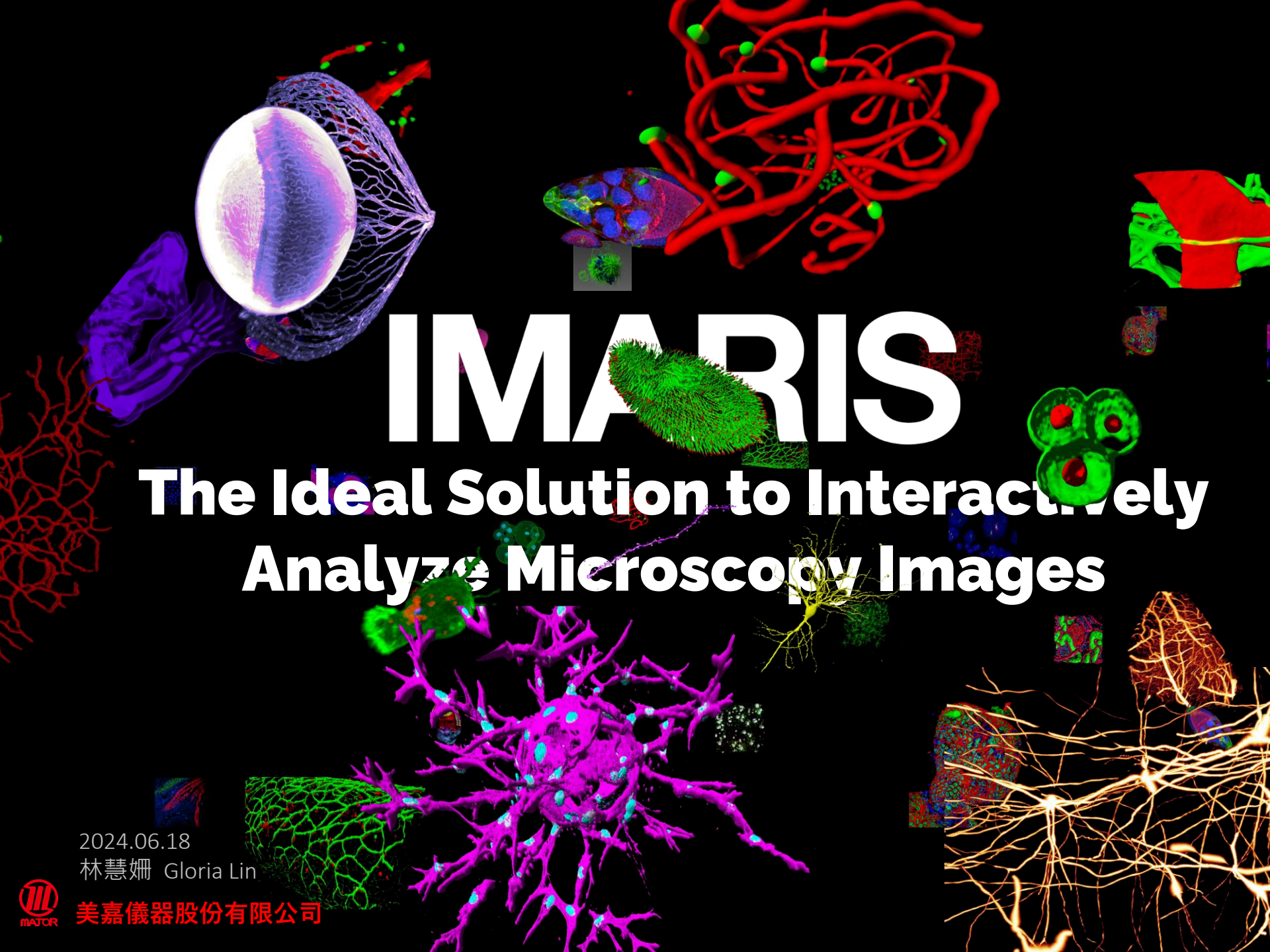




IMARIS

**The Ideal Solution to Interactively
Analyze Microscopy Images**

2024.06.18

林慧嫻 Gloria Lin

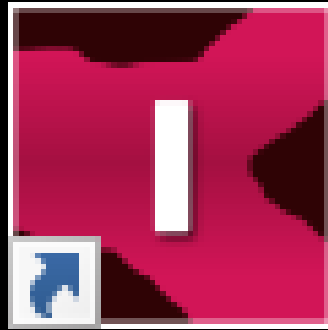


美嘉儀器股份有限公司

IMARIS – The Ideal Solution to Interactively Analyze Microscopy Images



Imaris
File converter
(Free)



Imaris



Imaris
Viewer
(Free)

Imaris File converter

Imaris File Converter

Input

Drag & Drop Files, or click Button below to add Files.

Add Files...

Output

☒ Same Folder as Input File

☐ Specific Folder: C:\Users\huasa\Documents\

Browse...

Download ImaresConvert-Bioformats Plugin

Input	Output	Voxel Size
D:\Imaris stitcher 20220712\561 laser\1.TIF	D:\Imaris stitcher 20220712\561 laser\1.ims	0.900, 0.900, 3.000
D:\Imaris stitcher 20220712\561 laser\2.TIF	D:\Imaris stitcher 20220712\561 laser\2.ims	0.900, 0.900, 3.000
D:\Imaris stitcher 20220712\561 laser\3.TIF	D:\Imaris stitcher 20220712\561 laser\3.ims	0.900, 0.900, 3.000
D:\Imaris stitcher 20220712\561 laser\4.TIF	D:\Imaris stitcher 20220712\561 laser\4.ims	0.900, 0.900, 3.000
D:\Imaris stitcher 20220712\561 laser\5.TIF	D:\Imaris stitcher 20220712\561 laser\5.ims	0.900, 0.900, 3.000
D:\Imaris stitcher 20220712\561 laser\6.TIF	D:\Imaris stitcher 20220712\561 laser\6.ims	0.900, 0.900, 3.000
D:\Imaris stitcher 20220712\561 laser\7.TIF	D:\Imaris stitcher 20220712\561 laser\7.ims	0.900, 0.900, 3.000
D:\Imaris stitcher 20220712\561 laser\8.TIF	D:\Imaris stitcher 20220712\561 laser\8.ims	0.900, 0.900, 3.000
D:\Imaris stitcher 20220712\561 laser\9.TIF	D:\Imaris stitcher 20220712\561 laser\9.ims	0.900, 0.900, 3.000

Selected Input File

Settings...

Set Voxel Size

Remove Selected

Remove All

Start All

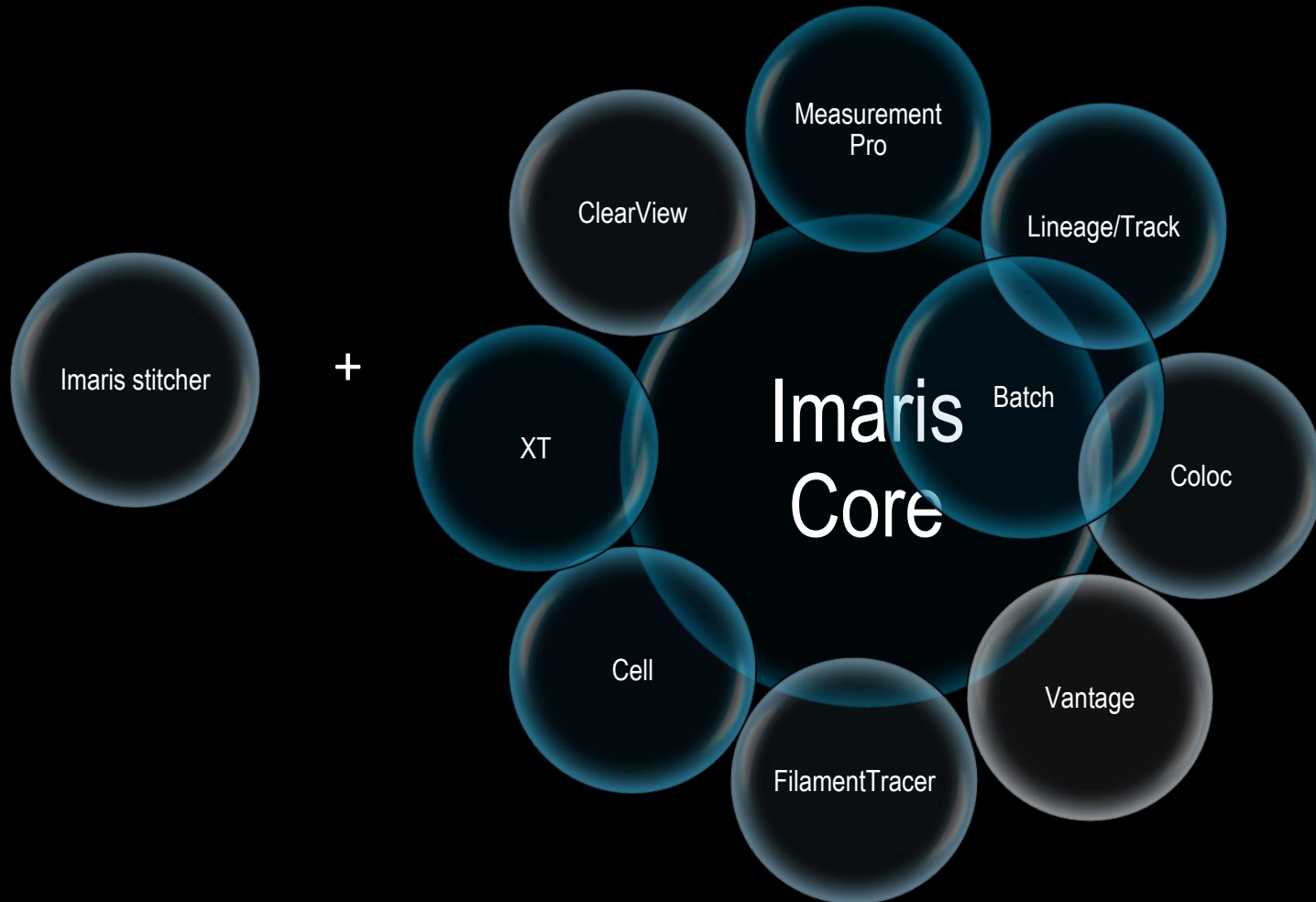
Input	Output
✓ D:\Imaris stitcher 20220712\561 laser\1.TIF	✓ D:\Imaris stitcher 20220712\561 laser\1.ims
✓ D:\Imaris stitcher 20220712\561 laser\2.TIF	✓ D:\Imaris stitcher 20220712\561 laser\2.ims
🔄 D:\Imaris stitcher 20220712\561 laser\3.TIF	🔄 D:\Imaris stitcher 20220712\561 laser\3.ims
0% D:\Imaris stitcher 20220712\561 laser\4.TIF	0% D:\Imaris stitcher 20220712\561 laser\4.ims
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🔄 D:\Imaris stitcher 20220712\561 laser\8.TIF	🔄 D:\Imaris stitcher 20220712\561 laser\8.ims
🔄 D:\Imaris stitcher 20220712\561 laser\9.TIF	🔄 D:\Imaris stitcher 20220712\561 laser\9.ims

Preferences... About...

Cancel All

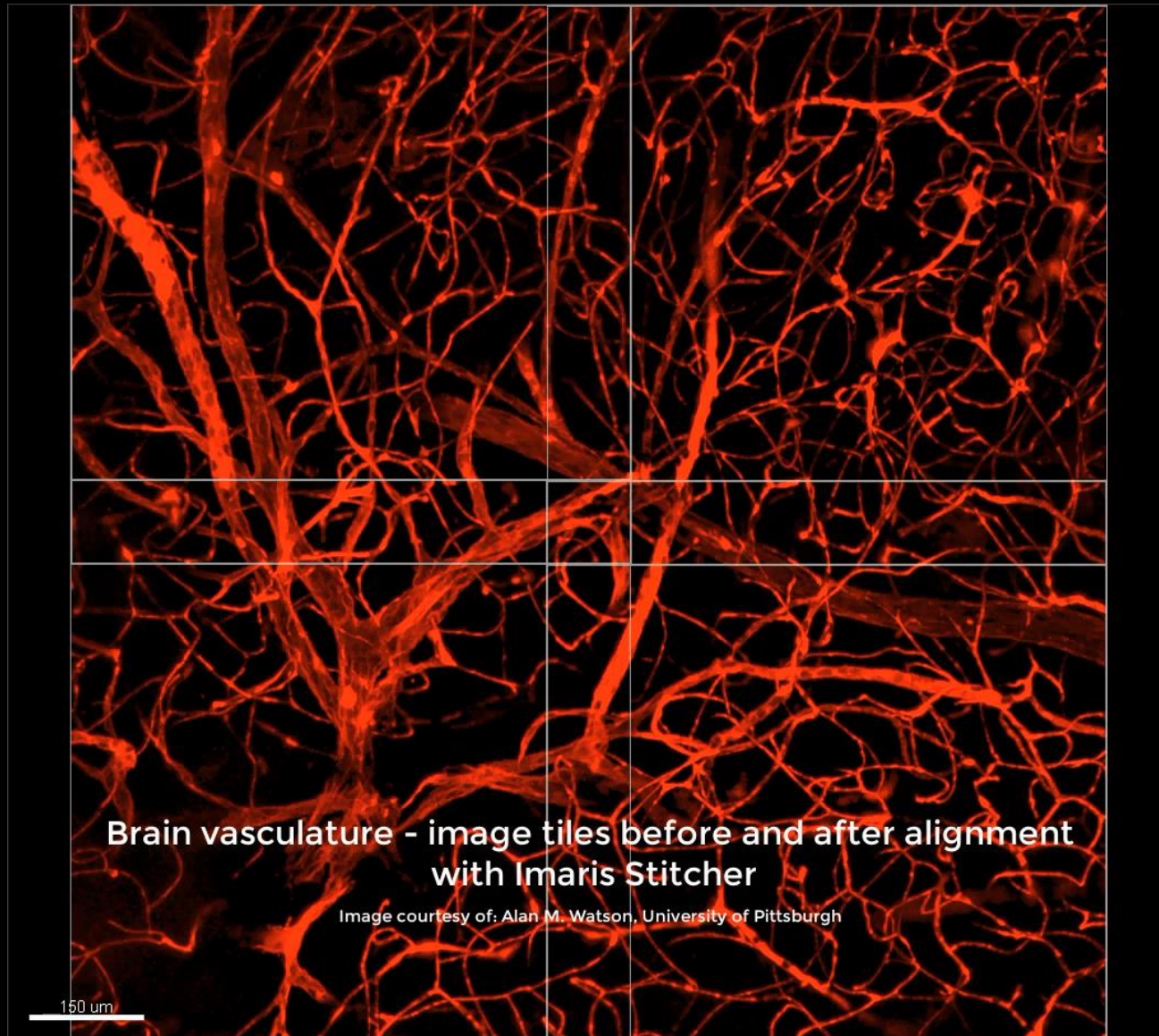
IMARIS – The Ideal Solution to Interactively Analyze Microscopy Images

Imaris: a modular software

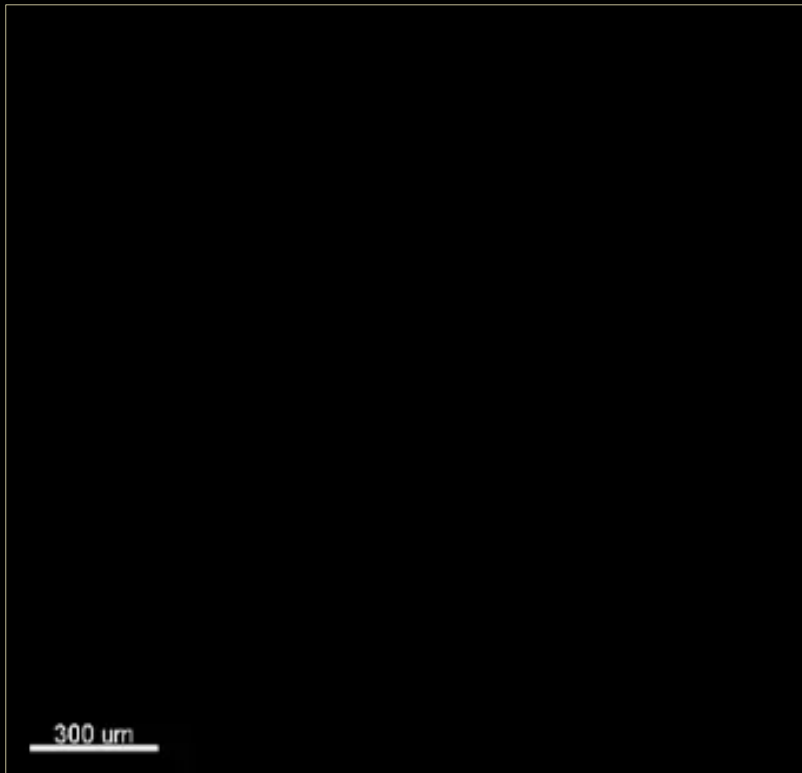




Imaris Stitcher

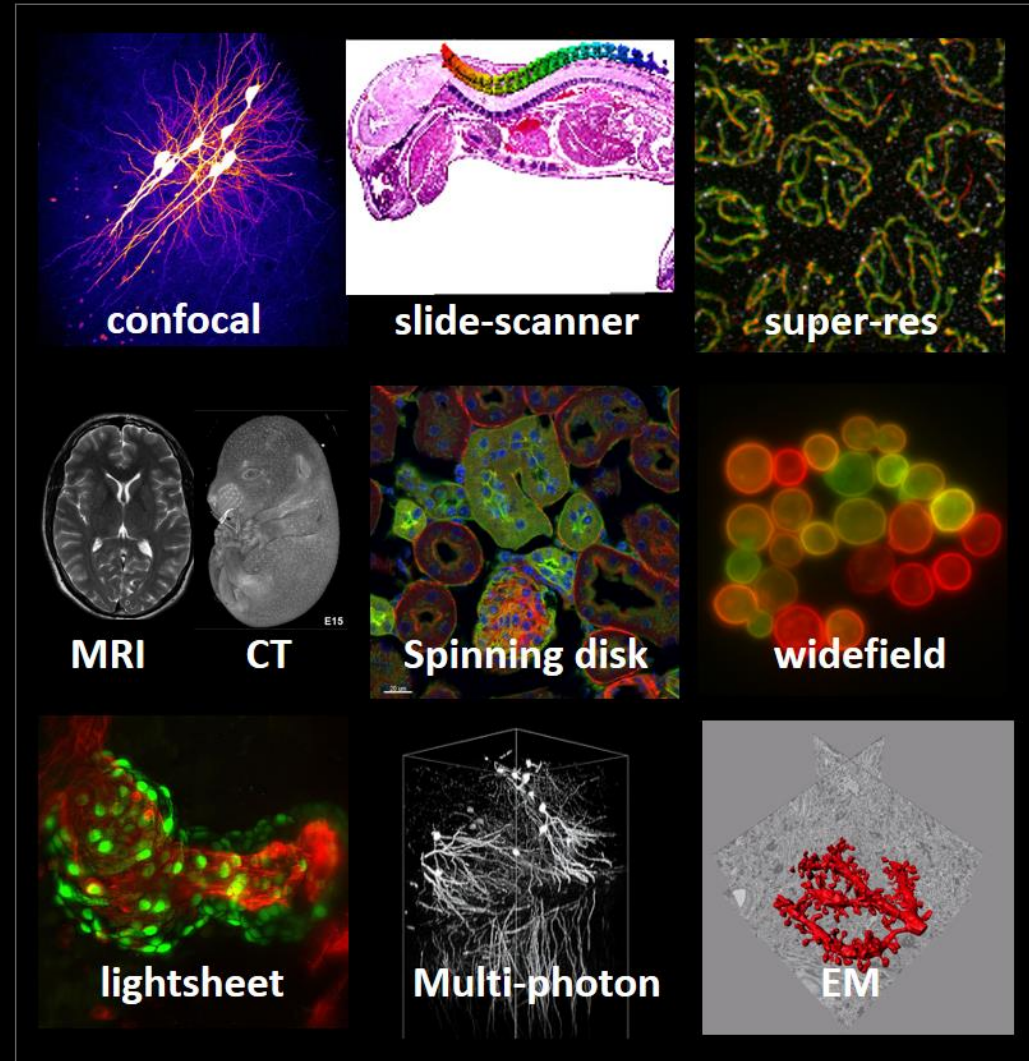


Import -- Imaging modalities



Developing Zebrafish Embryo
1.05 TB tiff series converted to
291 GB .ims file

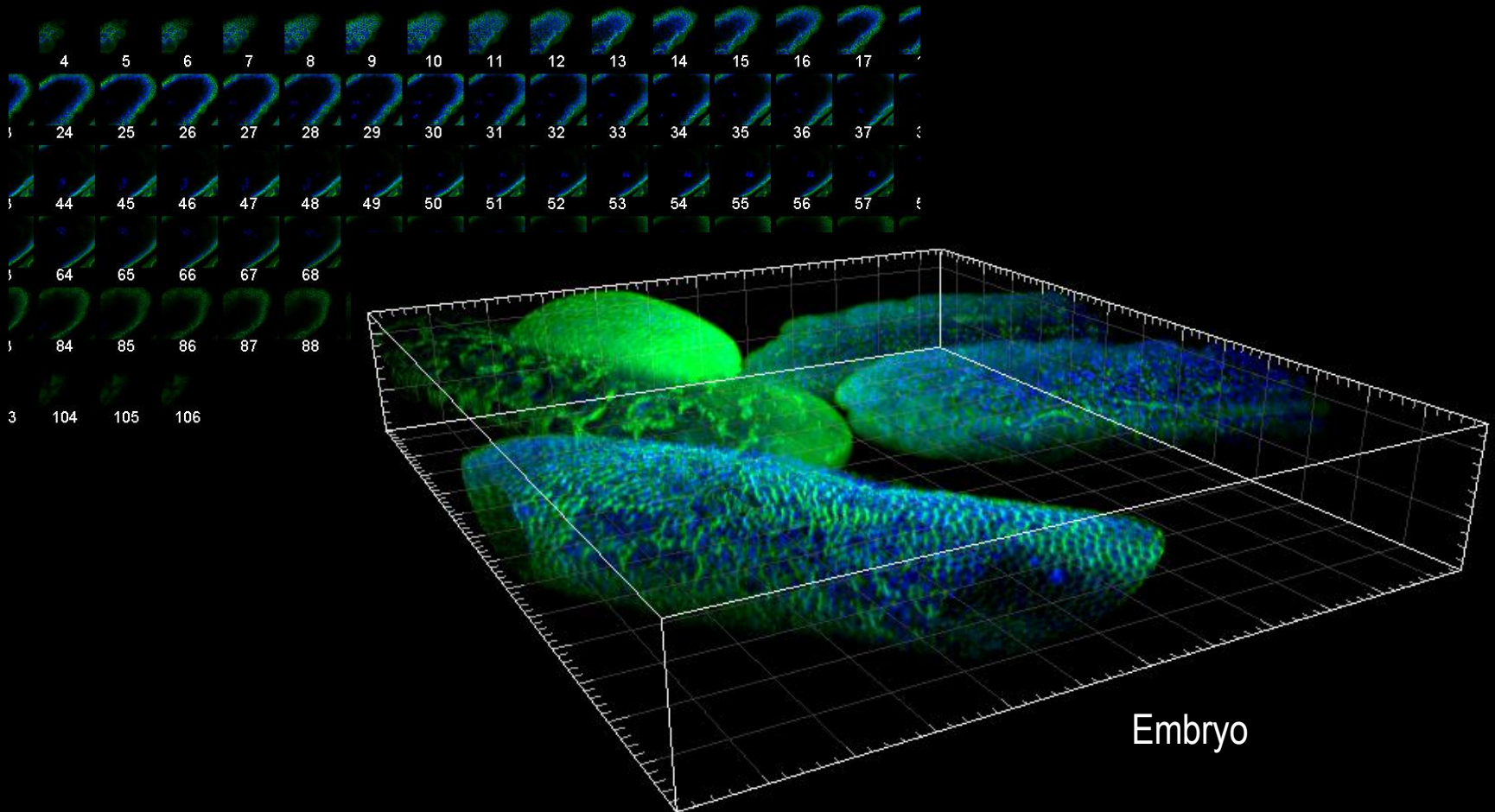
Courtesy of K. McDole,
HHMI Jamelia Farm research Campus,
Ref: Amat et al. 2014, Nature Methods



Import -- Formats

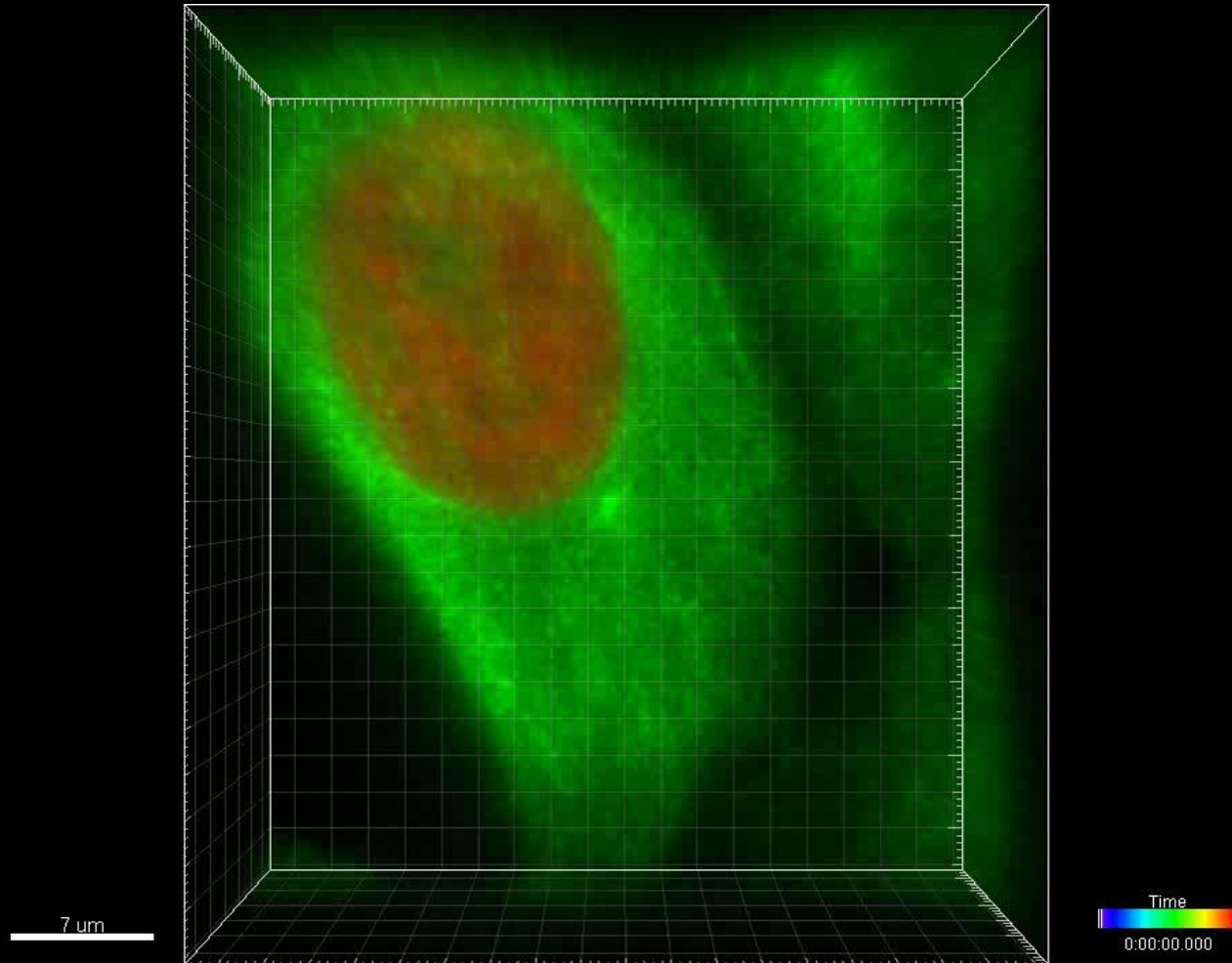
Visualizing volumetric data

Rendering a 3D volume from 2D slices



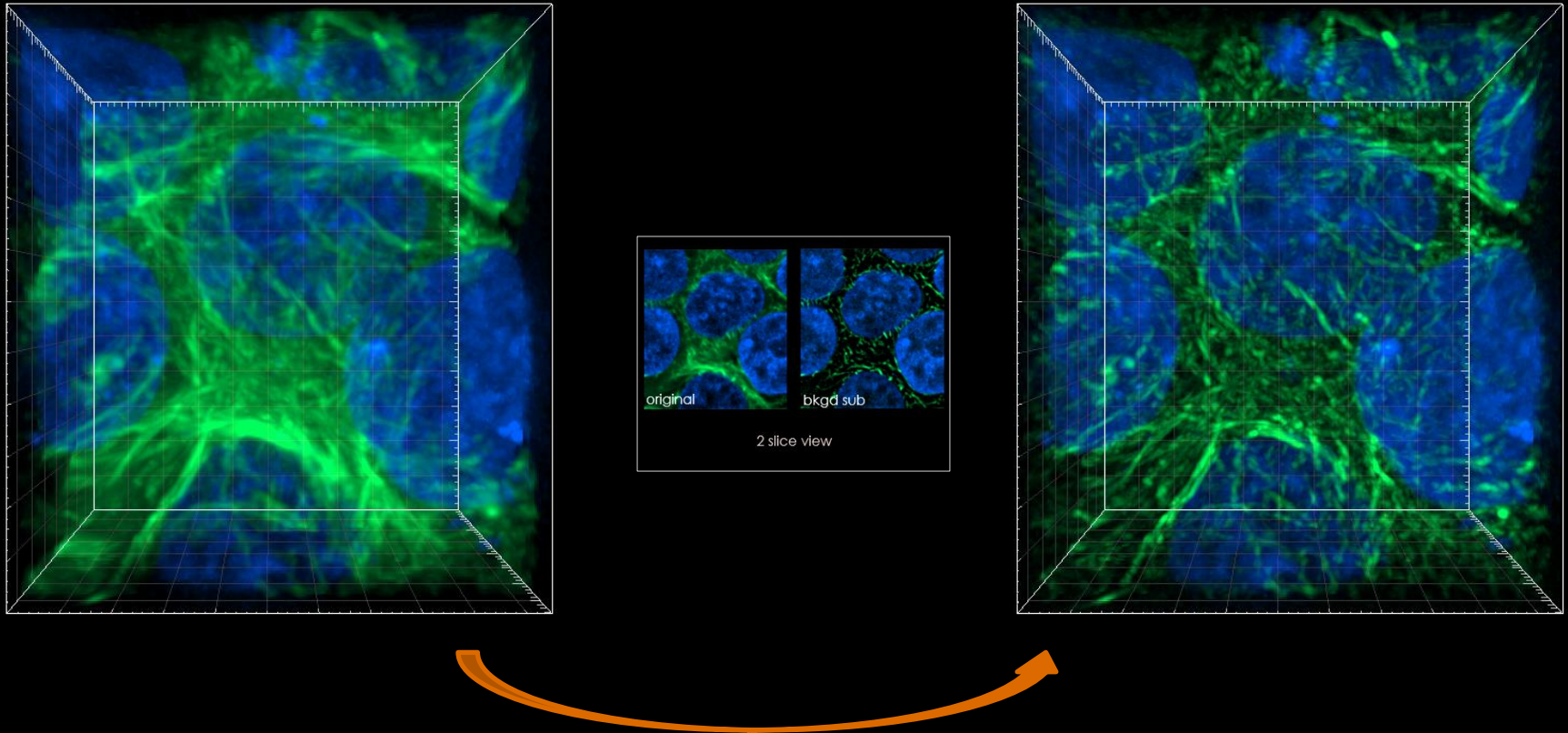
Import -- Formats

Or Even 4D...

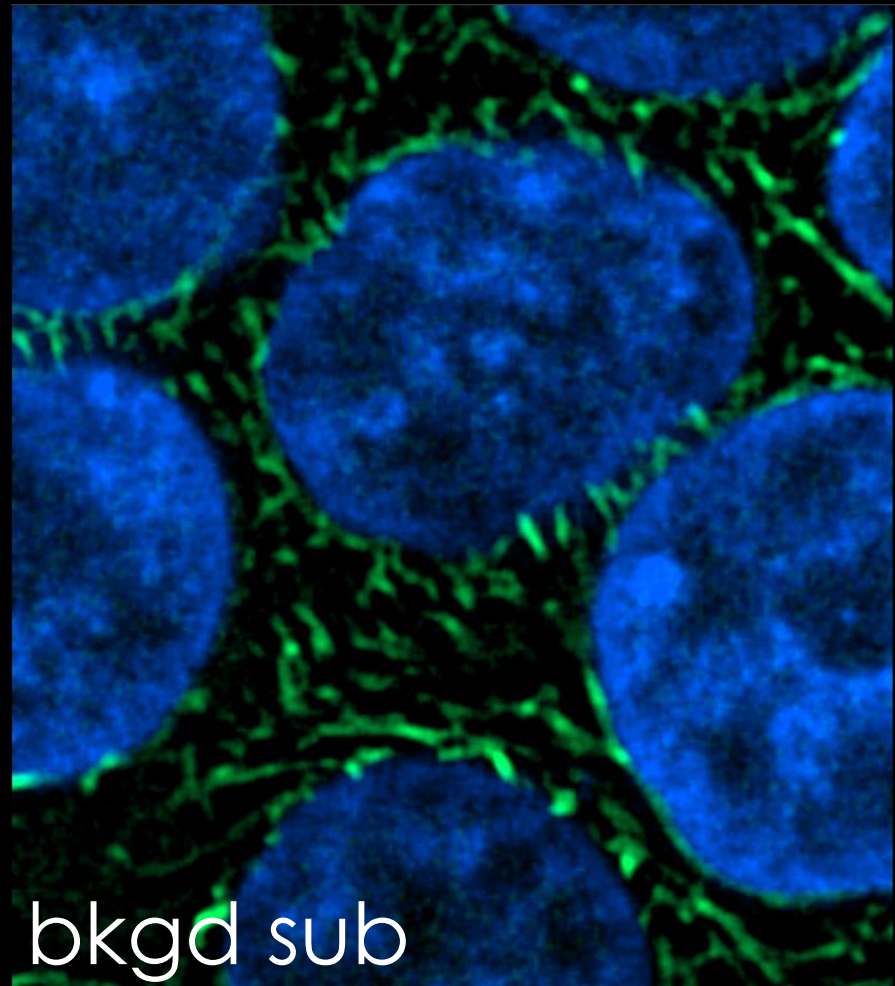
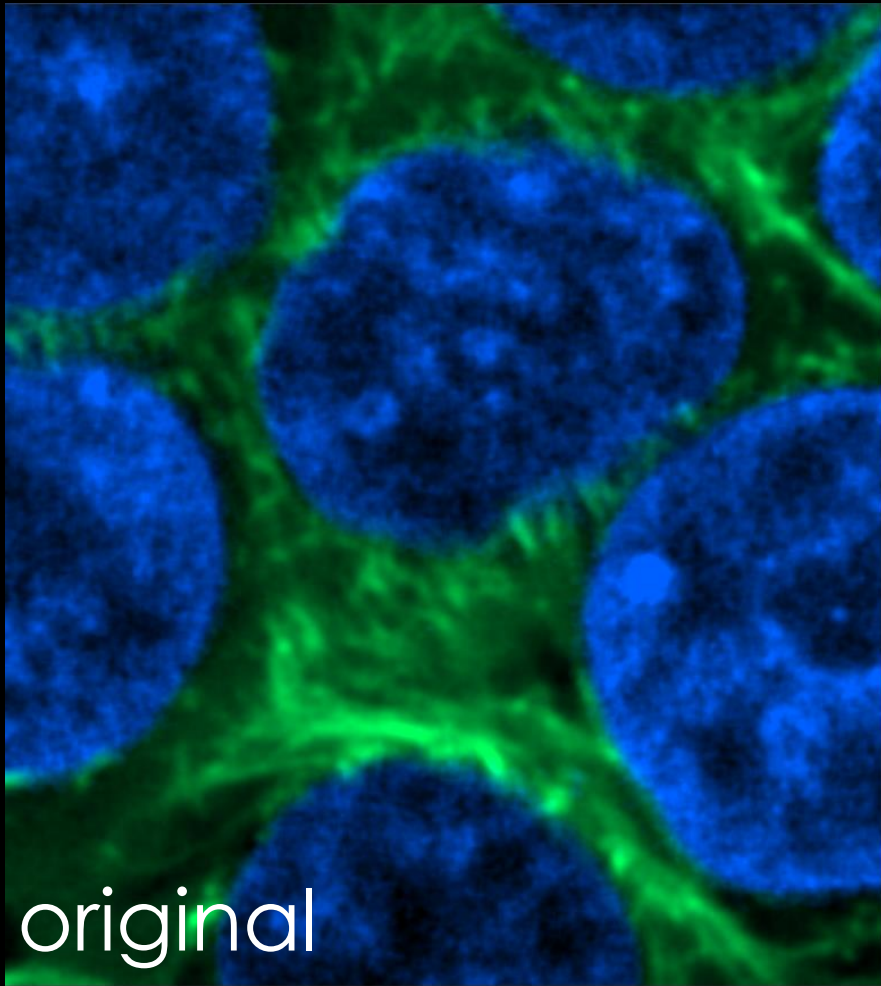


Background Subtraction

Removes background in order to improve signal to noise



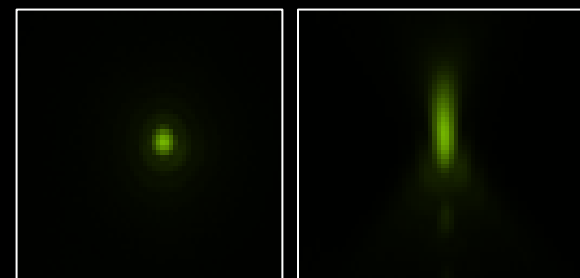
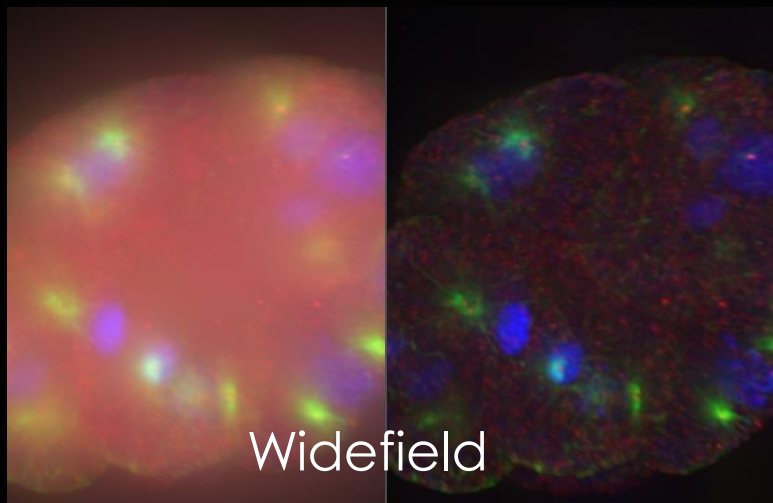
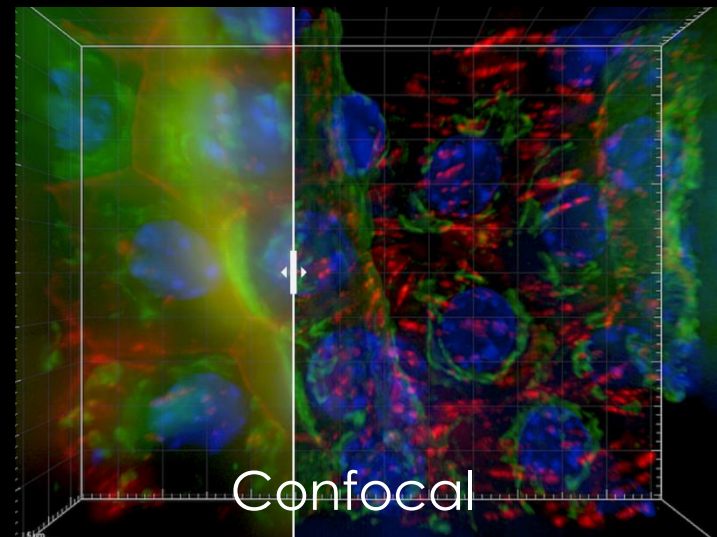
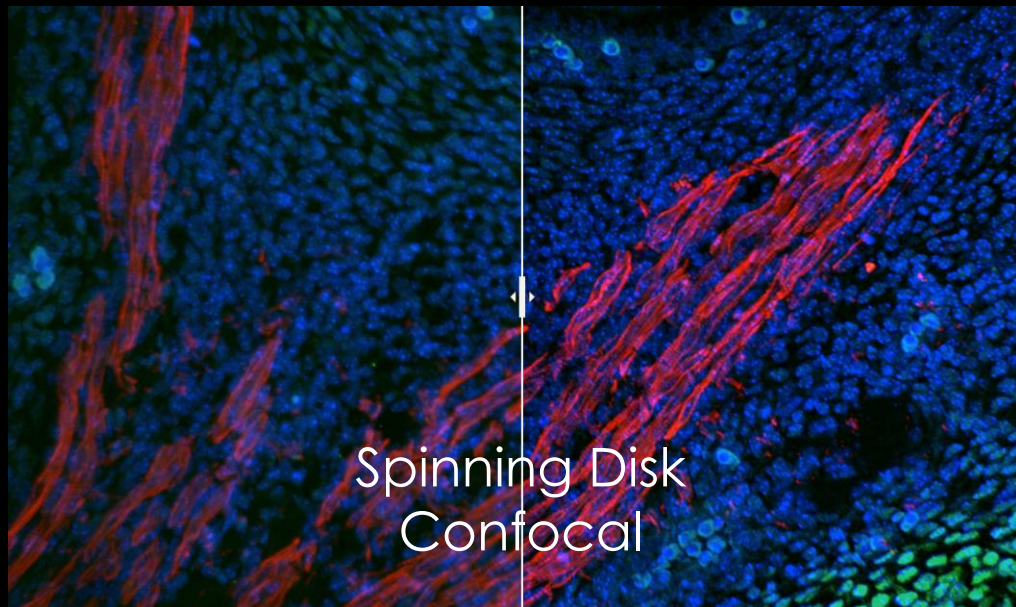
Background subtraction applies a Gaussian filter to define the background at each voxel, then performs a Baseline Subtraction of this variable background. The filter width is determined by the size of the smallest structure of interest.



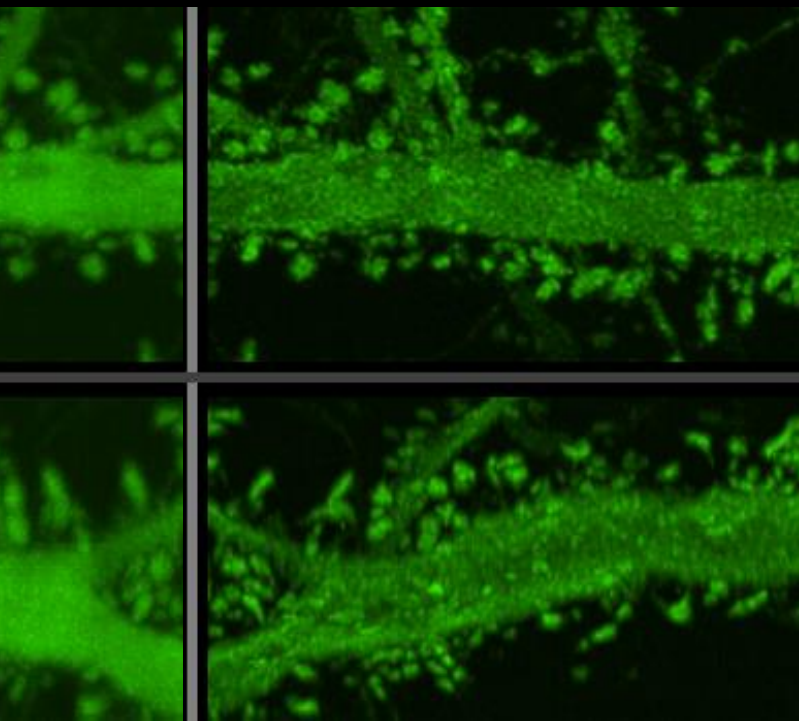
2 slice view

ClearView GPU Decon.

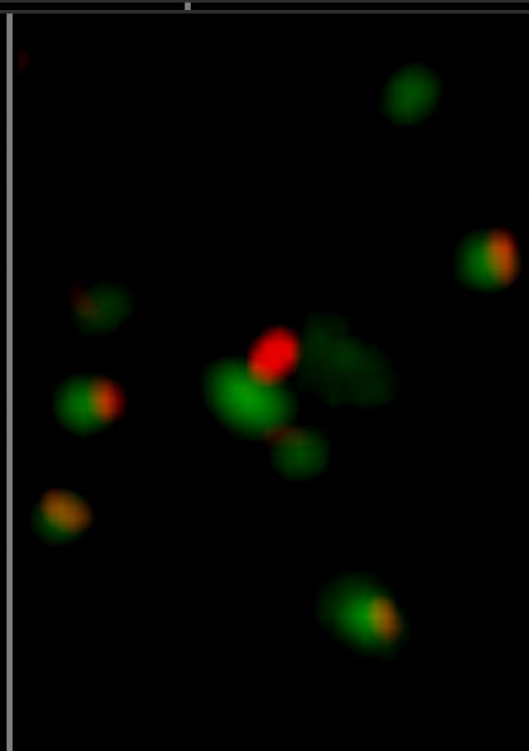
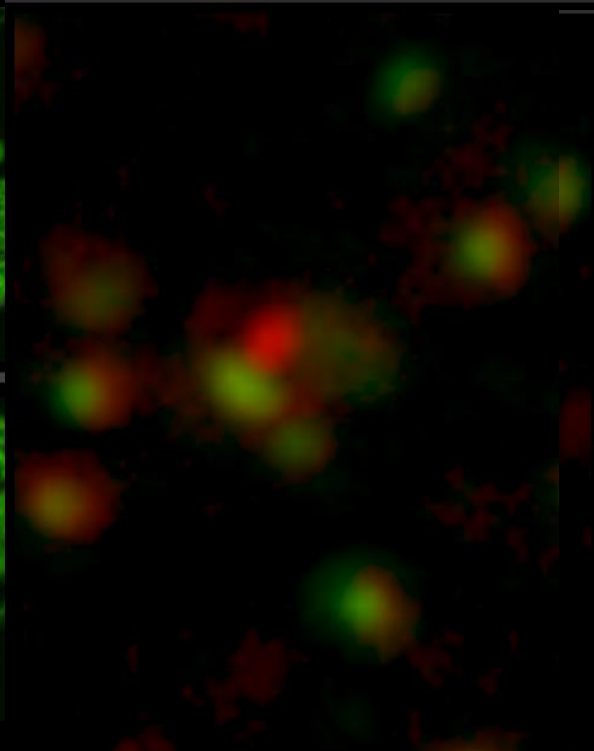
For different imaging modalities



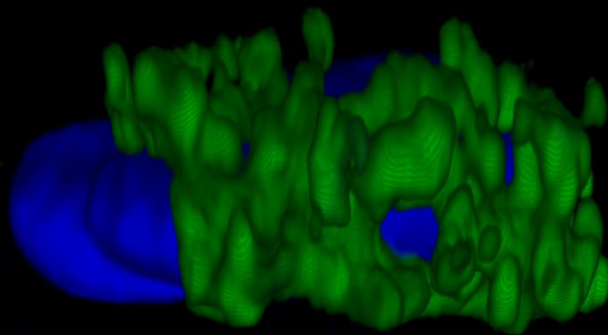
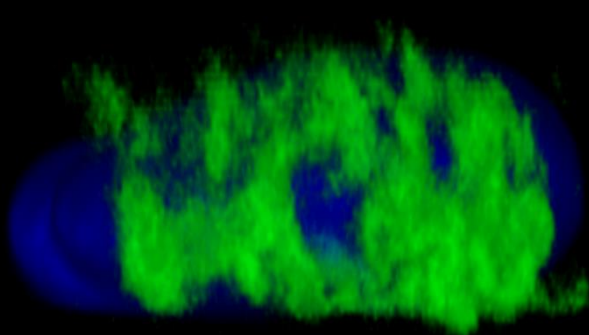
and Brightfield, TIRF



Spine Morphology

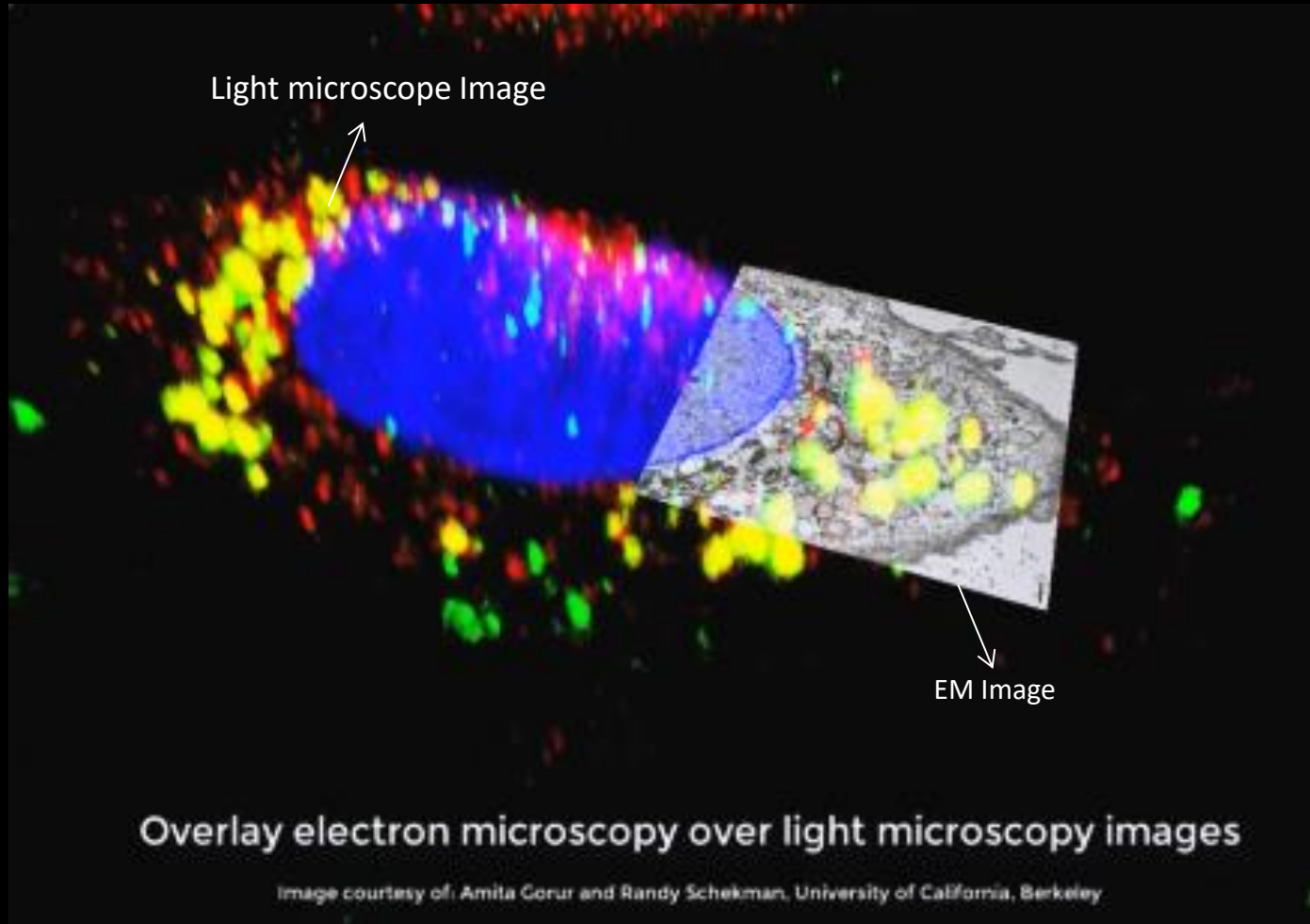


Colocalisation



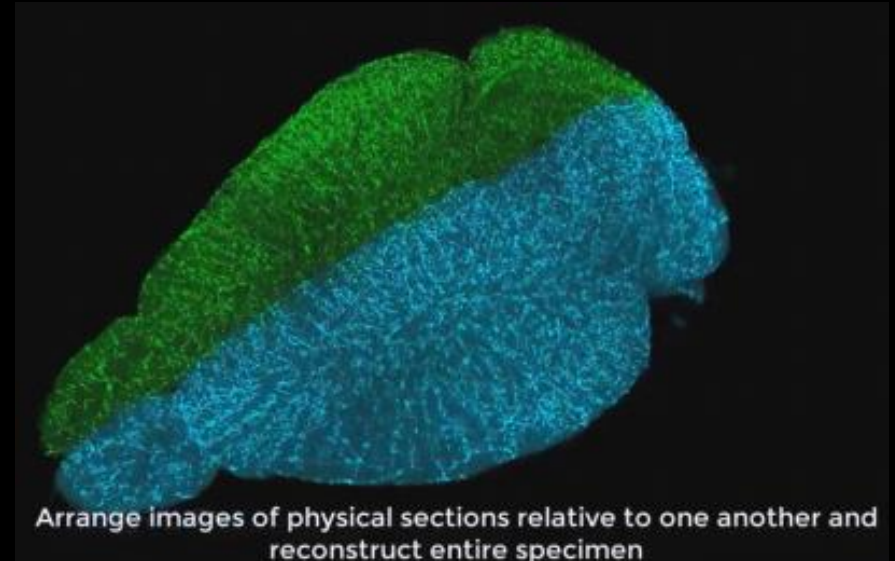
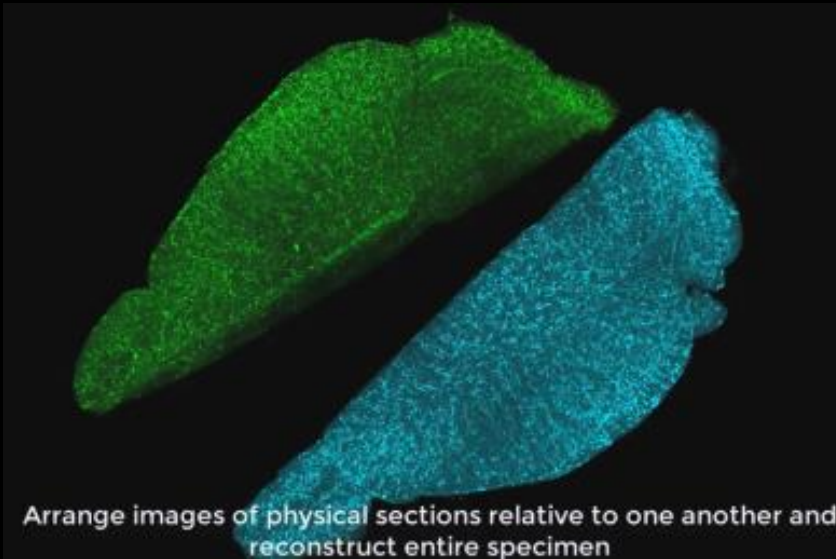
Golgi Segmentation

Visualize Solutions for Correlative Microscopy

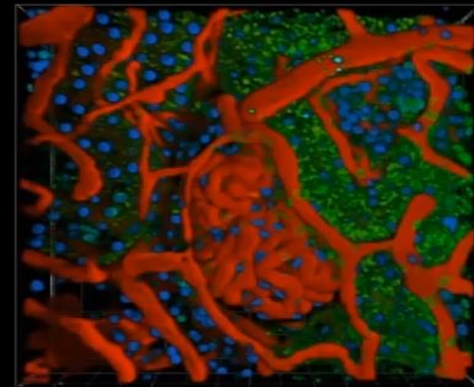
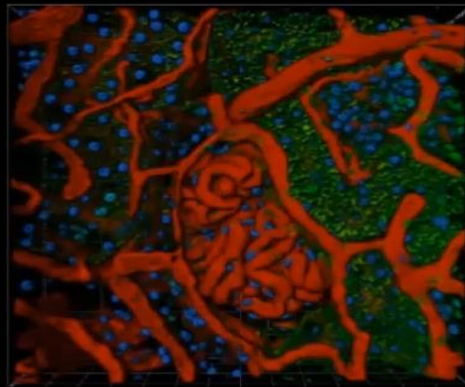
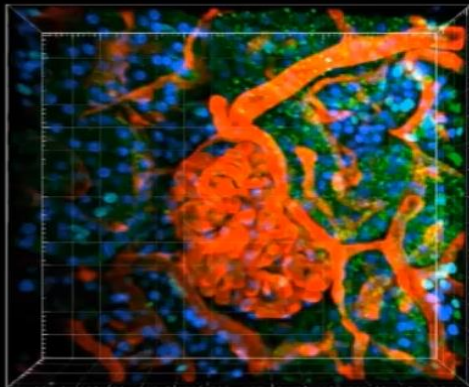


Visualize

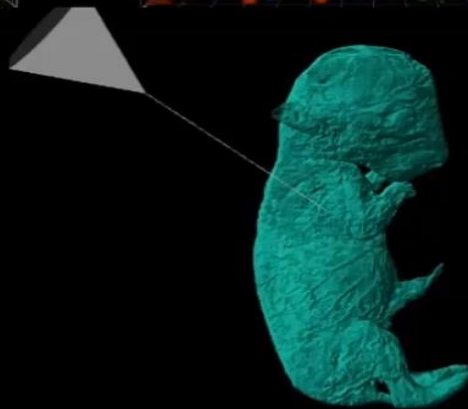
Solutions for Correlative Microscopy



Visualize Volume Rendering Modes



MIP



Normal Shading



Blend

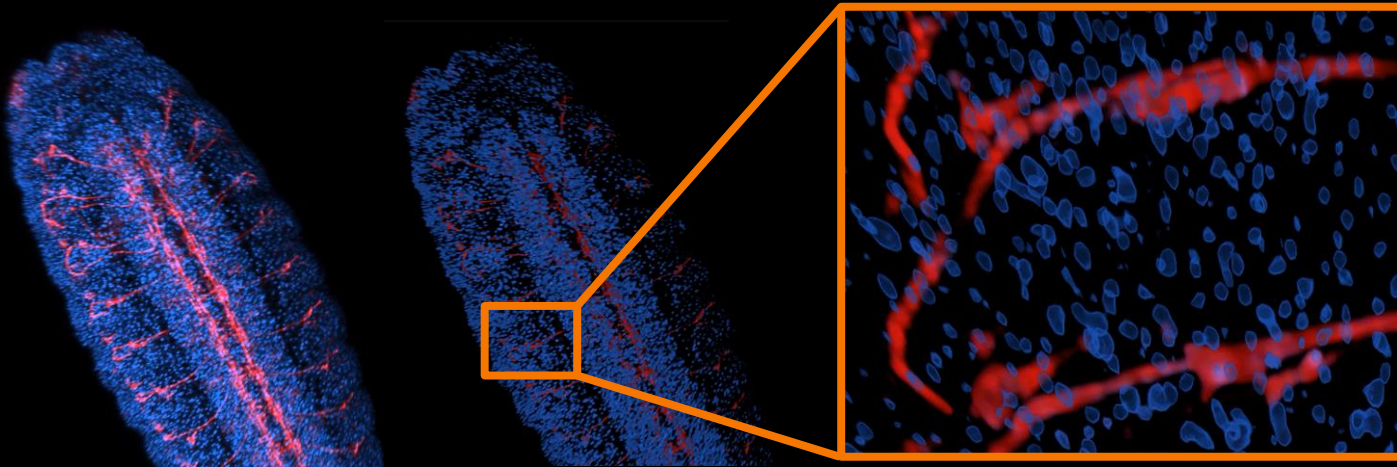
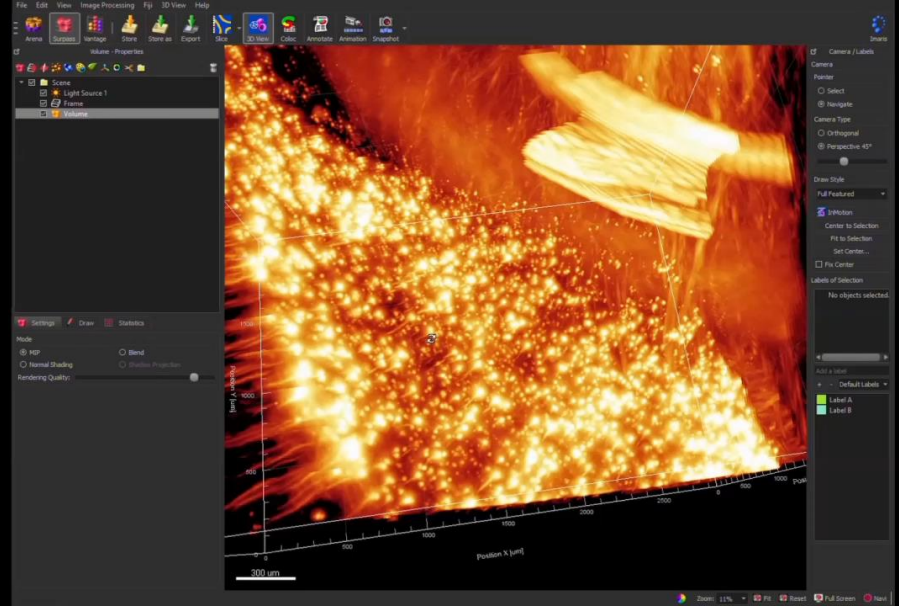
Volume Rendering modes



MIP

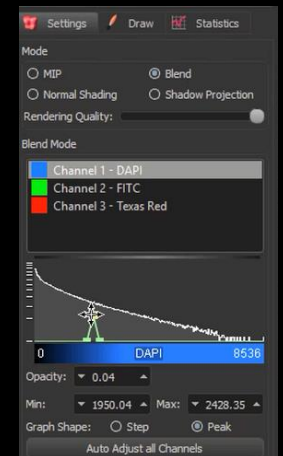


Blend with step



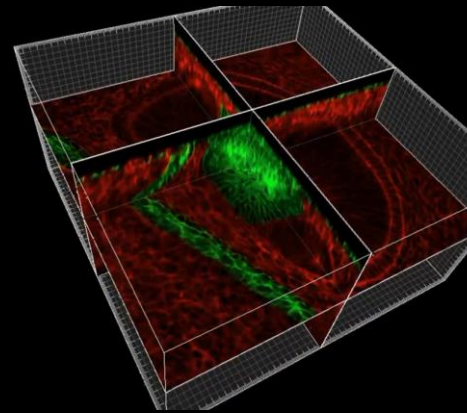
MIP

Blend with peak

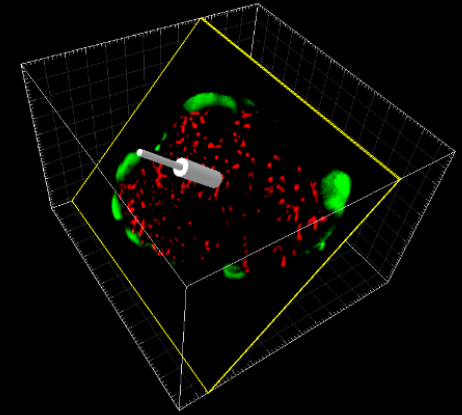


Visualize

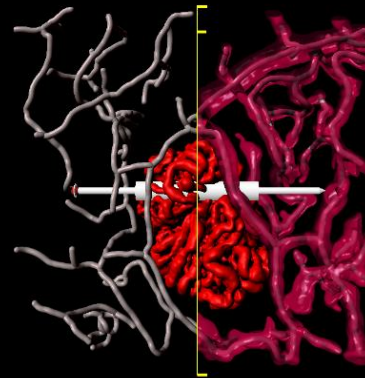
Visualization tools



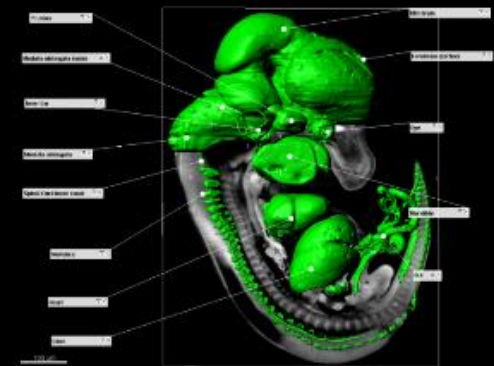
OrthoSlicers



ObliqueSlicer

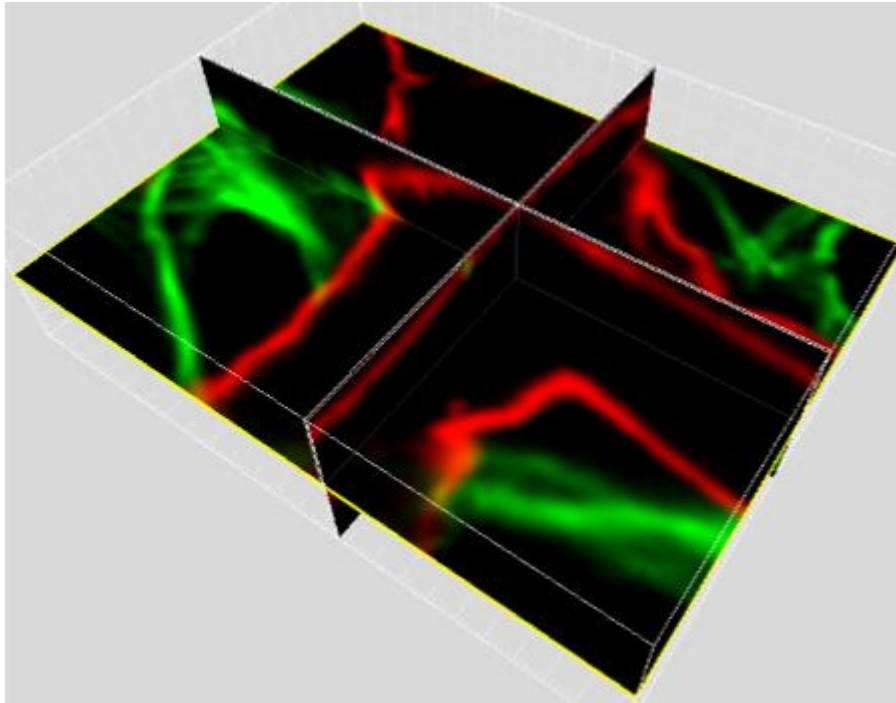


Clipping plane



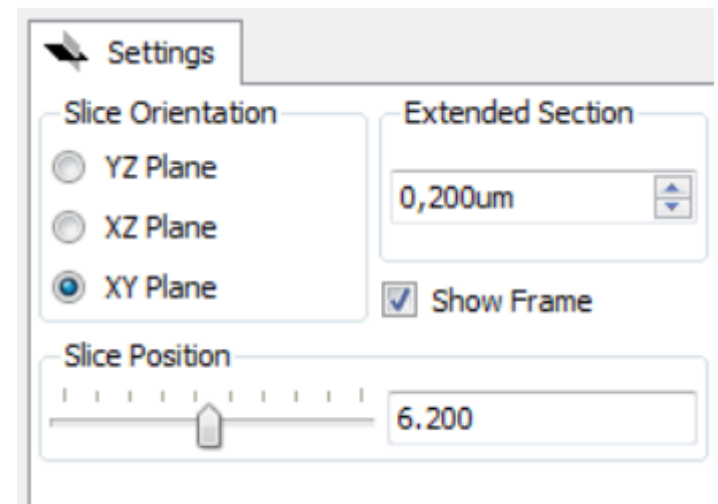
Annotations

OrthoSlicer

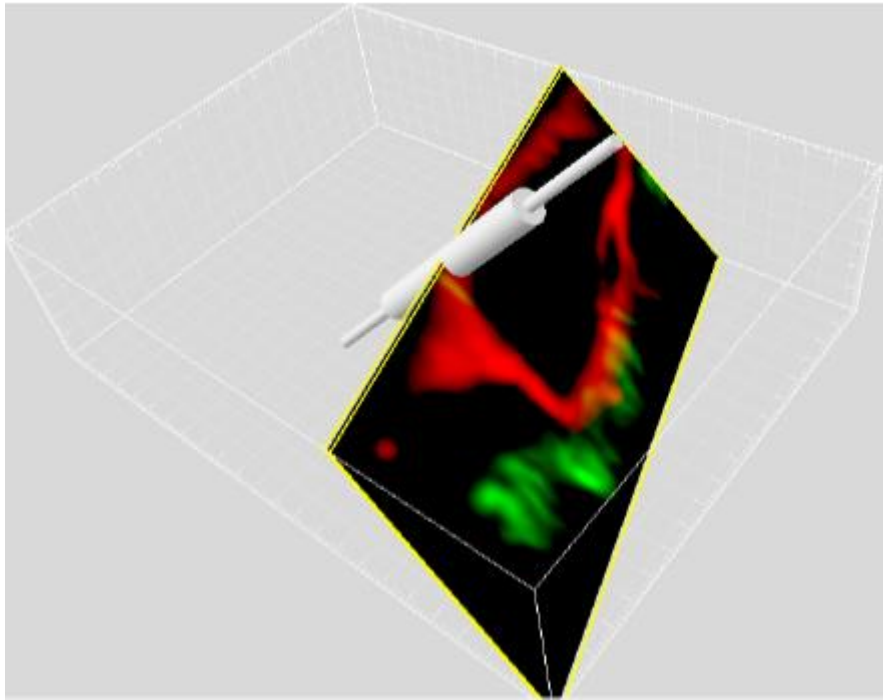


- ☒ Surpass Scene
- ☒ Light Source 1
- ☒ Frame
- ☐ Volume
- ☒ Ortho Slicer 1
- ☒ Ortho Slicer 2
- ☒ Ortho Slicer 3

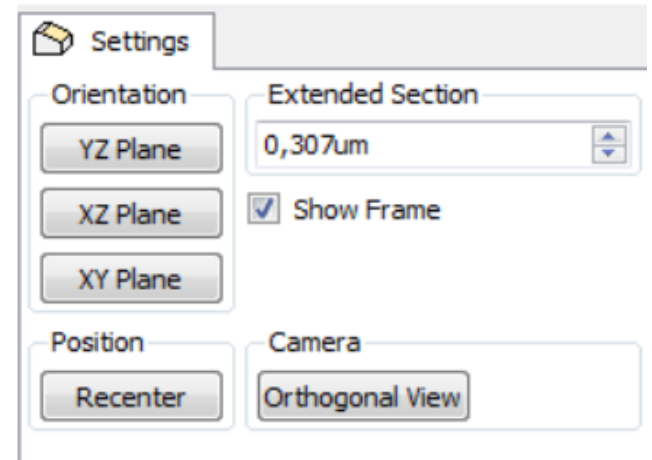
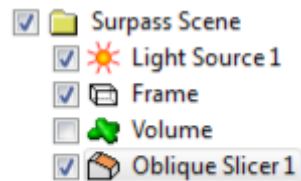
- Orthogonal plane on which original data are projected
- Can be moved within the dataset
- “Extended section” adjusts slices thickness



Oblique Slicer



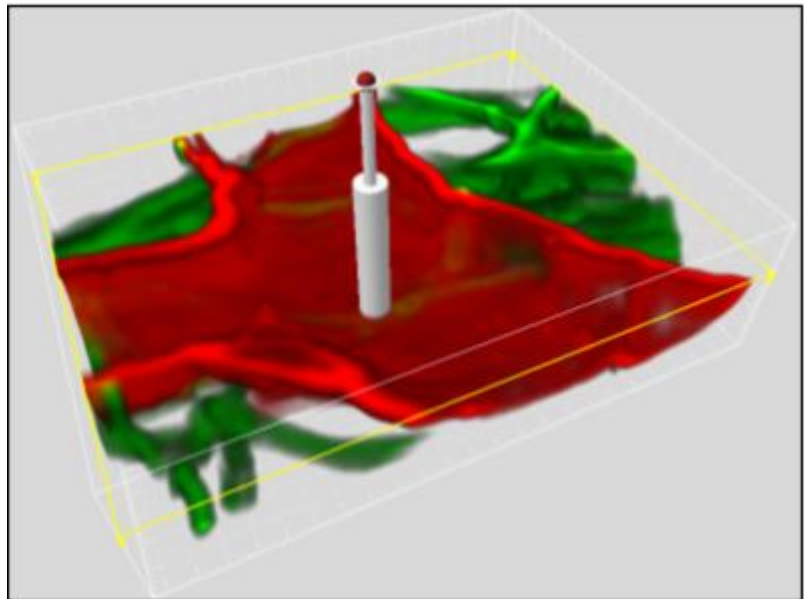
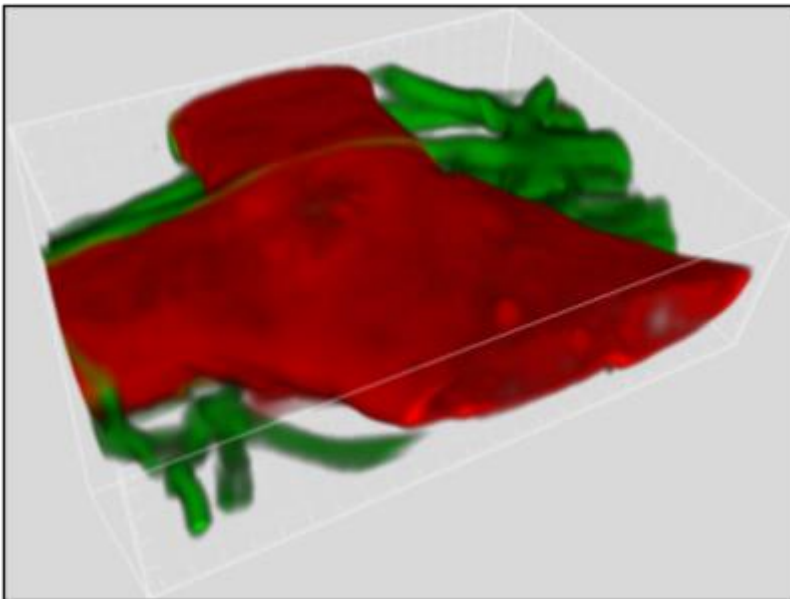
- Plane on which original data are projected
- Can be freely moved and rotated within the dataset (similar to Clipping Plane)
- “Extended section” adjusts slices thickness



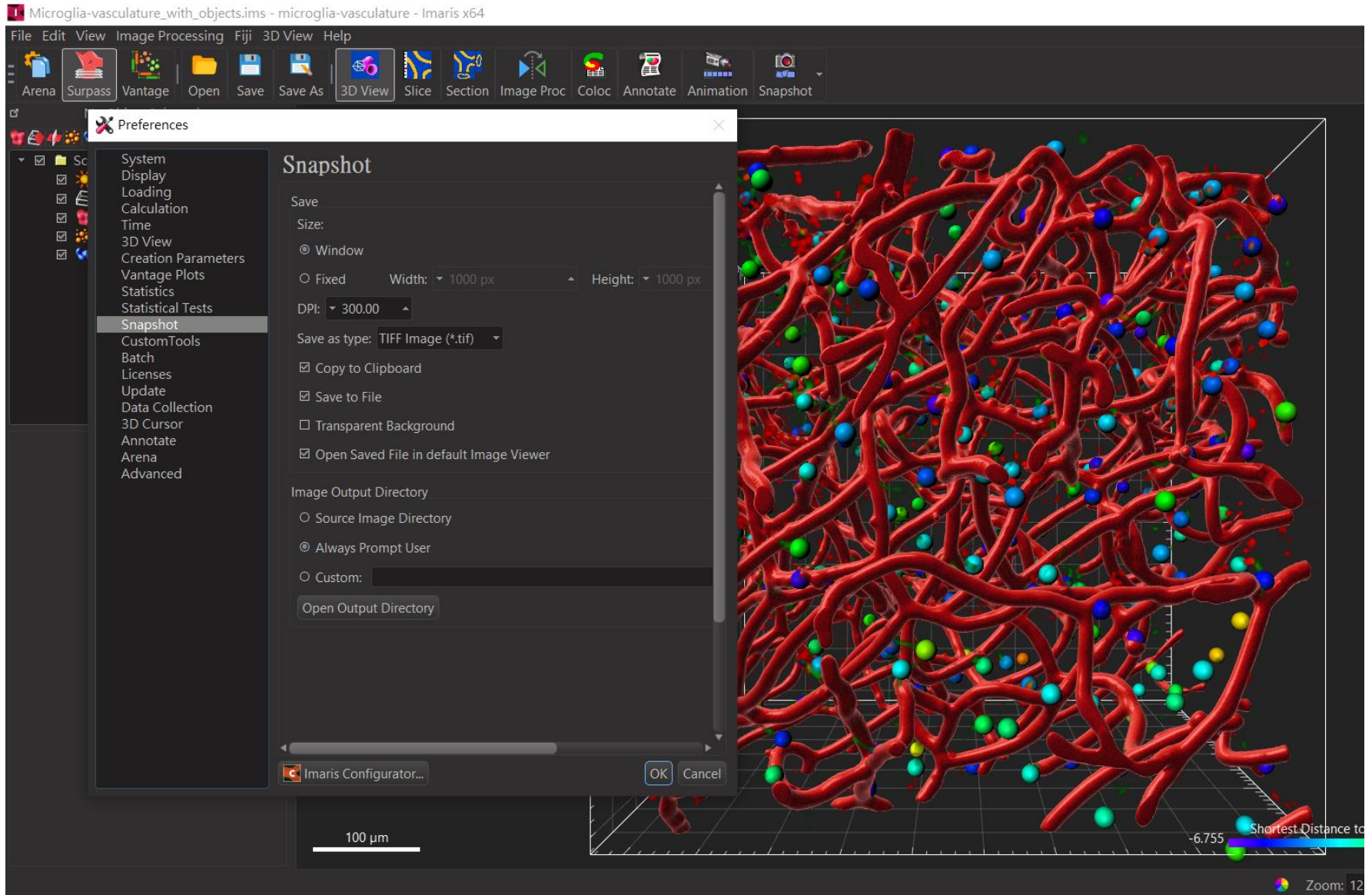
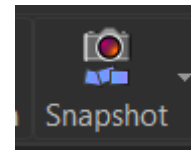
- ✓ Surpass Scene
- ✓ Light Source 1
- ✓ Frame
- ✓ Clipping Plane 1
- ✓ Volume

Clipping Plane

- Cuts away objects on one side of the plane
- Allows you to look inside any object
- Can be freely rotated

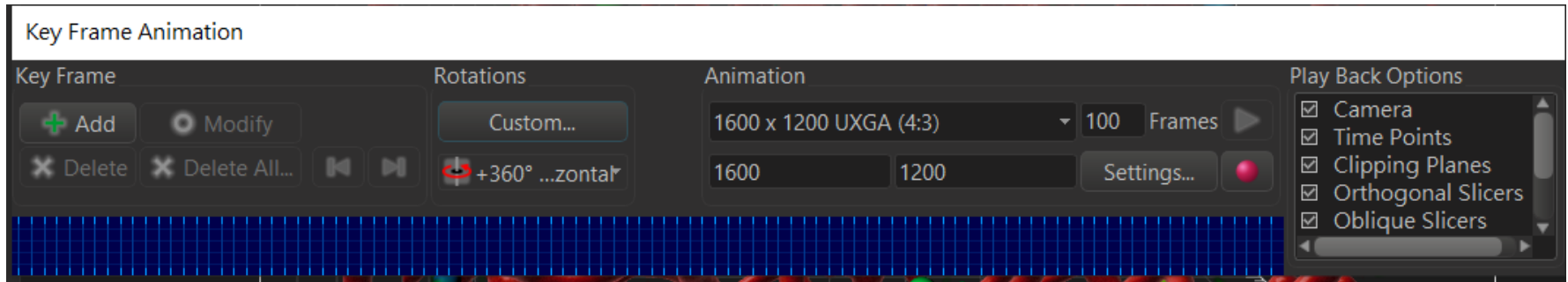
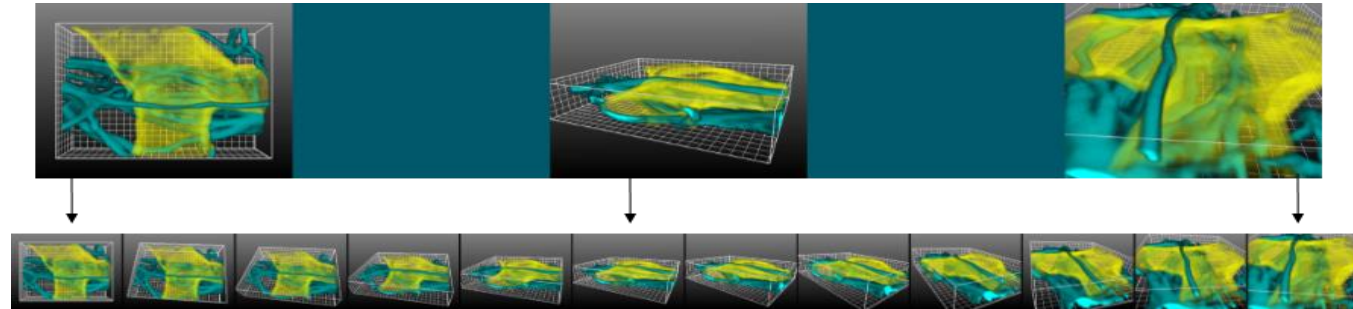


Snapshot



Movie Creation: Keyframe Animation

- Define special Keyframes with defined settings (zoom, rotation,...)
- Imaris calculates the frames between the defined positions



Setup the Animation

1. Turn the image view to the starting position.
 - Klick “Add” to add a keyframe
 - Change the image view
 - Klick “Add”...

- Choose the total number of frames of the movie
- In the settings window you can choose the frame rate of the movie
- Press the Play button to play the movie
- Press the Record button to export the movie

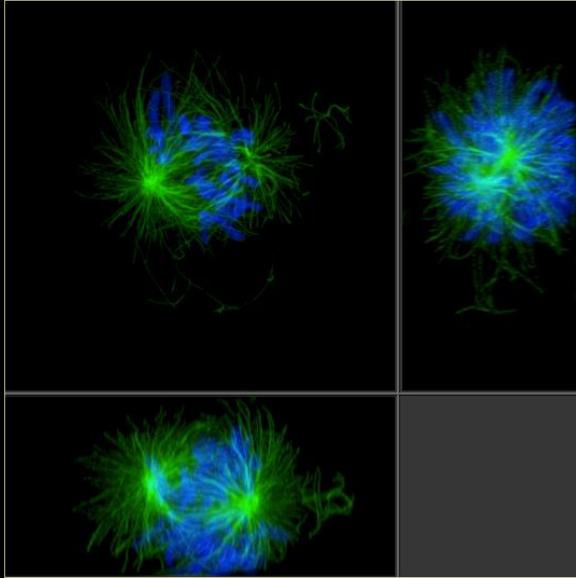
Visualize



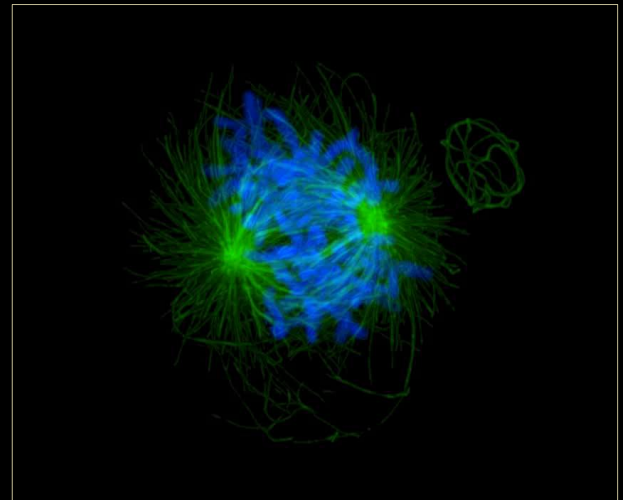
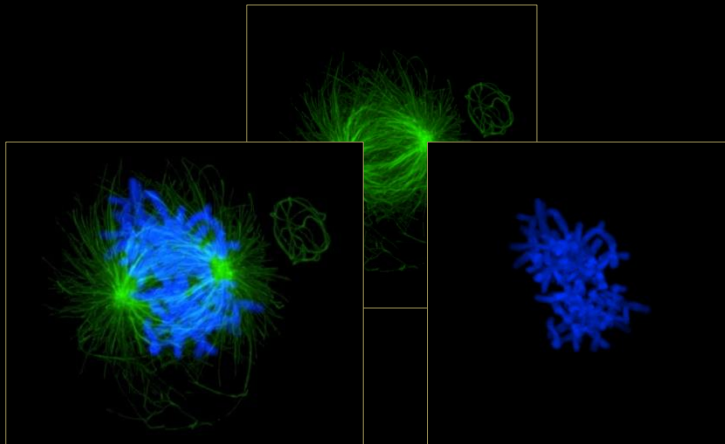
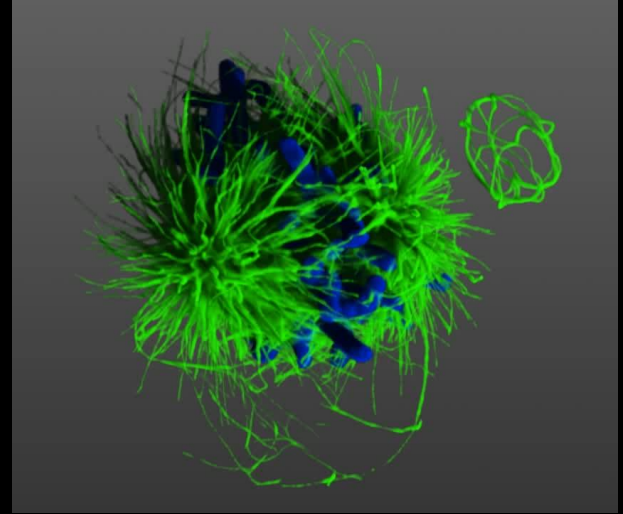
Visualize

Exporting data

Working interface: section

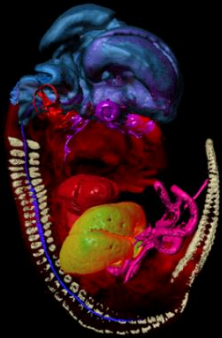


Export snapshots and videos

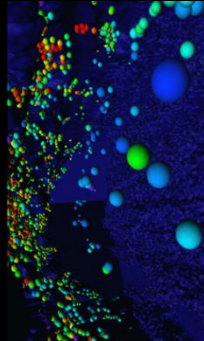


Detect & Analyze

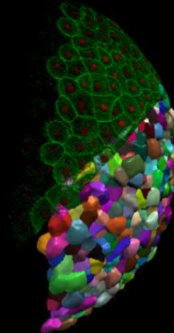
Surfaces



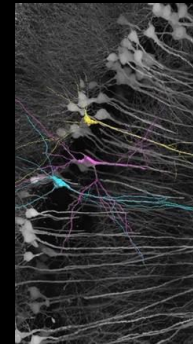
Spots



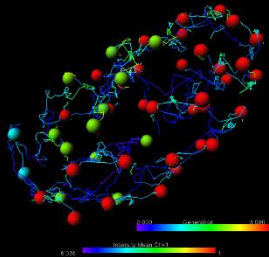
Cells



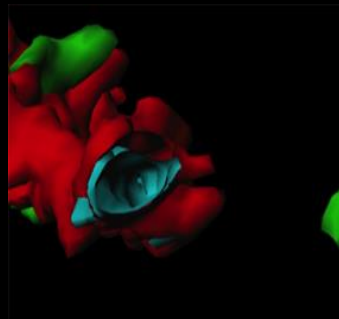
Filaments



Lineage/Tracking



Colocalisation



Customisation(XT)

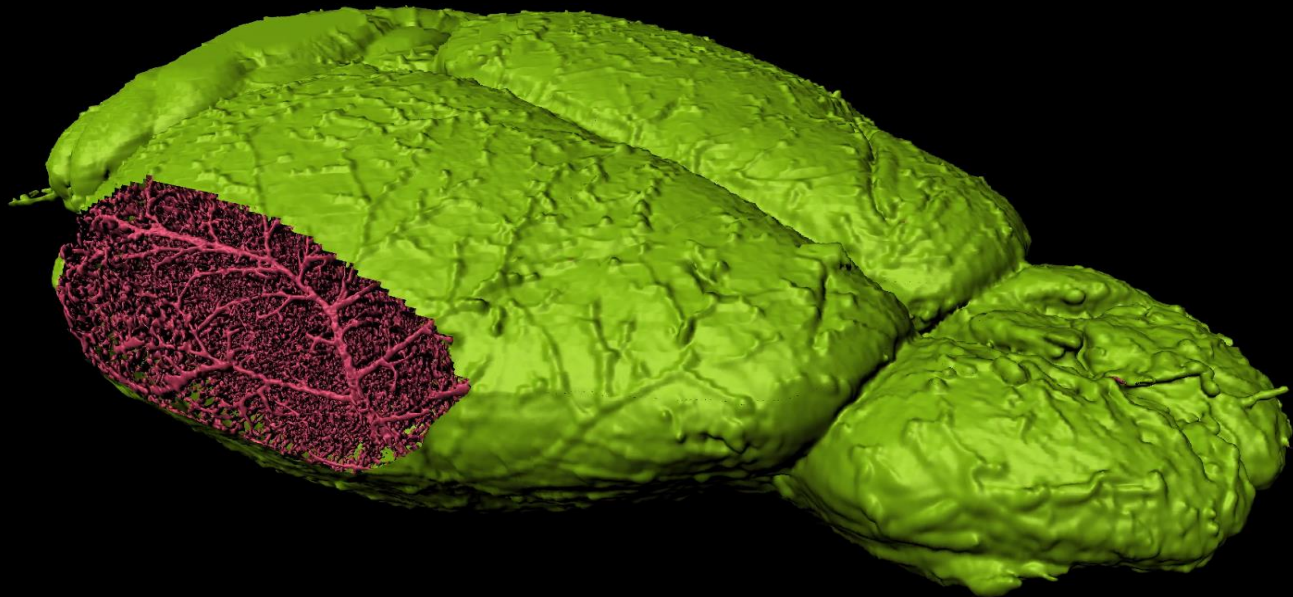




Surfaces

Allows for detection the boundary of structure,
Object Creation and segmentation

Automatic





Surface Semi-automatic and Manual

Adaptive Contour Tracer

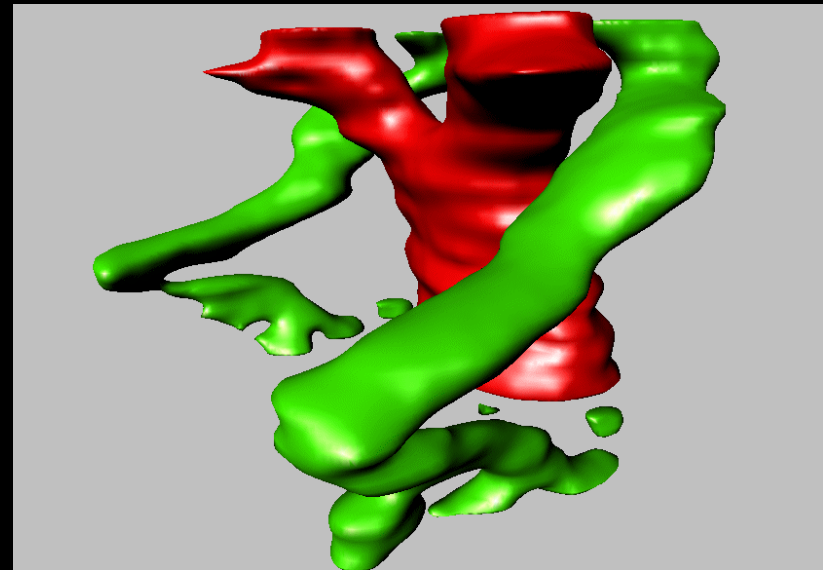
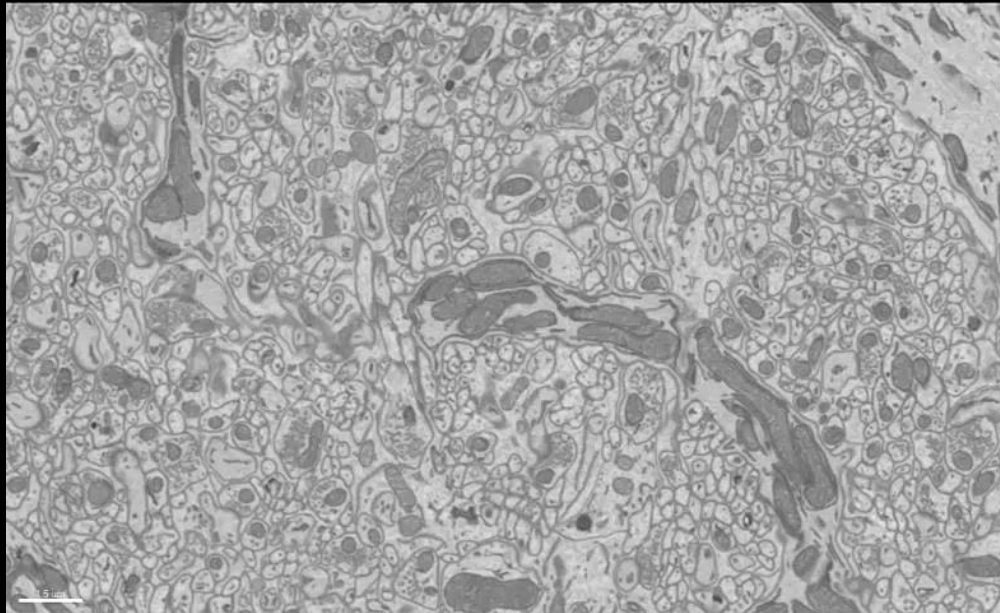
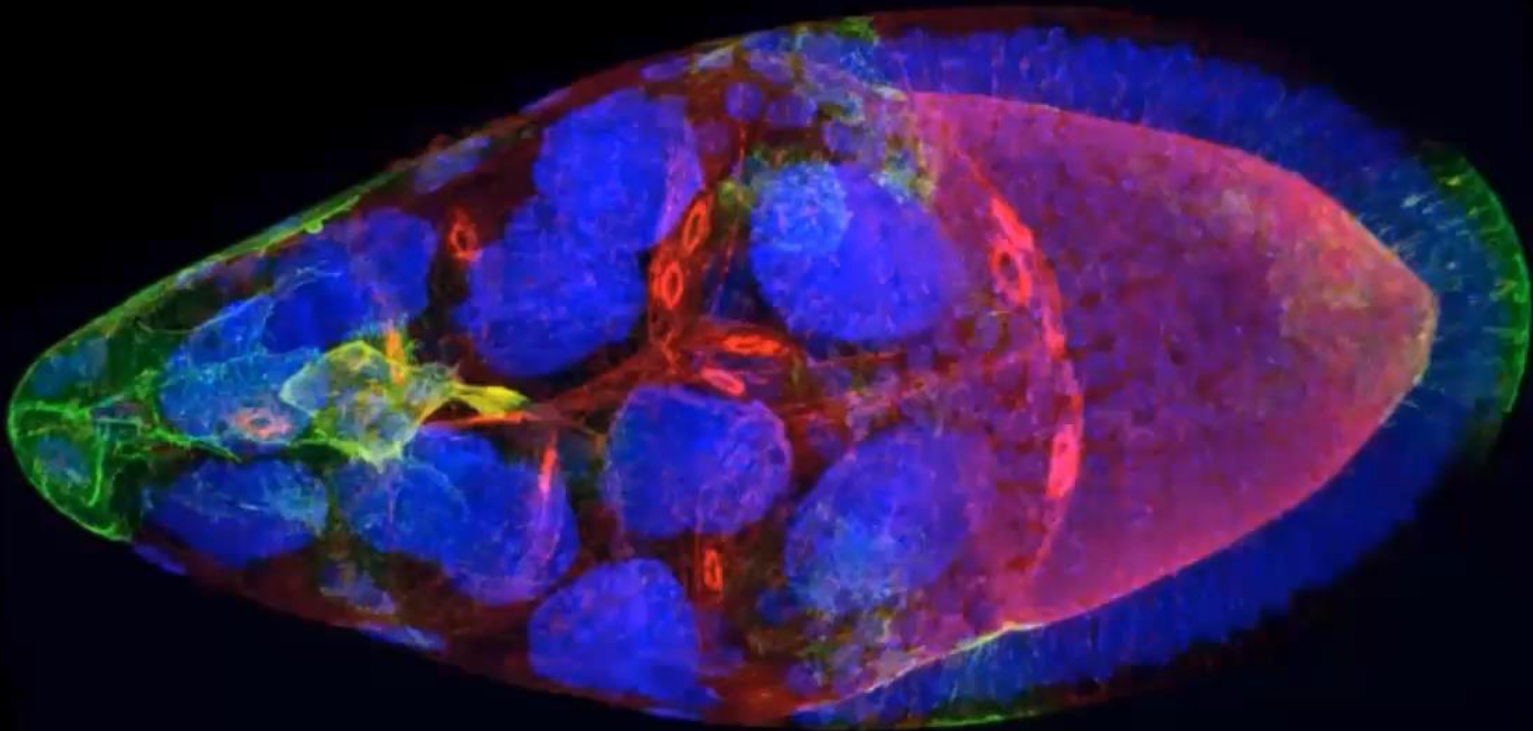


Image Courtesy Tom Deerinck and Dr. Mark Ellisman,
National Center for Microscopy and Imaging Research,
University of California, San Diego.

Surfaces for irregular fully stained shapes



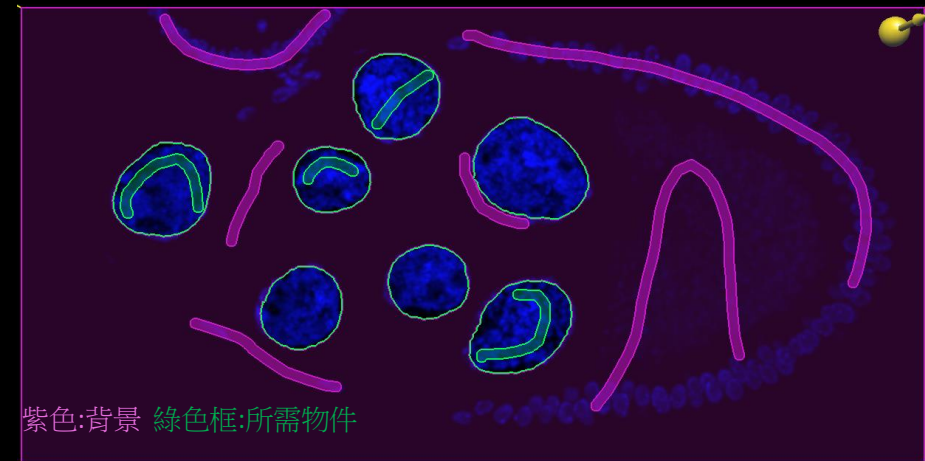
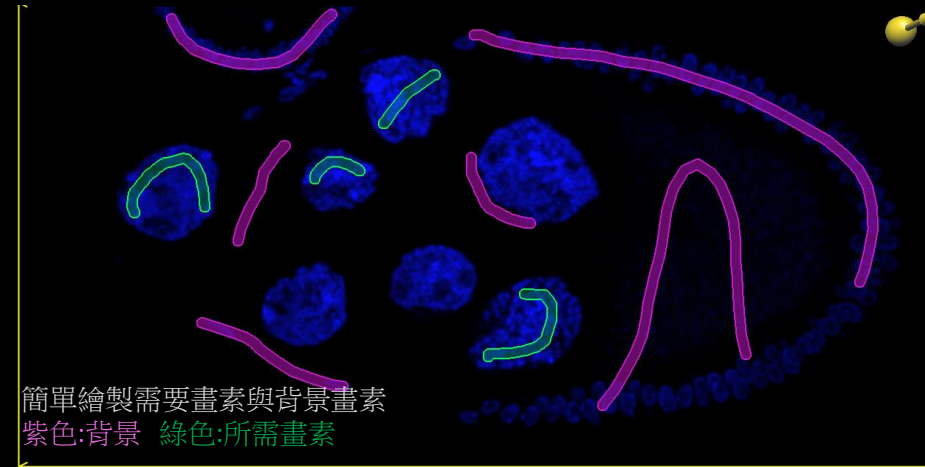
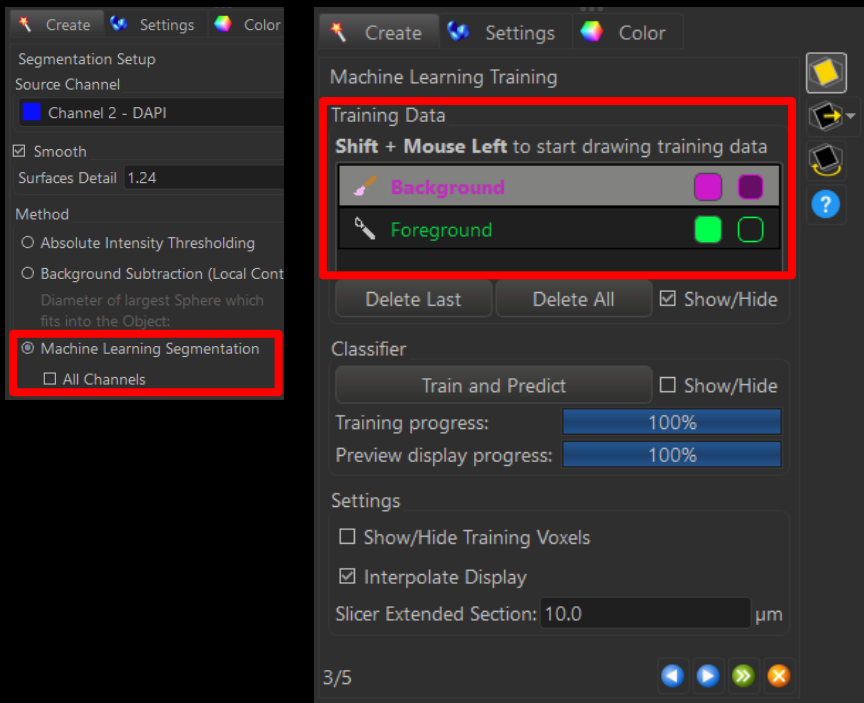
— Source —

Wei. Dai, Montell's lab, Department of Molecular, Cellular and Developmental Biology, UCSB



Surfaces

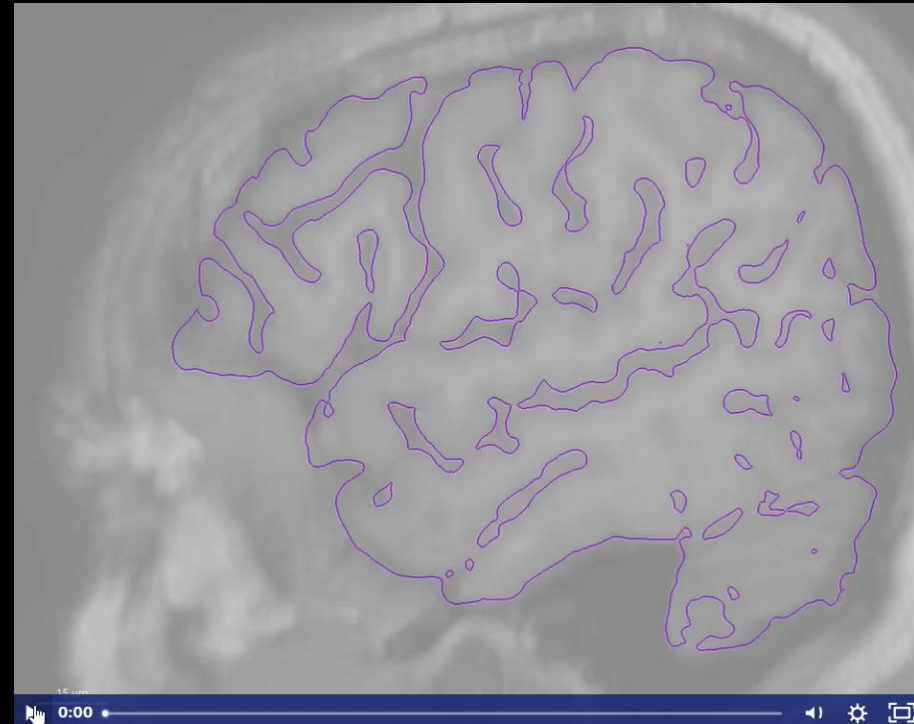
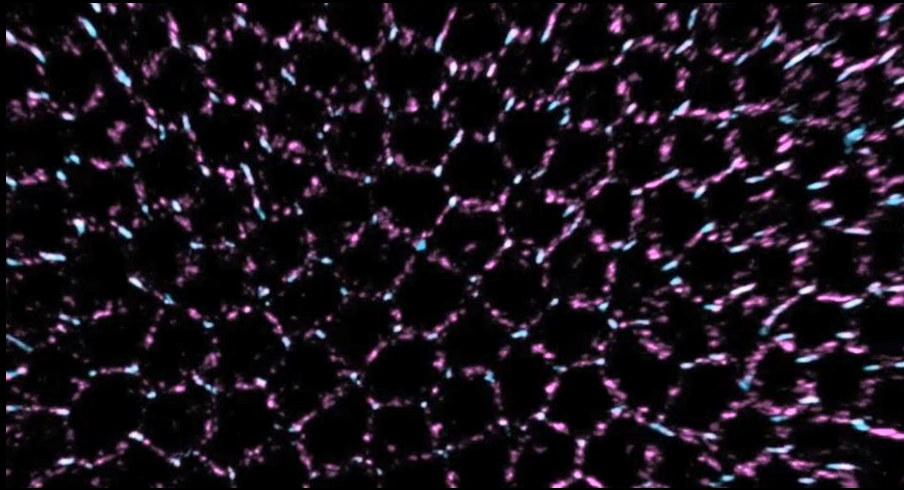
Trainable AI Image Analysis for Everyone



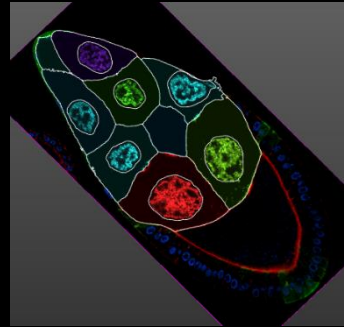
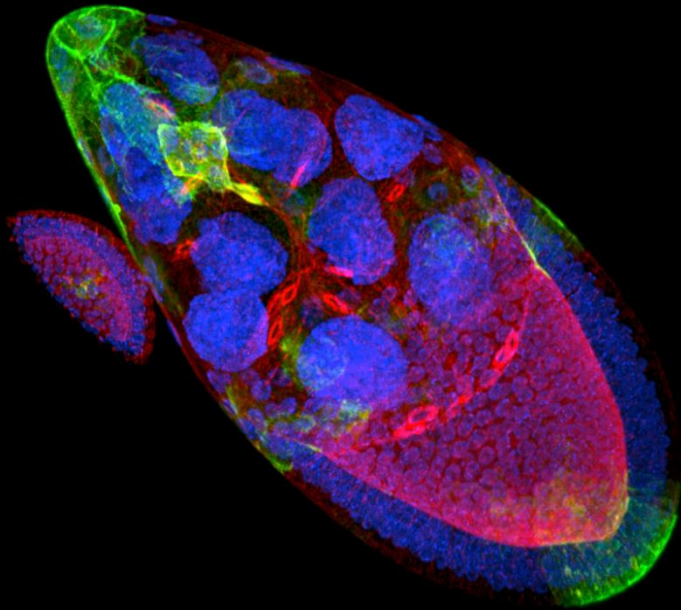


Surfaces

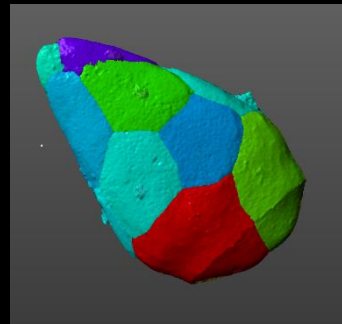
Trainable AI Image Analysis for Everyone



Quantification



Slicer view



Volume view

Count
Position
Volume
Area
Intensities
Morphology ...



Drosophila Egg Chamber. Image
courtesy of Wei. Dai, Montell's
lab, Department of Molecular,
Cellular and Developmental
Biology, UCSB

Spots

Allows for detection the number of objects

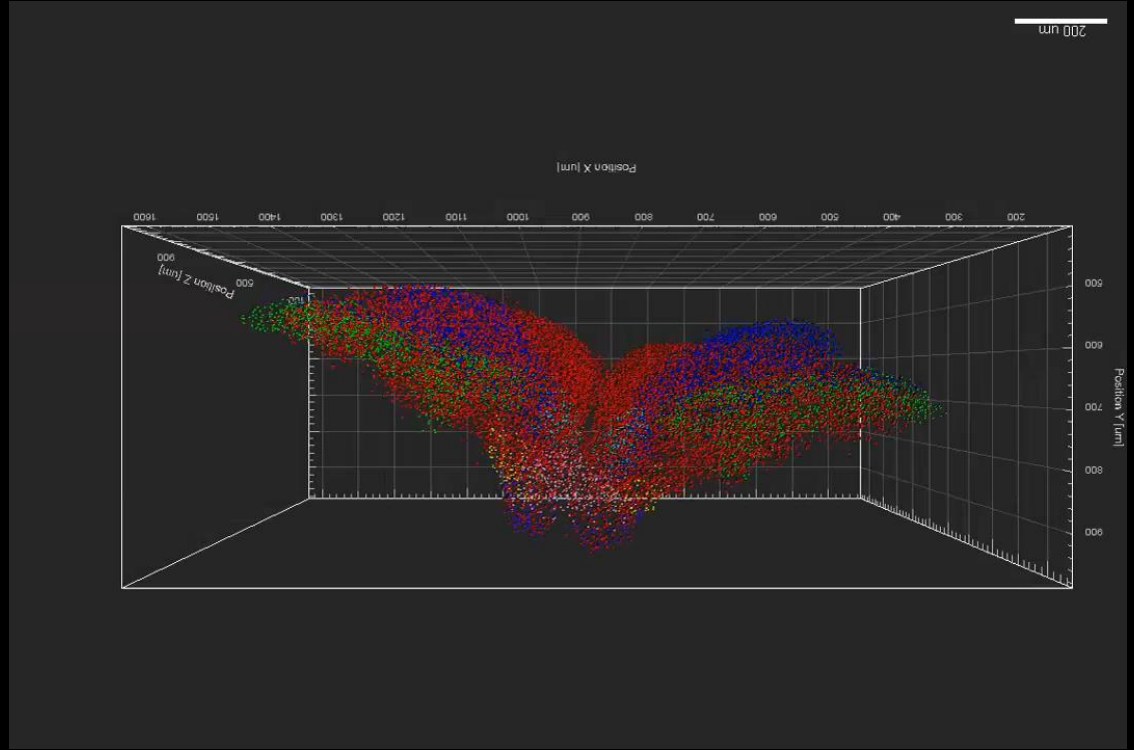
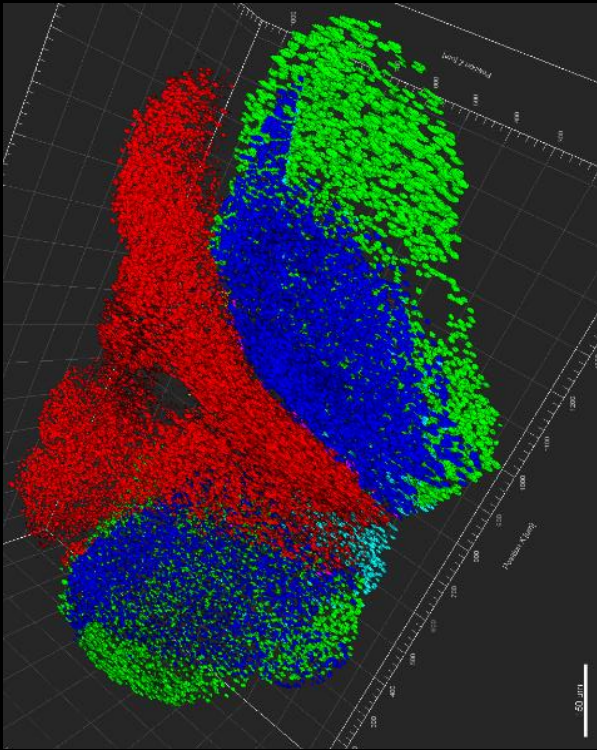
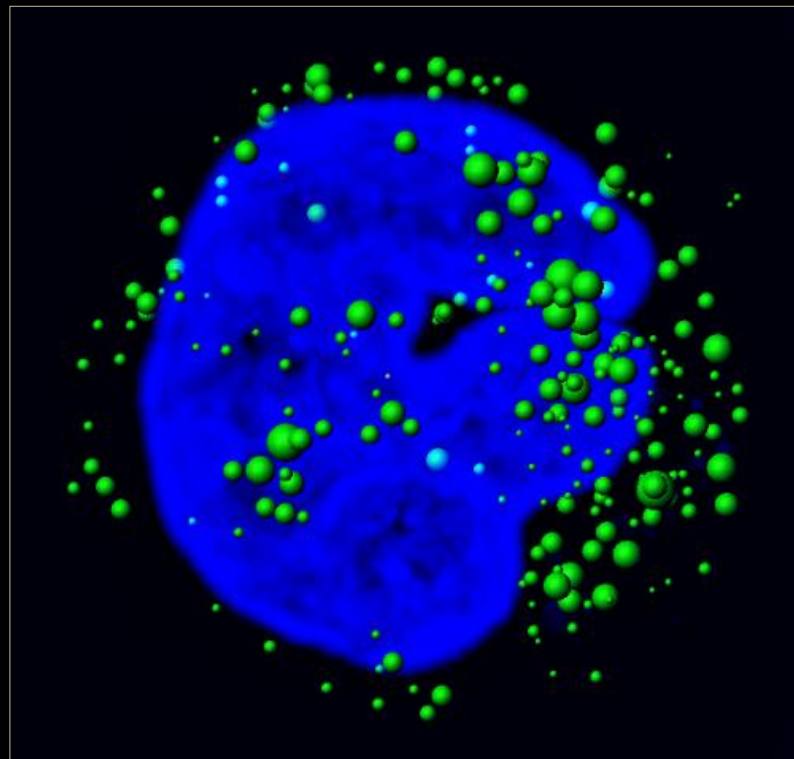
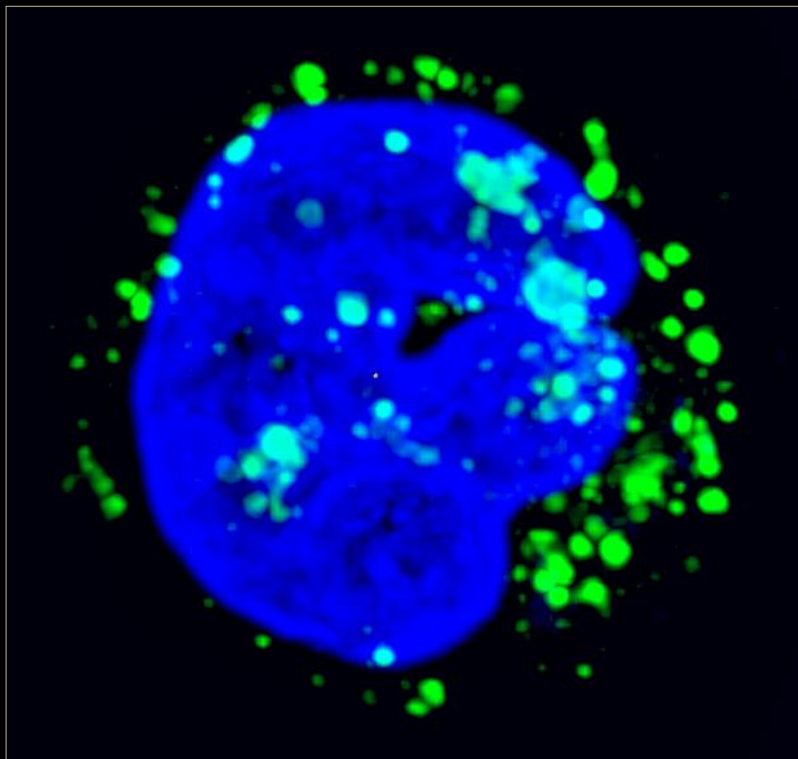


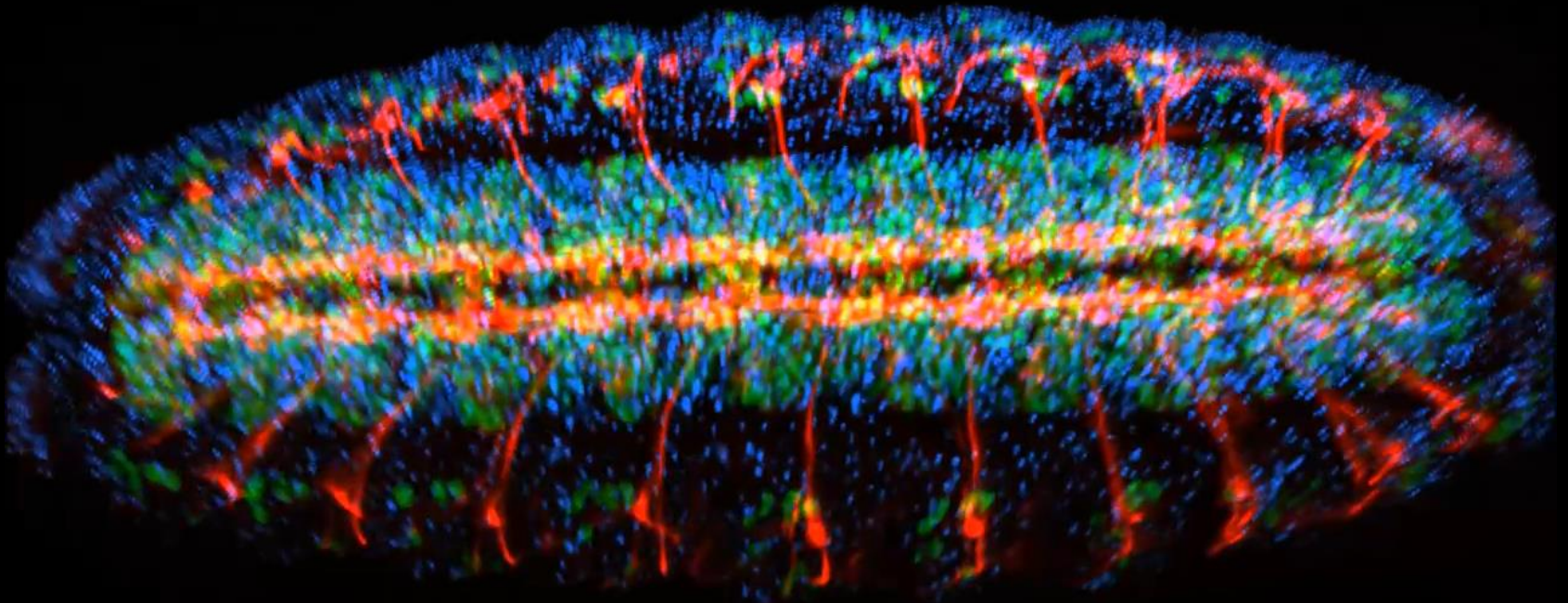
Image courtesy of M. Belle, D. Godefroy, Dr. C. Sotelo Chédotal team, Institut de la Vision, Paris, France.

Spots



Spots

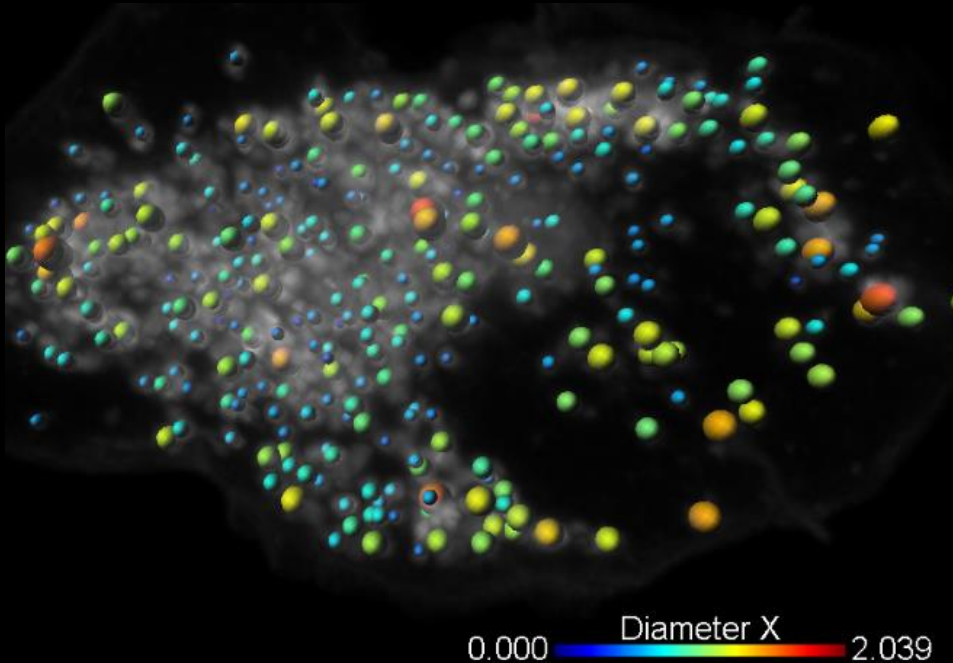
Spots for spherical shapes



— Source —

Drosophila Embryo: Embryology course at Woods Hole, Marine Biological Lab, Mass. USA.

Spots Statistics



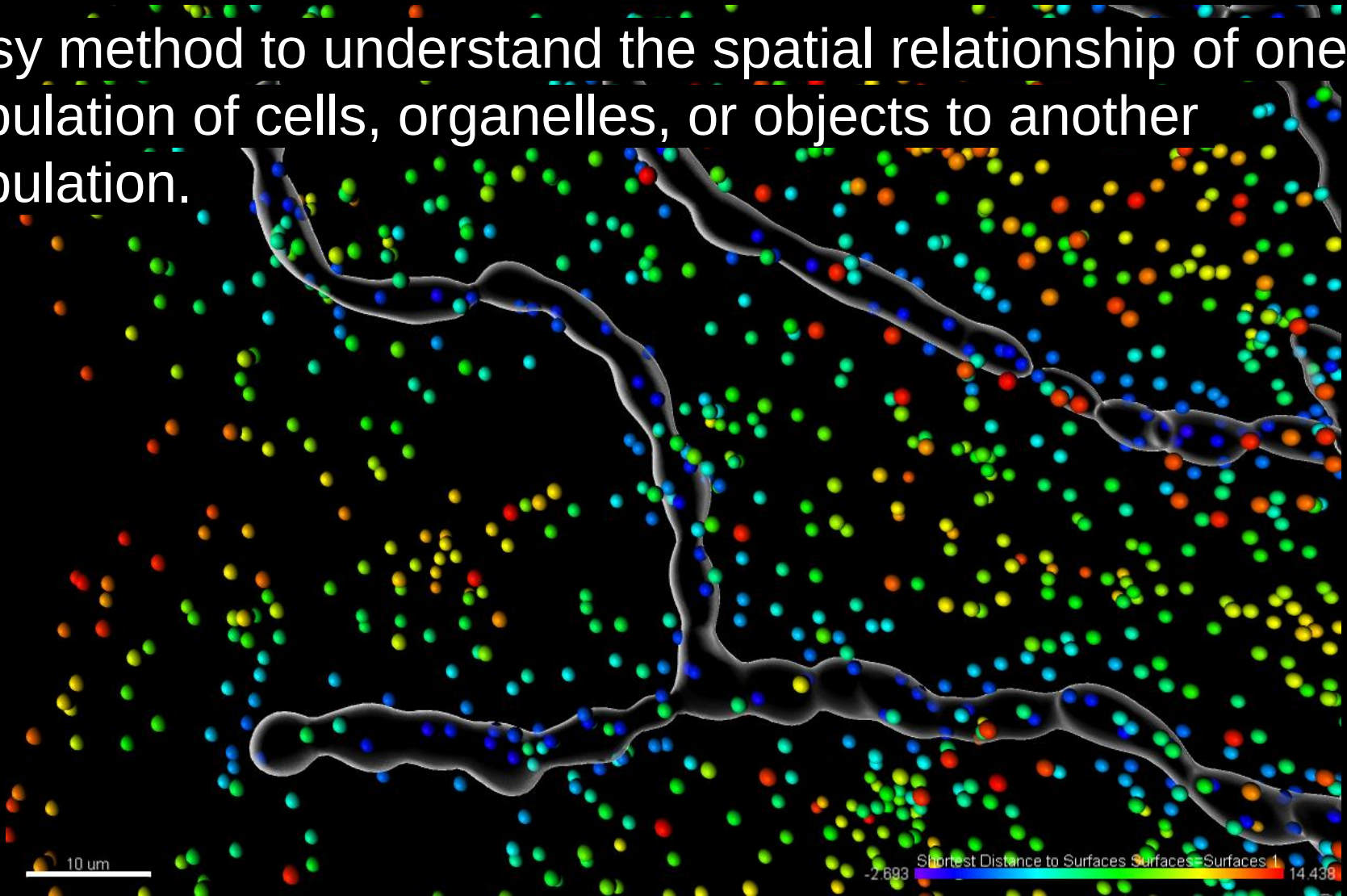
Count
Position
Diameter
Area
Intensities ...

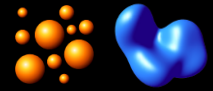
Filter / Classify objects
Color code objects



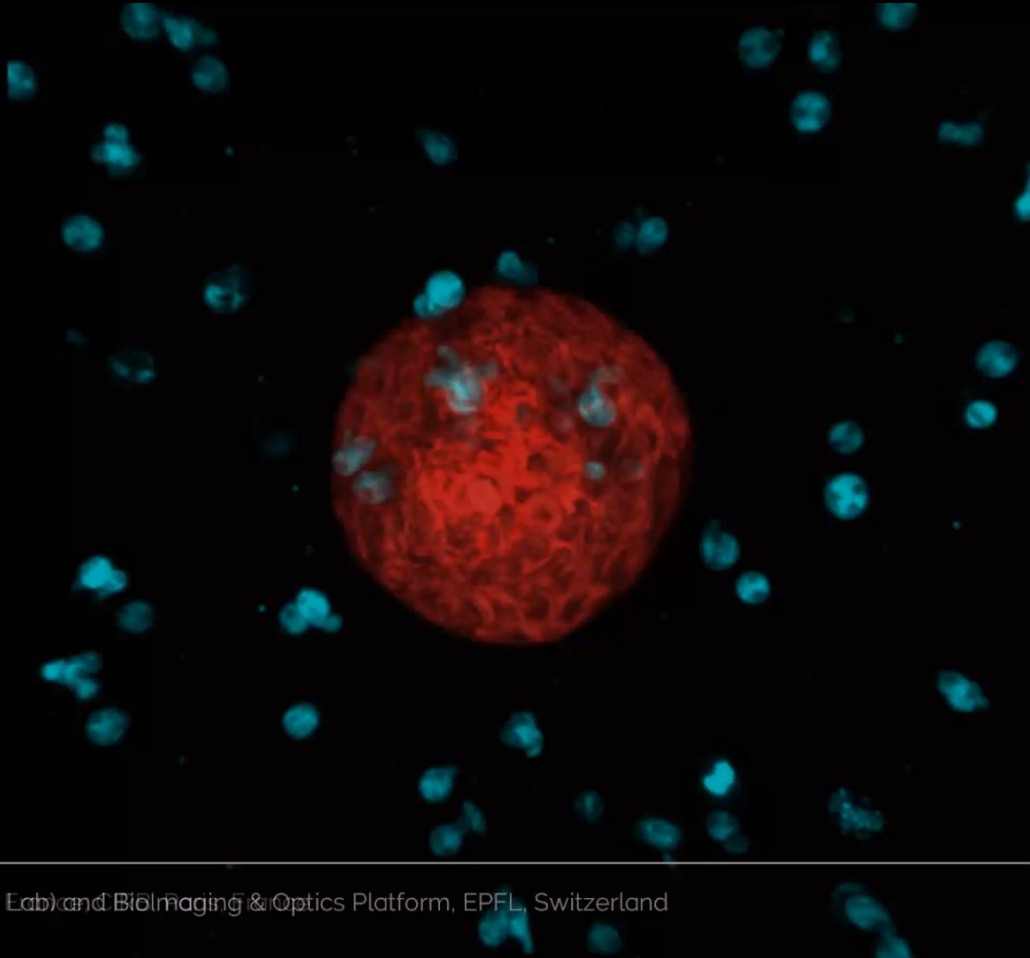
Native Distance Measurements

Easy method to understand the spatial relationship of one population of cells, organelles, or objects to another population.





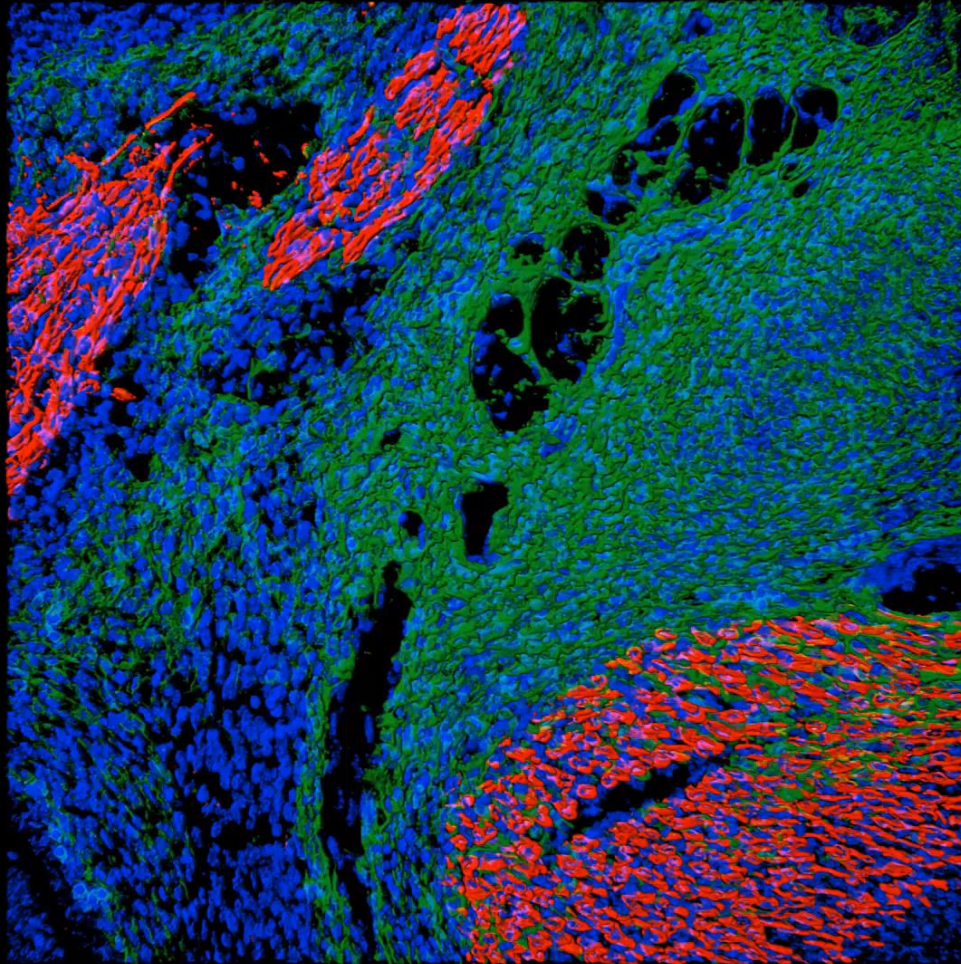
Surfaces-Spots Interactions



— Source —

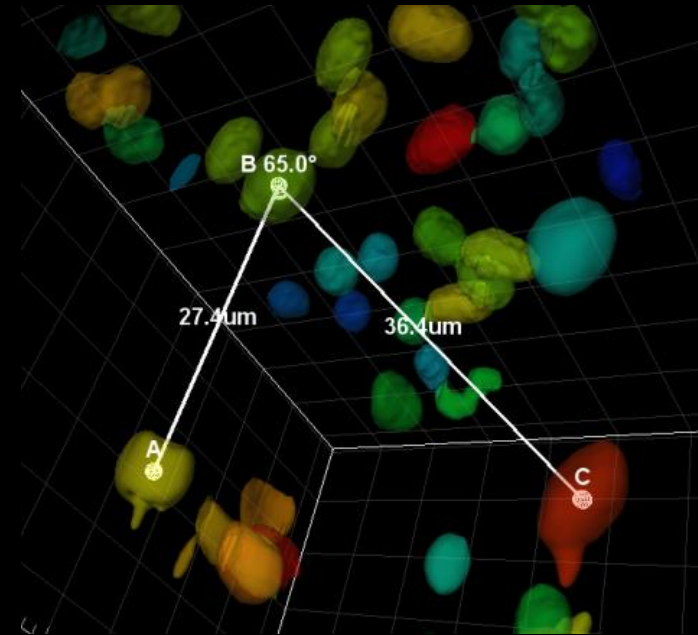
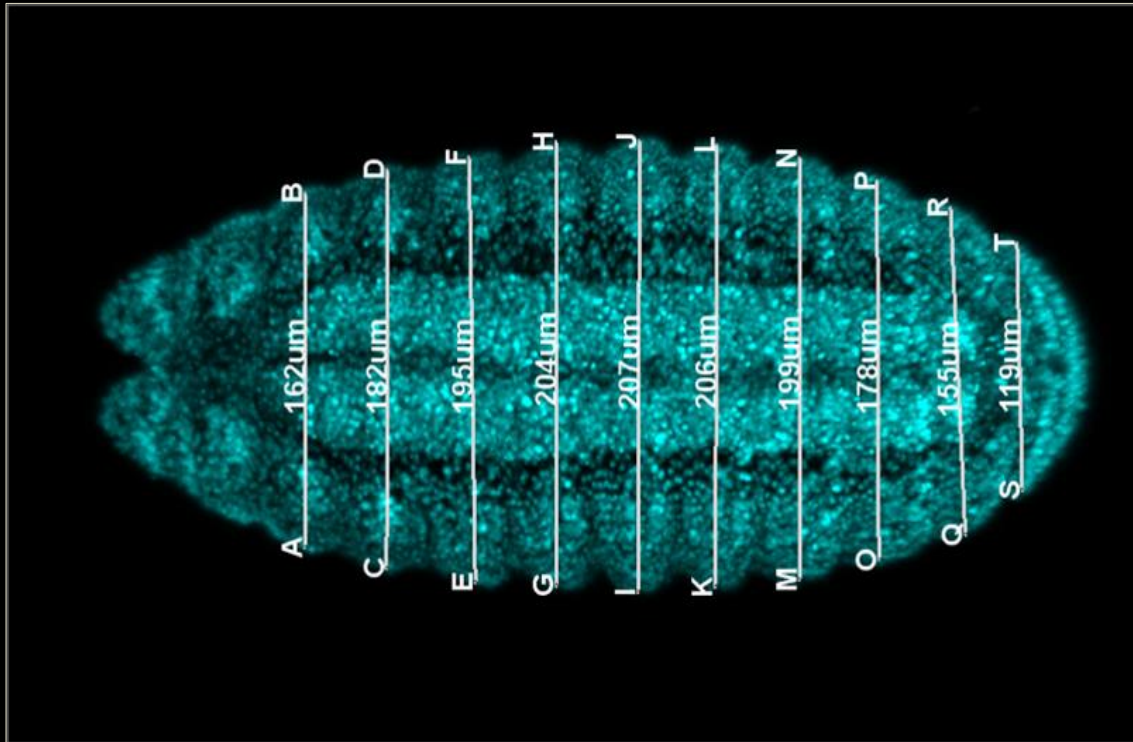
Kunal Sharma (McKinney Lab) and Bioimaging & Optics Platform, EPFL, Switzerland

🔴💙 Machine Learning Classification



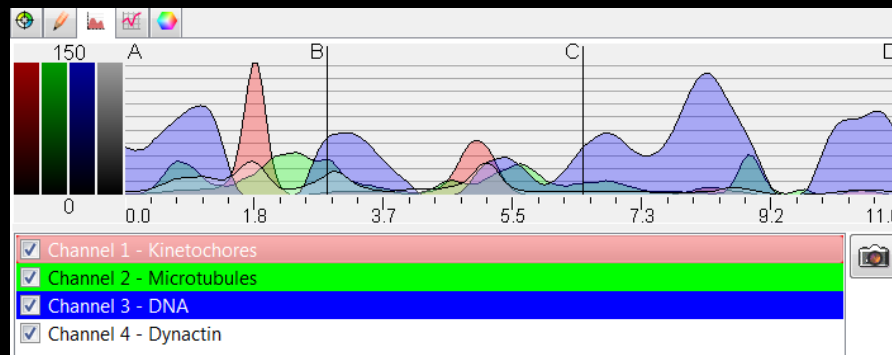
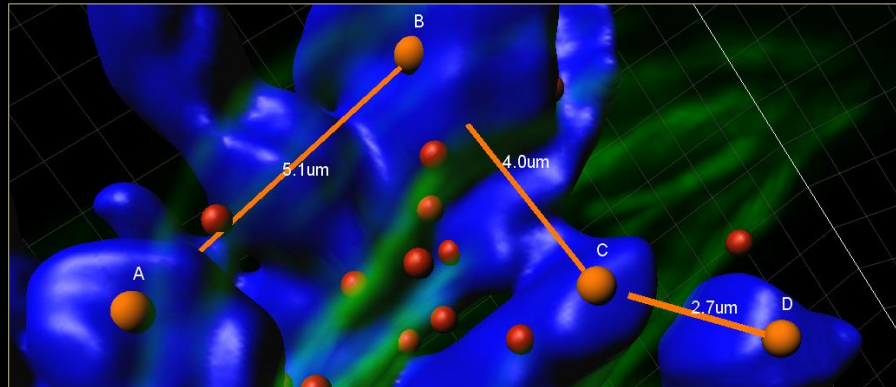
Measurement Pro

Line and angle measurements



Measurement Points

Intensity Profiles





Filament Tracer

**Allows for measurements of neuronal or other branching structures
(eg. Mycorrhiza, blood vessels, mitochondria network etc.)**

- Segment properties (length, diameter, etc.)
- Branch Angles
- Number of end points and branch points
- Spine classification
- Etc.

Automatic

Tree-like branching Structures

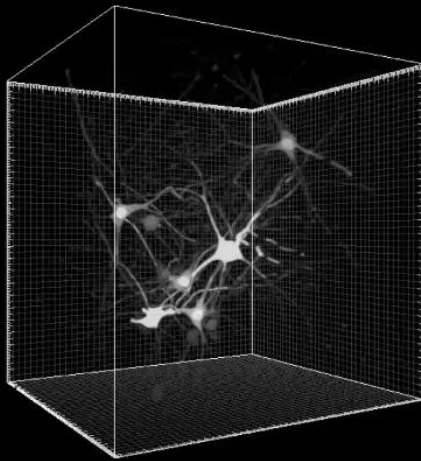
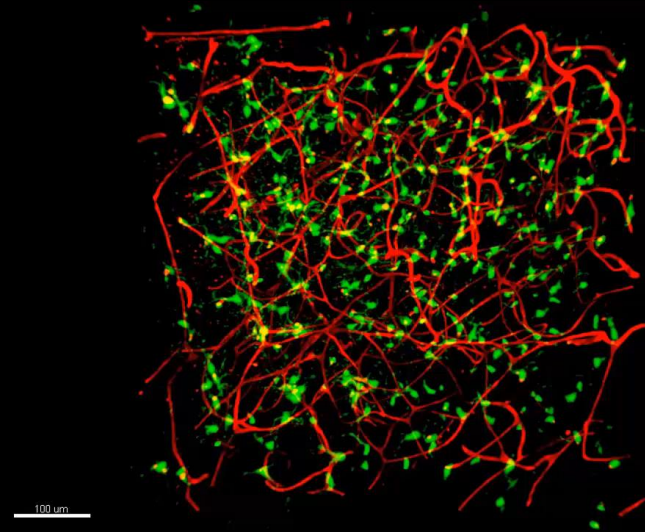


Image courtesy Dr Benjamin E. Deverman, PhD
Senior Research Scientist, California
Institute of Technology.

Network Structures



Microglia vasculature



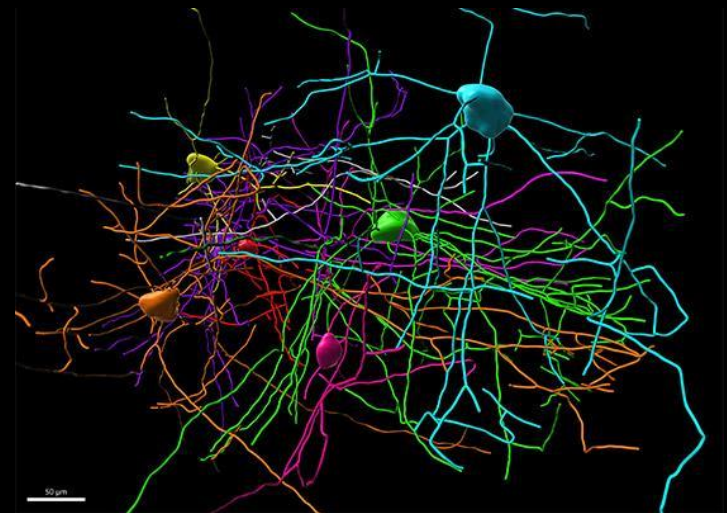
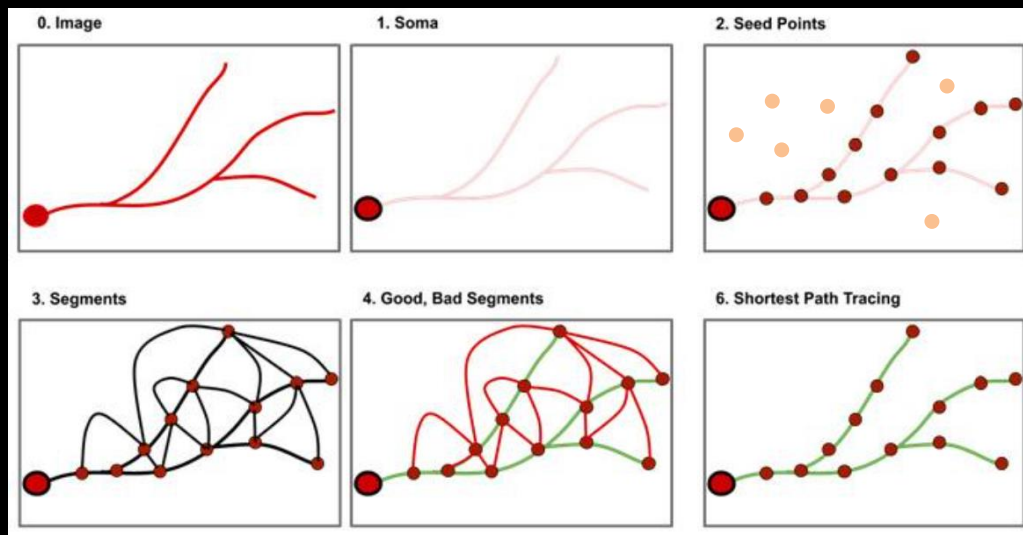
Filament Tracer

AI Powered Filament Tracer

1. Filament New Workflow for Neuron Tracing



Imaris 10.0 於神經追蹤模組提供最新AI功能, 全新神經追蹤分析步驟始於偵測神經體細胞 (Soma), 依照神經細絲 (Filament) 影像偵測 Seed points 。使用者可分類 Seed Points 以及所產生的Segment是“好”或“壞”, 並進行訓練, 接著軟體會進行機器學習 (Machine Learning), 針對整張影像保留“好”的 Seed Points 以及 Segments 而獲得最佳結果。針對 Seed Points 以及 Segment 的分類是Imaris10.0的最新功能, 對於更加複雜的神經影像分析, 提供更快速以及準確的分析結果。





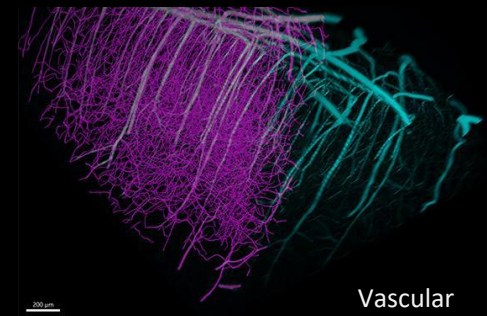
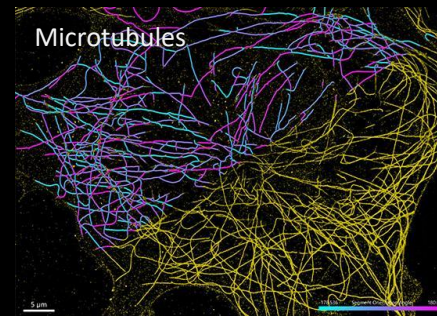
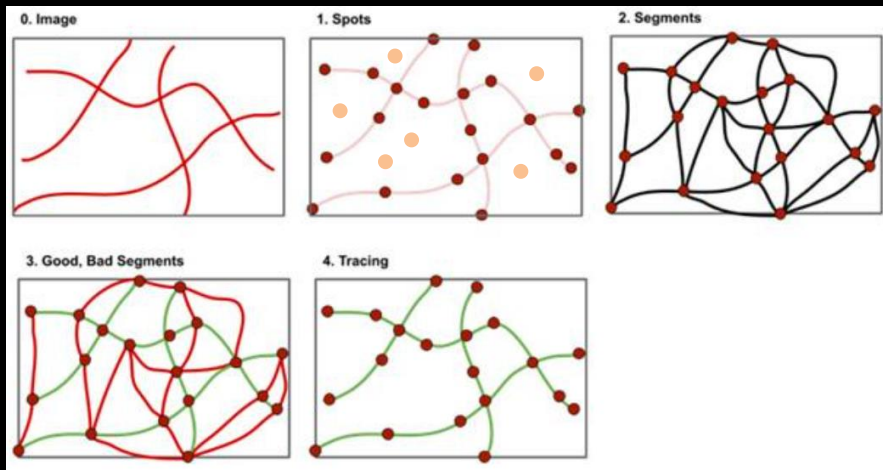
Filament Tracer

AI Powered Filament Tracer

2. Filament New Workflow for Network Tracing



全新網絡絲狀追蹤分析步驟, 與神經追蹤分析相似, 網狀追蹤分析始於偵測細絲 (Filament) 上的 Seed points。使用者可分類 Seed Points 以及所產生的 Segments 是“好”或“壞”, 並進行訓練, 接著軟體會進行機器學習 (Machine Learning), 針對整張影像保留“好”的 Seed Points 以及 Segments 而獲得最佳結果。在細胞生物學上, 可用於分析細胞內結構, 如:微管 (Microtubules), 內質網 (Endoplasmic Reticulum), 肌動蛋白 (Actin Filament)... 等, 也可應用於血管分析。

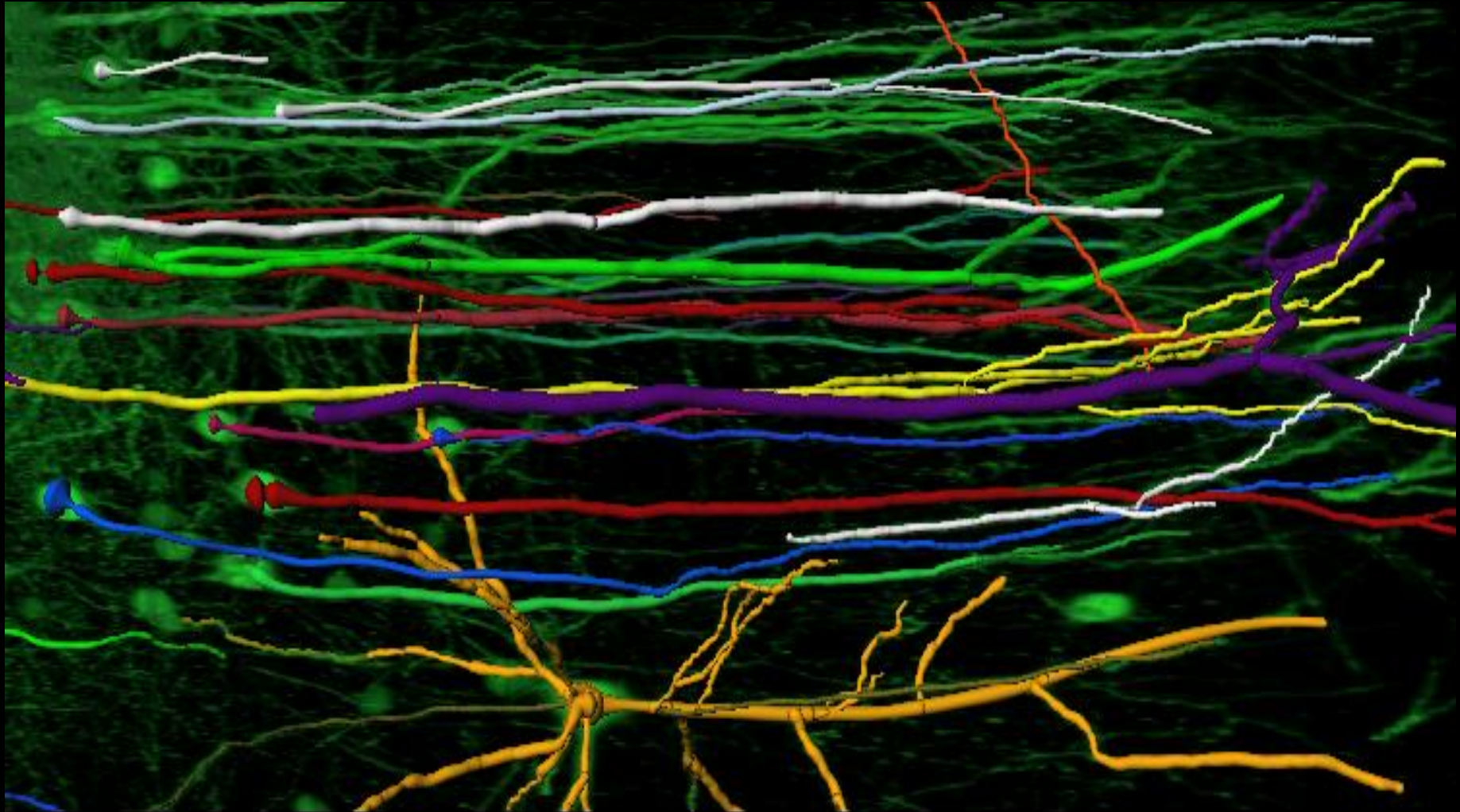




Filament Tracer

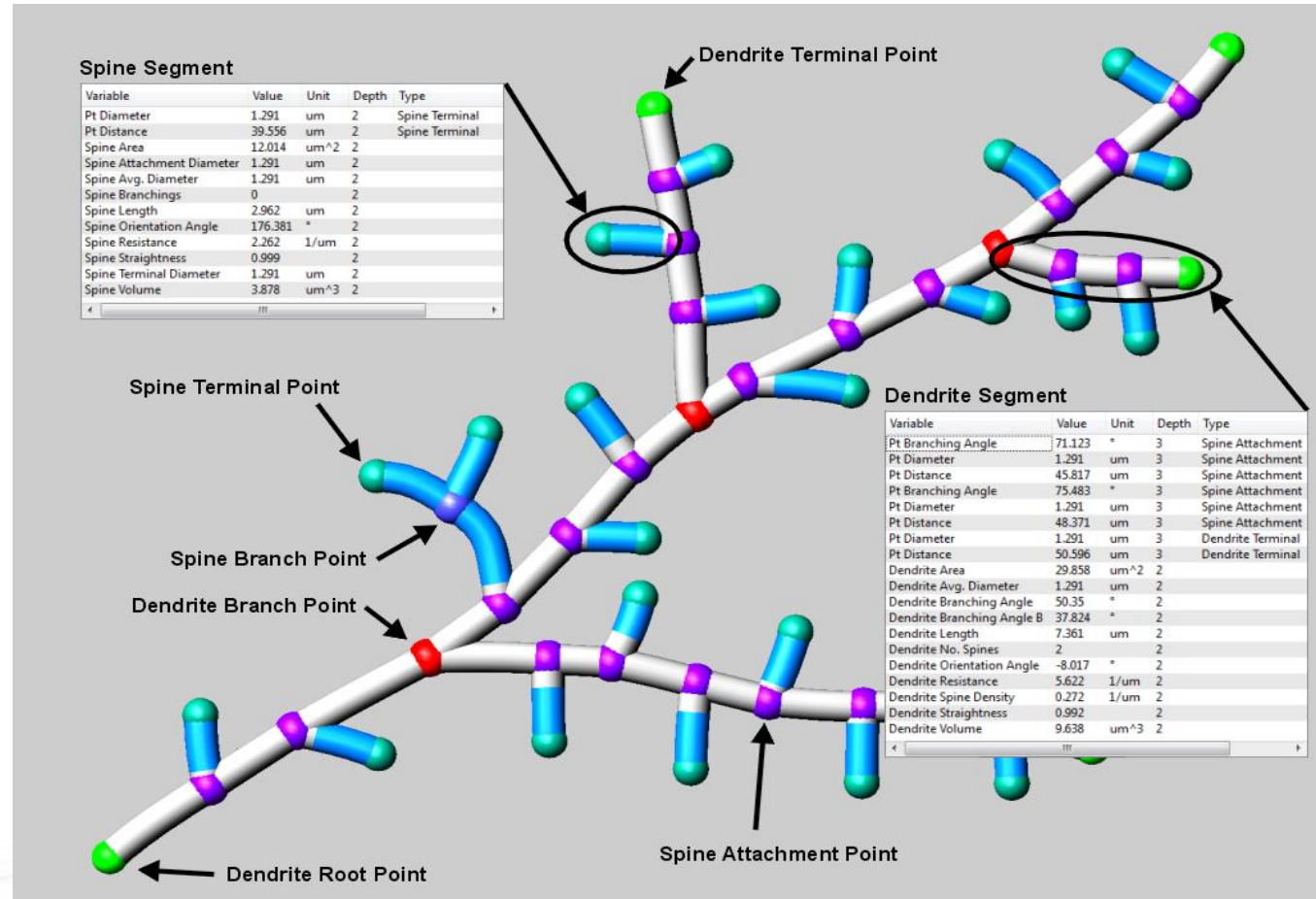
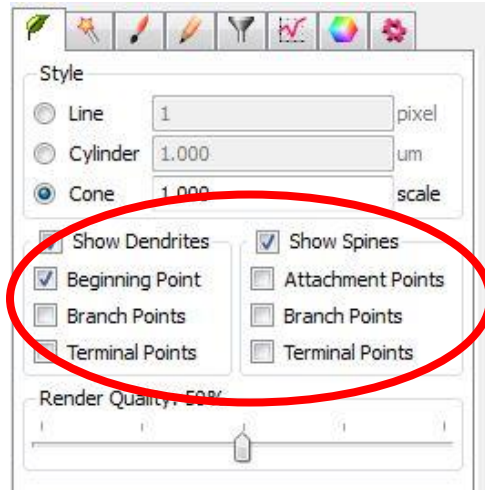
Semi-automatic

Torch View



FT

Filament Element Visualization

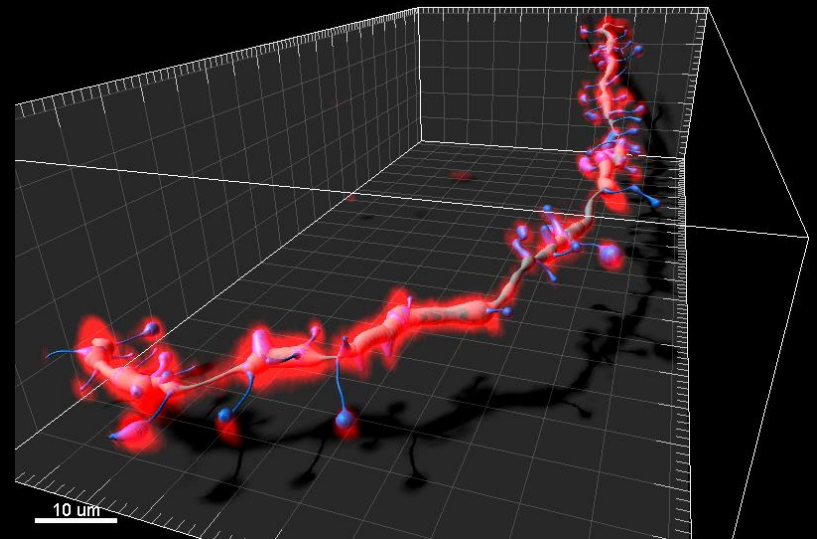
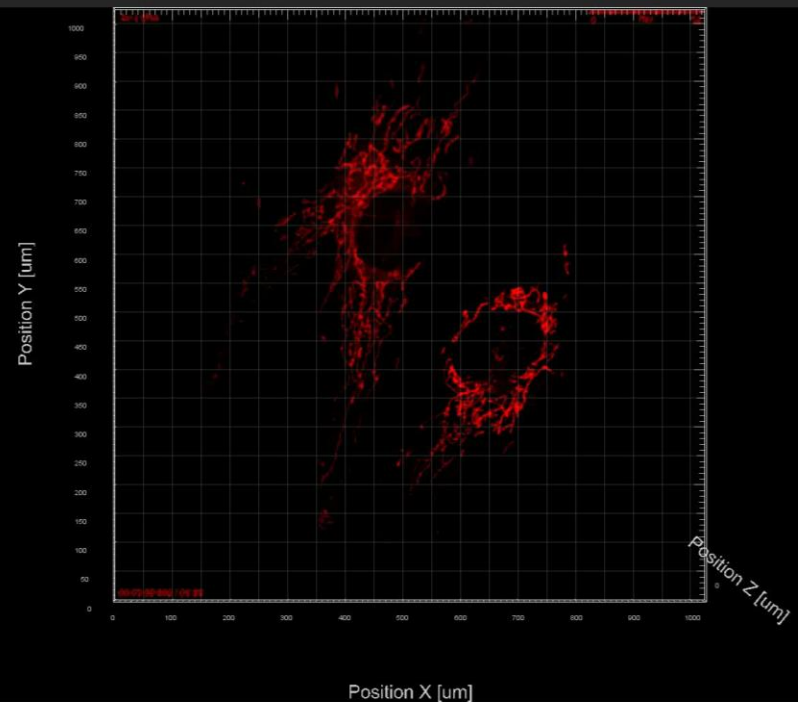


Statistics

Organized into ;

- Filaments
- Dendrites
- Points
- Spines

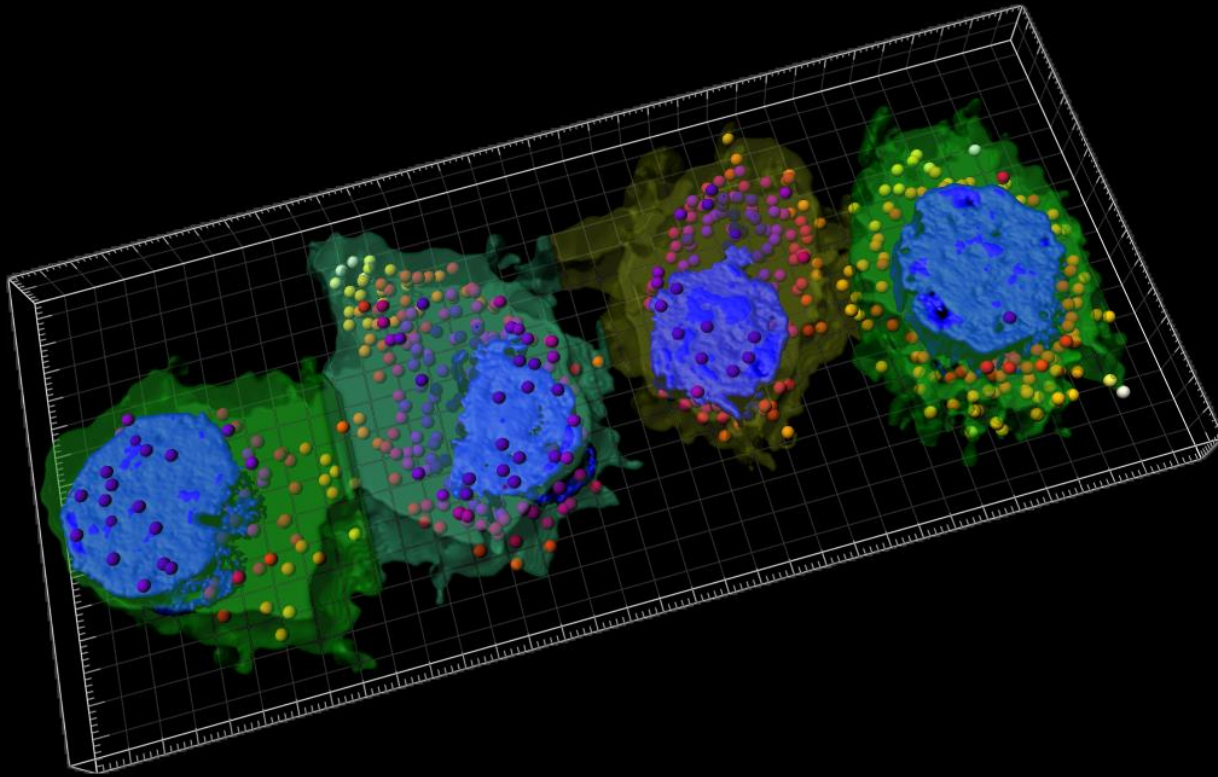
Such as length, diameter, volume, branching hierarchy, Sholl Analysis, spine density & morphology, filament tracking ...





Cell

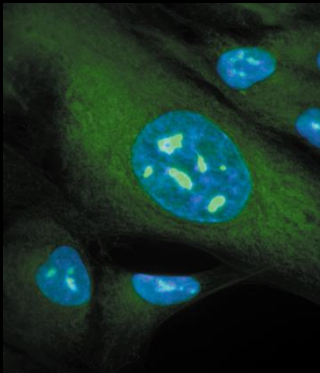
Automatic detection of Cells, Cell Membranes and Vesicles; analysis of data on a “per-Cell-basis”; study of intra cellular relationships...



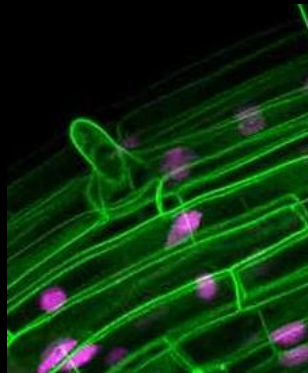
Detection modes



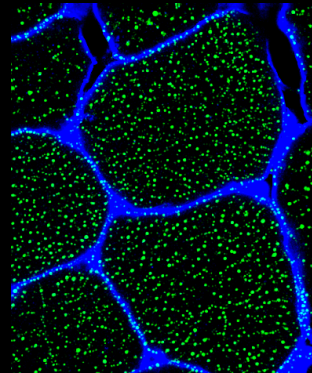
Cells, Nuclei and
Organelles



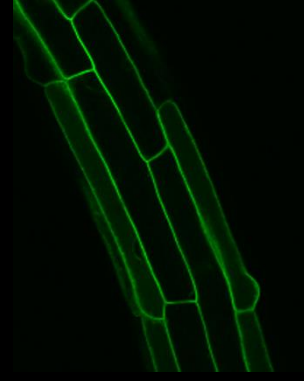
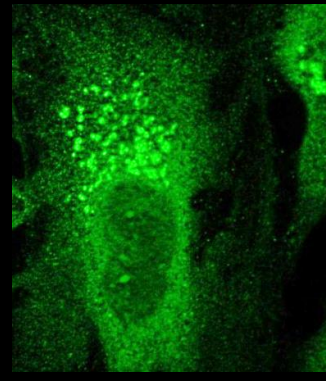
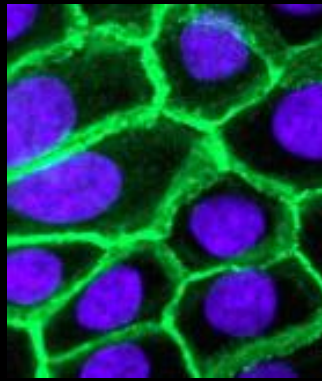
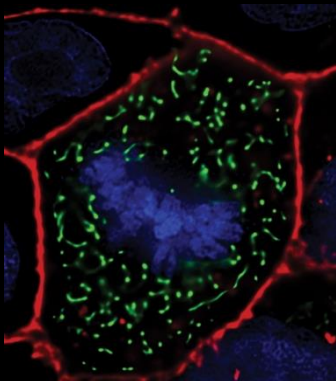
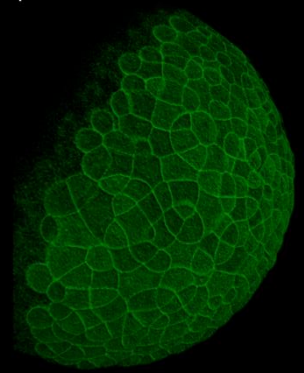
Cells and Nuclei



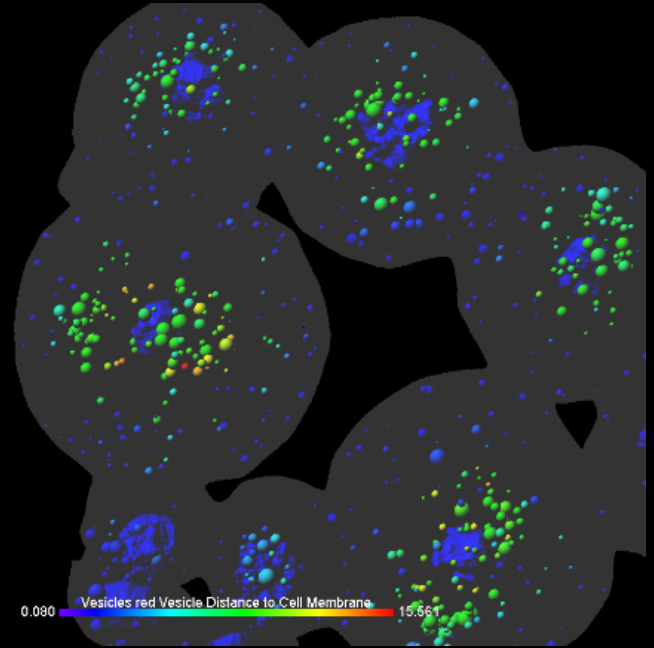
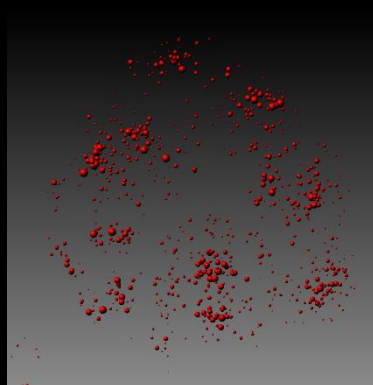
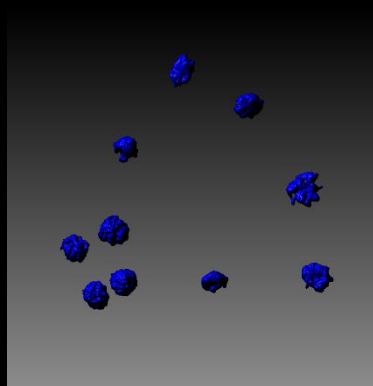
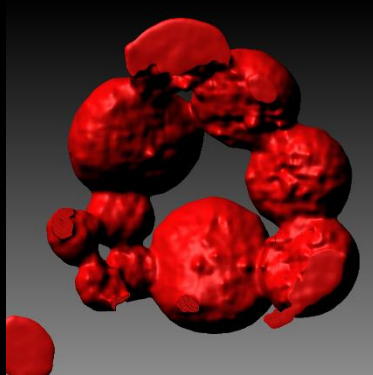
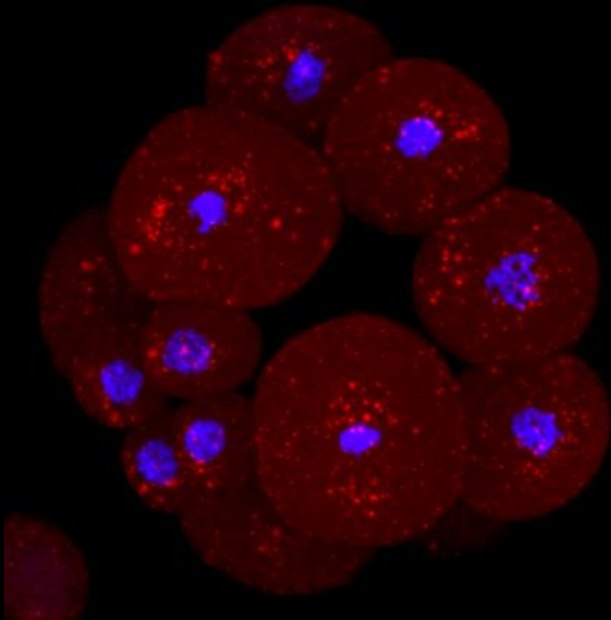
Cells and Organelles



Only Cells

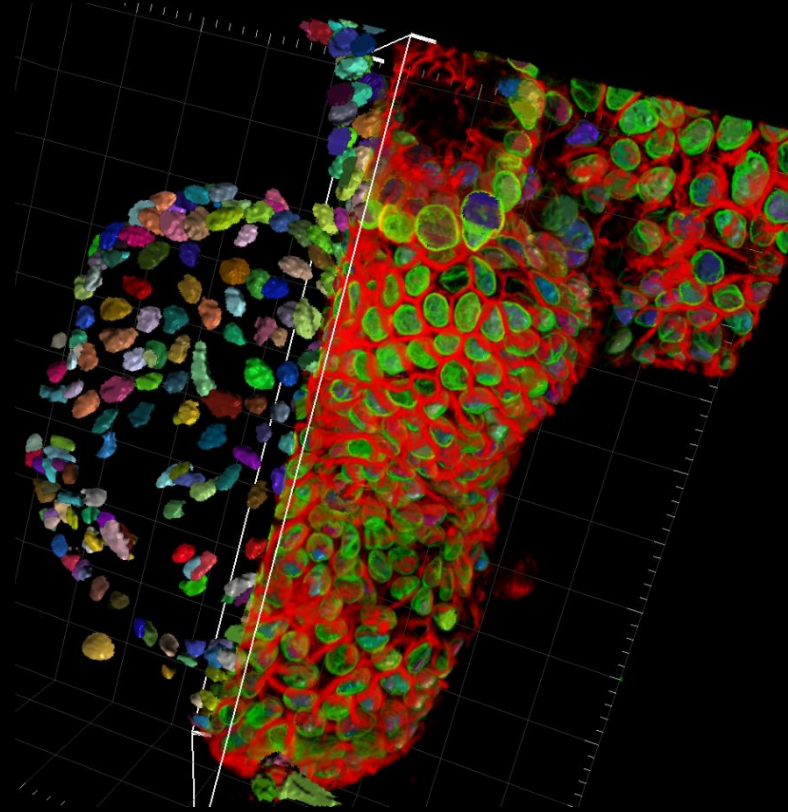
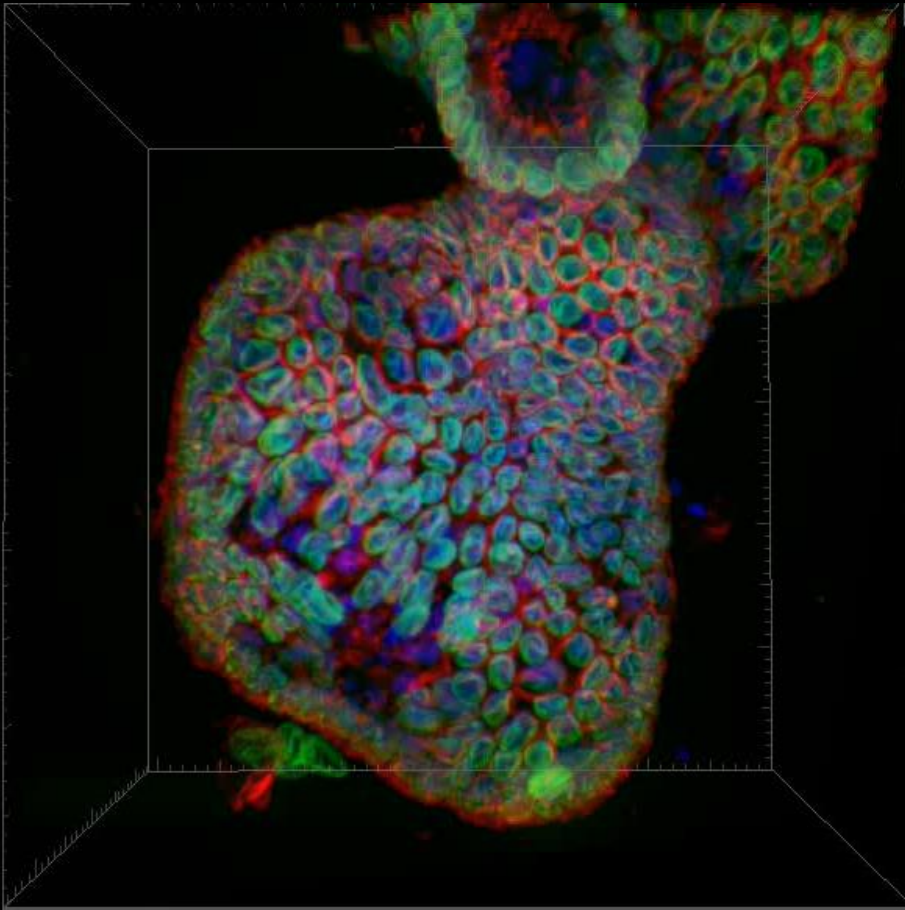


Cytoplasmic staining



Combines Surface and Spot models to automatically detects cells and their components

Membrane staining



Organoid, Dr Luke Boulter, Leverhulme Trust-Chancellor's Fellow, Principle Investigator, MRC Human Genetics Unit, Institute for Genetics and Molecular Medicine, University of Edinburgh.

Cell Statistics

Organized into :

- Cell
- Nuclei
- Vesicles

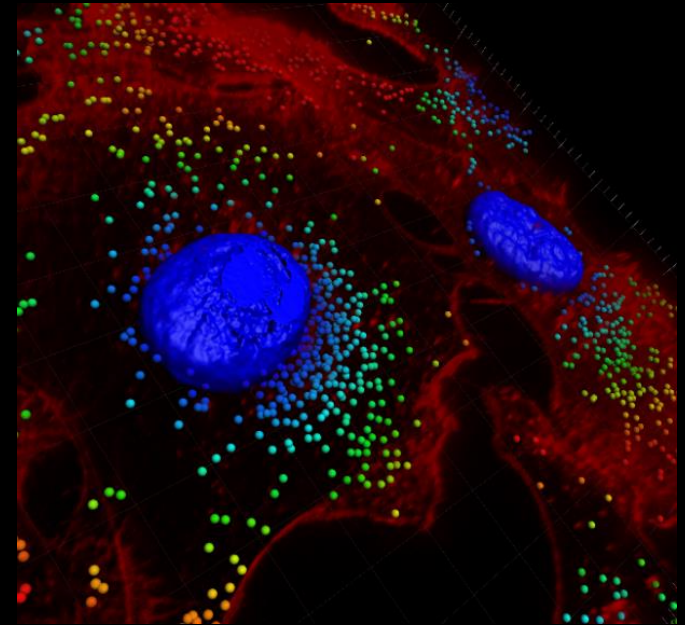
Counts

Volume, Area, Diameter

Position

Intensities

Morphology ...

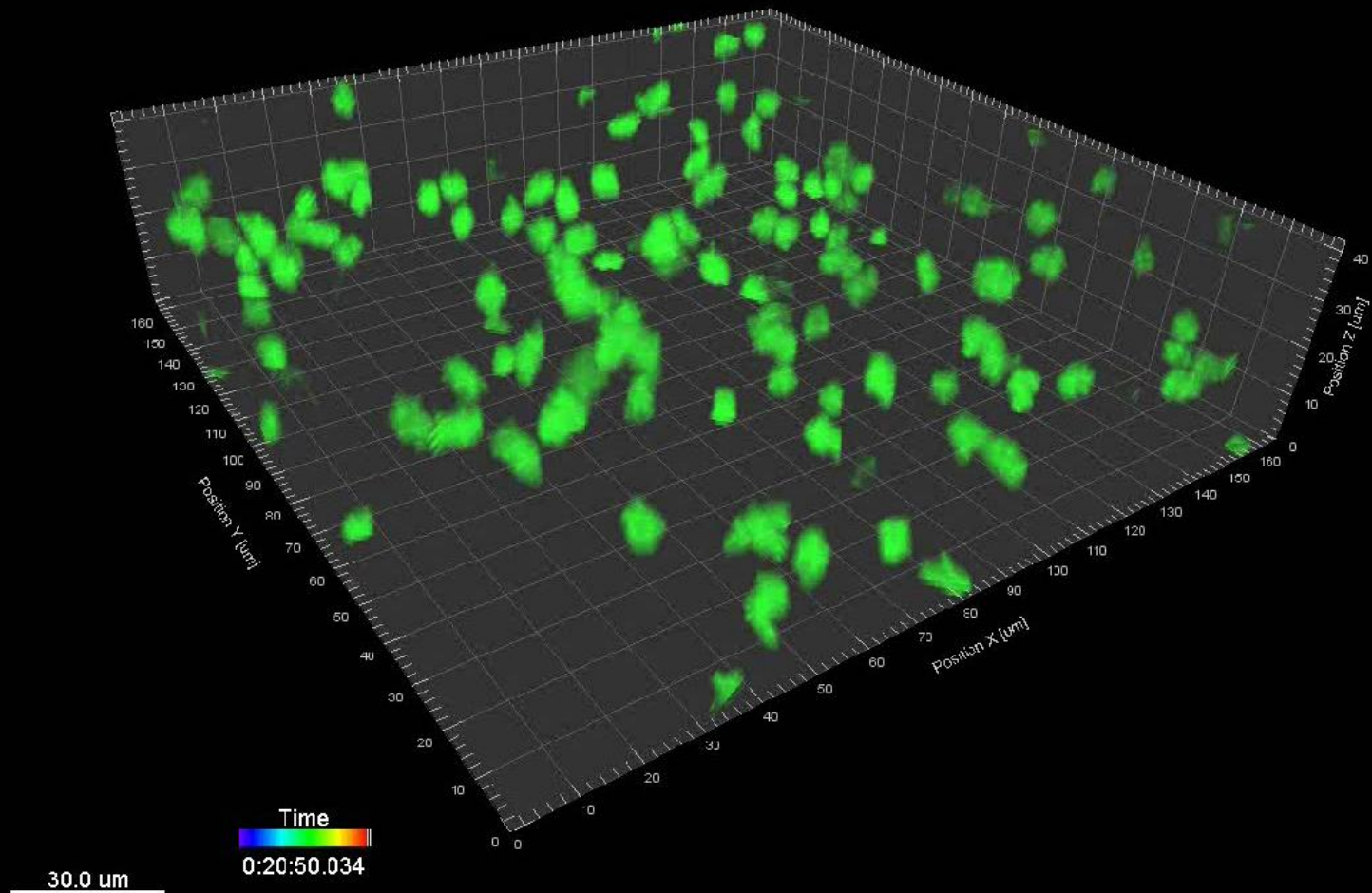


Vesicles colored according to
their distance
to the cell membrane

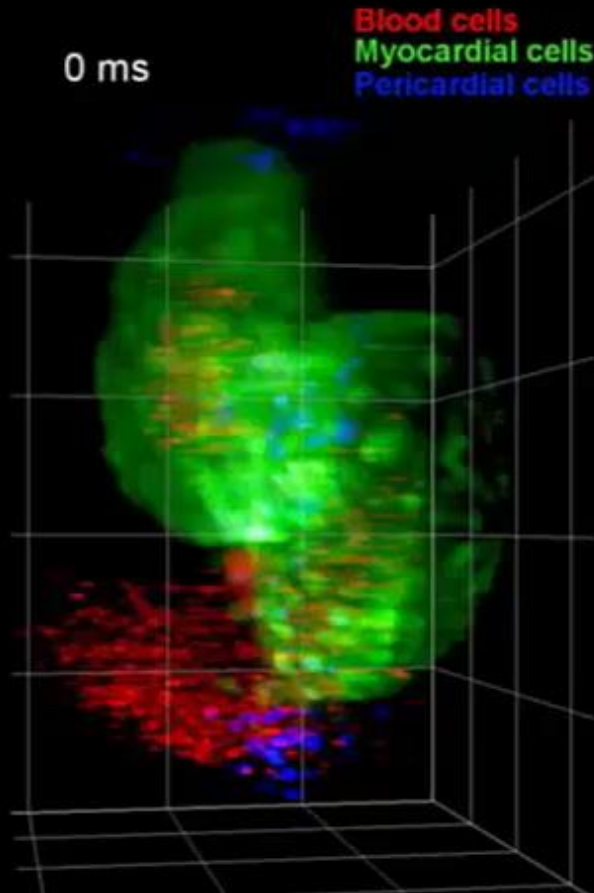


Lineage/Tracking

Lineage enables the study of cell lineages, including cell division detection
Tracking is the solution for 3D and 4D object tracking



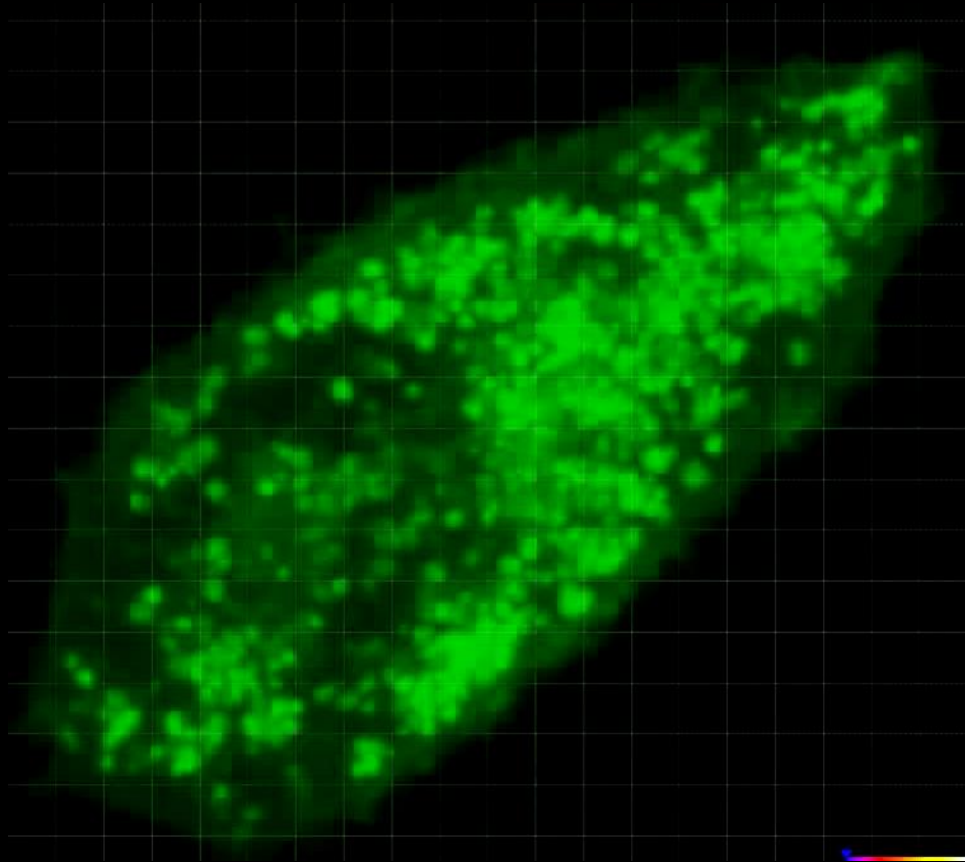
Different Algorithms



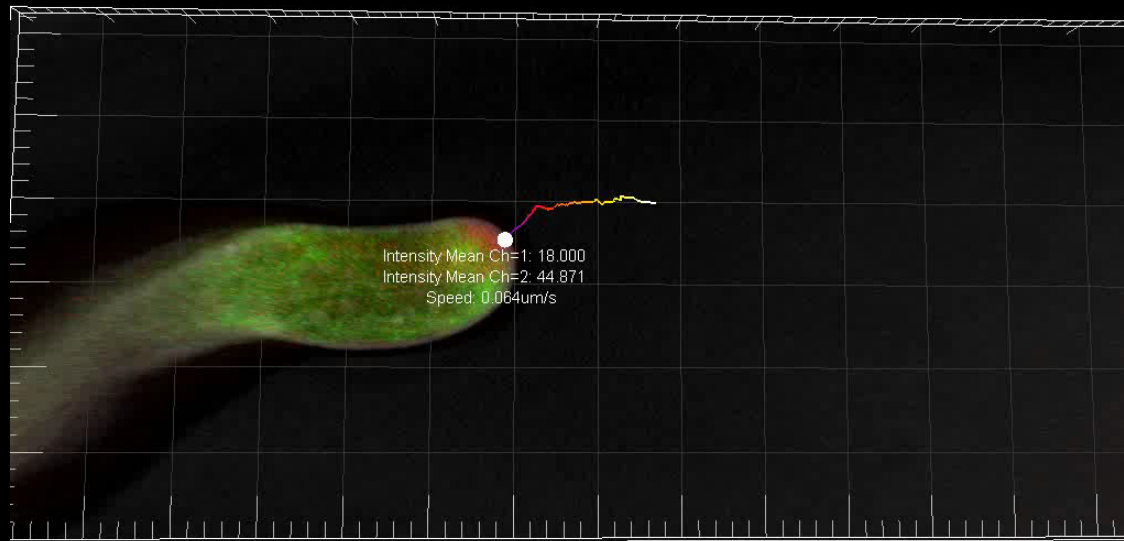
- Autoregressive
- Autoregressive Expert
- Connected Components
- Brownian Motion
- Lineage (standard, cells with space between them)
- Lineage (Maximum overlap)(Cell)

Image courtesy Willy Supatto, Laboratory for Optics and Biosciences, Ecole Polytechnique, Palaiseau

Autoregressive



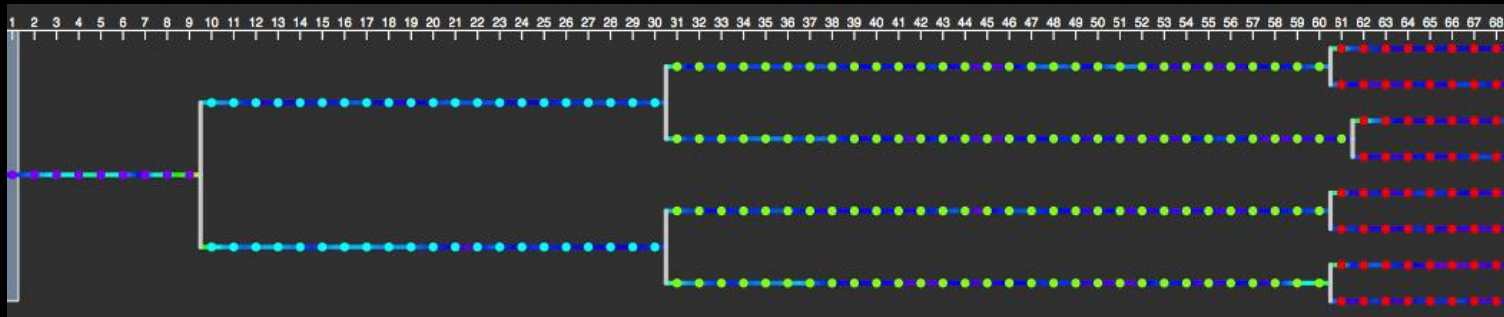
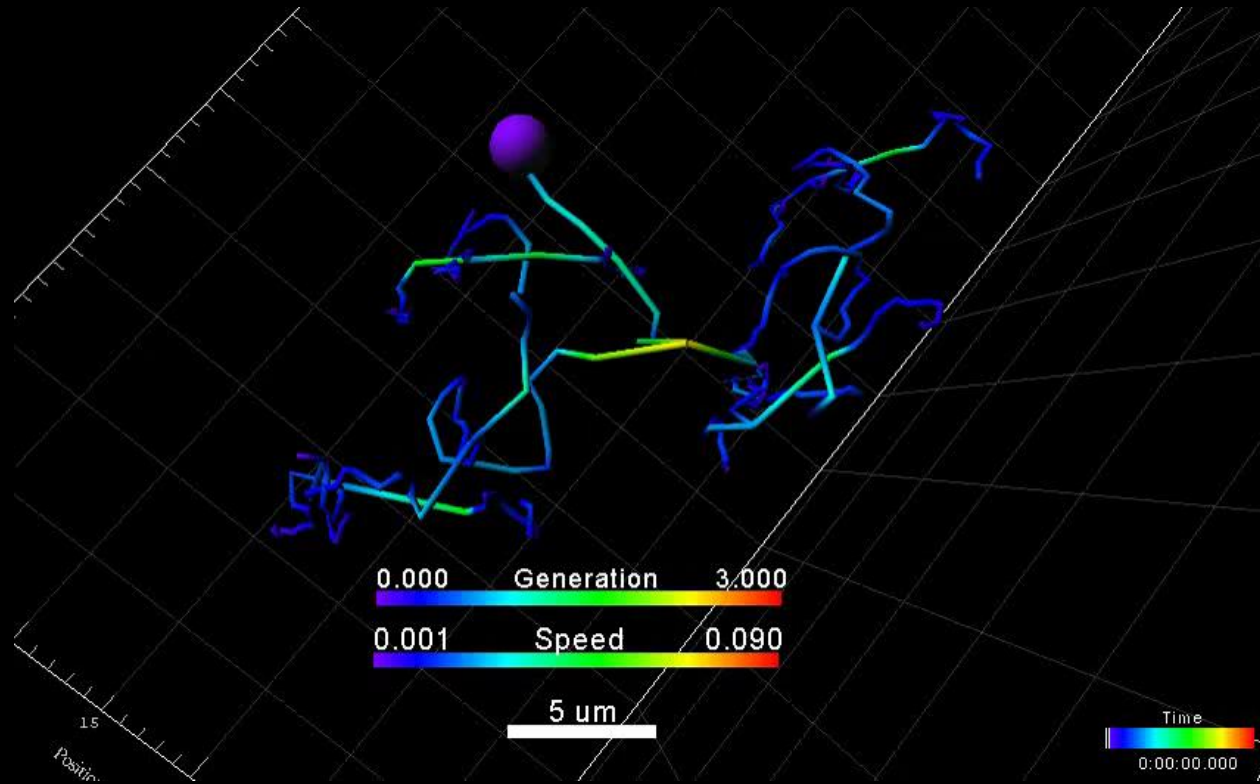
Connected Component



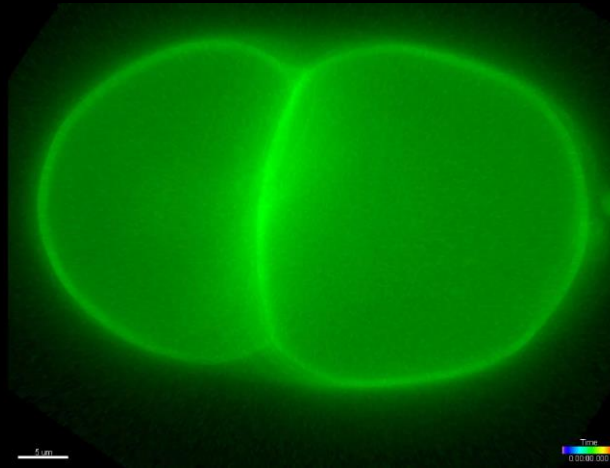
8 um
0d00:00:00.000

Time

Lineage Tracking - Standard



Lineage Tracking – Maximum Overlap

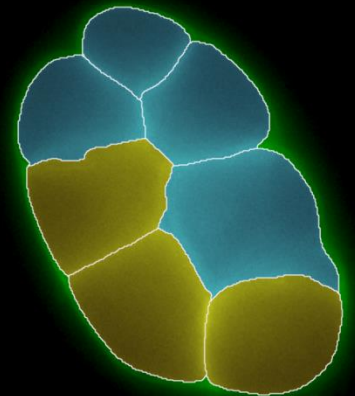
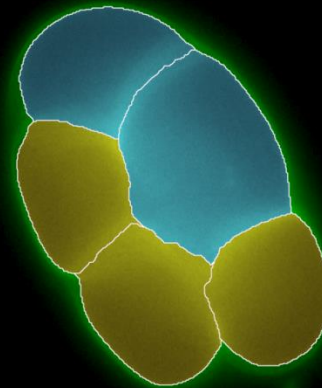
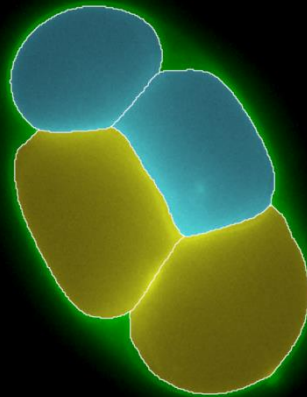
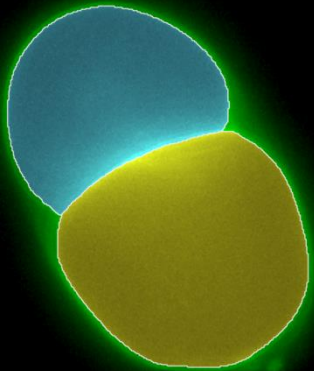


T1

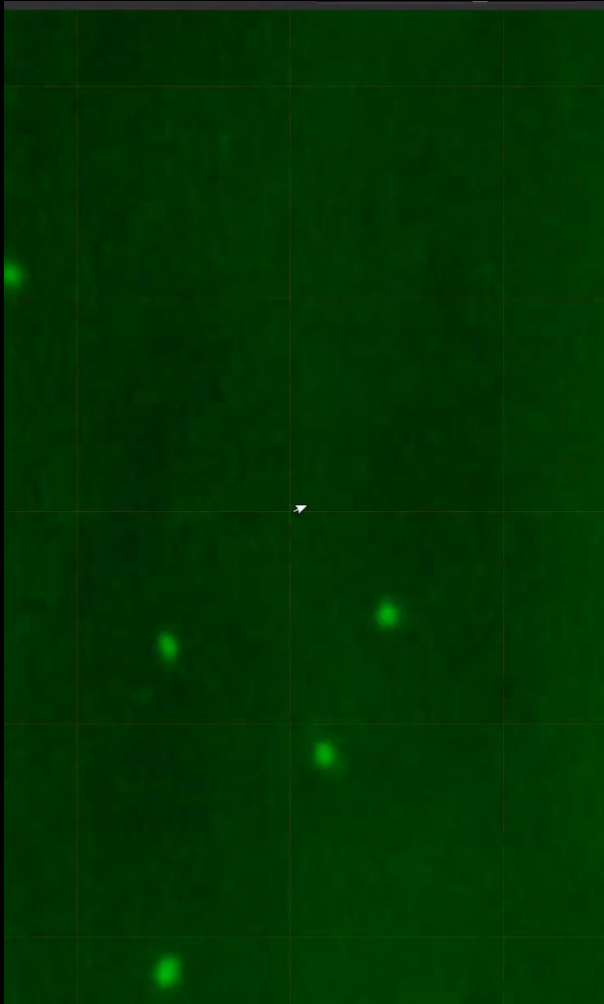
T10

T17

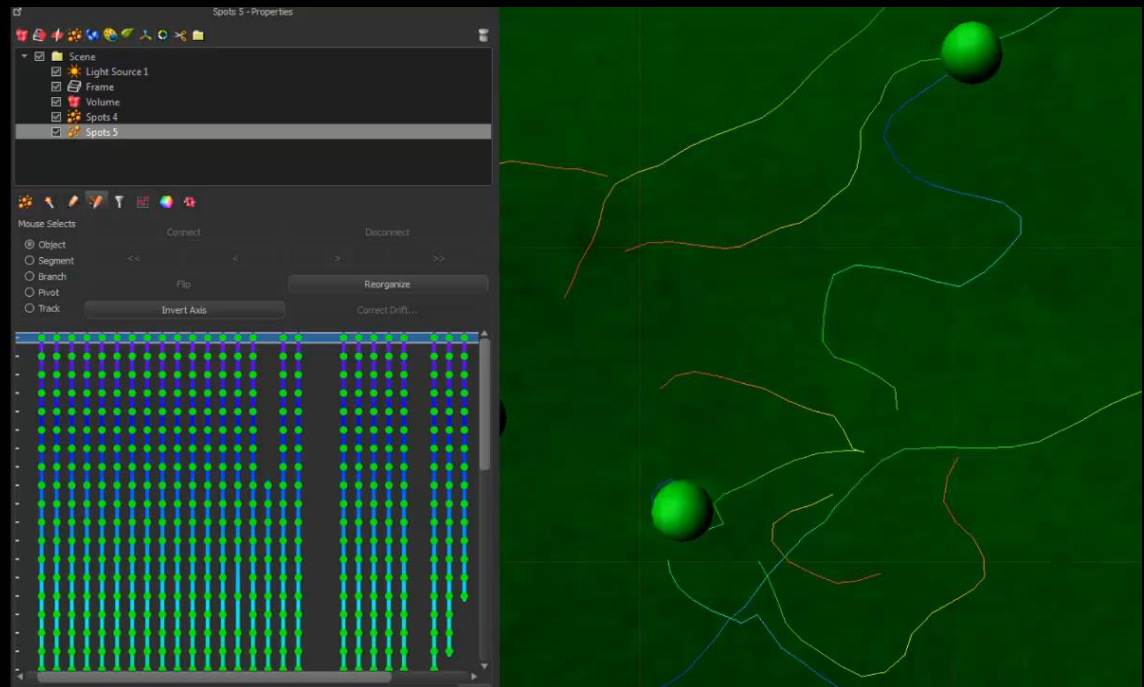
T21



Manual

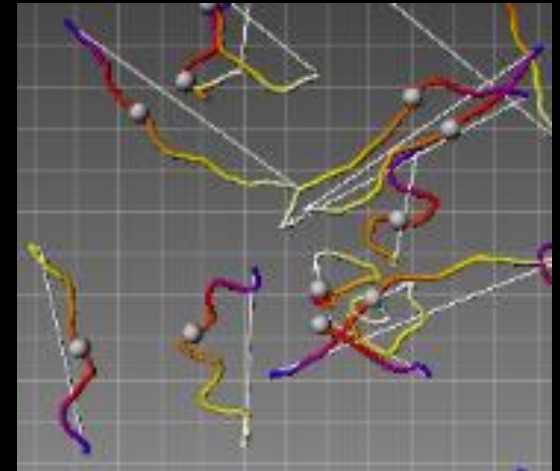


Edit



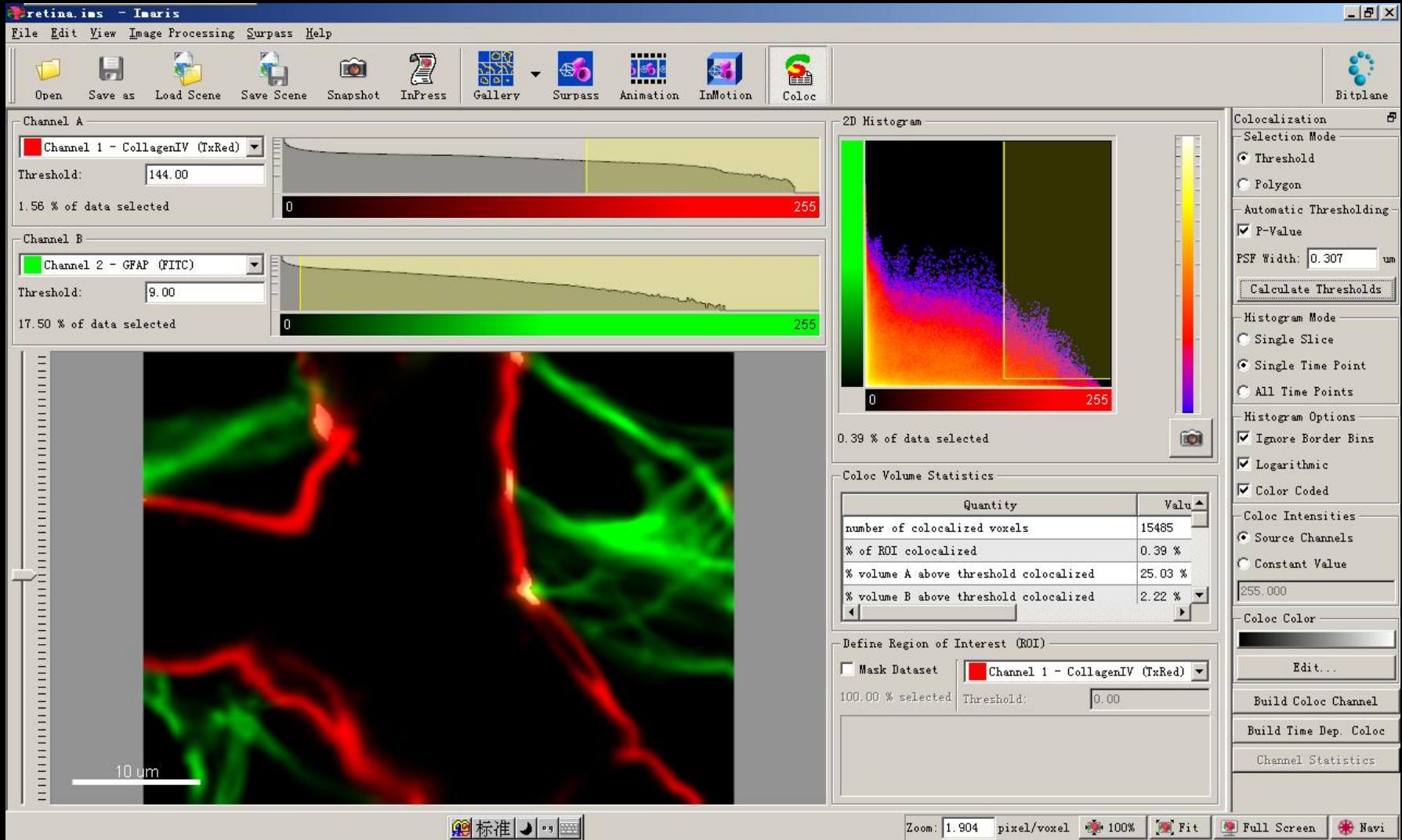
Statistics

- Track object properties over time (morphology, intensity, volume, position)
- Track length, duration, straightness
- Speed, acceleration
- Cell cycle / division (generation, time between divisions, etc...)
- Generation of Cell Lineage Trees

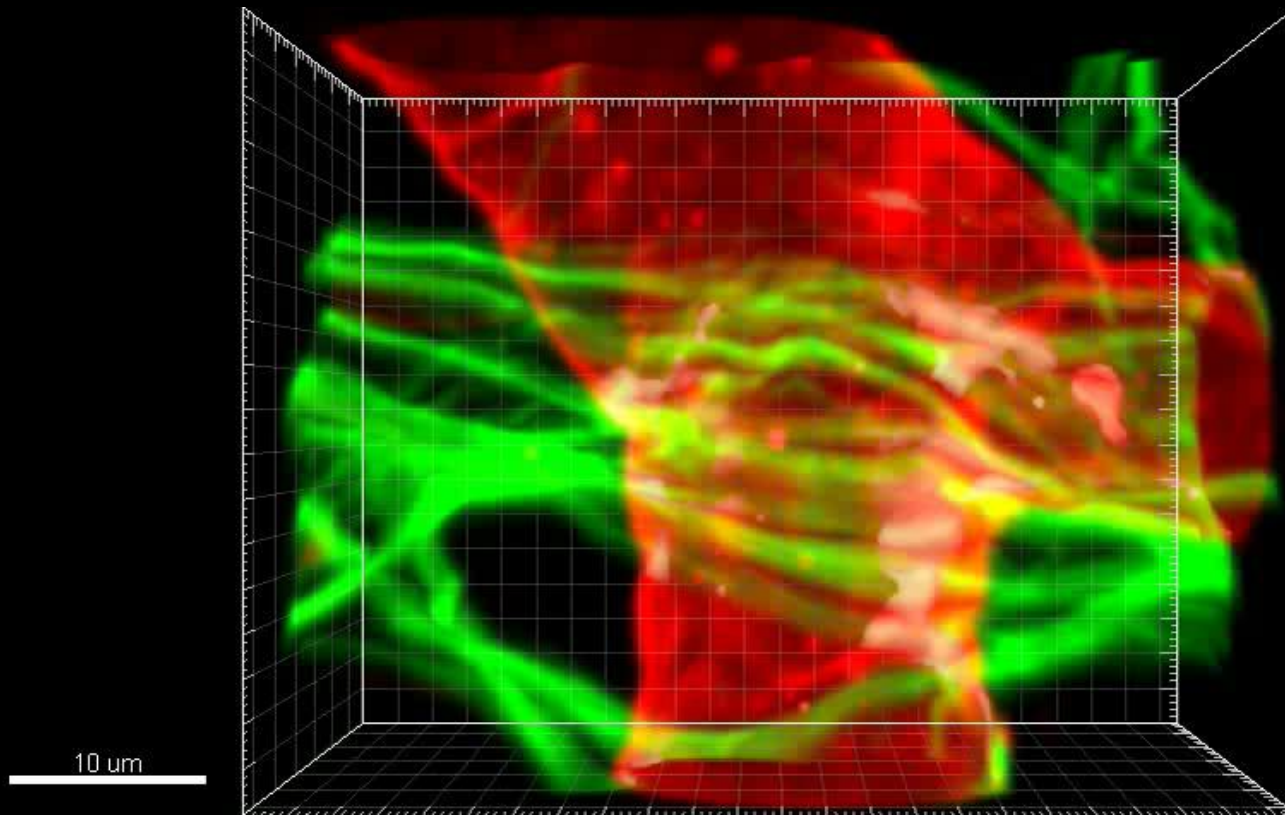


Colocalisation

- Co-localization in 2-D, 3-D and 4-D images
- Possible of >2 channels
- Histogram
- Intensity scaling



Colocalisation



- Calculate statistical parameters such:

Pearson Coefficient

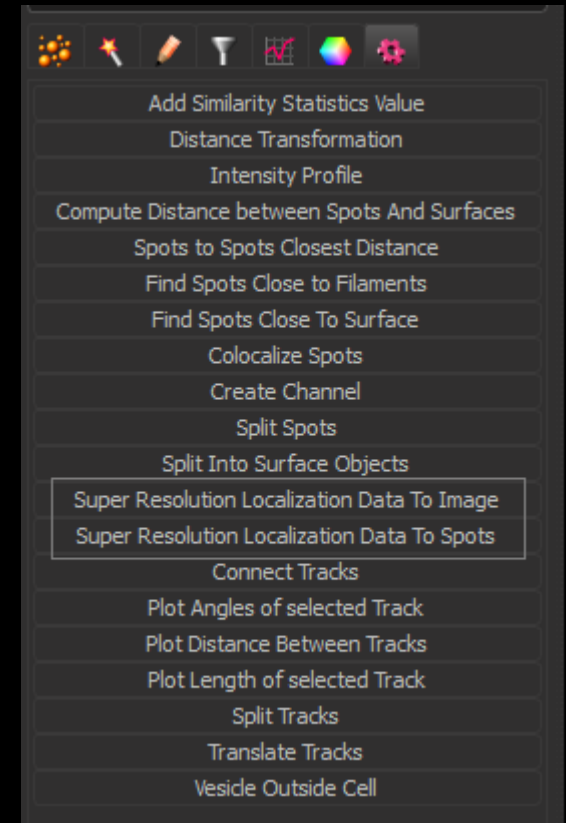
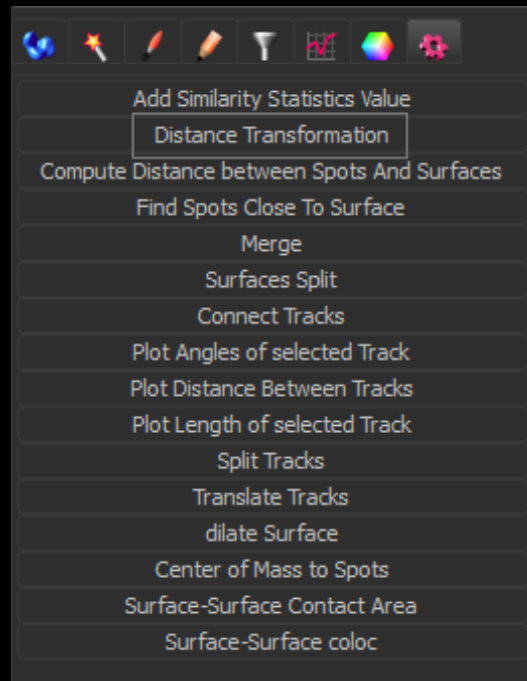
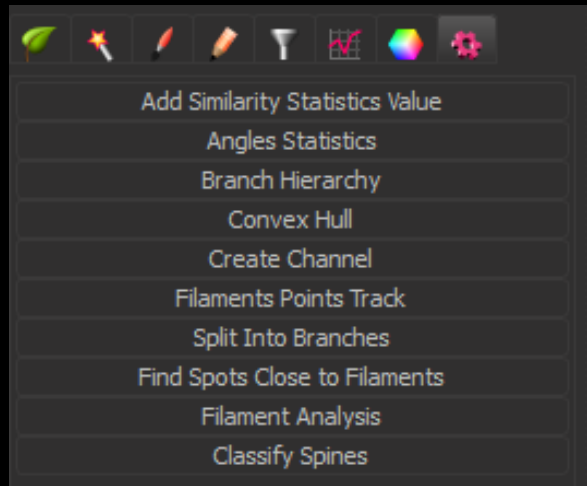
Manders Coefficient

% of Colocalization



Customisation (XTension)

- Incorporate your own Xtensions



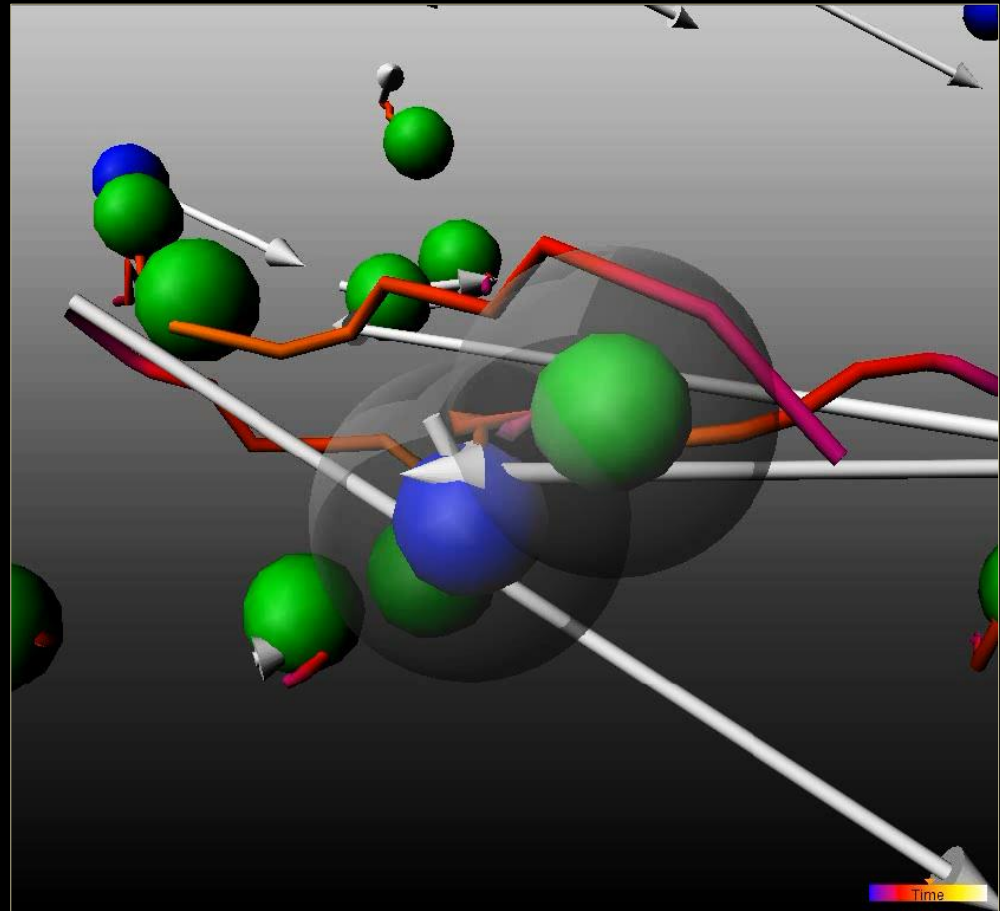
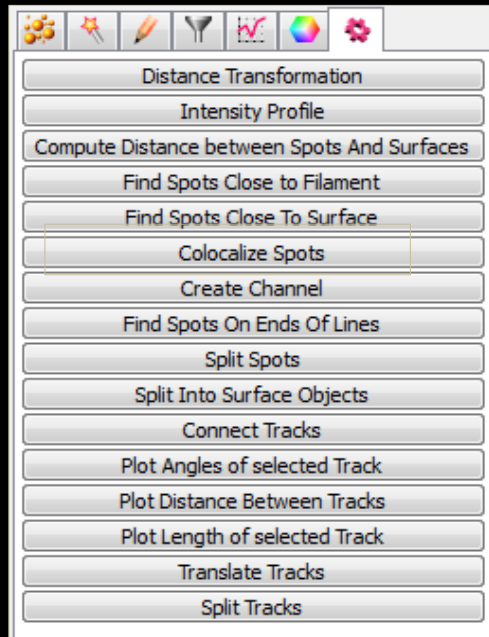
- Custom your analysis in:



C++

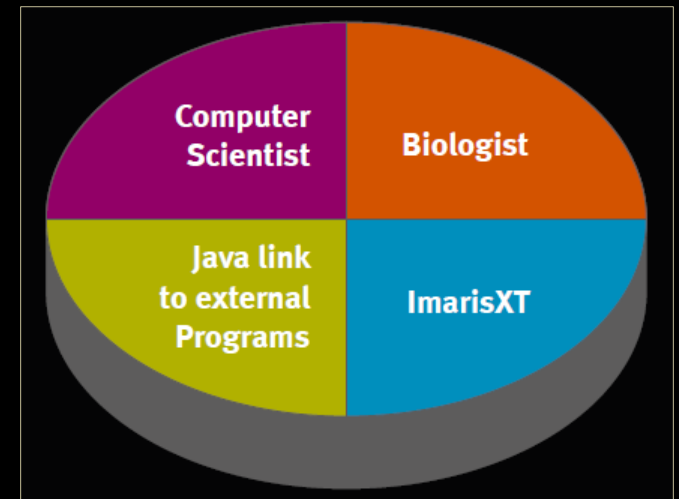
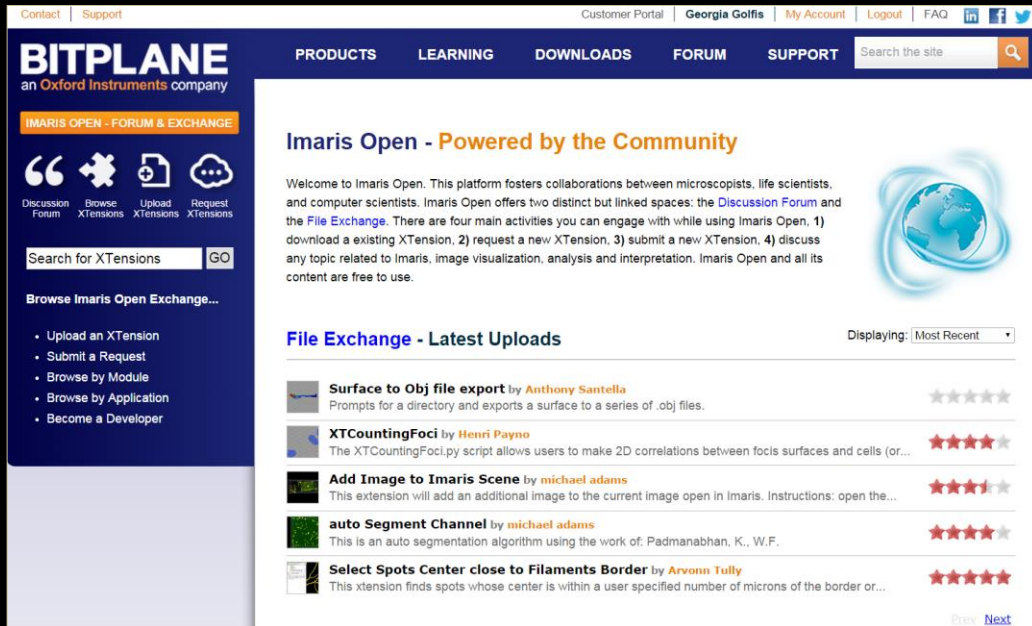


Xtensions : example Colocalize Spots

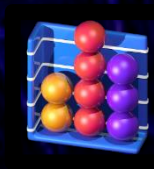


Share XTensions

- Offers source code of numerous XTensions to Imaris and allows researchers to share ...
- More than 40 XTensions already coded and fully editable

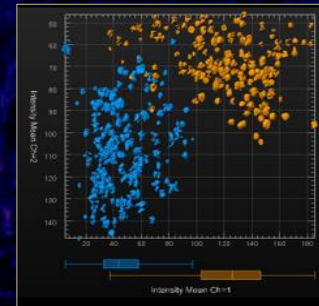
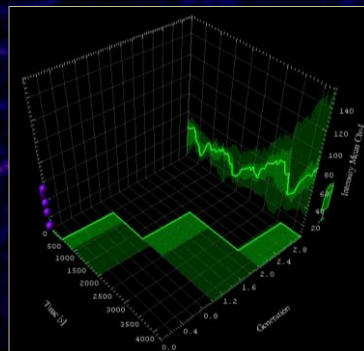
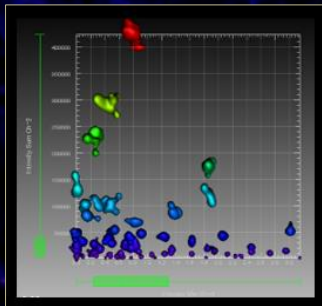
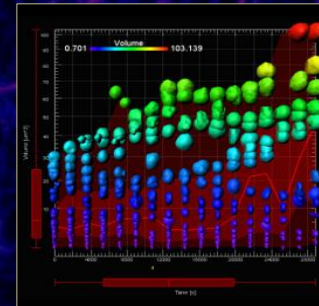
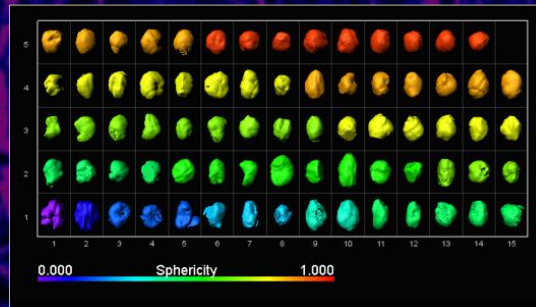
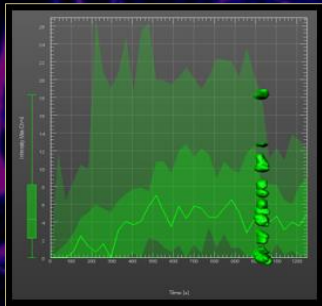


<https://imaris.oxinst.com/open/>

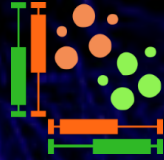


Interpret(Vantage)

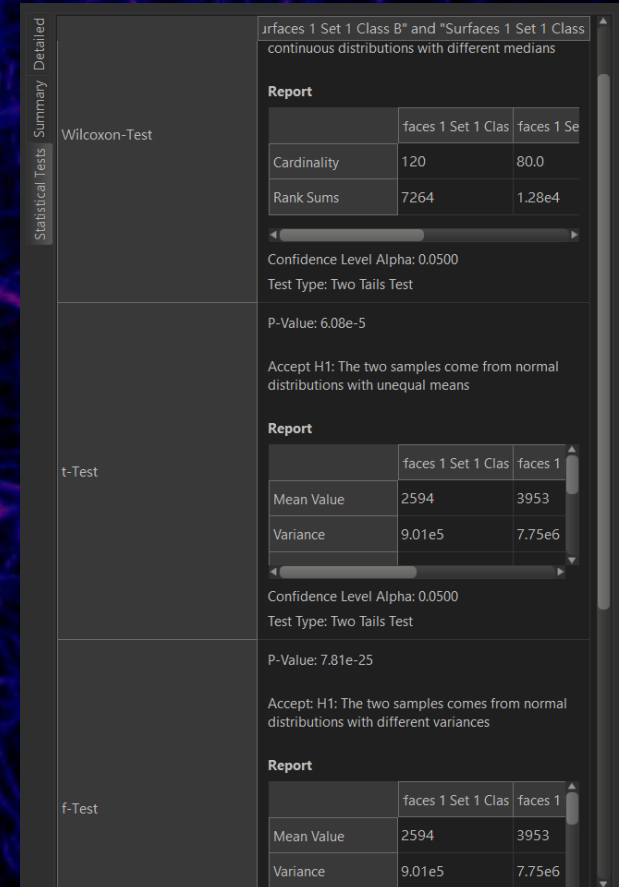
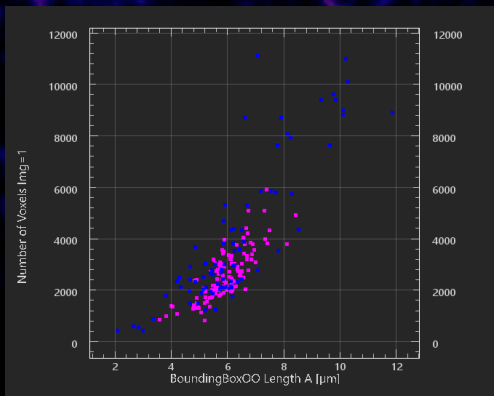
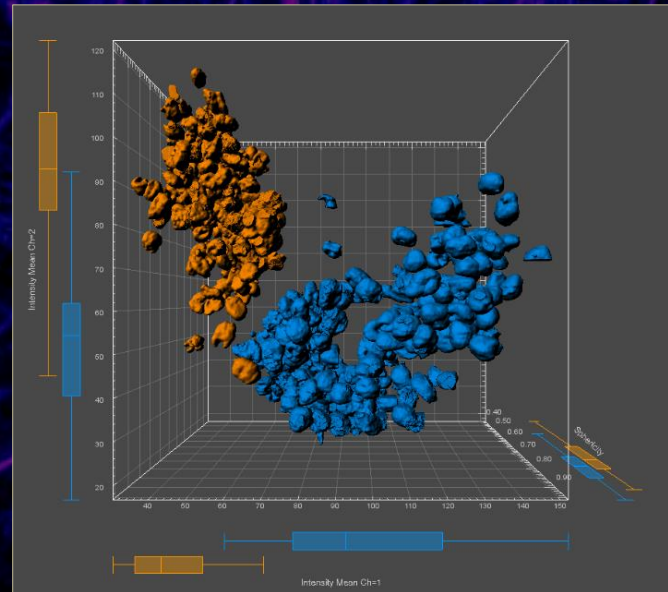
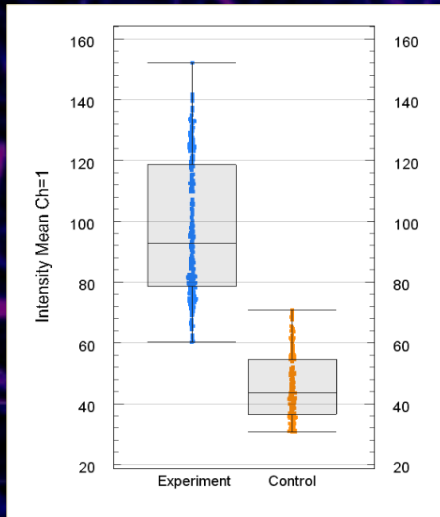
Allows users to interpret their results using interactive multi-dimensional plots



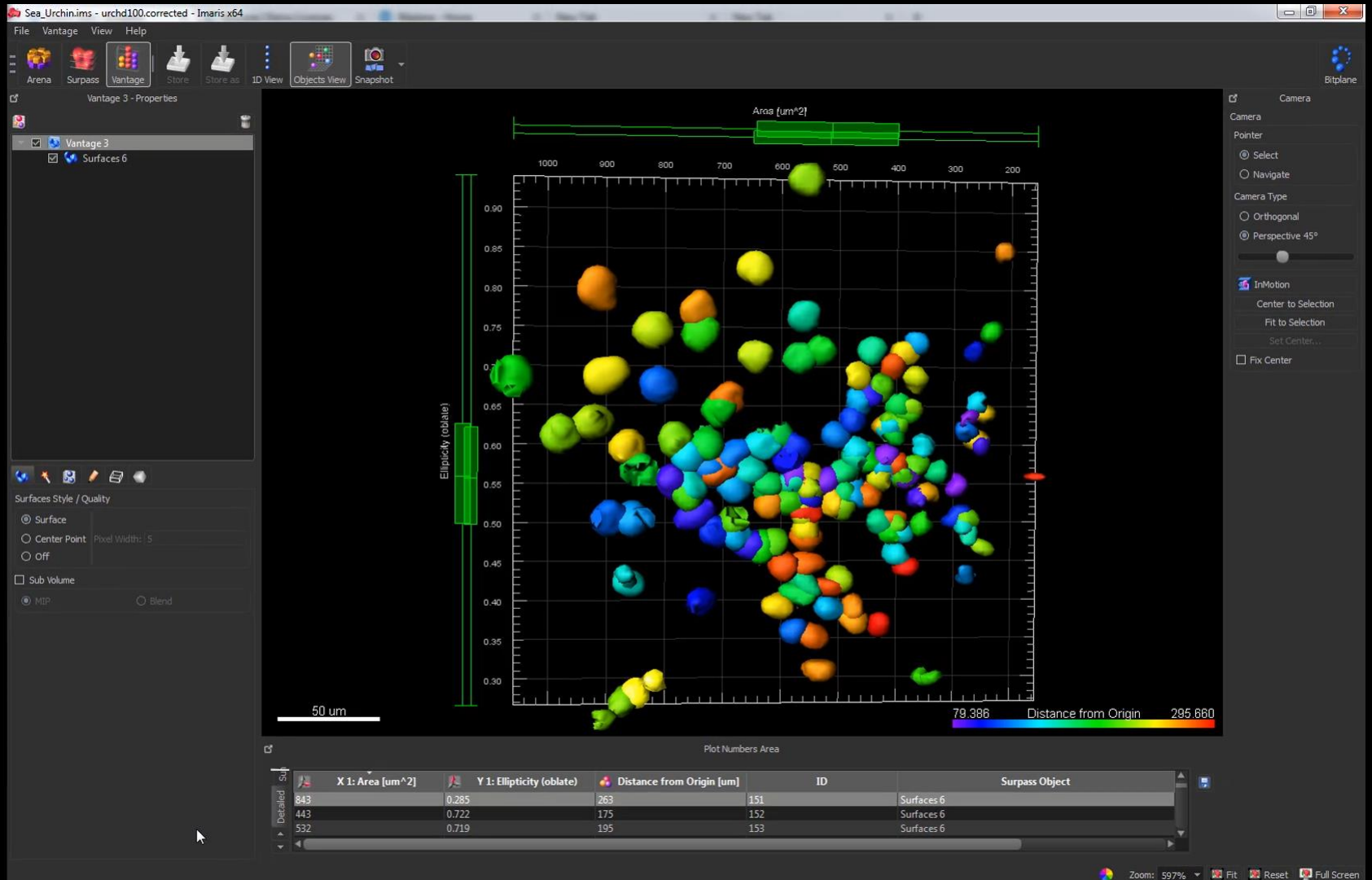
- t-test, f-test
- Wilcoxon test
- Kolmogorov-Smirnov test



Hypothesis Testing



Data Plotting



Microscopy Image Browser - ARENA

**IMARIS**

Direct integration of Batch and Image processing, including Deconvolution

Extraction of metadata

Control center for File conversion and Batch process

Folders mirrored from OS file system

Works with:

- Local Systems
- External Drives
- Network Drives

- Automatic detection of all microscopy image files.
- Quick Thumbnail generation for individual datasets from multi-image files
- One Thumbnail for .tiff stacks
- Hide or remove files from Arena and/or drive

The interface includes a menu bar (File, Arena, View, Help), a toolbar with icons for Arena, Surpass, Vantage, Observe Folder, New Folder, New Batch, and New Plot. The left sidebar shows a tree view of folders mirrored from the OS file system, including C:\Users\Anna De...aris Demo Image, F:\, G:\, H:\, Camtasia, Hamburg data, Japanese Dfly Data, KosiceGliomaCells, MiFoBio 2016, Montpellier, PASTEUR, 2017-03-10, 2017-03-15, 2017-03-16, 2017-03-17, Photos, Seagate, Start_Here_Mac.app, System Volume Information, Tutorials, and Weizmann. The main area displays a grid of image thumbnails, with a selected file '2017-03-16_16.59.43_Sample Prefix_BMWMS62_Protocol_F02.ims' highlighted. The right panel shows the 'Properties' tab for the selected file, displaying metadata such as File Location, Name, Description, FileFormat, DataType, Size, TimePoints, VoxelSize, MB Total, and Channel information. The bottom right panel shows the 'Batch Jobs' section, indicating a finished batch process for the selected file.

Batch processing in Arena

The screenshot displays the Arena software interface for batch processing. The top menu bar includes File, Arena, View, and Help. The toolbar contains icons for Arena, Surpass, Vantage, Observe Folder, New Folder, New Batch, and New Plot. The main workspace shows a folder tree on the left with 'Batch example' expanded, containing 'control' and 'treatment' subfolders. The central area displays a workflow diagram with three steps: 'control' (yellow folder icon), 'treatment' (yellow folder icon), and a sequence of three image processing steps: 'Green Nuclei.icsx' (blue arrow), 'Median Filter.icsx' (green arrow), and 'Red marker.icsx' (blue arrow). The right sidebar shows 'Nothing selected' and 'Folder Batch History'. The bottom right panel, 'Global Queues', lists the batch jobs with their source and destination paths.

File Arena View Help

Arena Surpass Vantage Observe Folder New Folder New Batch New Plot

Observed Folders

C:\Users\Anna Dell\Downloads
C:\Users\Anna Dell\Imaris Demo Images
 Batch example
 control
 treatment
F:\
F:\Developmental biology datasets
G:\
I\

control treatment Green Nuclei.icsx Median Filter.icsx Red marker.icsx

Nothing selected

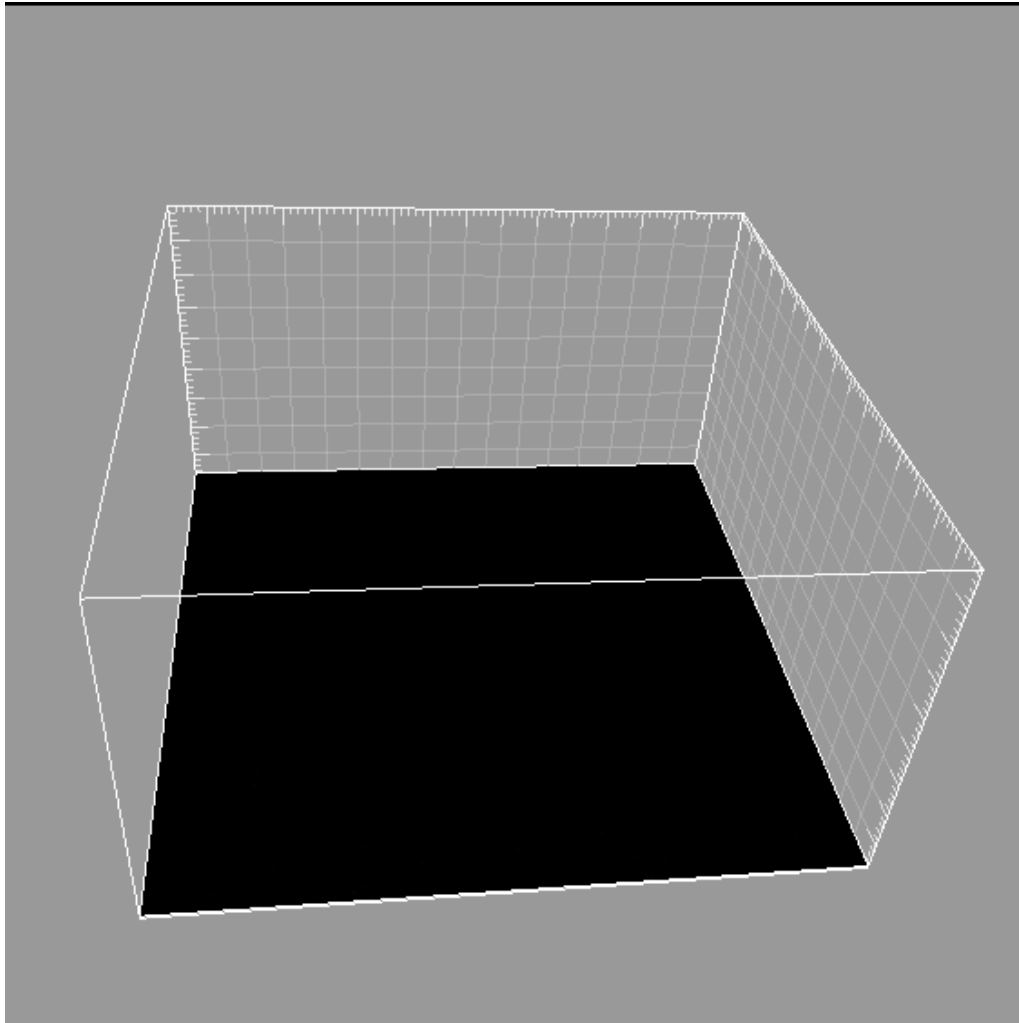
Folder Batch History

Global Queues

Batch Jobs File Conversion File Copy / Move

Item	Source	Destination
Green Nuclei.icsx	C:\Users\Anna Dell\Imaris Demo Images\control	C:\Users\Anna Dell\Imaris Demo Images\Batch example
control	C:\Users\Anna Dell\Imaris Demo Images	C:\Users\Anna Dell\Imaris Demo Images\Batch example
treatment	C:\Users\Anna Dell\Imaris Demo Images	C:\Users\Anna Dell\Imaris Demo Images\Batch example
Green Nuclei.icsx	C:\Users\Anna Dell\Imaris Demo Images	C:\Users\Anna Dell\Imaris Demo Images\Batch example
Median Filter.icsx	C:\Users\Anna Dell\Imaris Demo Images	C:\Users\Anna Dell\Imaris Demo Images\Batch example
Red marker.icsx	C:\Users\Anna Dell\Imaris Demo Images	C:\Users\Anna Dell\Imaris Demo Images\Batch example

Batch Runs: Idle File Conversion: Idle Zoom: Small Icons



Thank you!



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