YOKOGAWA

Confocal Scanner Unit

CSU-W1

Wide and Clear

CSU-W1

Confocal scanner unit CSU has evolved!

Bulletin80C01D01-01E

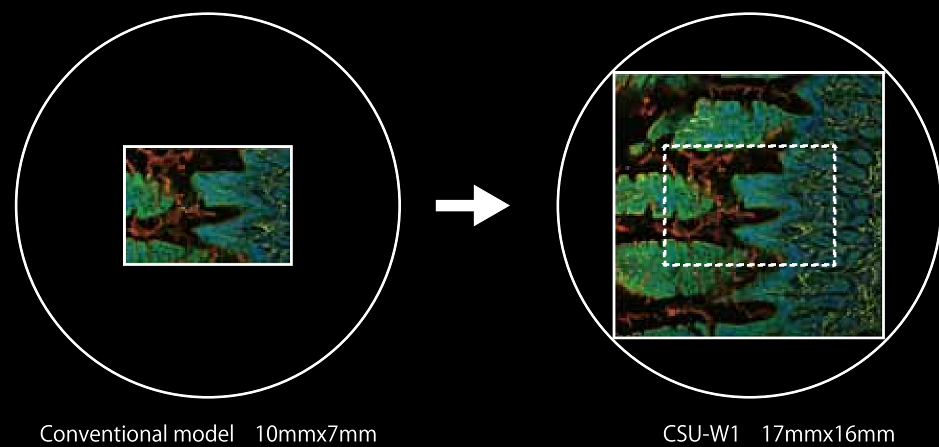
Advantages of the Evolution

Wide and Clear

Confocal Scanner Unit, CSU series, have been improved from the original CSU10 to the most recent CSU-X1, which are widely recognized as the de facto standard tool for live cell imaging, due to fast scanning and low photo-bleaching capability.
CSU-W1 is our answer to the researchers' request for "Wider FOV" and "Clearer Images".

Wide

Widest FOV confocal! Provides 4 times wider FOV than the conventional model.

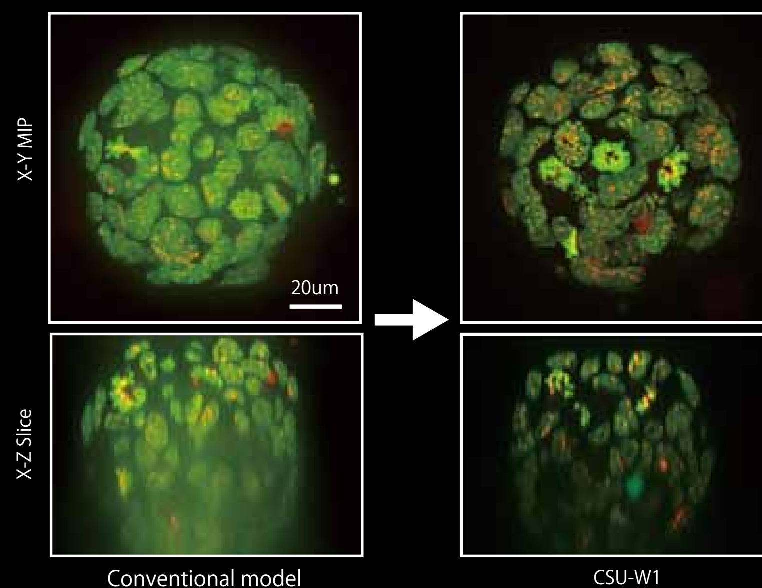


Conventional model 10mmx7mm   CSU-W1 17mmx16mm

Clear

Newly designed disk unit offers much improved image quality.

Due to significantly reduced pinhole crosstalk, CSU-W1 enables clear observation much deeper into thick samples.



Mouse ES cell colony
Fluorescent probe：
H2B-EGFP (Excitation：488nm)
mCherry-MBD-NLS (Excitation：561nm)
Objective lens：60x silicone
Z-sections/stack：100μm (0.4μm/251slices)

By courtesy of Jun Ueda, Ph.D. and Kazuo Yamagata, Ph.D.,
Center for Genetic Analysis of Biological Responses,
The Research Institute for Microbial Diseases, Osaka University
(Present post: Department of Genetic Engineering,
Faculty of Biology-Oriented Science and Tchnology, Kindai University)

Points of the Evolution

Original and Flexible

Original

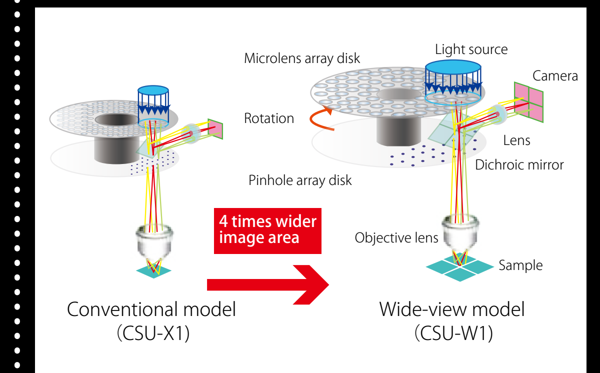
Newly designed disk unit to achieve wider FOV and much improved image quality

Large diameter disks

The large diameter disks offer 4 times wider FOV to compare with our conventional model. This wide FOV matches with most advanced wide-field cameras.

Newly designed pinhole (Nipkow) disk

Wider inter-pinhole distance for the CSU-W1 offers considerably reduced pinhole crosstalk and thus provides clearer images.



Microlens enhanced dual Nipkow disk scanning method

A Nipkow spinning disk containing many pinholes placed in the constant pitch helical pattern and a second disk containing the same number of micro-lens to focus excitation laser into each pinhole are mechanically fixed with a motor, and very rapidly raster scan the field of view with a large number of laser beams. The multi-beam scanning method offers not only high-speed imaging but also significantly reduced photo-toxicity and photo bleaching because of very reduced laser power of each beamlet.

Flexible

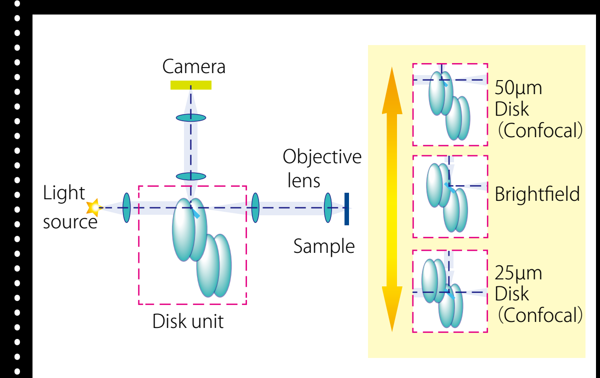
Flexibly selectable functions to meet versatile applications

New bright field path (Default)

New mechanism to move the disks out of the light path allows much easier projection of confocal and non-confocal images such as phase contrast .

High confocality pinhole (Optional Component)

In addition to our conventional 50μm pinhole size, 25μm pinhole size with higher confocality is available.
You can select either one or the both pinhole size, with easy-to-use motorized disk exchange mechanism.



	The standard of selection
25μm pinhple	•Low magnification (~40x) •Low contrast (higher crosstalk) samples
50μm pinhole	•Hgh magnification (60x~) •Low signal samples

Simultaneous dual color imaging mechanisms (T2 and T3 Models)

CSU-W1 offers single camera split-view model, in addition to the dual camera model which are much improved from those for the CSU-X1. Thanks to the wide FOV, even the split-view offers 2 times wider image area than with older model.By using various dichroic mirrors, it is possible to select various dye-combinations for dual-color imaging*1 with both the two camera model and split-view model.

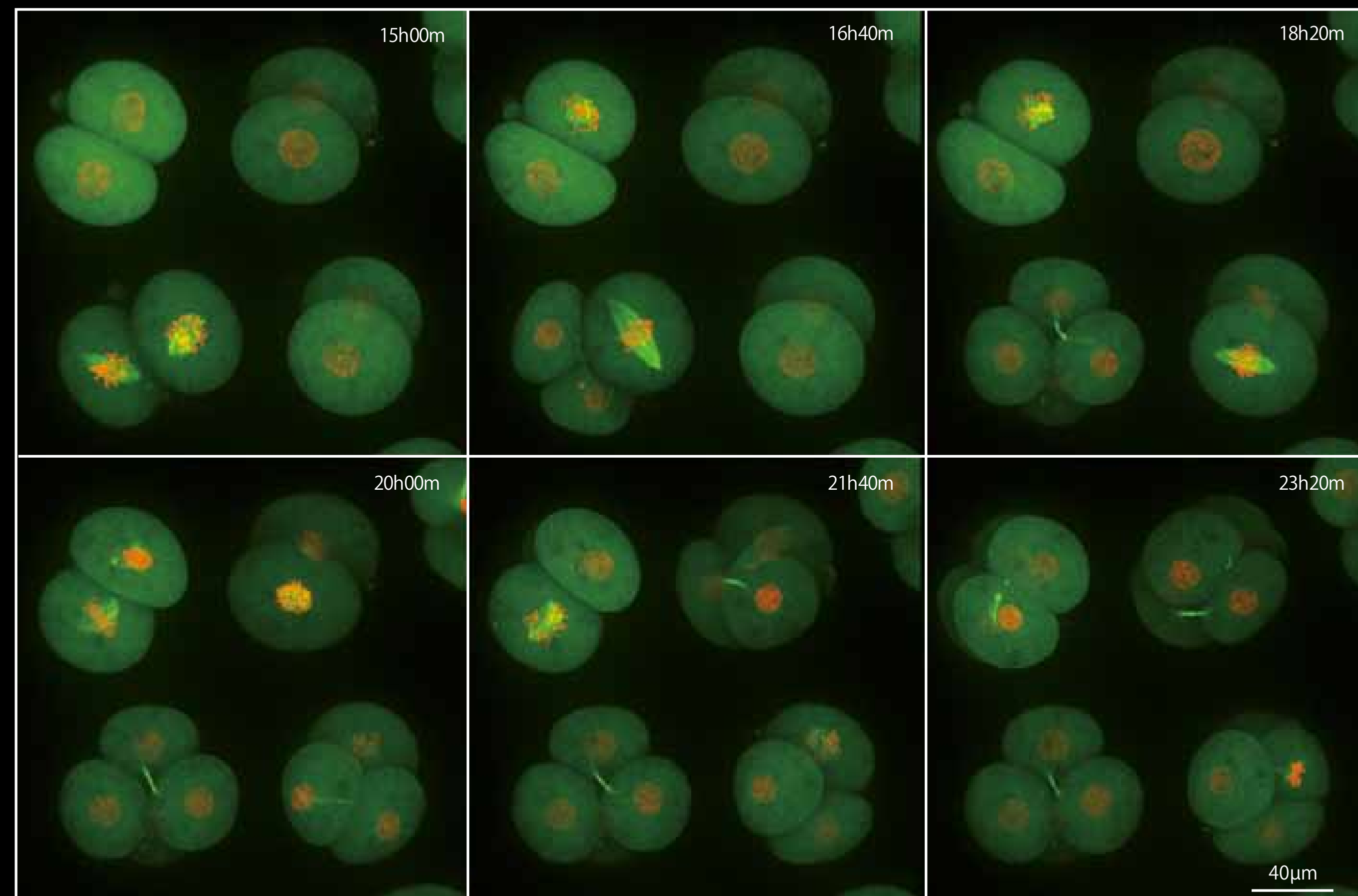
*1 Appropriate excitation lasers are necessary to utilize each dichroic mirror.

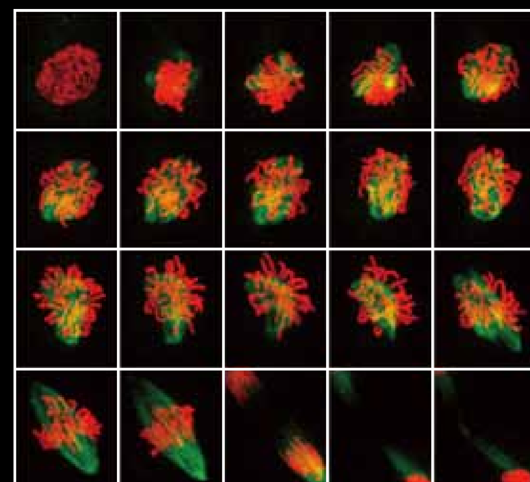
CSU-W1

Image gallery -Wide-

Wide FOV without compromising the resolution offers most effective long-term observation of various biological events in a large tissue or many cells.

Early stage mouse embryo

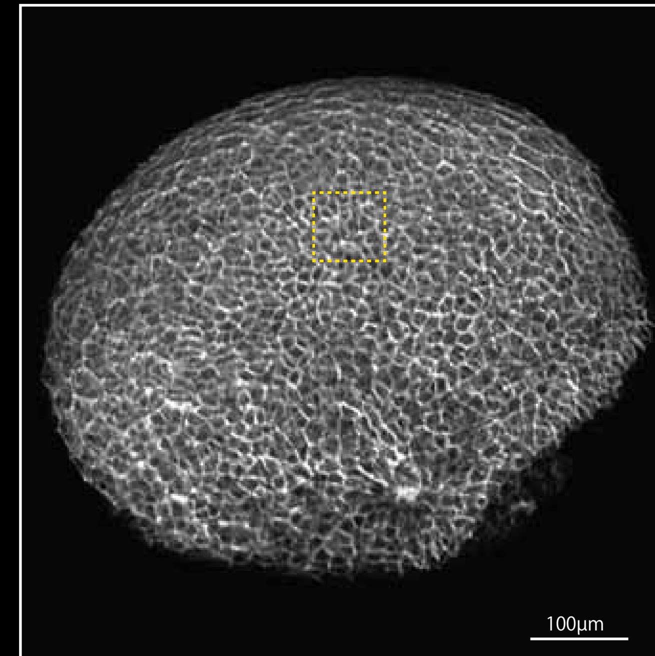


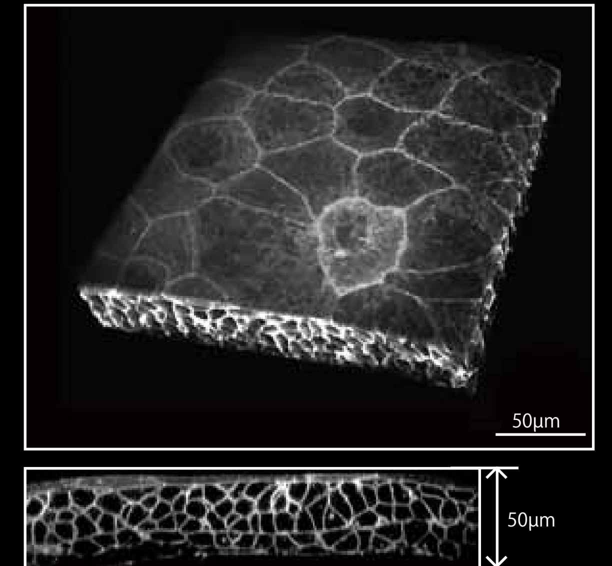


Upper : Excerpts from time-lapse data (MIP)
Lower: Excerpts from time-lapse data (MIP of chromosome)
Fluorescent probe : H2B-EGFP (Excitation : 488nm), mCherry-MBD-NLS (Excitation : 561nm)
Pinhole : 50μm
Objective lens : 60x silicone
Z-sections/stack : 100μm (1μm/101slices)
Total time: 48 hours (Interval : 10mins)

By courtesy of Kazuo Yamagata, Ph.D., Center for Genetic Analysis of Biological Responses, The Research Institute for Microbial Diseases, Osaka University
(Present post: Department of Genetic Engineering, Faculty of Biology-Oriented Science and Tchnology, Kindai University)

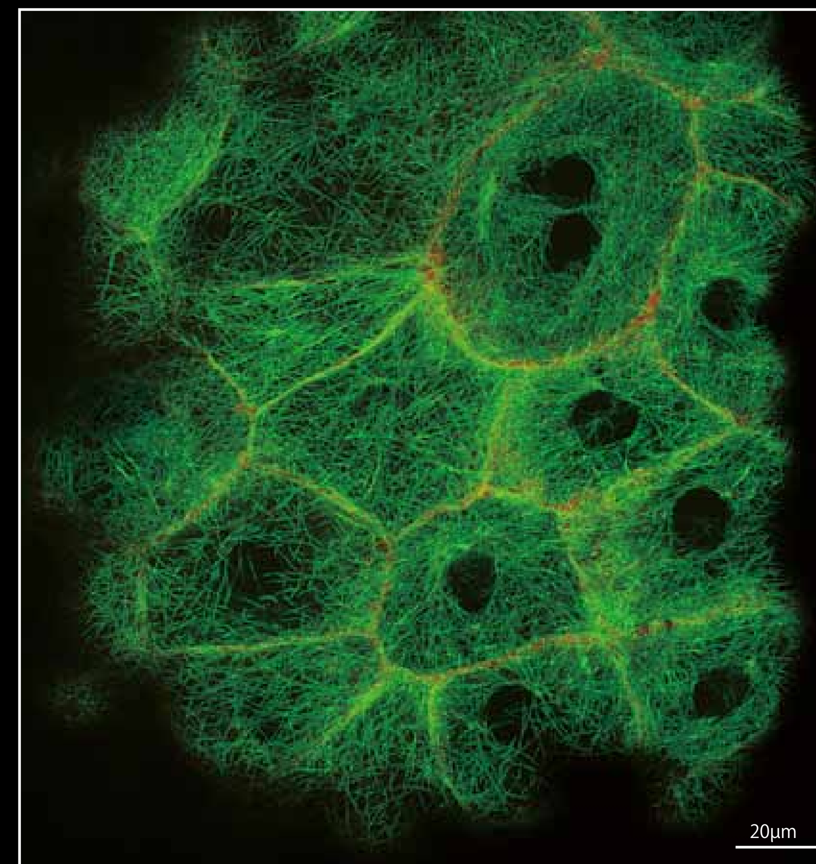
Zebra fish embryo

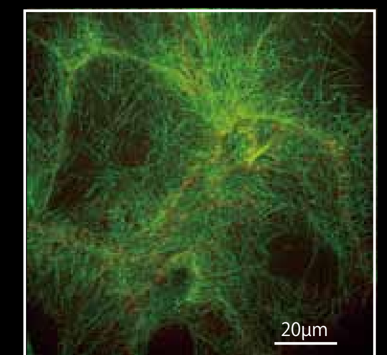




50μm

Left : 3D reconstructed image of whole embryo
Upper right : 3D reconstructed embryo (partial, at high magnification)
Lower right : XZ image
Fluorescent probe: membrane RFP (Excitation : 561nm)
Pinhole : 50μm
Objective lens : 20x dry(Left), 60x water(Upper right, Lower right)
Z-sections/stack : 99μm (1μm/100slices)(Left)
50μm (0.5μm/101slices)(Upper right, Lower right)





Left : Time-line MIP of time-lapse images
Right : Image by our conventional model
(x1.25 Camera port)
Fluorescent probe:
EB3-GFP (Excitation : 488nm)
membrane RFP (Excitation : 561nm)
Pinhole : 50μm
Objective lens : 60x water
Total time: 200sec (Interval : 1sec)

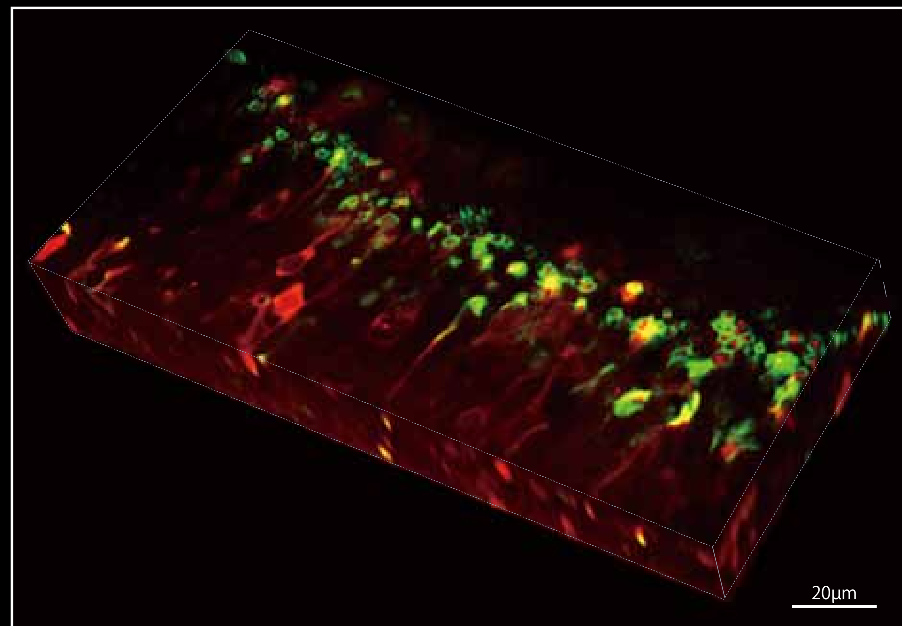
By courtesy of Makoto Suzuki, Ph.D. and Naoto Ueno, Ph.D.,Division of Morphogenesis, National Institute of Basic Biology

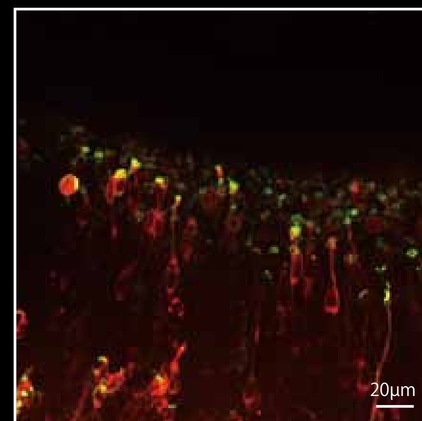
CSU-W1

Image gallery -Clear-

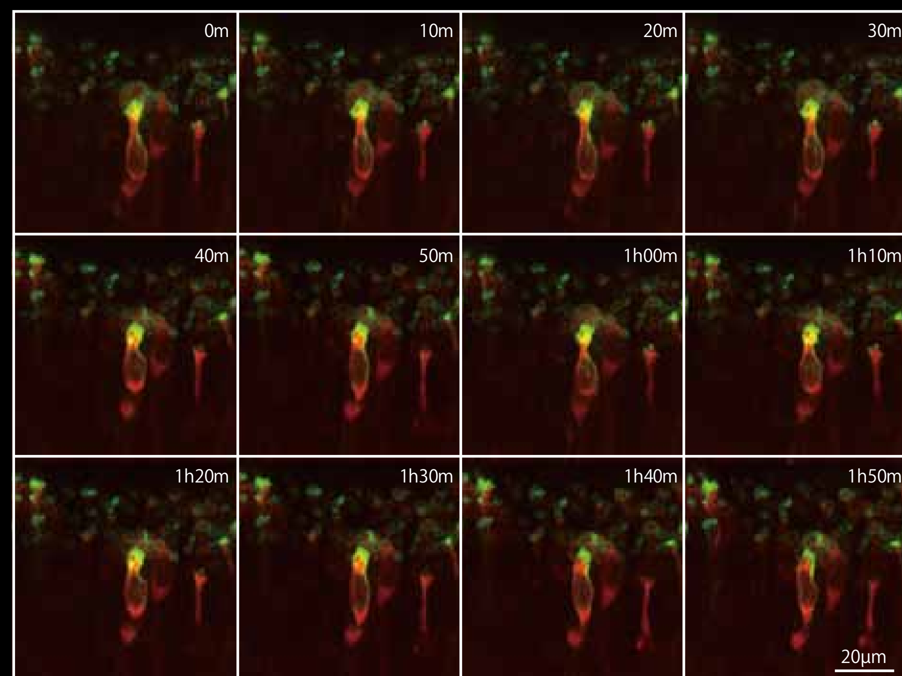
Most suitable for clear and thorough imaging of thick specimen, even tissues or small animal body, for a long time.
Selection of the optimal pinhole disk provides high level of confocality at both high and low magnification to give most detailed 3D reconstructions of live specimen.

Brain slice of mouse fetus





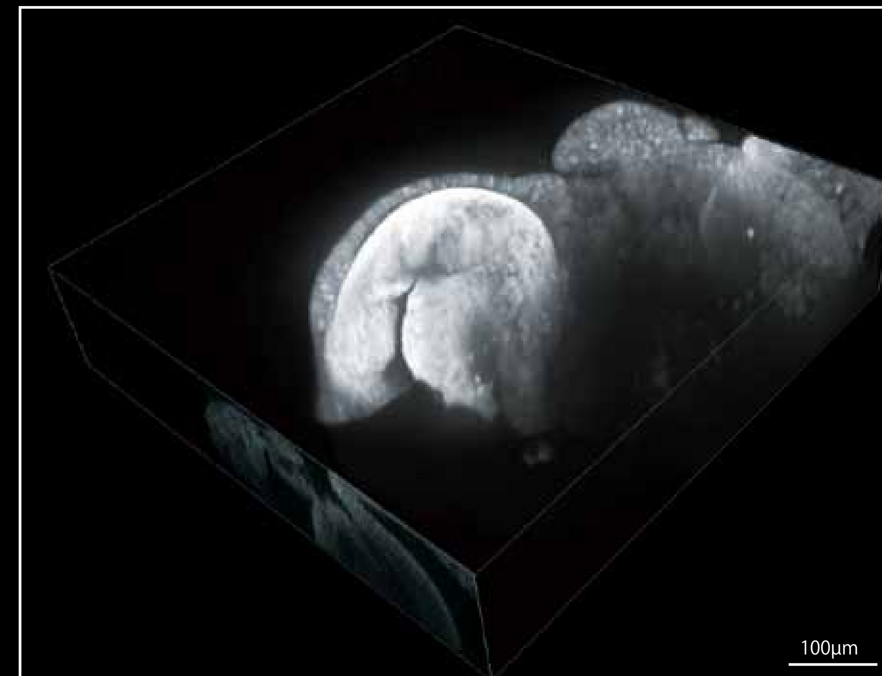
Left: 3D reconstructed slice (partial)
Right: 3D reconstructed image of whole slice
Fluorescent probe: GFP (Excitation: 488nm)
RFP (Excitation: 561nm)
Pinhole: 50μm
Objective lens: 60x water LWD
Z-sections/stack: 29.5μm (0.5μm/60slices)

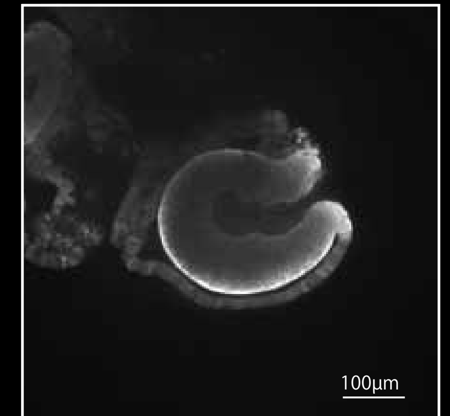


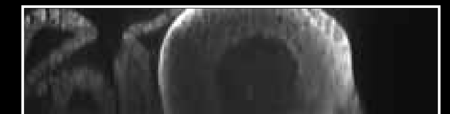
Excerpts (10 minuets' interval) from Time lapse(MIP)
Fluorescent probe: GFP (Excitation: 488nm)
RFP (Excitation: 561nm)
Pinhole: 50μm
Objective lens: 60x water LWD
Z-sections/stack: 15μm (0.5μm/31slices)
Total time: 2hours (Interval: 1min)

By courtesy of Atsunori Shitamukai, Ph.D., Laboratory for Cell Asymmetry, Center for Developmental Biology, RIKEN

Ocular cup organ regenerated from mouse ES cells



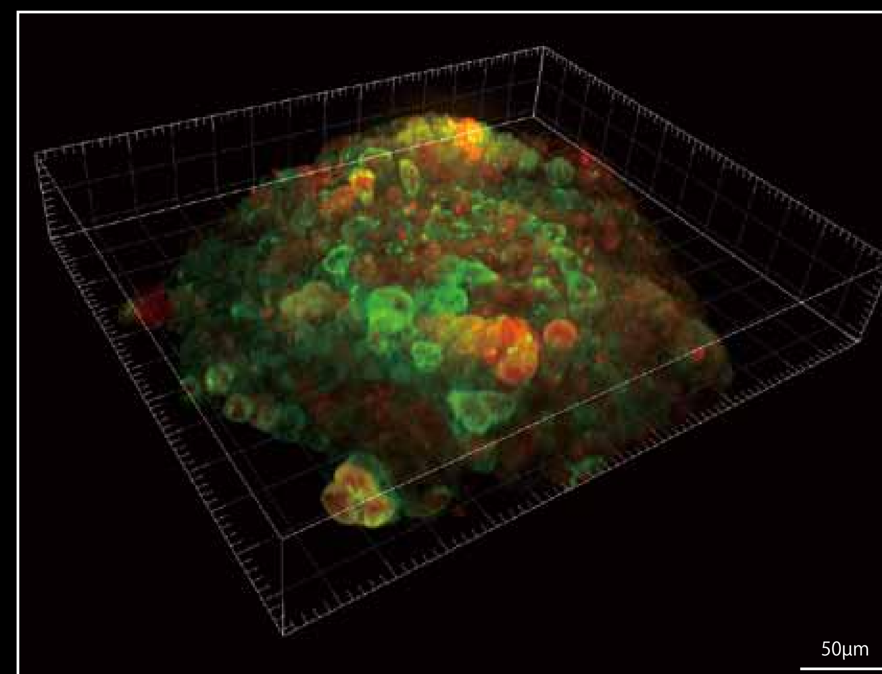


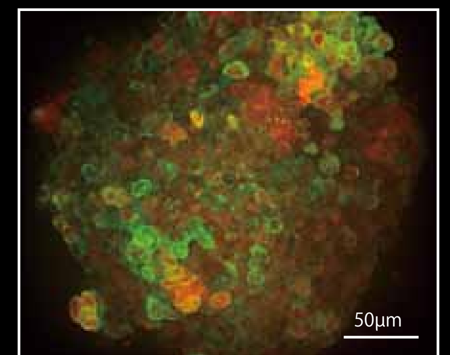


Left: 3D image
Upper right: MIP Lower right: YZ plane
Fluorescent probe: Cy5 (Excitation: 640nm)
Pinhole: 25μm
Objective lens: 20x dry
Z-sections/stack: 100μm (2μm/51slices)

By courtesy of Mototsugu Eiraku, Ph.D., and Yuiko Hasegawa, Ph.D., Sasai Lab., Organogenesis Neurogenesis group, Center for Developmental Biology, RIKEN
(Present post: Laboratory for in vitro Histogenesis, Center for Developmental Biology, RIKEN)

ES cell colony





Left: 3D image Right: MIP
Fluorescent probe:
GFP (Excitation: 488nm)
mCherry (Excitation: 561nm)
Pinhole: 50μm
Objective lens: 60x oil
Z-sections/stack: 50μm (1μm/51slices)

By courtesy of Nozomu Takata, Ph.D., Sasai Lab., Organogenesis Neurogenesis group, Center for Developmental Biology, RIKEN
(Present post: Laboratory for in vitro Histogenesis, Center for Developmental Biology, RIKEN)