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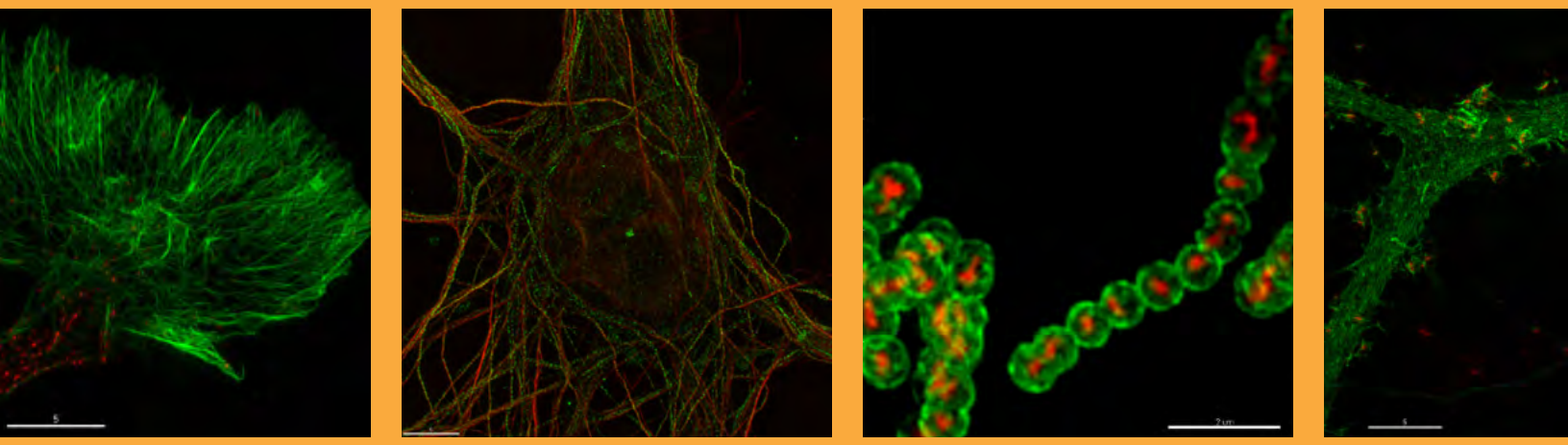
A GE Healthcare Company

DeltaVision OMX Imaging Systems

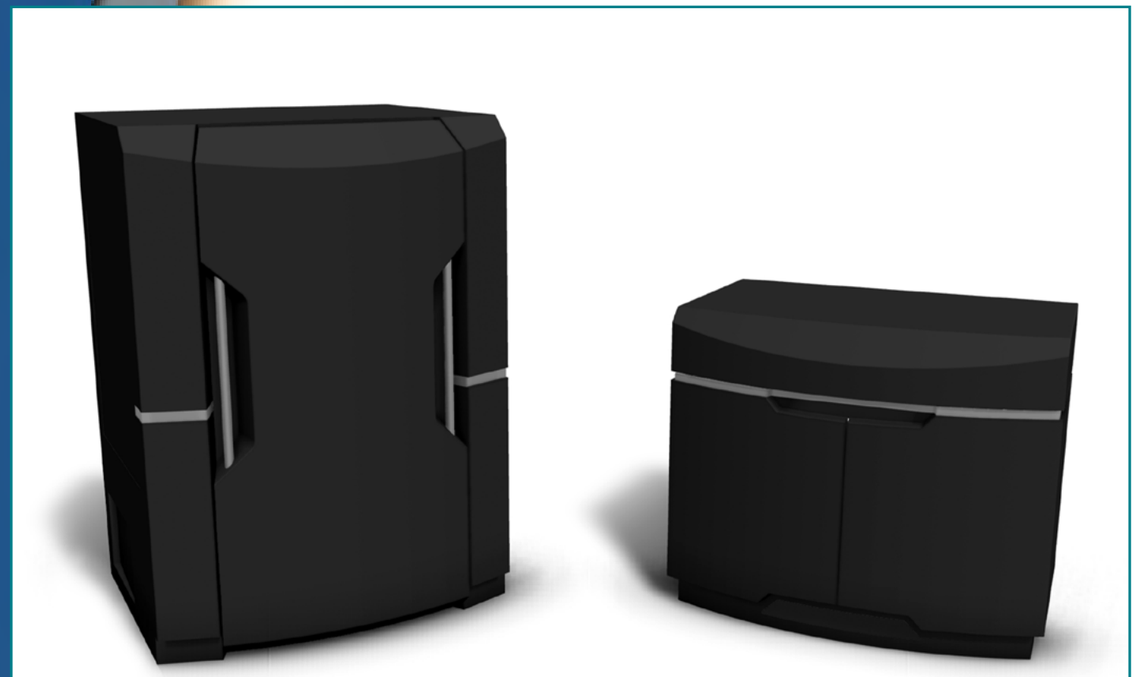


Super-Resolution Microscopy

DeltaVision OMX Super-resolution Imaging Systems

The DeltaVision OMX imaging platform is an advanced multi-mode, super-resolution microscope system representing the next generation of microscope evolution. The DeltaVision OMX offers super-resolution imaging using 3D structured illumination (3D-SIM) and/or localization microscopy techniques. In addition, the innovative Blaze SIM module offers dynamic high speed 3D-SIM.

Step up to high definition microscopy and see a whole new world that only super-resolution can reveal!



The OMX imaging platform was developed by scientists at the University of California, San Francisco (UCSF) and is exclusively licensed to Applied Precision Inc.

The Deltavision OMX system includes:

Uniquely Designed Optical System

- Multiple laser options support a wide range of fluorescent dyes and proteins
- EM-CCD or sCMOS camera options available for sensitivity and speed optimization
- Self-contained, HEPA-filtered enclosure eliminates the need for a dedicated darkroom

High-Speed Widefield Imaging Mode

- Simultaneously acquire up to four images - critical for high-speed live cell and FRET imaging
- Multiplex imaging derives more data from each sample
- Proprietary softWoRx® software features quantitative deconvolution capabilities

Super-Resolution Imaging

- True 3D structured illumination imaging enables resolution improvements in X, Y and Z
- 130 nm in XY and 280 nm in Z (resolution is wavelength and optics dependent)
- Axial light design allows simultaneous multi-wavelength structured illumination imaging

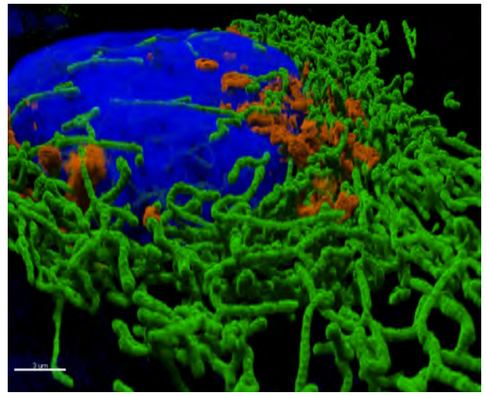
Blaze SIM Module

- Groundbreaking <1 sec/micron 3D-SIM imaging for live cell 3D super-resolution
- Ultra-fast widefield imaging (>400 fps depending on exposure time)

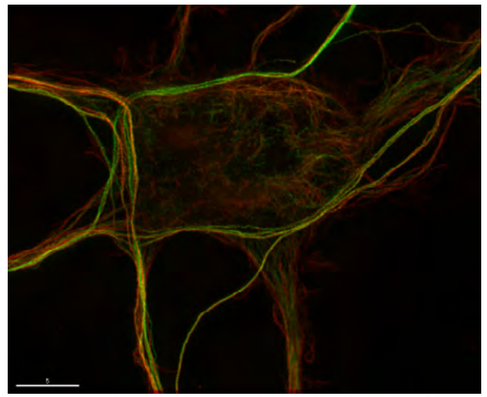
Localization Microscopy and TIRF Illumination

- Monet™ localization imaging with 20-50 nm lateral resolution
- Exclusive Multiline TIRF illumination optimized for each excitation wavelength for hassle free excitation switching
- Simultaneous photoactivation and sample imaging for fast photokinetic applications (e.g. caged-calcium release or PA-GFP activation)

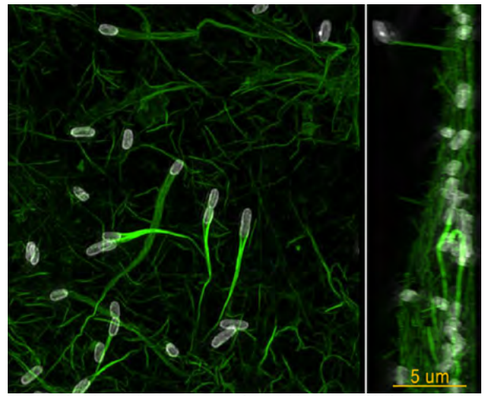
DeltaVision OMX systems come in various configurations to meet your research needs (see inside back cover for an outline of available systems).



COS-7 cells expressing mitochondrially targeted GFP and Golgi targeted RFP counterstained with Hoechst 33258 - Cells provided by Nick Dolman Life Technologies



Two isoforms of beta-tubulin in a cultured neuron - Image courtesy of Stefanie Kaech Petrie and Aurelie Snyder, Advanced Light Microscopy Core at The Jungers Institute, Oregon Health & Sciences University



R. parkeri infected Cos7 cells - Image courtesy of Matt Welch, University of California at Berkeley

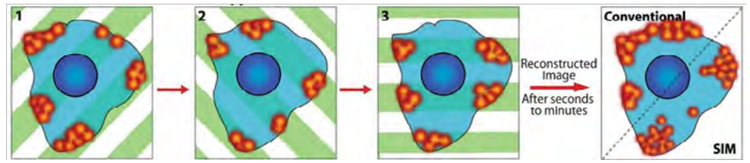
TECHNOLOGY

Three-Dimensional Structured Illumination (3D-SIM)

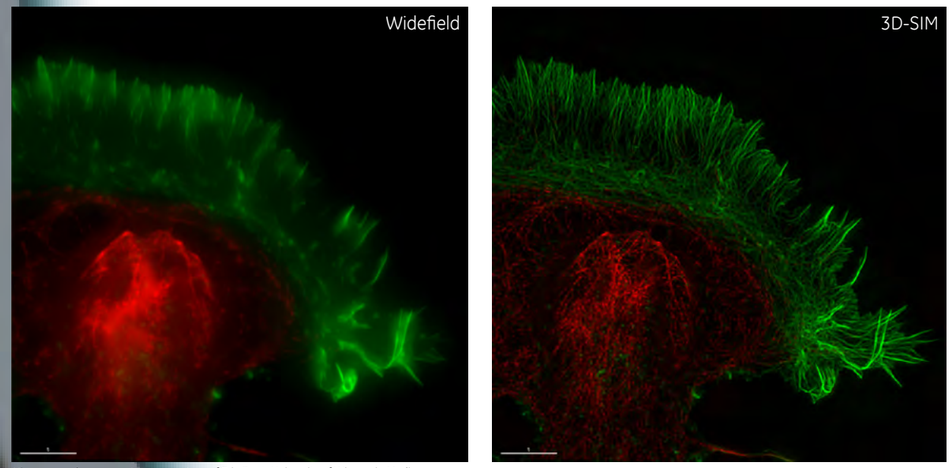
3D-SIM is a super-resolution technique that uses structured illumination patterns to achieve sub-diffraction limit imaging. The structured light pattern creates interference moiré patterns with the fine structures of the sample which are captured in the resulting fluorescence images. The sample is imaged using several different orientations and phases of the light pattern then computer algorithms process the data set and generate the final super-resolution image.

3D-SIM reconstructed images:

- Yield twice the resolution of conventional imaging techniques in X, Y and Z
- Provide an overall eight-fold improvement in volume resolution
- Can be collected with conventional fluorophores and sample preparation techniques



3D-SIM imaging on an OMX V4 imaging system



Hippocampal neurons - Image courtesy of Eric Dent, University of Wisconsin Madison

Monet™ Localization Microscopy

Localization microscopy has its foundations in single molecule imaging techniques which determine the position of fluorophores by statistically determing their position within an image. With localization microscopy, only one (or a few) fluorophores is allowed to fluoresce at a given time. Control of the fluorescence is achieved through the use of photoactivatable proteins, photoswitchable dyes or ground state depletion systems.

Monet localization microscopy uses a proprietary algorithm that is able to determine the location of the fluorophores in overlapping diffraction limited spots. This differs from other localization microscopy techniques which rely on single Gaussian fitting models.

Monet:

- Processes higher density image data making it possible to use higher activation energies or denser sample labeling
- Requires fewer raw data images during acquisition, significantly shortening acquisition time
- Greatly shortens the experiment and processing time for an image set

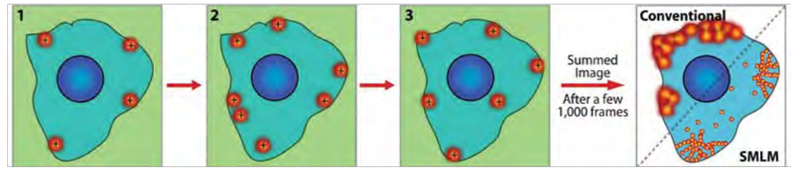


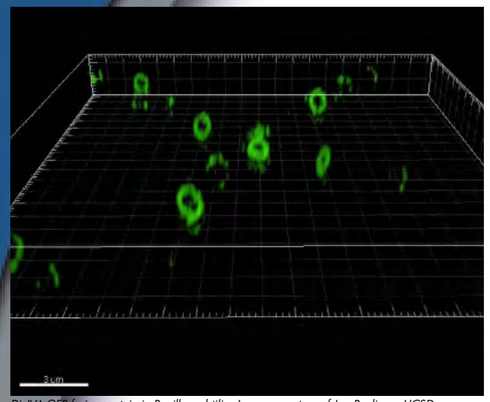
Image generation using Localization Microscopy

Resolution Comparisons

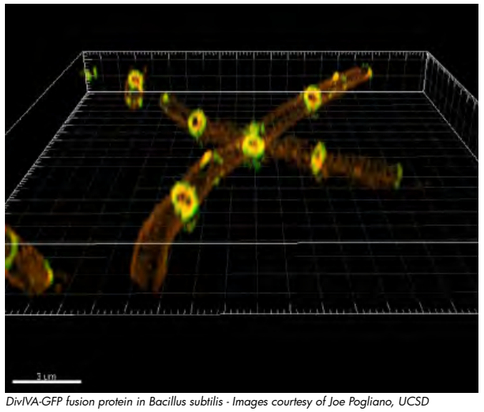
	Widefield Microscopy[1]	Widefield Deconvolution[1]	3D-SIM[1]	Localization Imaging
Lateral X, Y	320 nm	250 nm	130 nm	20-50 nm[2]
Axial Z	540 nm	430 nm	280 nm	~100 nm[3]
Applications	Live imaging Fast live imaging Fixed Tissue imaging	Live imaging Fast live imaging Fixed Tissue imaging	Slow Live imaging Fixed Tissue imaging	Fixed Tissue imaging

[1] Actual resolution is dependent on wavelength and optical configuration — values quoted for 405 nm excitation
[2] Localization precision dependent on number of photons imaged per spot
[3] Localization microscopy performed in TIRF mode only

OMX Images



DivIVA-GFP fusion protein in Bacillus subtilis - Images courtesy of Joe Pogliano, UCSD



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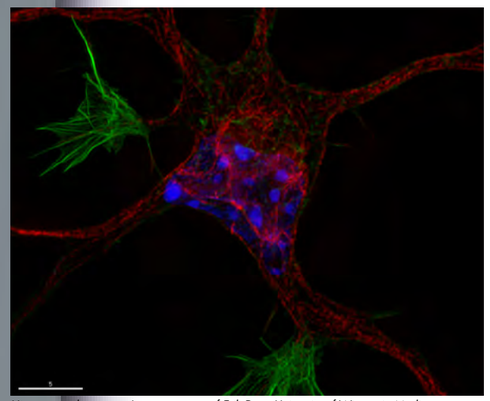
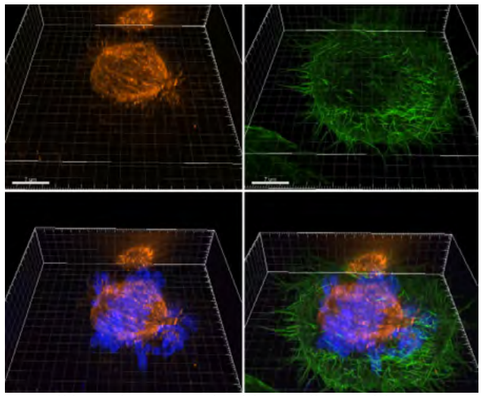
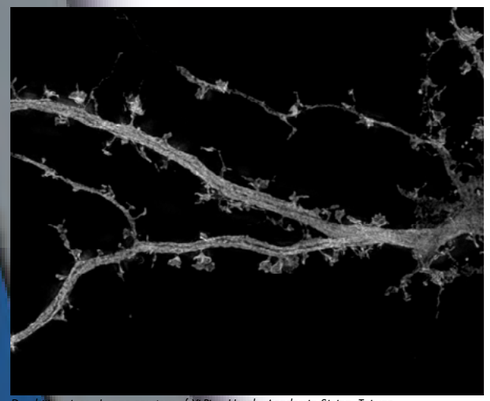


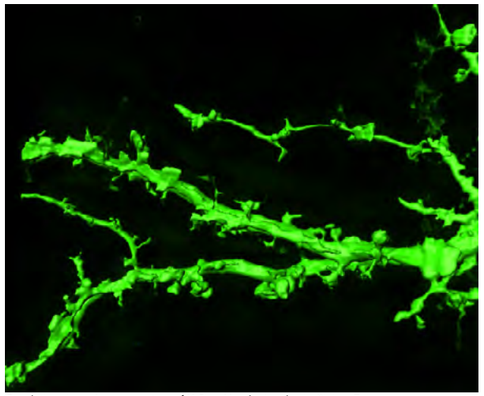
Hippocampal neurons - Image courtesy of Erik Dent, University of Wisconsin Madison



Mitosis in HeLa cells - Image courtesy of Linda Wordeman, University of Washington



Dendritic spines - Image courtesy of Yi-Ping Hsueh, Academia Sinica, Taiwan

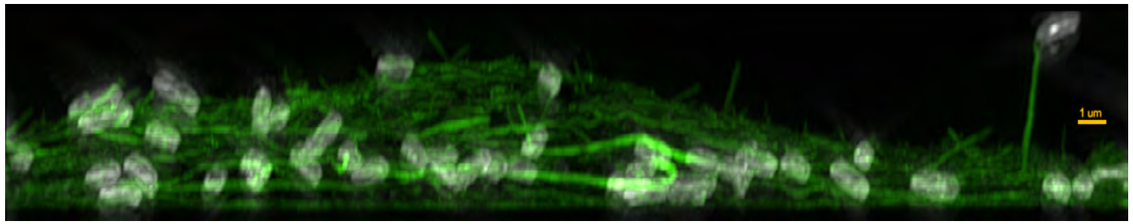


Dendritic spines - Image courtesy of Yi-Ping Hsueh, Academia Sinica, Taiwan

DeltaVision OMX System Configuration

Overview	3D-SIM Super-resolution imaging
Lateral Resolution[1]	120 nm
Axial Resolution[1]	300 nm
Acquisition speed 3D-SIM[2]	1.5 sec per 1 um stack
Standard Camera/Filter Setup	1 camera + filter wheel
Additional Cameras[3]	Optional, 4 max
Lasers Options	405 nm, 488 nm, 568 nm, 445 nm, 514 nm, 642 nm
Conventional Illumination	6 color InsightSSI™ illuminator with 405, 445, 488, 514, 568 642 nm excitation wavelengths
3D-SIM Illumination	Yes
Ring TIRF Illumination	Optional
Optional Accessories	DIC option, live cell heating kit

[1] Actual resolution is dependent on wavelength and optical configuration — values quoted for 488 nm excitation
[2] Acquisition speed is for a 1 um stack of 135 images with 1 ms exposures
[3] Additional cameras also require new filter which are included in camera package



Resolution Comparisons

	Widefield Microscopy	Widefield Deconvolution	3D-SIM
Lateral X, Y[1]	320 nm	250 nm	120 nm
Axial Z[1]	600 nm	500 nm	300 nm
Imaging Speed	> 400 fps	> 400 fps raw acquisition	120 fps raw acquisition speed effective 1 um/sec 3D-SIM
Applications	live imaging fast live imaging fixed tissue imaging	live imaging fast live imaging fixed tissue imaging	live cell super-resolution imaging fixed tissue imaging

[1] Actual resolution is dependent on wavelength and optical configuration — values quoted for 488 nm excitation

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