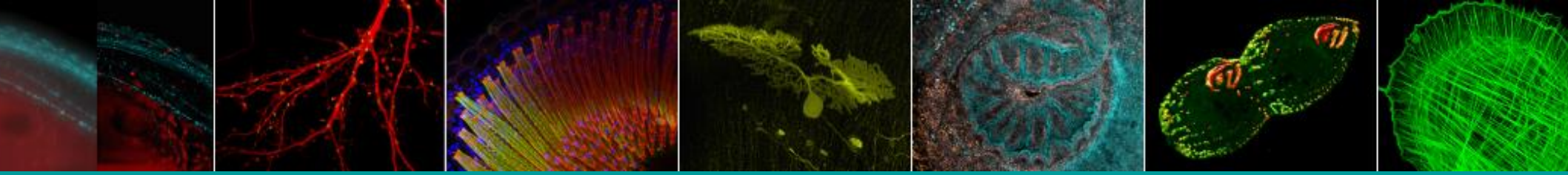

Scientific Volume Imaging (SVI)

About us

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Frans van der Have, PhD
Developer
frans@svi.nl

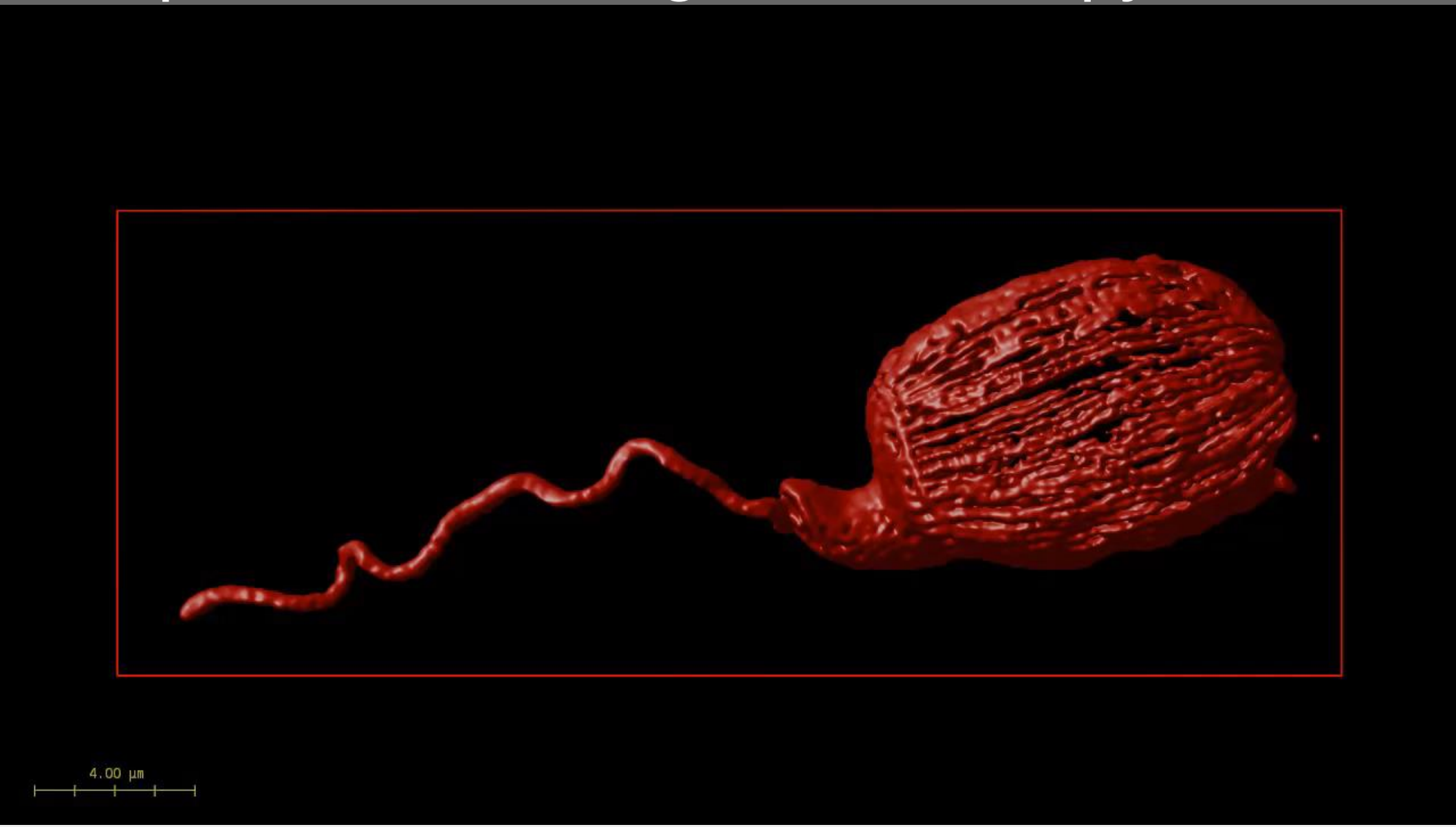
Scientific Volume Imaging

Deconvolution – Visualization - Analysis

Huygens Software

Light Microscopy

Super-resolution light-microscopy

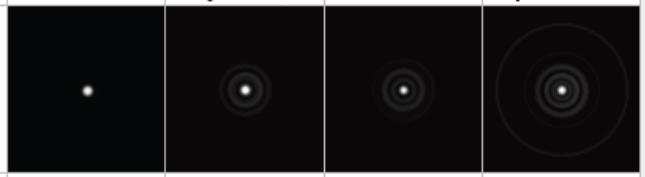


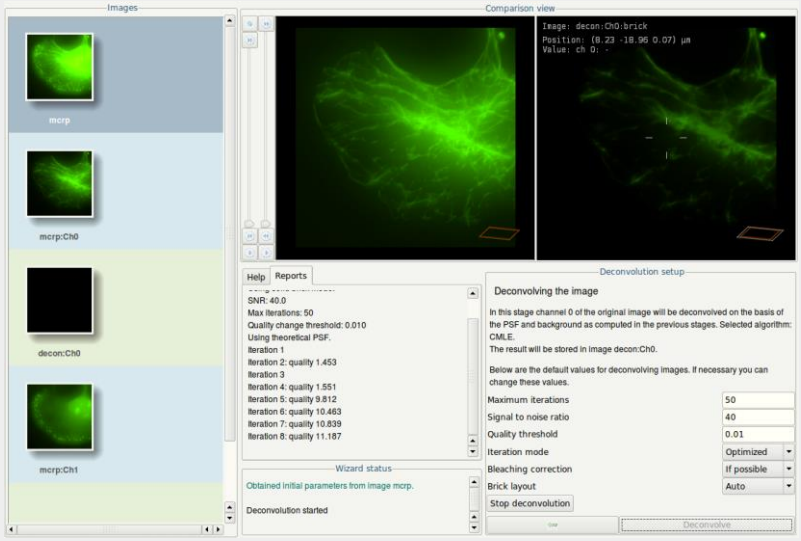
Huygens

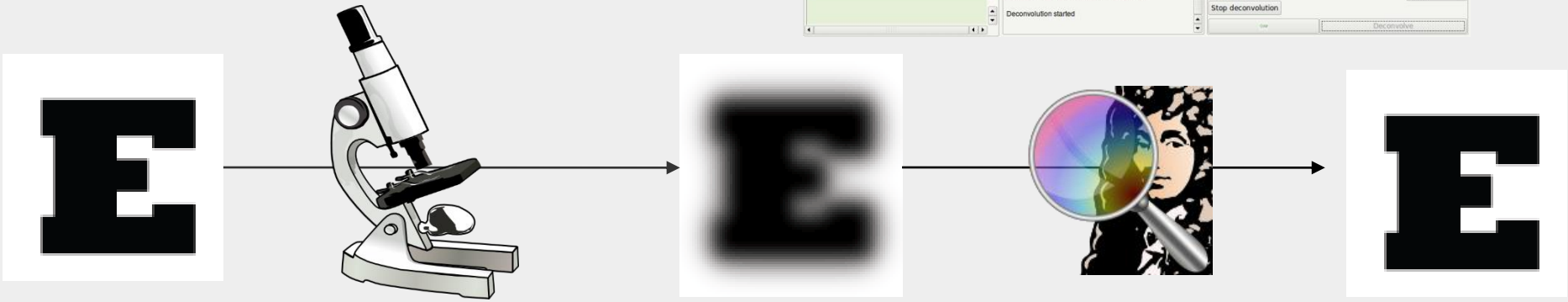
Isaac Newton (1642-1725)

Christiaan Huygens
(1629-1695)

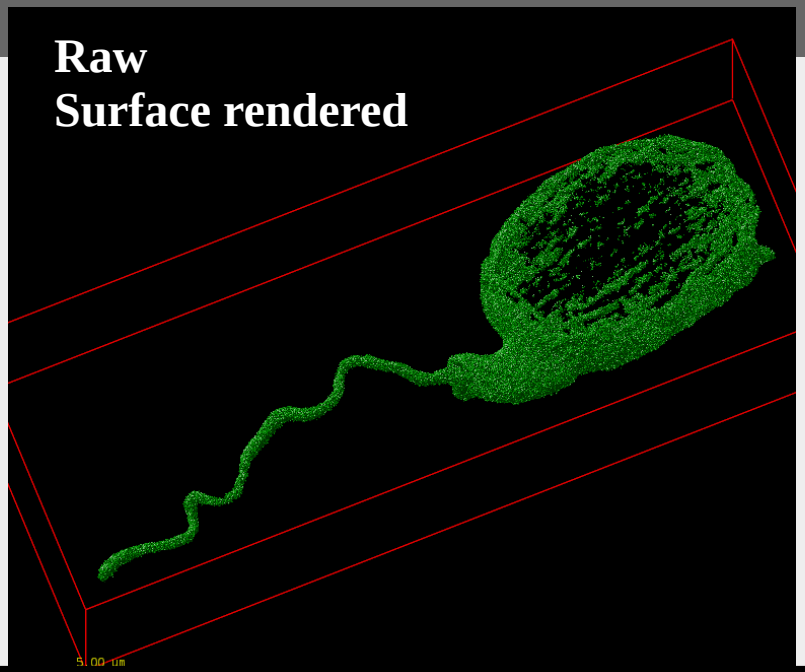
Deconvolution

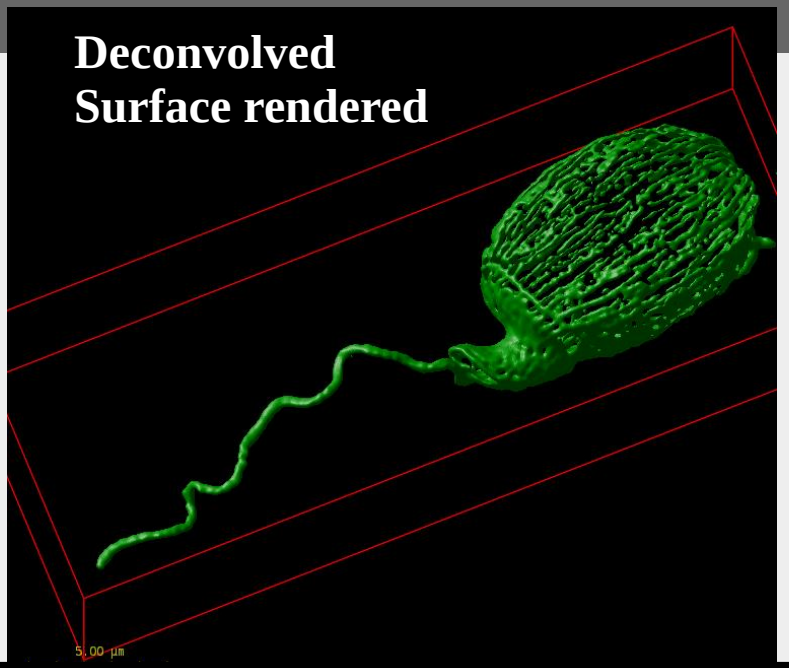
Lens	TECNIS® Lens	AcrySof** IQ IOL	B&L LI61AO IOL	Spherical IOL
Point Spread Function*†				
20/20*				
Average Corneal SA	+.27	+.27	+.27	+.27
Lens SA††	-.27	-.17	0.0	+.15
Total Residual SA	**0.0**	**+.10**	**+0.27**	**+0.42**



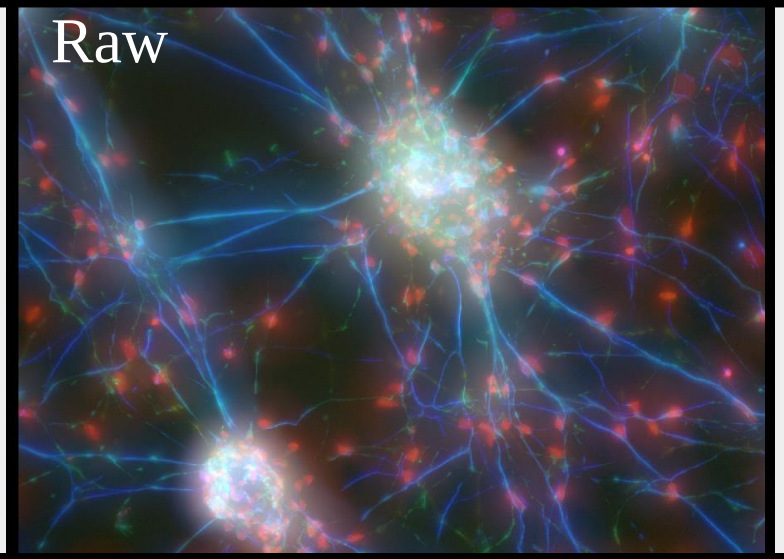


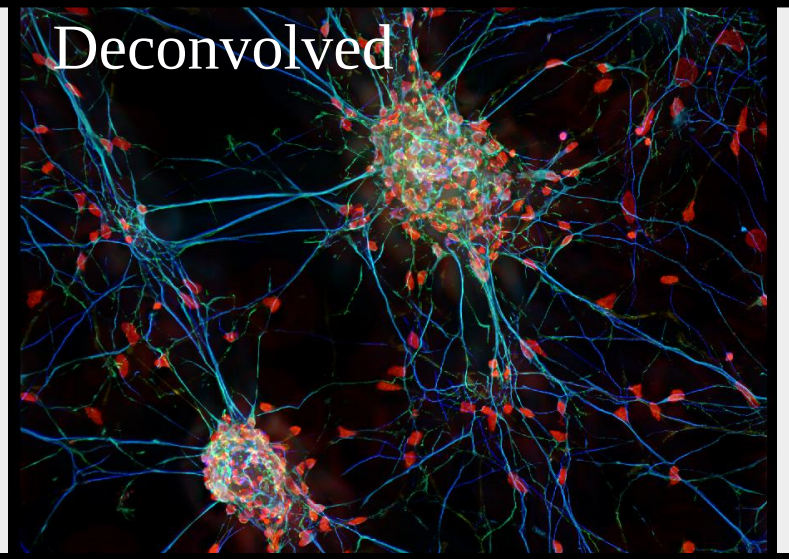
Deconvolution





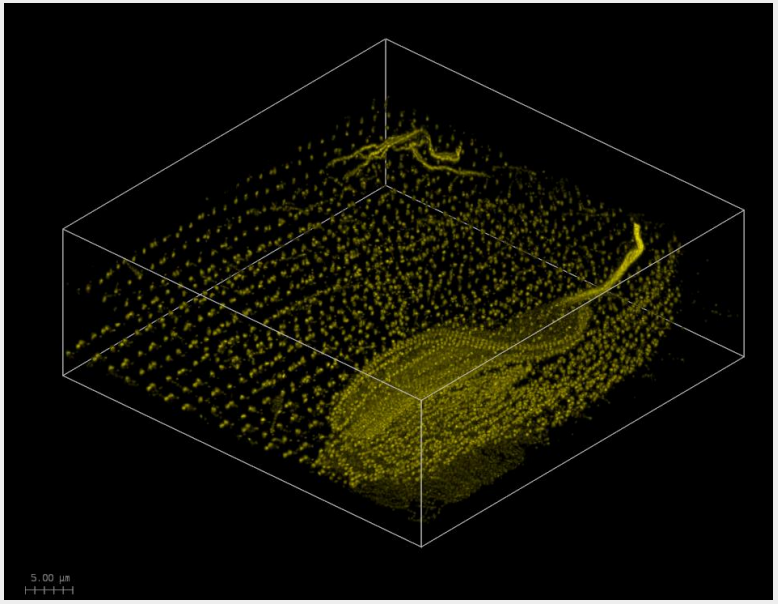
Microtubular staining after methanol fixation using a primary antibody against a Tubulin and an Oregon Green 488 conjugated secondary antibody.
Image acquired by: Elisa Berdalet, CSIC Institute of Marine Sciences/Timo Zimmermann, Center for Genomic Regulation, Barcelona

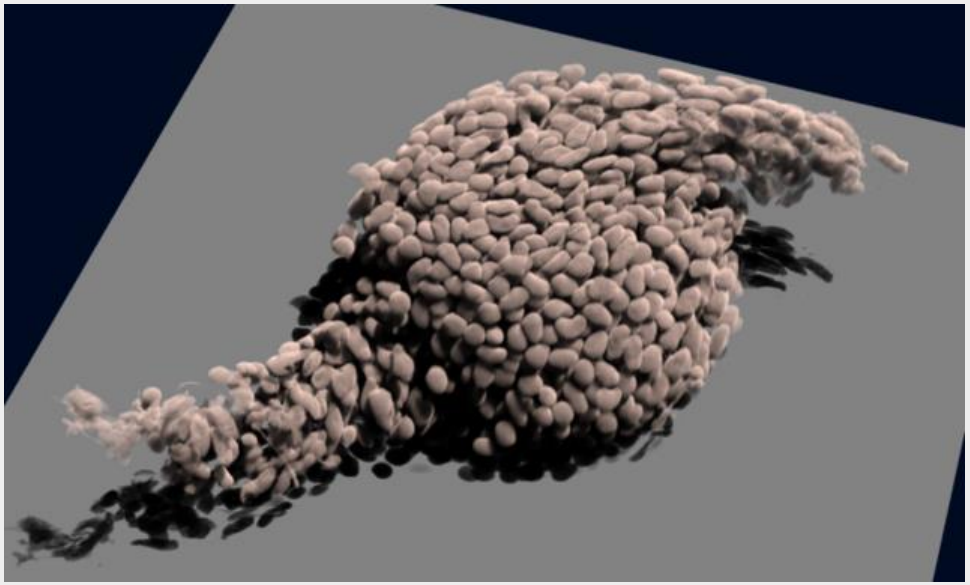


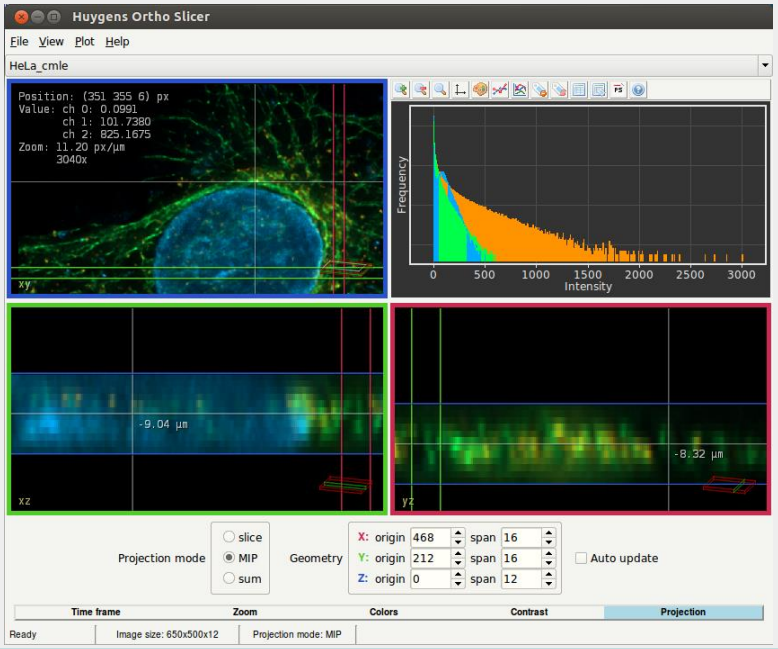


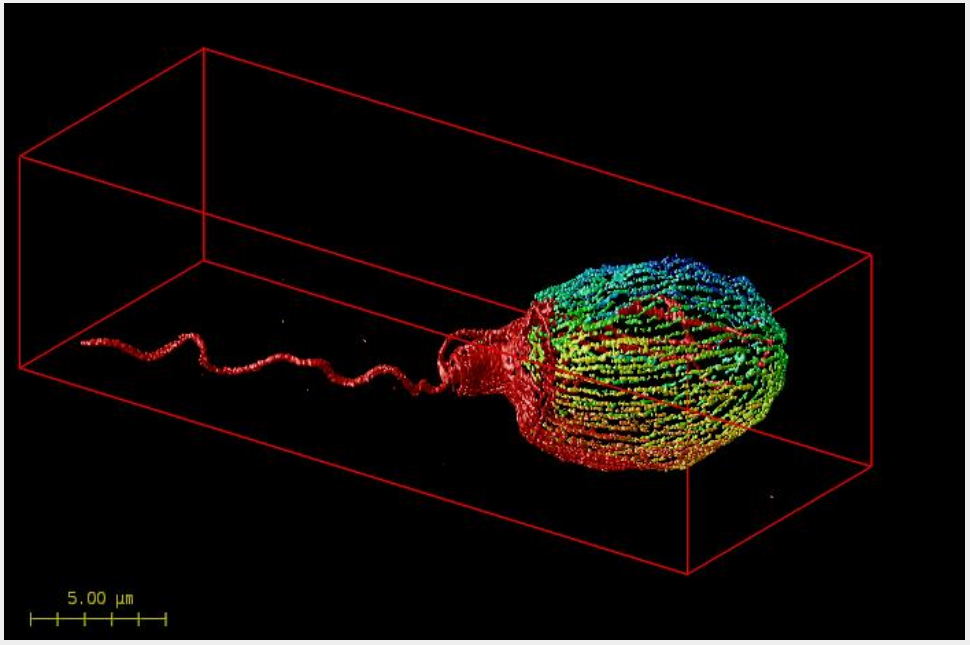
Widefield imaging of Neurons. Image provided by Leica Microsystems

3D data visualization

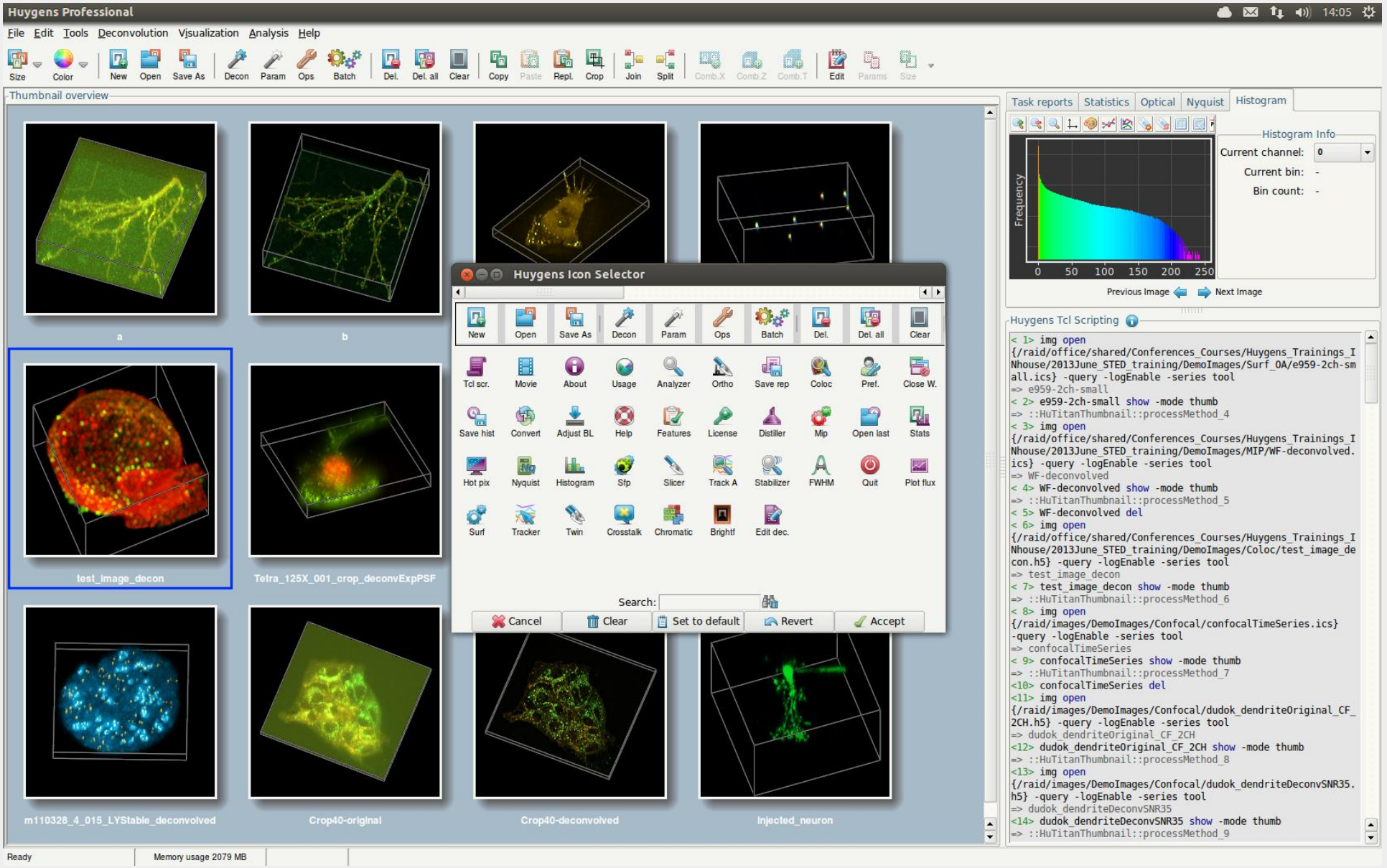




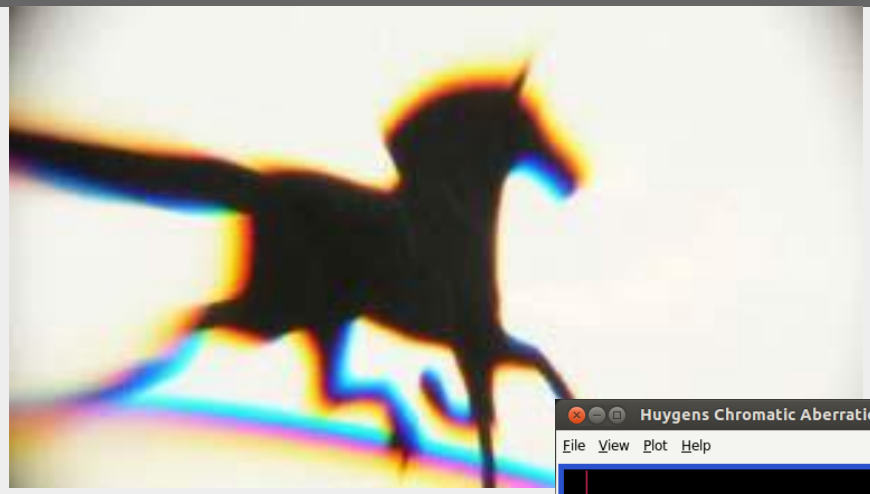


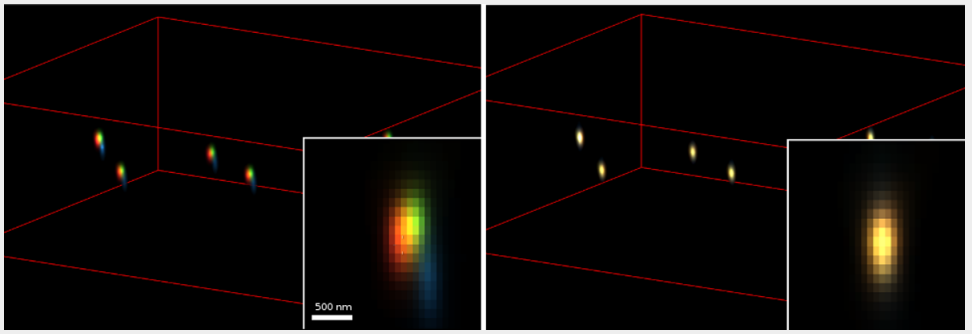


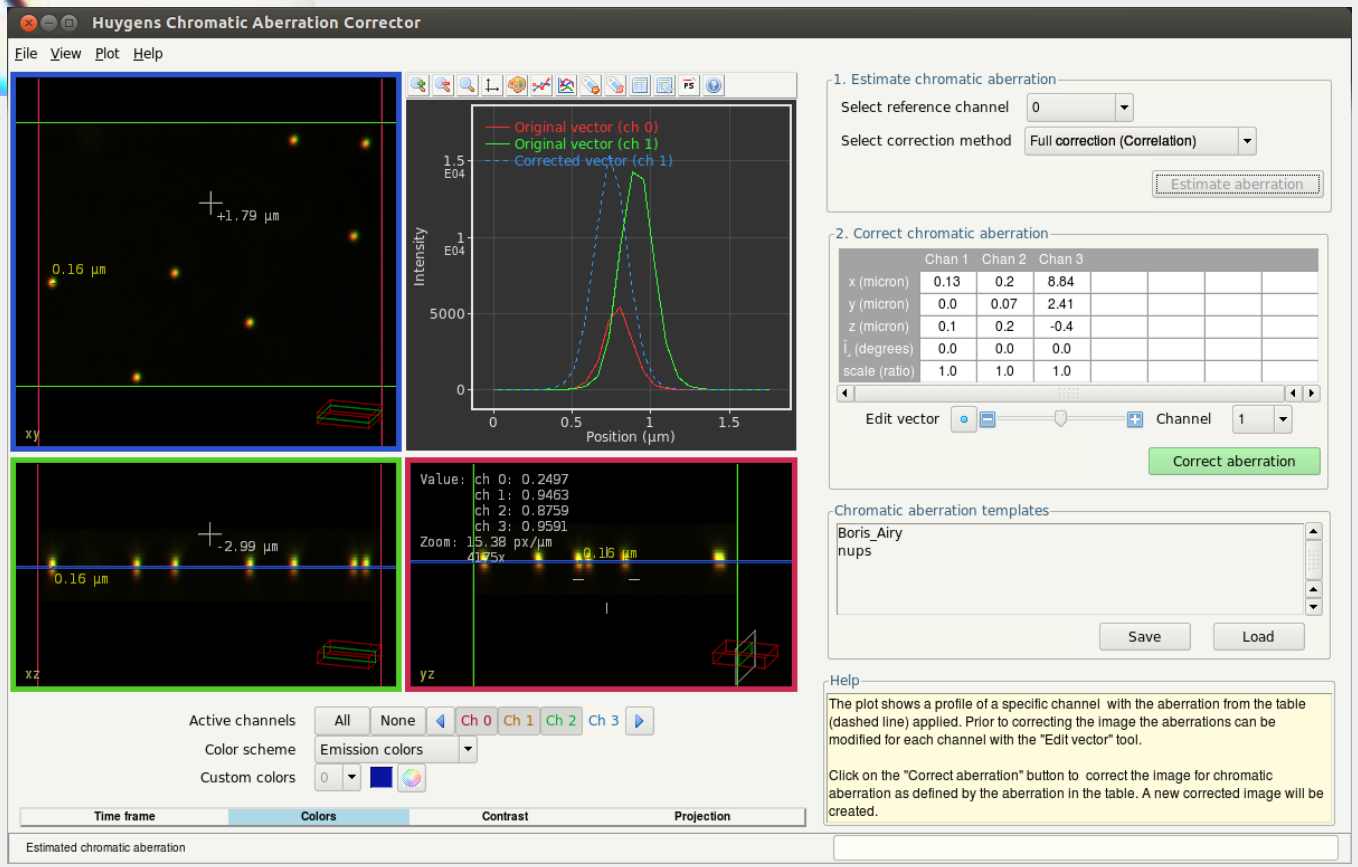
GUI


Huygens Professional
14:05
File Edit Tools Deconvolution Visualization Analysis Help
Size Color New Open Save As Decon Param Ops Batch Del. Del. all Clear Copy Paste Repl. Crop Join Split Comb.X Comb.Z Comb.T Edit Params Size
Thumbnail overview
a
b
test_image_decon
Tetra_125X_001_crop_deconvExpPSF
m110328_4_015_LYStable_deconvolved
Crop40-original
Crop40-deconvolved
Injected_neuron
Huygens Icon Selector
New Open Save As Decon Param Ops Batch Del. Del. all Clear
Tcl scr. Movie About Usage Analyzer Ortho Save rep Coloc Pref. Close W.
Save hist Convert Adjust BL Help Features License Distiller Mip Open last Stats
Hot pix Nyquist Histogram Sfp Slicer Track A Stabilizer FWHM Quit Plot flux
Surf Tracker Twin Crosstalk Chromatic BrightF Edit dec.
Search:
Cancel Clear Set to default Revert Accept
Task reports Statistics Optical Nyquist Histogram
Histogram Info
Current channel: 0
Current bin: -
Bin count: -
Frequency
0 50 100 150 200 250
Previous Image Next Image
Huygens Tcl Scripting
< 1> img open {/raid/office/shared/Conferences_Courses/Huygens_Trainings_InHouse/2013June_STED_training/DemoImages/Surf_OA/e959-2ch-small.ics} -query -logEnable -series tool
=> e959-2ch-small
< 2> e959-2ch-small show -mode thumb
=> ::HuTitanThumbnail::processMethod_4
< 3> img open {/raid/office/shared/Conferences_Courses/Huygens_Trainings_InHouse/2013June_STED_training/DemoImages/MIP/WF-deconvolved.ics} -query -logEnable -series tool
=> WF-deconvolved
< 4> WF-deconvolved show -mode thumb
=> ::HuTitanThumbnail::processMethod_5
< 5> WF-deconvolved del
< 6> img open {/raid/office/shared/Conferences_Courses/Huygens_Trainings_InHouse/2013June_STED_training/DemoImages/Coloc/test_image_decon.h5} -query -logEnable -series tool
=> test_image_decon
< 7> test_image_decon show -mode thumb
=> ::HuTitanThumbnail::processMethod_6
< 8> img open {/raid/images/DemoImages/Confocal/confocalTimeSeries.ics} -query -logEnable -series tool
=> confocalTimeSeries
< 9> confocalTimeSeries show -mode thumb
=> ::HuTitanThumbnail::processMethod_7
<10> confocalTimeSeries del
<11> img open {/raid/images/DemoImages/Confocal/dudok_dendriteOriginal_CF_2CH.h5} -query -logEnable -series tool
=> dudok_dendriteOriginal_CF_2CH
<12> dudok_dendriteOriginal_CF_2CH show -mode thumb
=> ::HuTitanThumbnail::processMethod_8
<13> img open {/raid/images/DemoImages/Confocal/dudok_dendriteDeconvSNR35.h5} -query -logEnable -series tool
=> dudok_dendriteDeconvSNR35
<14> dudok_dendriteDeconvSNR35 show -mode thumb
=> ::HuTitanThumbnail::processMethod_9
Ready
Memory usage 2079 MB

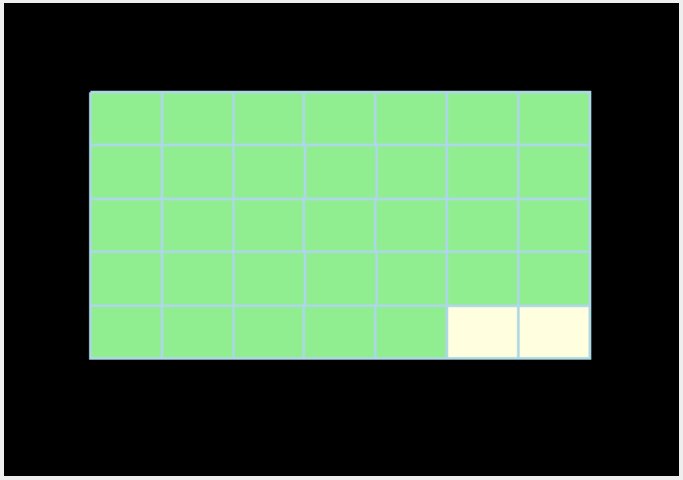
Chromatic Aberration

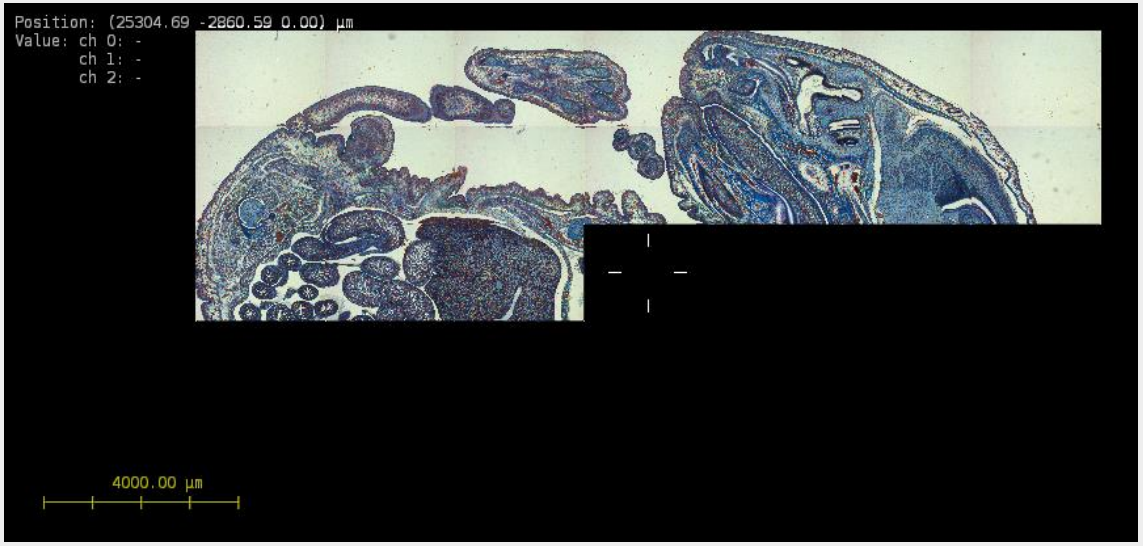




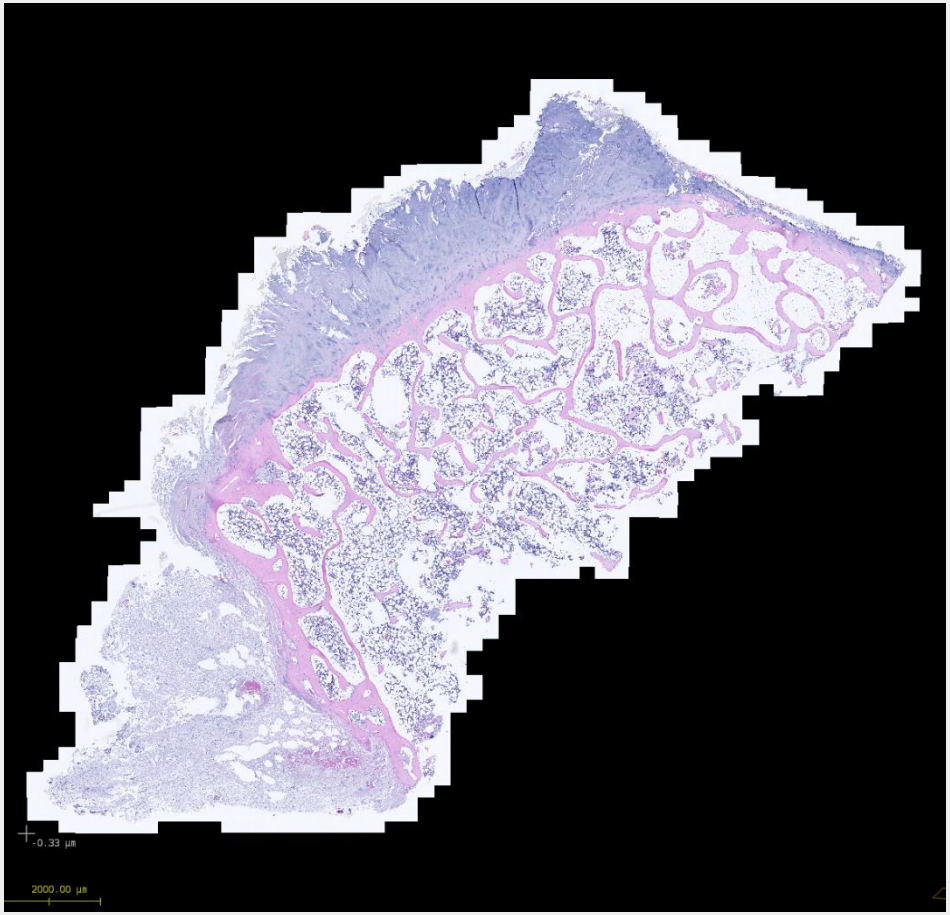


Huygens Stitcher





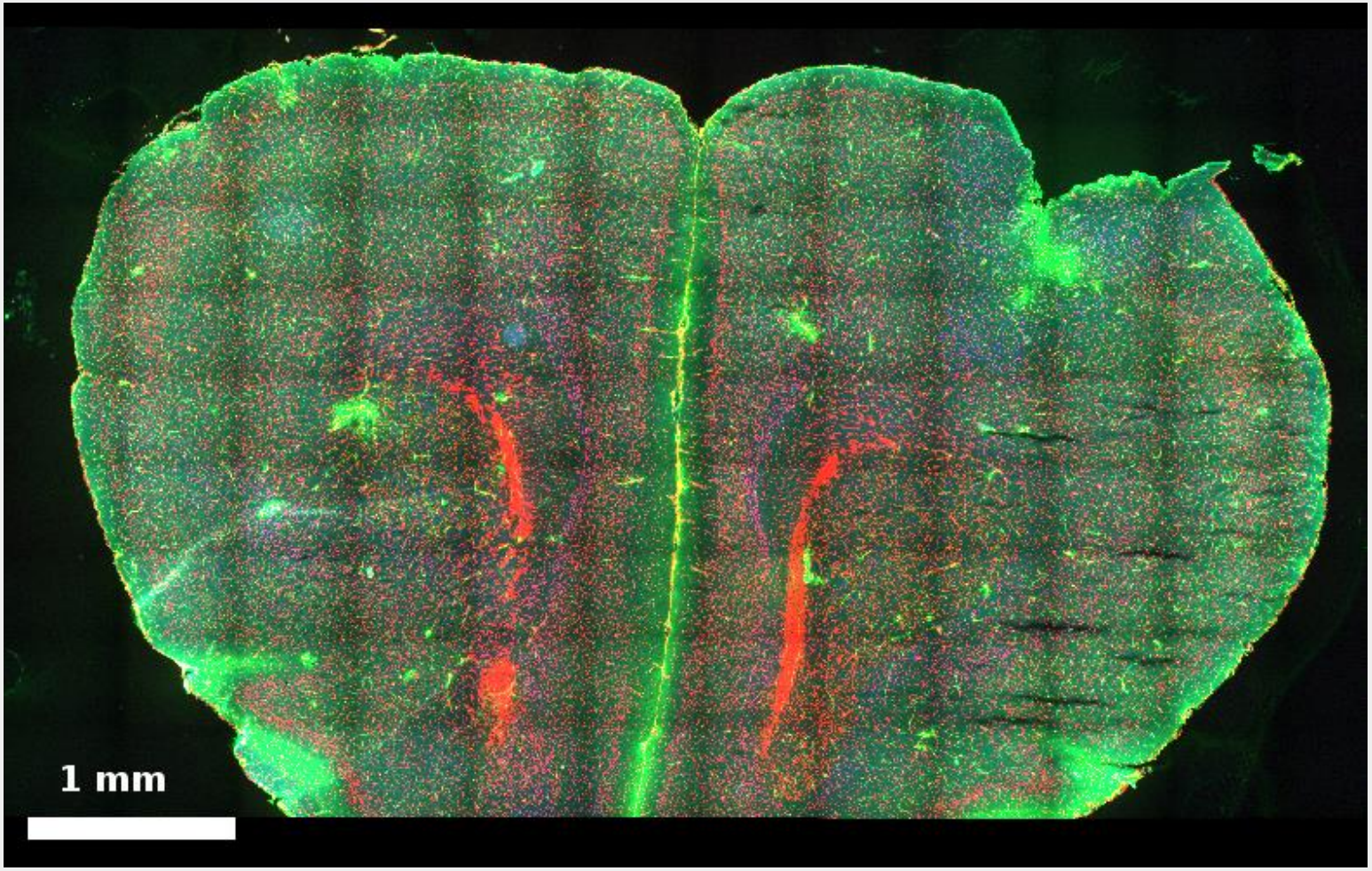
Tile image of a mouse Embryo being stitched.



An impressive 1700+ tile compound merged by the Huygens Stitcher to a large 60GB dataset. Notice the scaling bar indicating 2 mm. Raw data by © Carl Zeiss Microscopy GmbH.

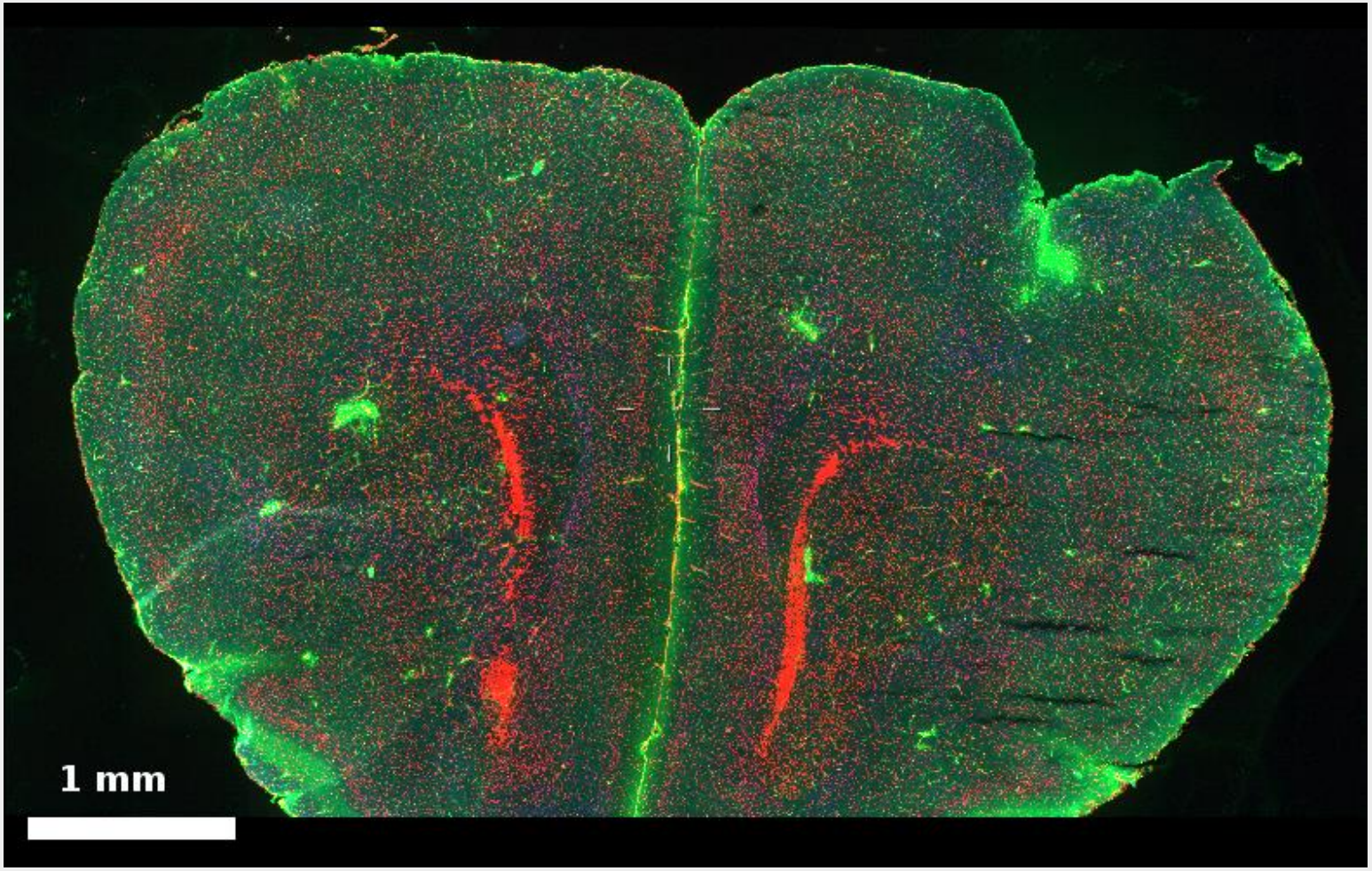
Huygens Stitcher

Vignetting problem

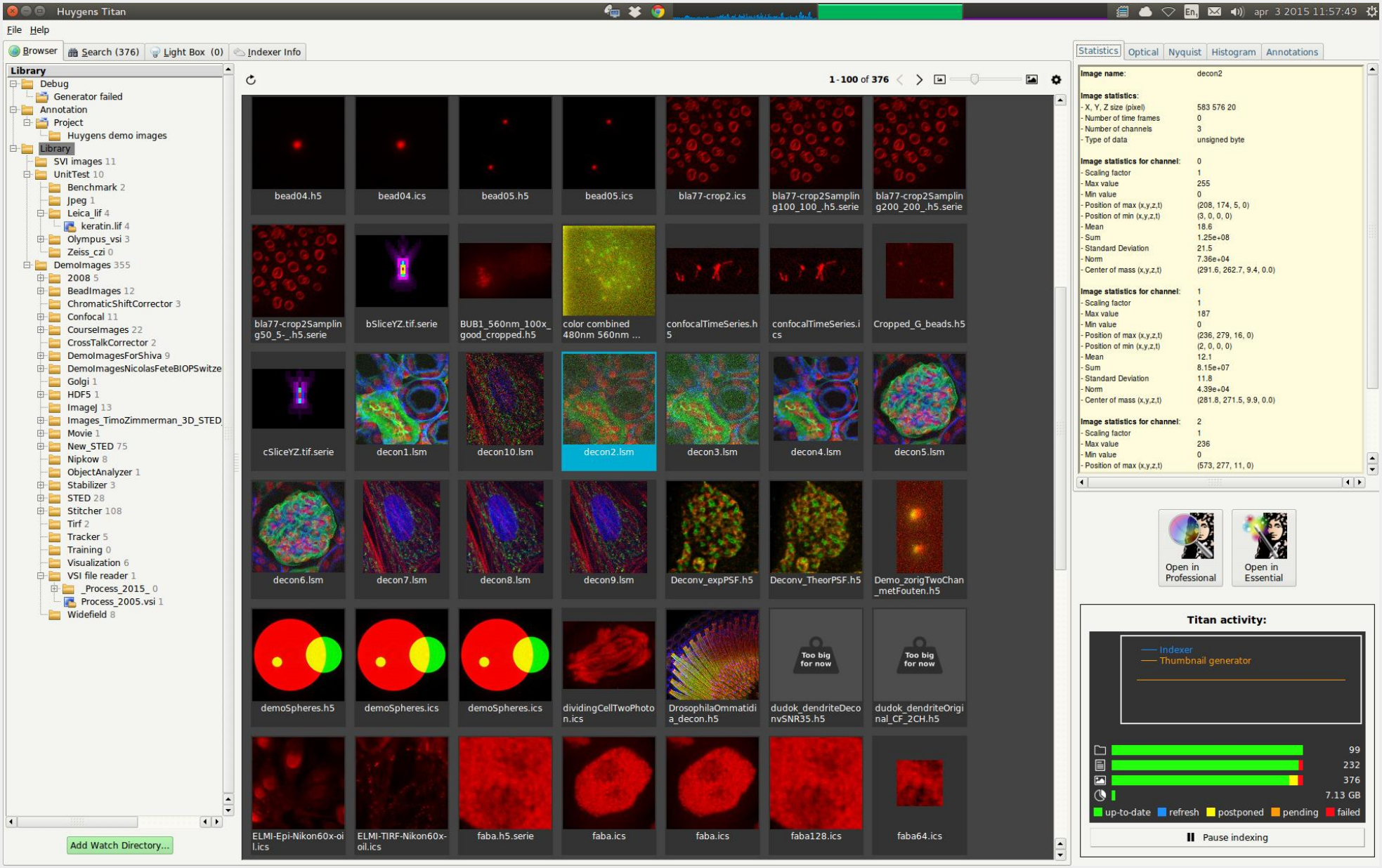


Huygens Stitcher

Automatic vignetting correction

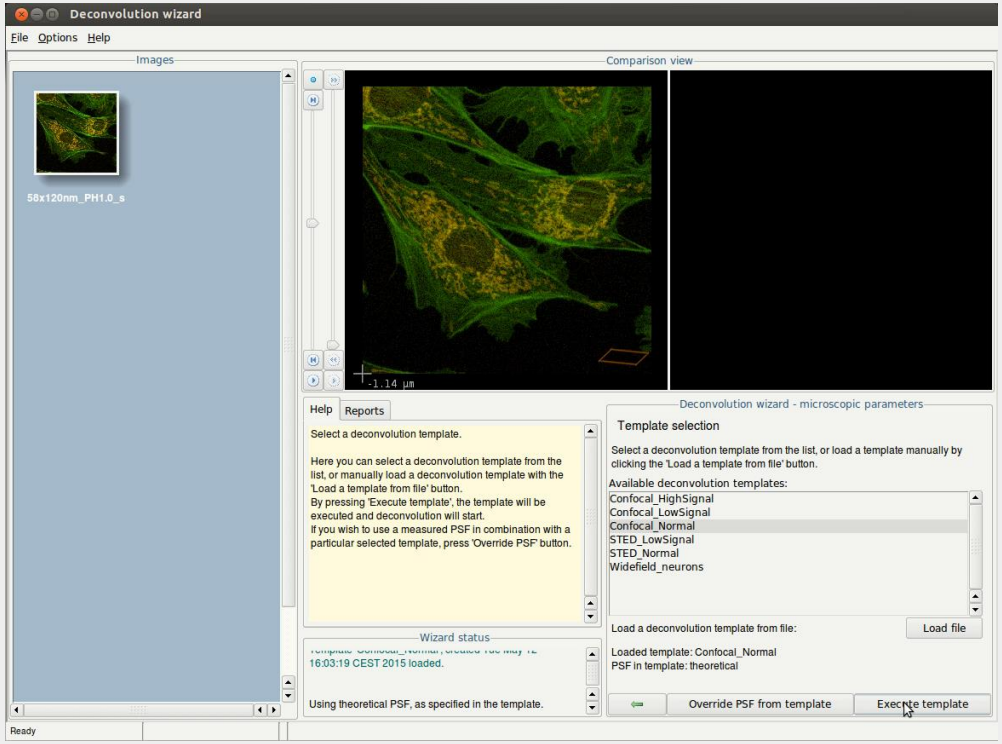


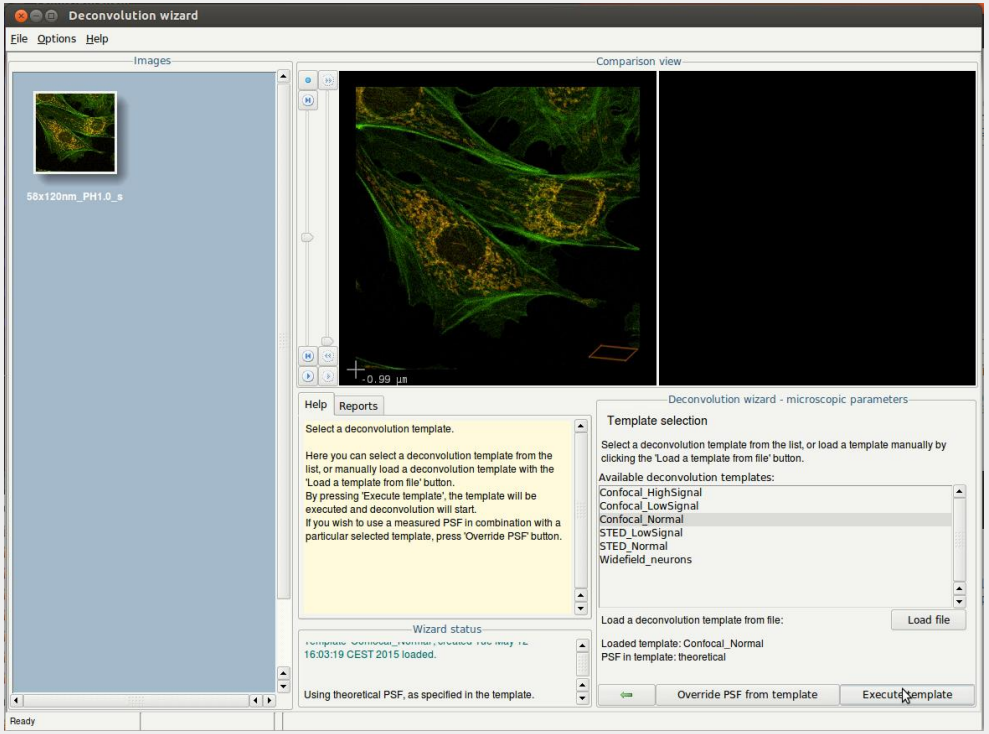
Titan: Indexing Microscopic Images



Huygens GPU acceleration

Confocal dataset: 2 channels, 1445 * 1439 * 18 (X*Y*Z) pixels





CPU
Multiple Cores

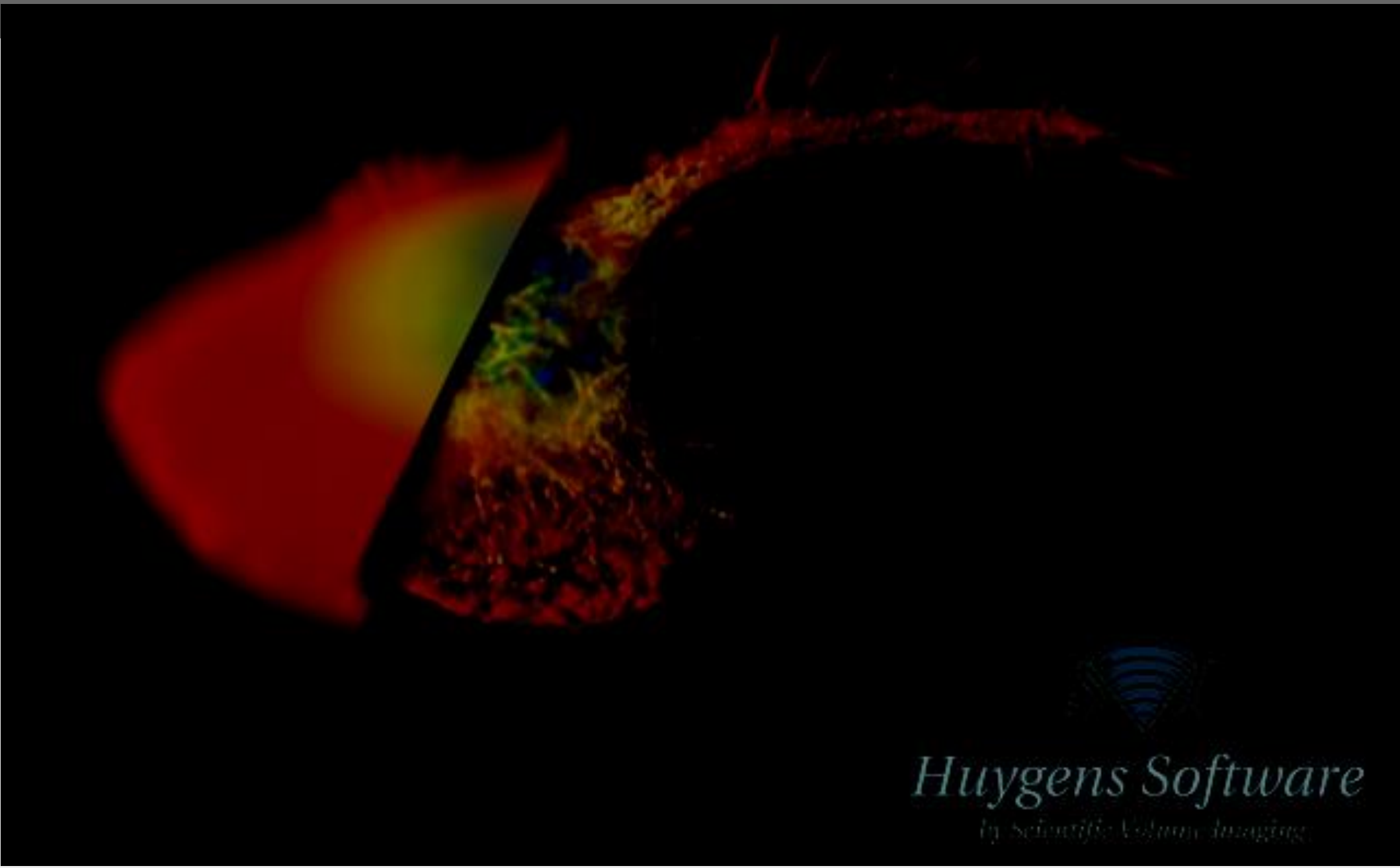
Using CPU:
Intel Xeon E5-2667 v3
(4 cores @ 3.2 GHz)

CPU
Multiple Cores

+

GPU
Thousands of Cores

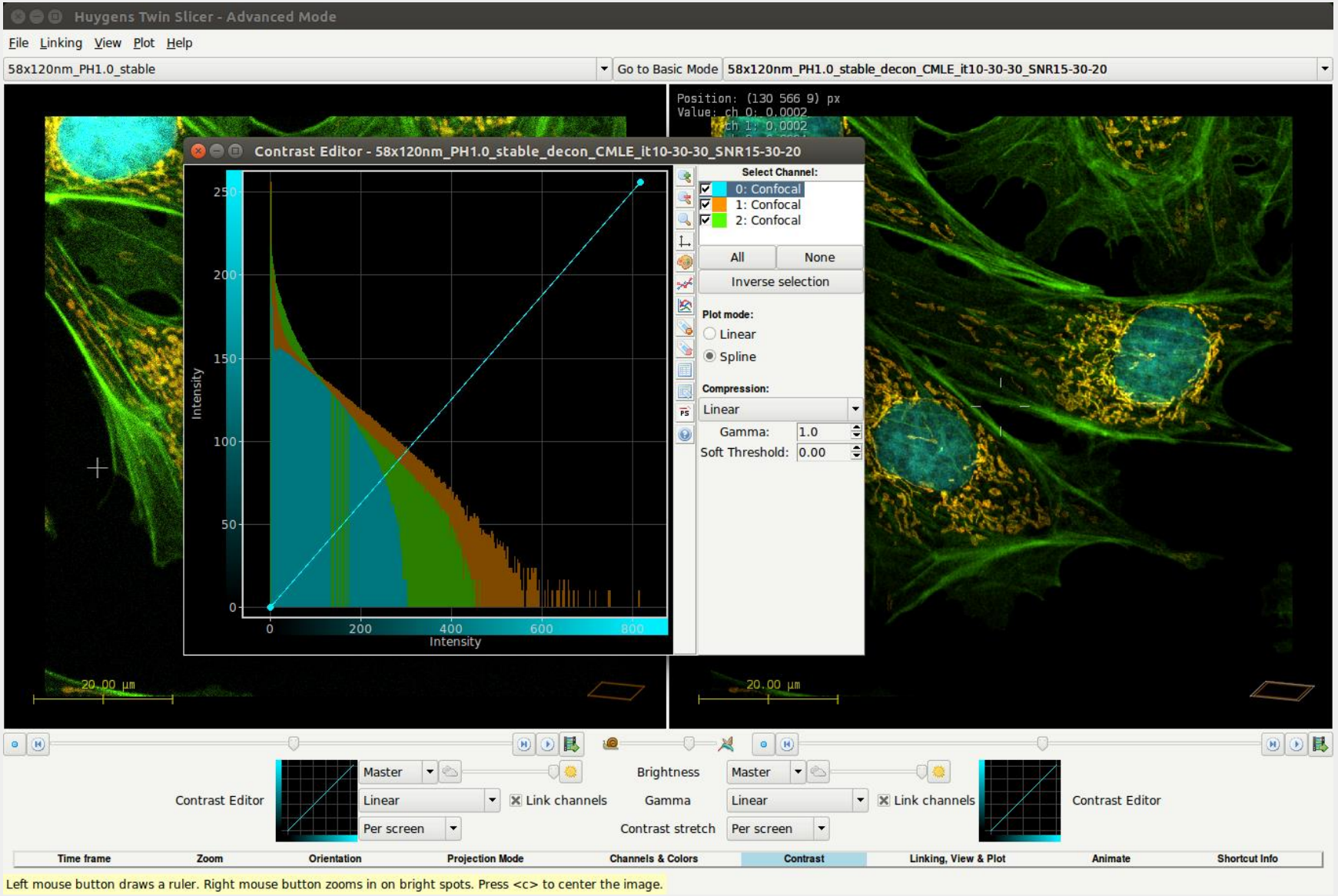
Geforce GTX Titan-X
3072 CUDA cores
12 GB video-RAM


Huygens Software

Languages used

Tcl / Tk	C / Cuda
GUI	Low level image processing (deconvolution, filters, etc)
Internal tcl shell	Renderings: (surface, volume slices, etc)

Window Editor



Tcl extensions

- Internal Tcl shell

- Register image names as Tcl commands

  img1 save “foo1.png”

  img1 + img2 -> img3

Tk usage

- All of the GUI,
  - windows, widget

- Tkphoto

  from 2D pixel array -> photo

- Movie

  From multiple pixel array -> avi

Our tcl approach

- Mainly namespace
  - 1000 lines each
  - 50 procedures
  - 1,2 or 3 array’s to store namespace variables.

- Few objects
  - Widgets, window

Typical use of tcl

```
namespace eval ::myTool {
   variable vP


   proc getTotalPixels { v } {
      variable vP

      set dimX $vP(dimx,$v)
      set dimY $vP(dimy,$v)
      set dimZ $vP(dimz,$v)
      return [expr {$dimX * $dimY * $dimZ}]
   }
}
```

Questions from our side

- openSceneGraph
- OpenGl
- Faster TkPhoto
- Advantages of using objects vs namespaces
- Font / widget scaling

Font / Widget scaling