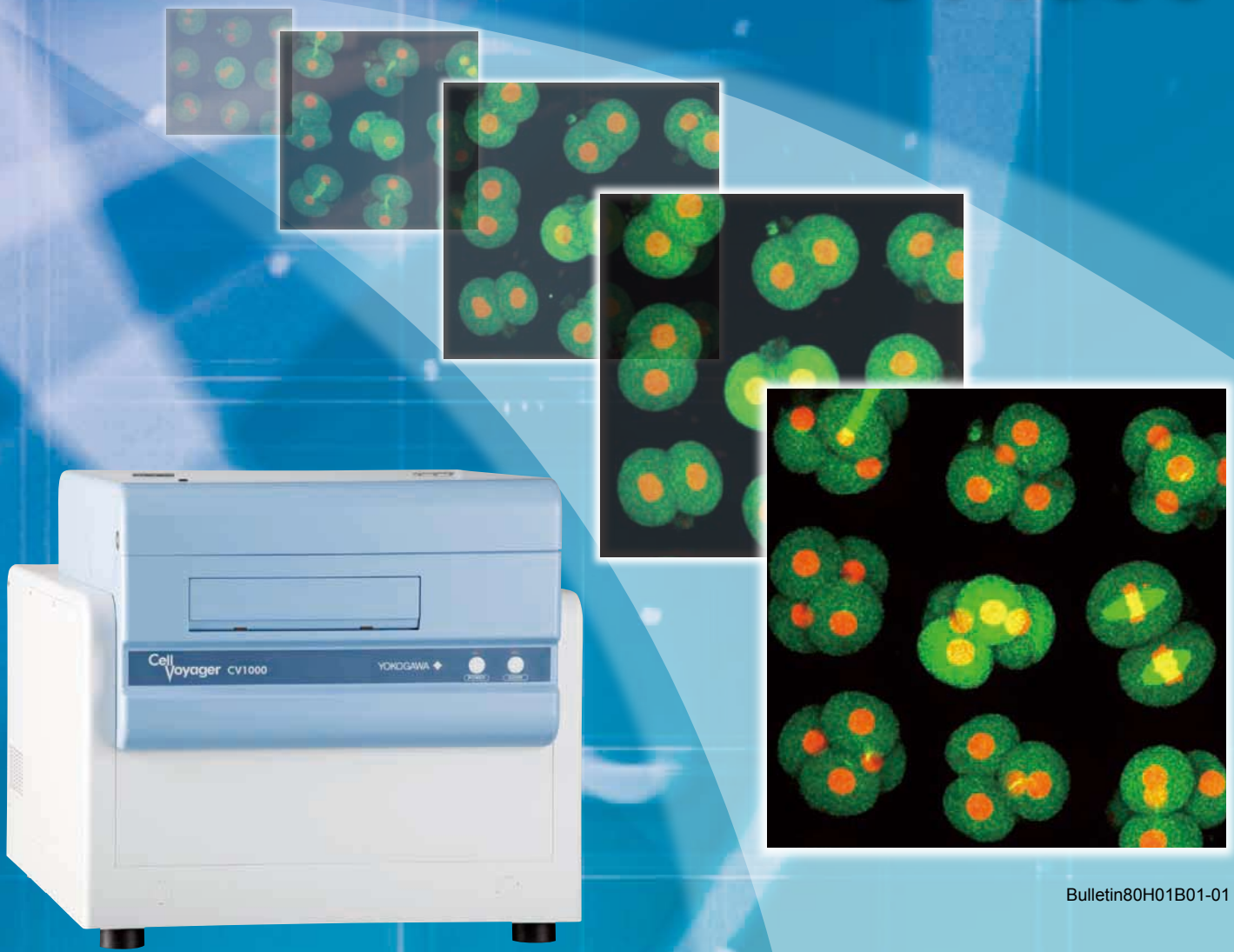
YOKOGAWA

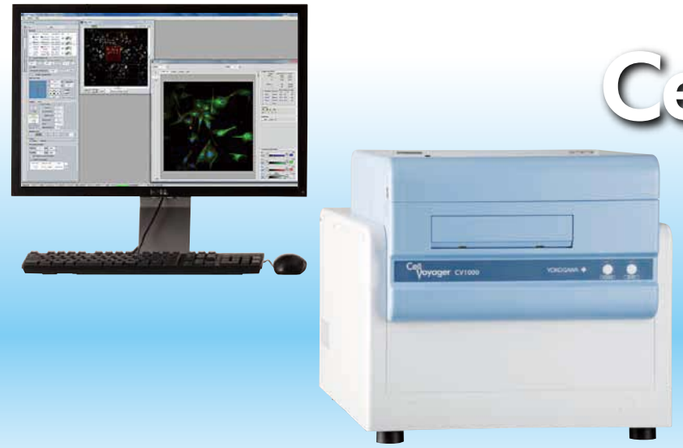
Confocal Scanner Box

Cell Voyager CV1000

All-in-one live cell imaging solution



Bulletin80H01B01-01



Cell Voyager CV1000

The CellVoyager™ CV1000 Confocal Scanner Box is a fully integrated desktop imaging system. With its microlens enhanced dual Nipkow disc scanning technology, phototoxicity and photobleaching are drastically reduced, making it ideal for use in observing highly delicate life processes such as iPS/ES cell generation and embryogenesis. The system is easy to use and eliminates the need for a dark room.

Major advantages

Reduced photo damage ····· CSU (Dual Nipkow disk scanning)
Brighter images ····· Ultra-high sensitivity EMCCD camera※1
Reliable environmental control ····· Stage incubator with high-precision temperature/CO_2 control※1
Precise reproducibility ····· High-precision auto X-Y stage
User friendly ····· Easy-to-use integrated software

Live cell imaging is no longer difficult or complicated – get started right away!

■Want to do long-term time lapse imaging?

The CV1000 is the compact all-in-one confocal system that you can install and get started using right away at your lab bench. It eliminates the need for setting up a microscope, using a dark room, and carefully controlling room temperature.

■Are you having trouble getting the optimal live cell imaging setup?

The CV1000 uses a dual Nipkow disk confocal scanner, the de facto standard tool for live cell imaging that minimizes phototoxicity and photobleaching. The system's incubator keeps delicate embryos, ES/iPS cells, and other types of cells healthy and at a stable temperature for the entire duration of your experiment.

■Do you need to observe different specimen types and lack the time to train users?

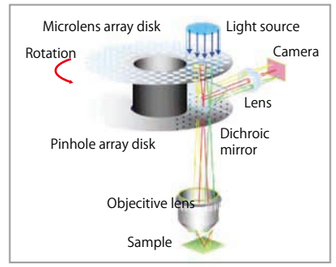
The CV1000 comes with a variety of attachments suitable for applications ranging from high-end multi-point, multi-color time lapse imaging of live cells to single shot high-resolution imaging of fixed specimens.
The software is easy to use – even first time users can quickly master it.
This combination of hardware and software makes the CV1000 the ideal tool for research facilities

※1 Optional feature on the basic model

《What makes the CV1000 ideal for long-term live cell imaging?》

Microlens enhanced dual Nipkow disk scanning

A Nipkow spinning disk containing about 20,000 pinholes and a second spinning disk containing the same number of microlens to focus excitation laser light into each corresponding pinhole are mechanically fixed with a motor, and very rapidly raster scan the field of view with about 1,000 laser beams when rotated.
Multi-beam scanning with the CSU not only increases scanning speed, but also results in significantly lower photo bleaching and photo toxicity, because multiple excitation needs only a low level of laser power at the specimen to fully excite fluorescence.
More than 1,500 units of the CSU series are used as the de facto standard tool for live cell imaging, worldwide.



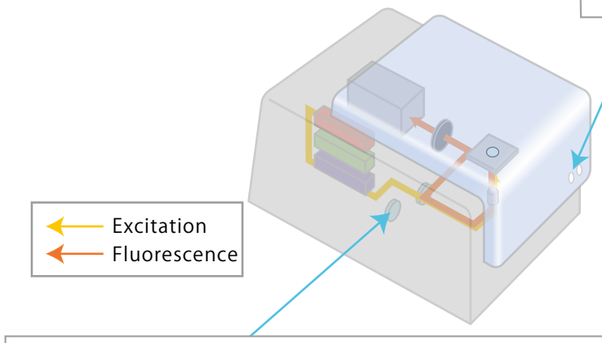
《All-in-one》

Desktop imaging system

You no longer have to bother with complicated system setup. Get started right away with confocal live cell imaging!

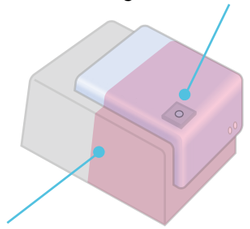
Compact all-in-one unit:
No need for a dark room – use the CV1000 right at your lab bench.

Easy to use:
Get started with just the push of a button. The custom-designed, easy-to-use software does all the hard work for you.



Double-disk unit with two pinhole sizes ※2 **New**
Select the optimal pinhole size depending on the magnification.
A direct optical path setting is available for bright field imaging.

Reliable environmental control
Temperature is precisely controlled inside the stage incubator and measurement unit, keeping cells healthy for long periods.



《Versatile range of attachments for various specimen types》

Attachments ※2 **New**

From high-end multi-point, long-term time lapse imaging to single shots of fixed cells

Select the attachment that best meets your requirements.
Use an attachment together with the stage incubator (for either single or triple 35 mm dish) to keep cells healthy during time lapse imaging.
Attachments for micro-plates with up to 96 wells are now available.


35mmDish


35mm 3Dish


Slide glass


Microplate

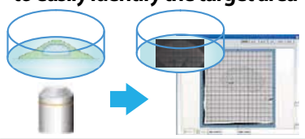
※2 Option

《Easy setting even for complicated multi-point time lapse imaging》

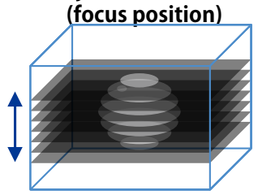
Observation procedure

Insert the sample

Capture a map view image of the entire area (this can take up to one minute) to easily identify the target area



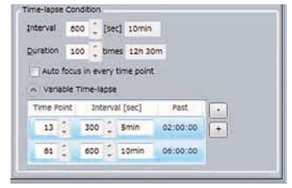
Adjust the z-stroke (focus position)



Repeat steps 3 and 4 to set multi-points

Click on the map view area to set the recording area

Select the time lapse settings

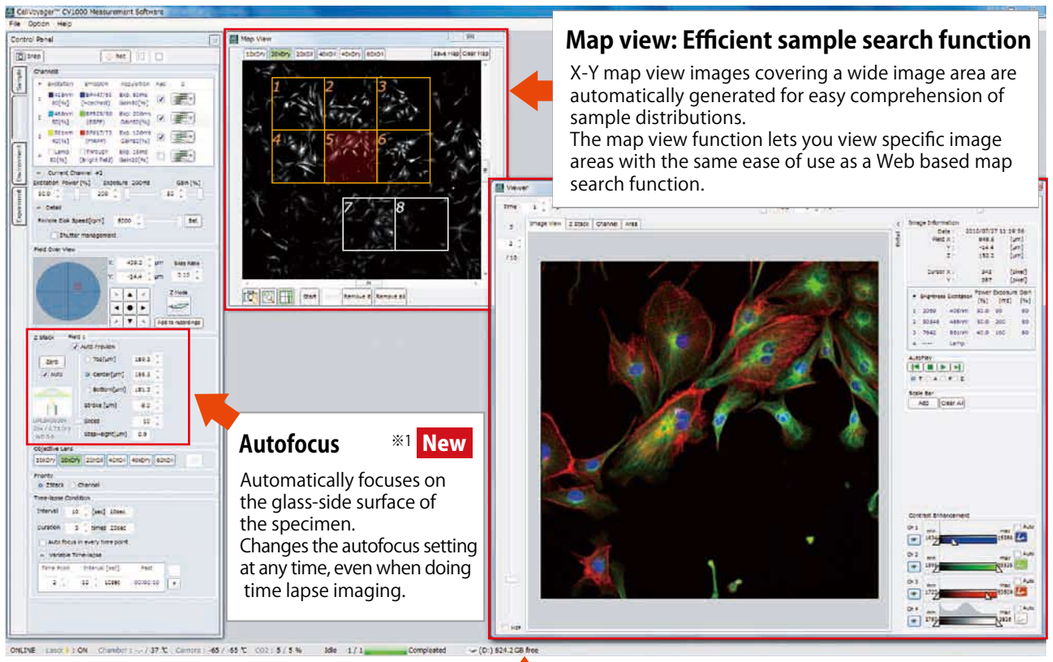


Push the REC button to begin recording!

While recording time lapse images, you can view and compare previously recorded images as well as the current images – a very useful function for long-term time lapse experiments.

《Friendly to both the user and cells!》

Control software



Map view: Efficient sample search function

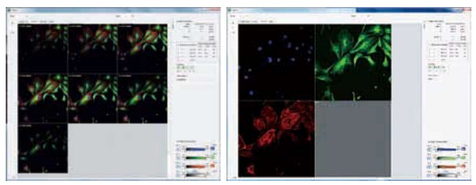
X-Y map view images covering a wide image area are automatically generated for easy comprehension of sample distributions.
The map view function lets you view specific image areas with the same ease of use as a Web based map search function.

Autofocus ※1 New

Automatically focuses on the glass-side surface of the specimen.
Changes the autofocus setting at any time, even when doing time lapse imaging.

Recorded data viewer

Allows you to easily confirm previously recorded images while capturing time lapse images.

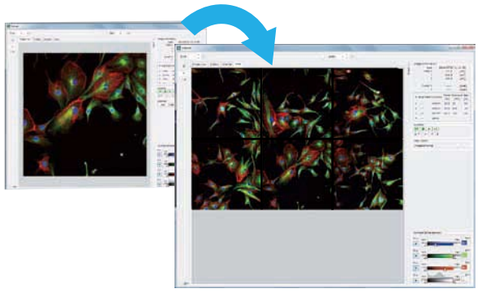


Z-stack

Channel

Area view New

In addition to being able to view individual recording fields, you can select area view to see all the fields; this facilitates quick comprehension of movements occurring over a wide area.



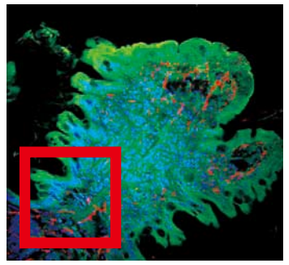
Field: a single recording field
Area: a group of recording fields, including 1x1 fields

《Easy selection of optimal condition》

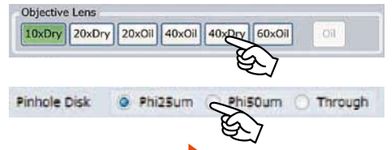
Automatic objective lens switching / Double-disk unit ※1

Local magnification selection with automatic objective lens switching

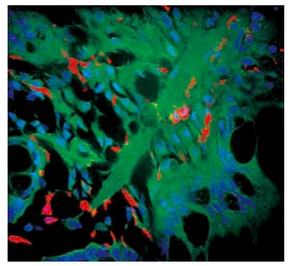
When you select a lens with a higher magnification, the objective lens switches automatically and the image is shown at that magnification.
With just one click, you can record a magnified image of whatever region interests you.
With the double-disk unit (optional), you can select the pinhole size that works best with your chosen magnification, for optimal imaging.
With a single CV1000 system, you can observe thick and large samples such as a whole mount embryo or an organ slice as well as small and complex samples such as a neurite.



New 25 um pinhole disk
(for low magnification) 20X oil



Achieves much higher image quality (resolution and S/N) at both low and high magnification!!



Standard 50 um pinhole disk
(for high magnification) 60X oil

Specimens: Rat small intestine; blue: nuclei, Hoechst 33342; green: golgi, Oregon Green 488; red: actin, Alexa 568

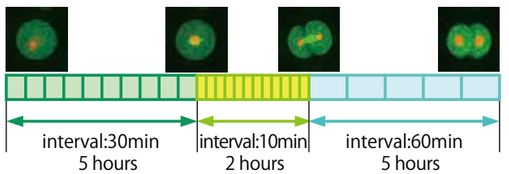
《Capable for complicated setting,too》

Useful functions

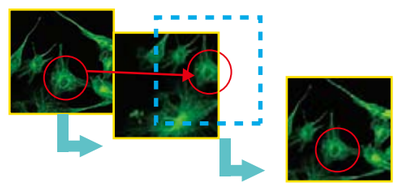
Time lapse settings:

During a time lapse experiment, you can change the settings to allow more precise recording of specific events.

You can set either a single interval or multiple intervals at specific time points.
The intervals and the number of recordings can be changed at any time while time lapse images are being captured.



Correction of imaging area: Imaging of moving objects



You can correct image center of each field during a time-lapse imaging, no more loss of long-term data!

Capable for various condition setting in one experiment: New

Allows you to change imaging conditions at each specific area

Channel settings of laser power, exposure time, and EM gain can be set for each area, in addition to the focus positions. You can change such settings during the course of a time lapse imaging.

※1 Option

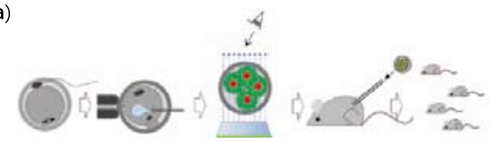
Application

《Developmental biology》 Long-term,4D timelapse imaging

■Long-term, multi-dimensional imaging of early stage mouse embryos

Following the injection of mouse embryos with mRNA, nearly 25,000 multicolor and multilayer confocal images of the embryos were acquired over a 60 hour period as they developed to the blastocycst stage. Thereafter, they were transferred to a recipient mouse that gave birth to healthy pups, each of which developed normally and had full reproductive capability. This is firm evidence that long-term, multi-dimensional confocal imaging with the CV1000 causes no harm to a delicate specimen such as an early stage embryo.

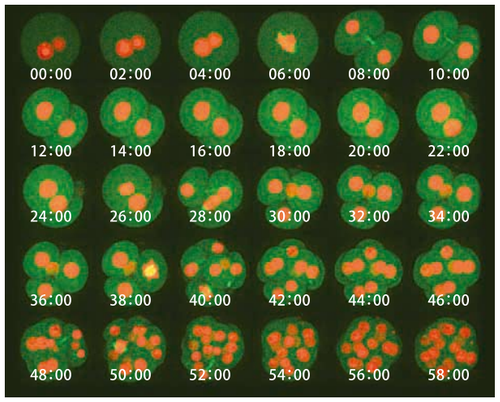
(a)



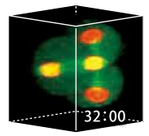
(b) Imaging conditions

Total time	60 hours (2.5 days)
Imaging interval	15 min/stack
Z-sections/stack	51 sections(2 micrometers apart)
Imaging positions	6 fields (72 embryos)
Excitation (nm)	488nm/561nm
Objective lens	20X Oil

(c)



Images extracted at 2-hour intervals from 60 hours of data.
Each image is the maximum intensity projection of a total of 51 z-section images.
Green: Spindle (E-GFP-alpha-tubulin)
Red: Nucleus (H2B-mRFP1)



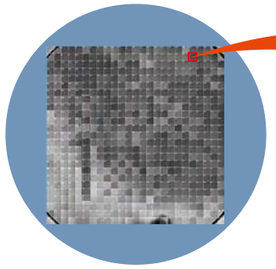
DATA: Kazuo Yamagata, PhD., Wakayama Lab. (Laboratory for Genomic Reprogramming),Center for Developmental Biology, RIKEN

《Developmental biology》 Wide-area imaging of primordial germ cells

■Wide-area imaging of primordial germ cell

The process to form colonies of EG cell (a kind of iPS cell) from primordial germ cells expressing GFP of 12.5 days embryo of TG mouse was imaged for a long-time at the whole area of a culture dish (625 fields).
As a result of 5 days' imaging, colonies of EG cells were formed as frequently as was formed when the cells were cultured in a CO_2 incubator.
With the CV1000, you can record whole area quite at ease when you don't know where to find the target, and can discover what happened from the acquired data.

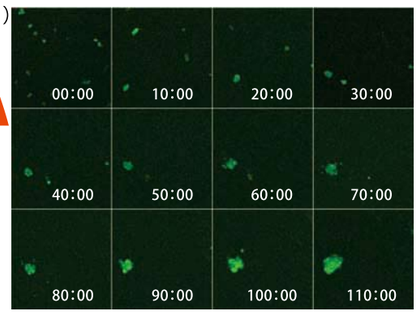
(a)



(b) Imaging conditions

Total time	120 hours (5 days)
Imaging interval	30 min/stack
Z-sections/stack	3 sections(2 micrometers apart)
Imaging positions	625 fields (the whole area of a culture dish
Excitation (nm)	488nm
Objective lens	10X Dry

(c)



Images extracted at 30min intervals from 120 hours of data.
Each image is the maximum intensity projection of a total of 3 z-section images.
Green: Membrane (eGFP-alpha-tubulin)

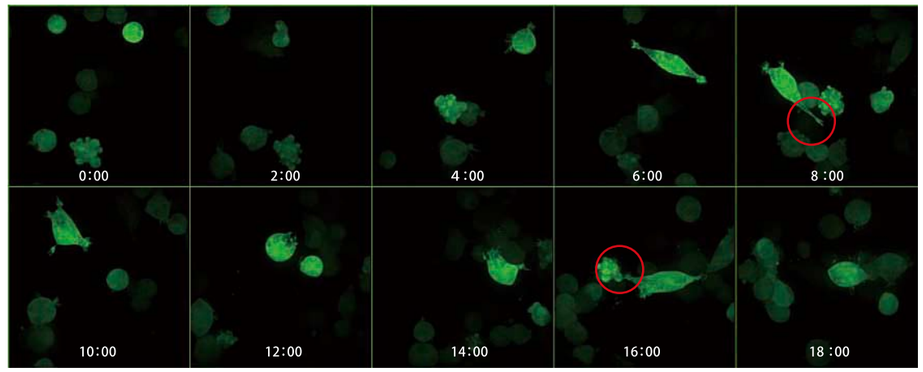
DATA: Yasuhisa MATSUI , PhD., Cell Resource Center ,Institute of Development, Aging and Cancer, Tohoku University

《Cancer application》 High-speed 4D imaging

■Imaging of 293F cells transfected with eGFP by using NeoFectin

Floating 293F cells were transfected with eGFP by using NeoFectin, a transfection accelerating agent made by ASTEC.
The cells were shake-cultured overnight.As a result of time lapse imaging, active movement of cells expressing eGFP inside the floating cell clusters, and structural changes in the cell wall such as ruffling were clearly observed.

(a)



(b) Imaging conditions

Total time	20 hours
Imaging interval	10 min/stack
Z-sections/stack	101 sections(0.3micrometers apart)
Imaging positions	25 fields
Excitation (nm)	488nm
Objective lens	60X Oil

Images extracted at 2-hour intervals from 20 hours of data.
Each image is the maximum intensity projection of a total of 101 z-section images.
Green: Membrane (eGFP)

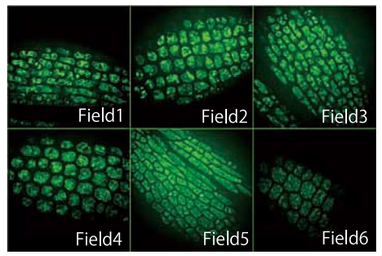
DATA:ASTEC CO., LTD.

《Plant application》 High-speed multi-field imaging

■Imaging of the vacuolar membrane shape during germination proces in Arabidopsis thaliana

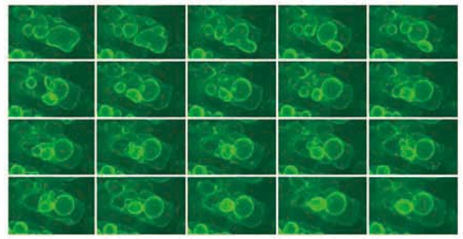
Changes in the shape of a vacuolar membrane during the germination process were continuously recorded.
High-speed and multi-point time lapse imaging with the CV1000 allows accurate and high-resolution tracking of rapid changes in living organisms, something that has proven quite difficult with conventional imaging systems.
By selecting the appropriate filter and pinhole size, thick samples and auto fluorescent plant cells can be clearly observed with the CV1000.

(a)



Maximum Intensity Projection Images for each imaging position..

(c)

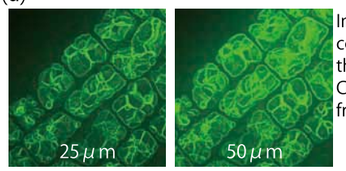


Maximum Intensity Projection Images at 1 min interval for Field 2.
Green : Vacuolar membrane (Vam3-GFP)

(b) Imaging conditions

Total time	14 hours
Imaging interval	1 min/stack
Z-sections/stack	11 sections(1 micrometers apart)
Imaging positions	6 fields
Excitation (nm)	488nm
Objective lens	60X Oil

(d)



Images with the same condition except for the pinhole size.
Clear image was obtained from 25um pinhole.※1

DATA: Chieko Saito ,PhD., Senior Research Scientist,Live-cell Molecular Imaging Research Team, Extreme Photonics Research Group,RIKEN

※1 Option

Specification

Model			CV1000			
Main unit	Type		3-color model	2-color model	Single-color model	Basic model
	Confocal scanning method		Microlens enhanced dual Nipkow disk scanning			
	Scanning speed		1,500～5,000rpm （Max 1,000fps※1）			
	Excitation laser wavelength		405, 488, 561nm	488, 561nm	488nm	488nm
	Bright field imaging		LED transmission			–
	Camera	Type	Back-illuminated EMCCD			Cooled CCD
		Effective no. of pixels	512×512			1344×1024
	XY-stage		High-precision auto X-Y stage Designated resolution: 0.1 μm			
	Z-axis control		Motorized Z-axis control Designated resolution: 0.1 μm			
	Objective lens		【Standard】 Dry: 10X 【Option】 Up to 5 lenses can be added Dry: 10X, 20X, 40X Oil: 20X, 40X, 60X Water: 60X LWD: 20X, 40X			
	Stage incubator ※2		High-precision temperature controllable incubator 【Temperature】 Range : 30 – 40℃ (Room temperature +5℃ or higher) Designated resolution：0.1℃ 【Humidity control】Forced humidification with a water bath unit			–
	CO_2		CO_2 5% Gas cylinder : CO_2※3			–
	Attachment		Single 35mm dish attachment with stage incubator			Slide glass attachment
	External dimension		W580×D835×H532 mm			
	Weight		93Kg			
Utility box	External dimension		W319×D368×H518 mm			W319×D368×H346 mm
	Weight		16kg			10Kg
Control software			Sets conditions for imaging, camera, time lapse, environments※2, 3D imaging, map view acquisition,multi-color imaging , and multi-point imaging. Functions include image display. Output file type：16bit TIFF			
Work station			Controller work station、Display（24inch 1920×1200）			
Operating temperature			15～35℃（When operating temperature is over 30 C, water cooling of the camera is required.）			
Operating humidity level			20–70% RH (no condensation)			
Power consumption			100～240VAC/50 or 60Hz 1500VAmax			

CellVoyager and CSU are registered trademarks of Yokogawa.

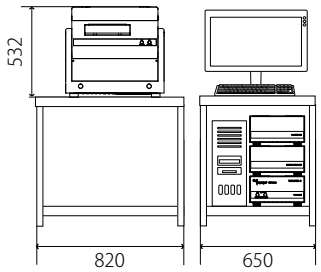
Option

Pinhole change unit	50 μm/25 μm Switching time : 2sec
Back-illuminated EMCCD	Effective no. of pixels：1024×1024
Auto focus	Detection of glass surface with laser + offset
Attachment	For Single 35mm dish with Stage incubator ※2 ※4 For Triple 35mm dishes with Stage incubator※4 For Micro wellplate For Slide glass ※5

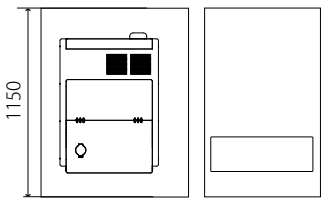
※1 fsp : frame per second
Frame rate : Actual frame rate depends on the specification of the camera.
※2 Available with basic model
※3 CO_2 gas cylinder not included with CV1000 system
※4 When you use stage incubator, CO_2 mixing unit is required
※5 Available with 3-color model,2-color model and single-color model

Layout

■Front view



■Plain view



・Recommended lab bench size
【Main unit】 W820 X D1150 mm or larger
Minimum clearance : front: 160 mm, back: 150 mm,above: 350 mm, side: 120 mm
【Utility box and Controller work station】W650 X D1130 mm or larger
Minimum clearance : front: 50mm, back: 50 mm, side: 50 mm

YOKOGAWA

CLASS 1 LASER PRODUCT
IEC60825-1 : 2007

Safety Precautions
* Read the user's manual carefully in order to use the instrument correctly and safely.
* This product falls under the category of class 1 laser products.

YOKOGAWA ELECTRIC CORPORATION
Life Science HQ

Kanazawa 2-3 Hokuyodai, Kanazawa-shi, Ishikawa, 920-0177 Japan
Phone: (81)-76-258-7028, Fax: (81)-76-258-7029

Tokyo 2-9-32 Nakacho, Musashino-shi, Tokyo, 180-8750 Japan
Phone: (81)-422-52-5550, Fax: (81)-422-52-7300

E-mail CSU_Livecell_imaging@cs.jp.yokogawa.co.jp
URL: http://www.yokogawa.com/scanner

Represented by :

[Ed:01/b]

Printed in Japan, 010