers absolute correlated labels without spatiotemporal mismatch

U2OS cells stained with MitoTracker green (mitochondria structure, cyan) and TMRE (active mitochondria, magenta). **Sequential acquisition** (left side, conventional microscope) and **simultaneous acquisition** (right side, Mica) of the two channels over 2 minutes 100 frames using the 63x/1.20 CS2 Water MotCORR objective..

Powered by:



4 labels
simultaneously



4 labels 100%
correlated



Patented
FluoSync
technology

Select the right modality in real-time

Seamlessly move from fast overview to high resolution when required by your experiment

Powered by:



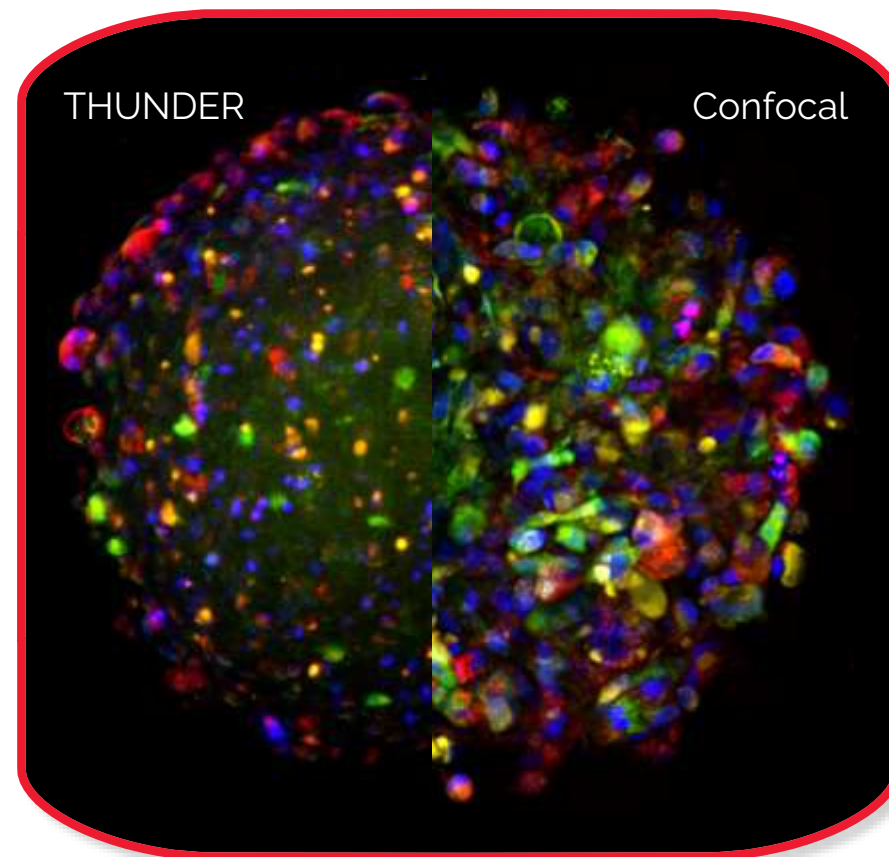
Unified
Imaging
Modalities



Point
Scanning
Confocal



Mica is an
incubator



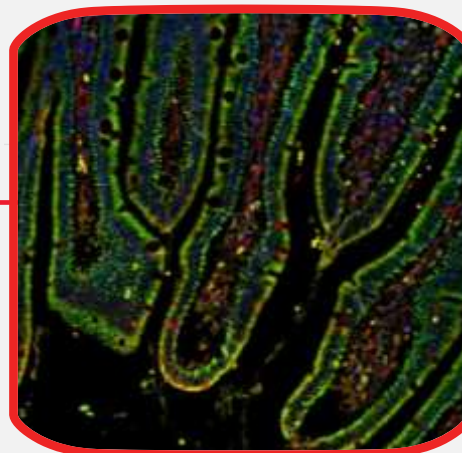
3D Cell Culture, 7d spheroid formation of U343 cells. tfLC3 EGFP and mRFP + DAPI + WGA Alexa 680. Objective: 20x/0.75 CS2 DRY

Seamlessly move from fast overview to high resolution

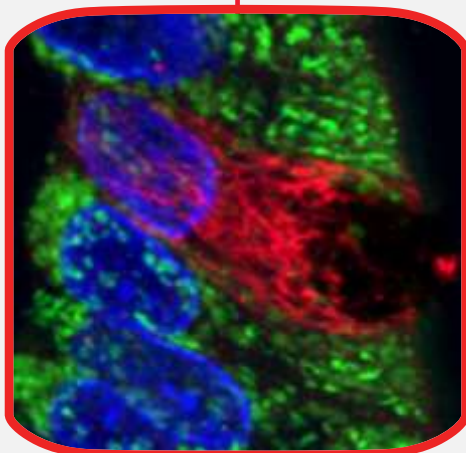
1.6X Widefield
Create Overview



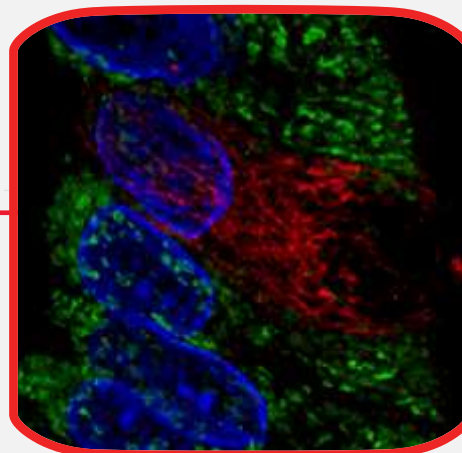
20X THUNDER
Select the cell of interest



63X Confocal
Get the subcellular information



63X LIGHTNING
Get even more of the subcellular information



Powered
by:



Unified
Imaging
Modalities



Point
Scanning
Confocal



Mica is an
incubator

Intestine tissue section acquired with different objectives ranging from low to high magnification (1.6x, 10x, 20x, 63x), using widefield and confocal imaging. 20x widefield images are processed with THUNDER and 63x confocal images with LIGHTNING. Nuclei are labeled in blue, mitochondria in green, and detyrosinated tubulin in red.

Achieve physiological-like conditions throughout your experiment



Multiple Spheroids Growing over 2.5 days

Powered by:



Mica is an incubator

Formation of 3D spheroids from 1000 stably transfected MDCK MX1-GFP cells per well (upper row) and 1000 U2OS cells per well (lower row) shown at 5 different timepoints. Time-lapse acquisition over 60 hrs with 30 minutes interval. Green, GFP. Gray, integrated modulation contrast.

Mica is an incubator to maintain your sample in optimal conditions and to minimize evaporation



Multiple Spheroids Growing over 2.5 days

Powered by:



Mica is an incubator

Formation of 3D spheroids from 1000 stably transfected MDCK MX1-GFP cells per well (upper row) and 1000 U2OS cells per well (lower row) shown at 5 different timepoints. Time-lapse acquisition over 60 hrs with 30 minutes interval. Green, GFP. Gray, integrated modulation contrast.

Step into the era of **Radically simplified workflows**

*Bringing you faster from
sample to discovery*



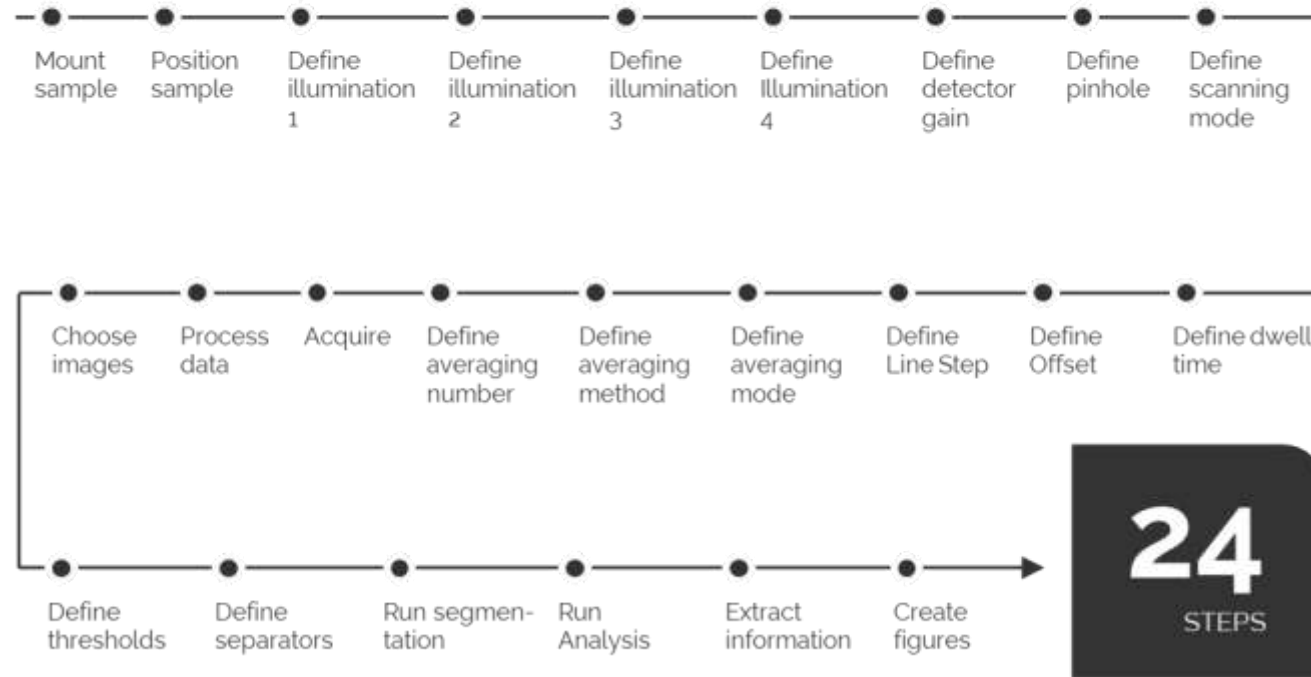
Reduce over

60%

of process steps through
system intelligence

Reduce time and effort from sample to insight by simplifying the entire workflow

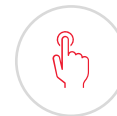
Conventional Microscopes



Powered by:



Sample finder



OneTouch-Auto Illumination



AI-based Analysis

Mica



- 1 Mount sample
- 2 Position sample
- 3 Start Live Acquisition
- 4 Define positions
- 5 Acquire
- 6 Choose images
- 7 Run segmentation
- 8 Run analysis

8
STEPS

Reduce time and effort from sample to insight by simplifying your entire workflow



AI based training of mitochondrial segmentation using your scientific expertise

Enable 100% reproducibility and repeatability throughout your experiment

Powered by:



Pixel classifier



GUI operated annotations



Reusable AI models and project parameters

U2OS cells were labelled with SiR-Actin, TMRE (mitochondria activity), CellEvent (caspase activity), and DAPI (nuclei). Apoptosis inducer staurosporine was added at time-point 0. 63x magnification, widefield mode. 13 hours time-lapse.



Meet Mica

Experience the future in key applications



Fluorescence
Assay



3D Tissue
Imaging

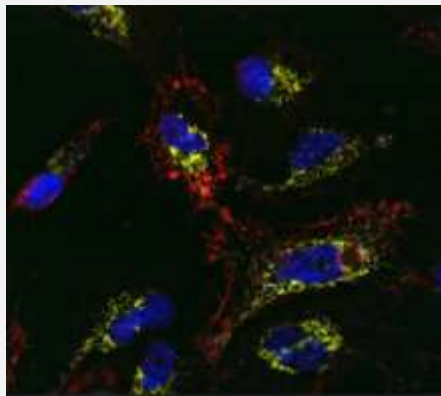


Long-term
Time-lapse

Meet Mica in key applications

Fluorescence Multi-well Plate Assay

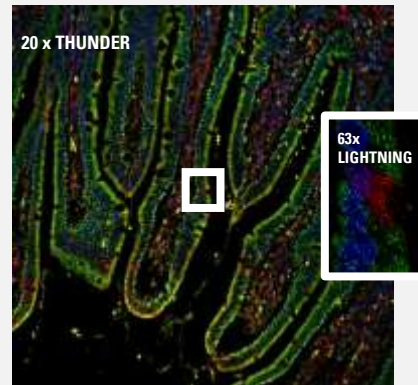
Mica allows you to image 4 labels simultaneously, with 100% spatiotemporal correlation. This key application shows how Mica is used with fluorescent multi-well plate assays around Caspase 3/7 activations in apoptosis.



U2OS cells were labelled with SiR-Actin, TMRE (mitochondria activity), CellEvent™ (caspase activity), and DAPI (nuclei). Apoptosis inducer staurosporine (3µM) was added at time-point 0. 63x magnification, widefield mode. 13 hours time-lapse.

3D Tissue Imaging

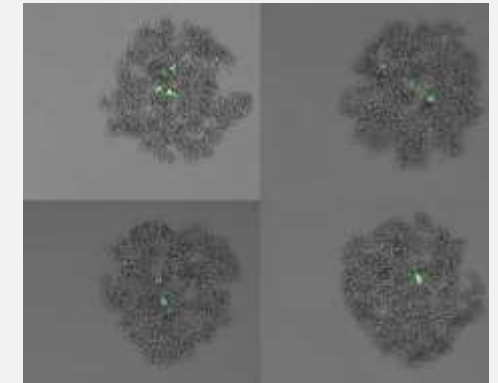
Mica enables you to seamlessly move from fast overview to high resolution when required by your experiment. See how Mica allows you identify a detyrosinated tubulin positive cell and progress from overview to the segmentation of the tubulin network.



Intestine tissue section acquired with 20x and 63x magnification, using widefield and confocal imaging. 20x widefield images are processed with THUNDER and 63x confocal images with LIGHTNING. Nuclei are labeled in blue, mitochondria in green, and detyrosinated tubulin in red.

Long-term Time-lapse

Mica is an incubator to maintain your sample in physiological-like conditions and to minimize evaporation. Discover how Mica allows you to measure spheroids growth and to analyze protein expression levels.



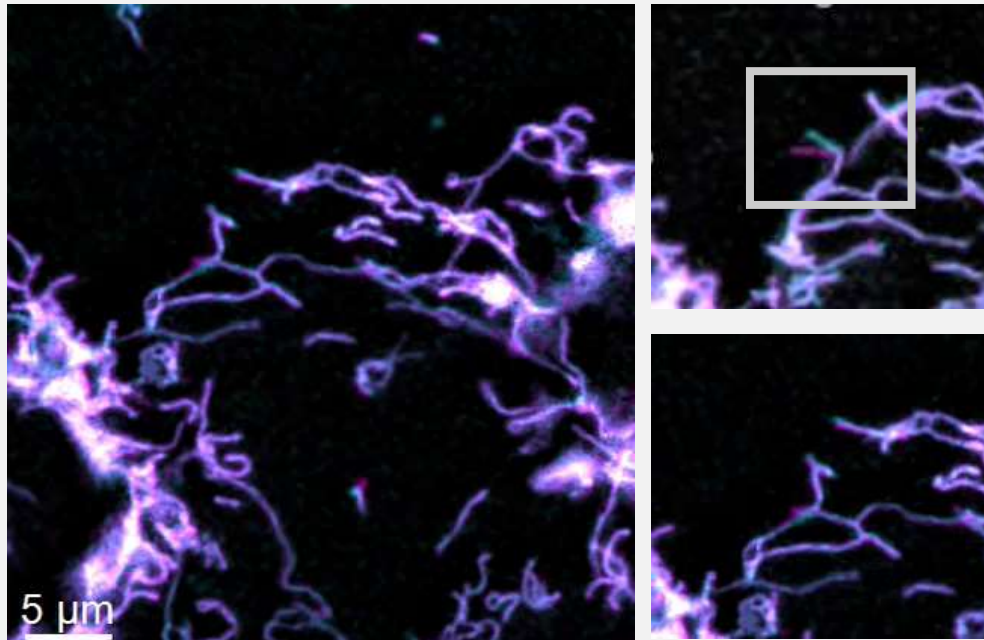
Formation of 3D spheroids from 1000 stably transfected MX1-GFP cells per well. Time-lapse acquisition over 60 hours with 30 minutes interval. Green, GFP. Gray, integrated modulation contrast.

Challenge of spatiotemporal multicolor acquisition

Mitochondrial dynamics

U2OS cells were stained with MitoTracker green (green) and TMRE (red). Short time-lapse sequences of 1 min have been acquired in widefield mode. The traditional widefield labels (left) were acquired sequentially, with Mica (right) the acquisition is done simultaneously.

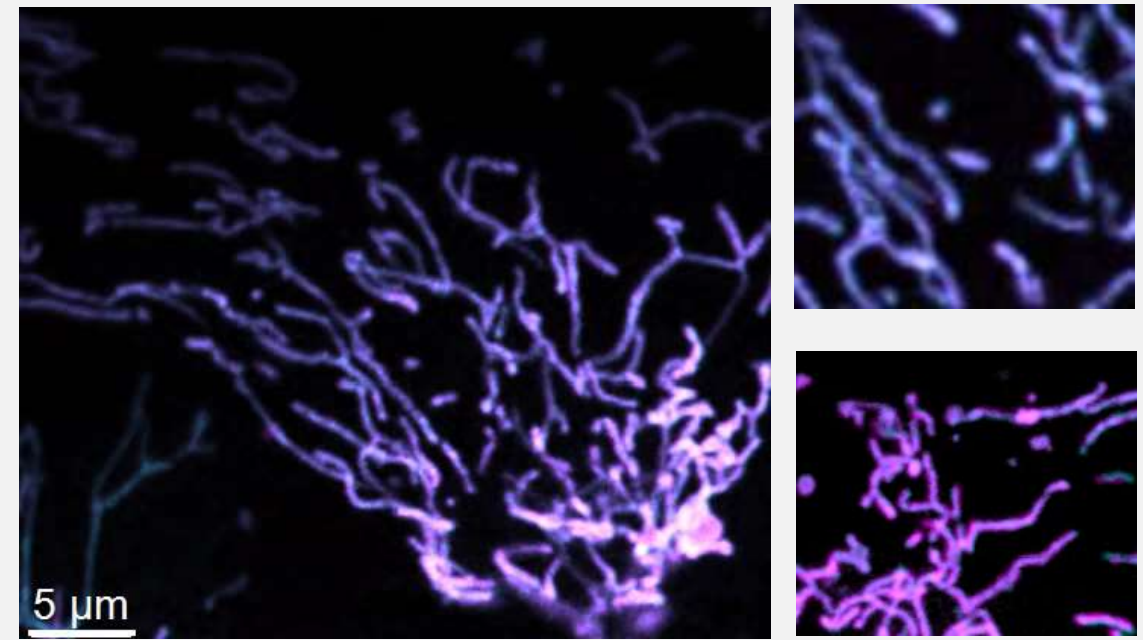
Traditional Widefield



Simultaneous detection eliminates spatiotemporal artifacts when visualizing mitochondrial structure and membrane potential.

When using traditional widefield imaging spatiotemporal artifacts – as a result of sequential acquisition – falsify measurements and prohibit correlation of structure and function. With FluoSync, the simultaneous acquisition ensures spatiotemporal correlation, no artifacts are acquired, and the membrane potential is correctly correlated with the mitochondrial structure.

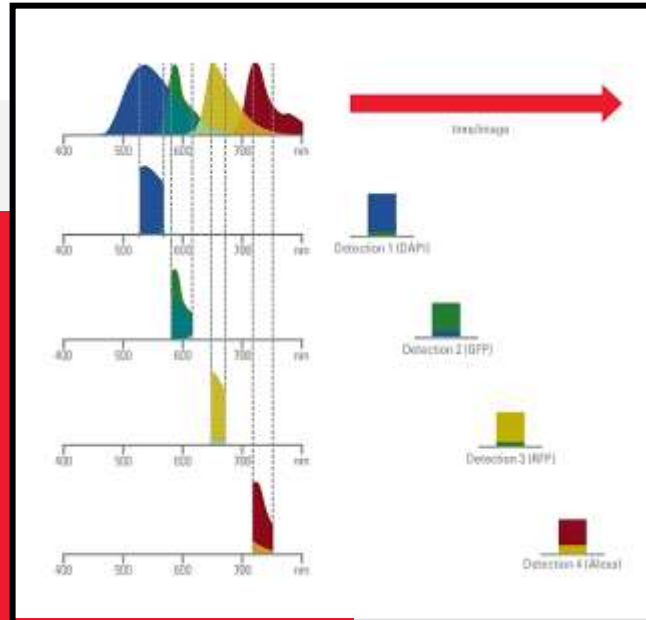
Mica



Simultaneous 4 Label Imaging, Broad Spectrum Detection and Hybrid Unmixing

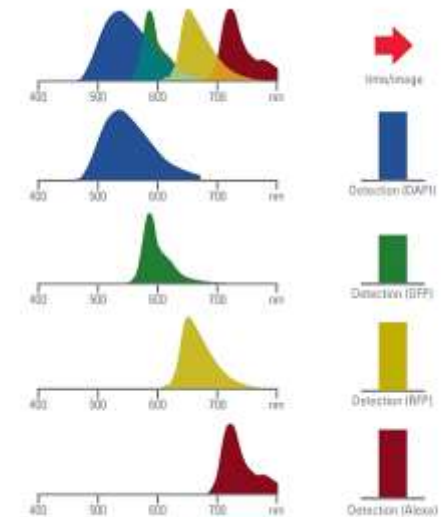
Conventional 4 color fluorescence imaging

- › Poor dye separation results in low localization accuracy
- › Cut away signals to reduce cross talk
- › Slow sequential imaging



FluoSync – Simultaneous true 4 label imaging

- › Broad spectrum detection
- › True dye separation
- › 4 times faster imaging simultaneously



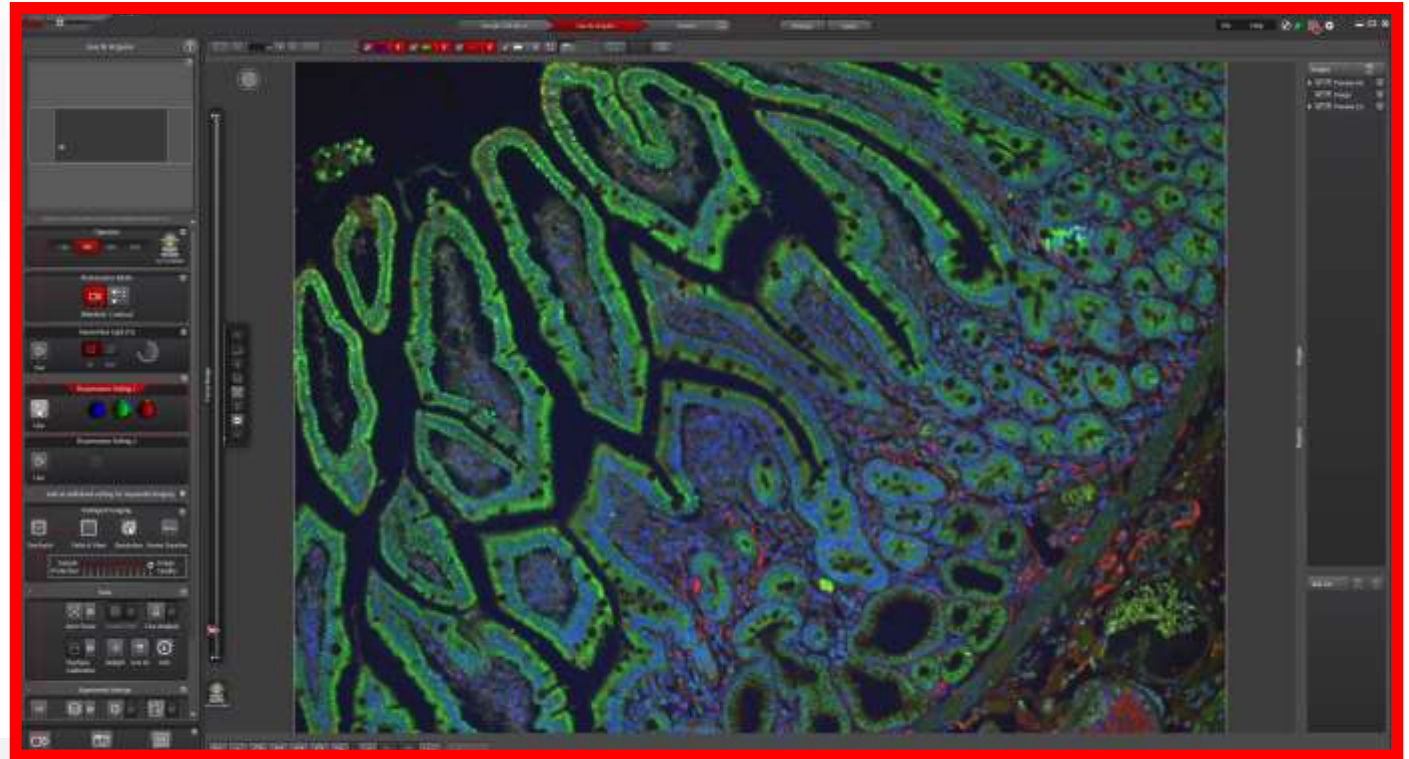
3D Tissue Imaging

Experiment description:

In this experiment we are creating a large overview of an intestine slide and increase the magnification to identify the right positions to acquire a confocal z-stack.

Experiment Challenges:

- › Objects are not in focus when the objective is changed and user need to search.
- › With increasing magnification it is difficult to keep the overview.
- › With increasing magnification finding the same location is challenging.
- › When using confocal, searching the right spot is very time consuming.
- › When using a WF first and then a CF, finding the same location is difficult.
- › Analyzing heterogeneous tissue with global thresholded parameters is prone to missing out objects.

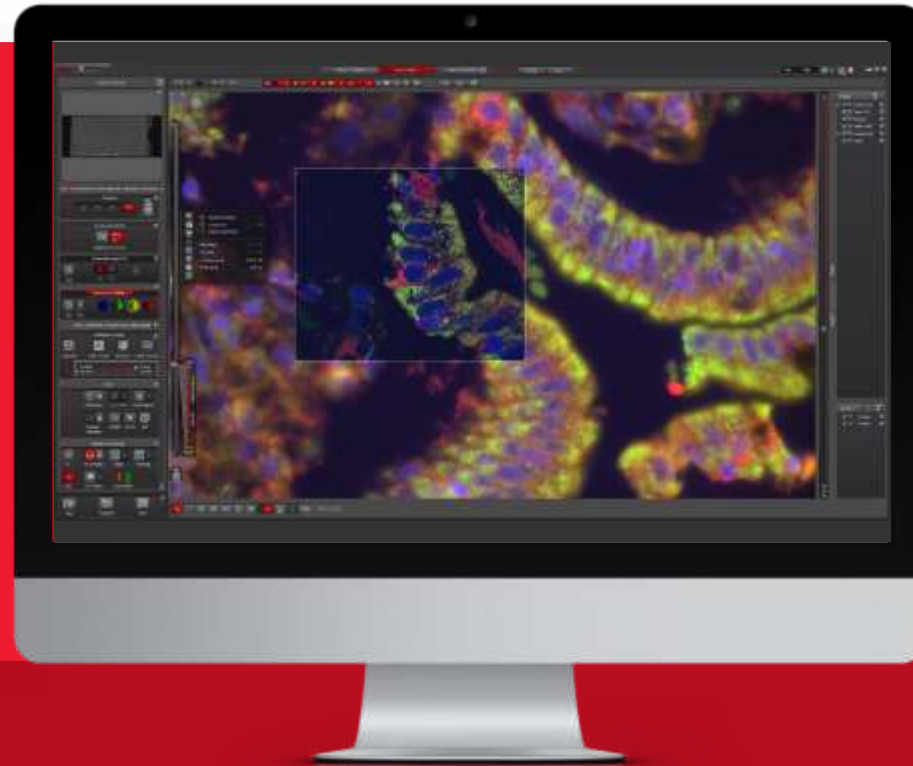


Mica's benefits:

- ✓ **Access for all** : Mica provides a clear sample overview and allows to easily change observation conditions with just a few clicks.
- ✓ **No constraints** : Mica seamlessly combines transmitted and fluorescence widefield with confocal imaging.
- ✓ **Radically simplified workflows** : Mica allows to effortlessly transit from a large sample overview to highly resolved images and provides AI based analysis within the same workflow.

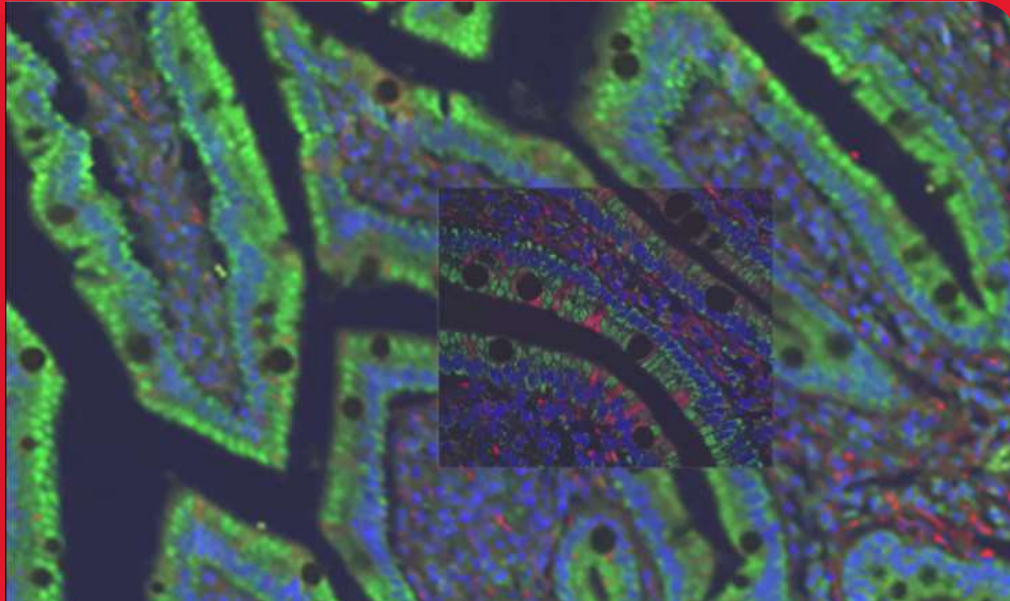
3D Tissue Imaging

Seamlessly move from fast overview to high resolution when required by your experiment.

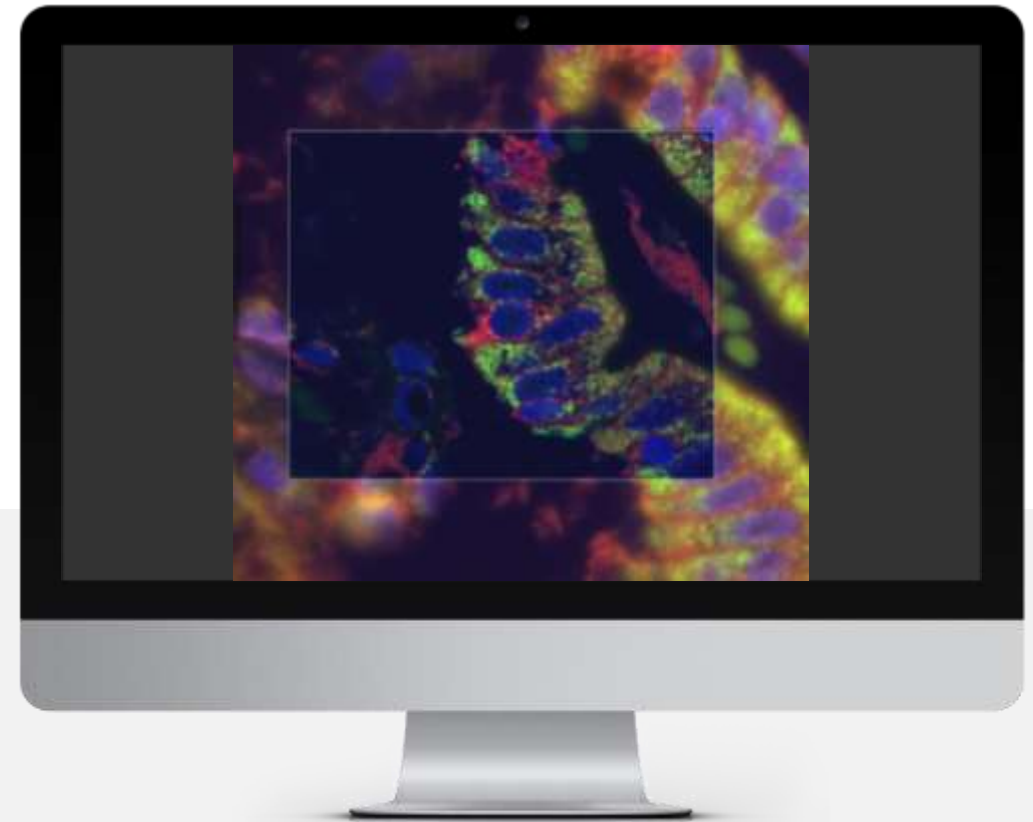


We can observe how the overview is rapidly created in widefield and a more detailed view of areas of interest is created with 10X and 20X magnification. This is followed by a high magnification view (63X) in widefield and followed by acquisition of a confocal image. The acquired confocal image is then segmented to quantify sizes.

Seamlessly connecting modalities



Without an integrated system with widefield and confocal imaging, you have to either carry your sample between systems or compromise on the efficiency. And the alignment of image data after moving from one system to another adds an extra step.



Mica provides you with widefield and confocal imaging seamlessly connected in a contained system – use the optimally fitting imaging modality when it is needed.

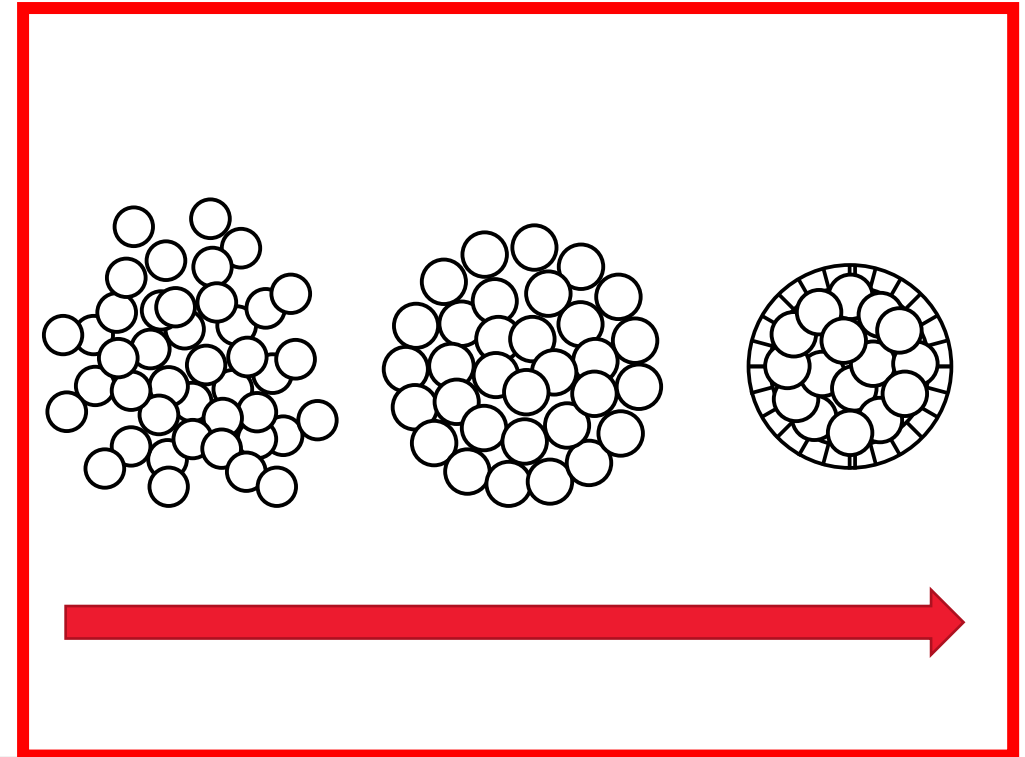
Long-term Time-lapse experiment

Experiment description:

In this experiment we see the formation of spheroids starting from a mono-cell layer. The formation of a spheroid requires optimal physiological conditions – ensuring undisturbed cell cycles and proliferation.

Experiment Challenges:

- > Prolonged sample survival, ensuring physiological conditions.
- > Low expression levels of markers, endogenous levels need to be kept to not impair cell homeostasis.
- > Stable supply of nutrients and unchanged concentration in the medium – impaired by evaporation.
- > Staying in focus and adapt imaging to changing sample characteristic like lateral and axial growth.



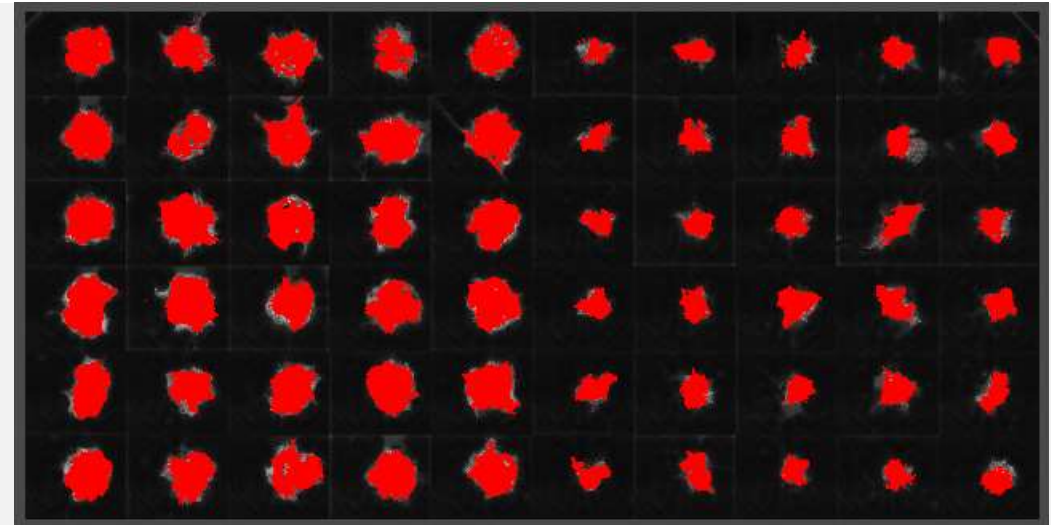
Mica's benefits:

- ✓ **Access for all** : Easy setting up of controlled environmental conditions and matching focus strategy.
- ✓ **Radically simplified workflows** : On screen annotation and extraction of multiple parameters.
- ✓ **No constraints** : Optimal environmental conditions and multiple modalities (BF, WF, and CF) to match experimental needs and intelligent automation for water immersion and focus strategies.

Long-term Time-lapse experiment

Supplement: spheroid growth

- MX1-GFP stably transfected cells (left half)
 - U2OS cells (right half)
 - Formation of 3D Spheroids
 - 1000 cells per well
- Time-lapse over 72 hrs. every 30 minutes
 - Green, GFP
 - Black and white, integrated modulation contrast



Long-term Time-lapse experiment



Spheroid growth

- Formation of 3D Spheroids of
 - stably transfected MDCK MX1-GFP (upper row)
 - U2OS cells (lower row)
- 1000 cells per well
- Time-lapse over 60 hrs. every 30 minutes (or whatever the correct spelling of timelapse is)
- Green, GFP. Gray, integrated modulation contrast



The Microhub era is now! Experience the future



Access
for all



No
constraints



Radically simplified
workflows

Meet Mica

Thank you for attention



Martin Kopecký
vedoucí divize mikroskopie
kopecky@pragolab.cz
+420 736 622 585

