

# KEYENCE

**NEW** All-in-One Fluorescence Microscope  
BZ-X800E



**No darkroom required  
Streamline Imaging and Analysis  
with a Single Platform**

Simple setup and easy operation  
for outstanding research results



# Built-in Darkroom, Space Saving

A specimen enclosure is built into the body of the microscope, allowing users to perform fluorescence imaging even in a brightly-lit room  
Space-saving design means the unit can be set up in any location for optimal testing efficiency

# Any User Can Easily Capture Images

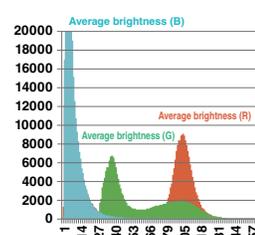
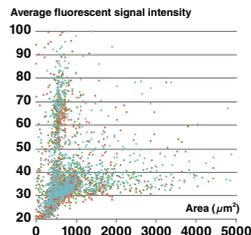
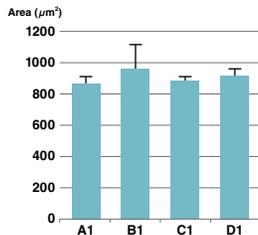
No complicated configuration required  
With a single click, any user can capture publication-quality images

# Batch Analysis of Large Data Sets

Capture and analyze in dramatically shorter time frames than with conventional microscopes  
The image cytometer module reinforces testing reliability

**NEW** Image cytometer module **► p.14**

Copying settings enables bulk observation and analysis in one operation



All-in-One System

# Enhanced Core Performance

[ **No darkroom required** ]

High-contrast fluorescence imaging even in a brightly-lit room  
Enables an optimal working environment with space-saving design

[ **Full electronic control** ]

All operations controlled within an easy-to-use software  
High-reproducibility, user-independent imaging

[ **Publication-quality images** ]

Built-in high-sensitivity, high-resolution cooled monochrome camera  
Supports clear fluorescence, brightfield, and phase contrast observation over a range of samples



# Adaptable to Research Needs

NEW

Well scanning



NEW

Image cytometer

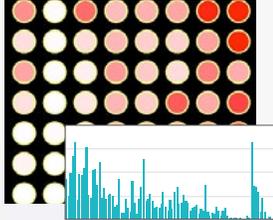
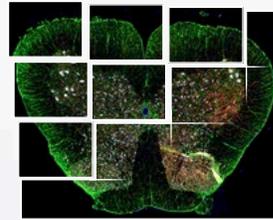
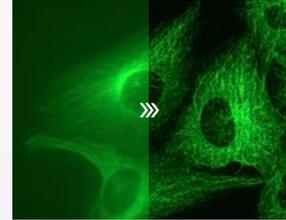


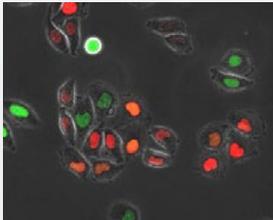
Image stitching



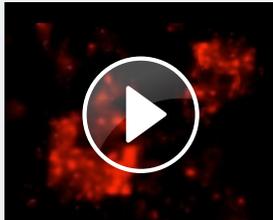
Optical sectioning



Live cell imaging

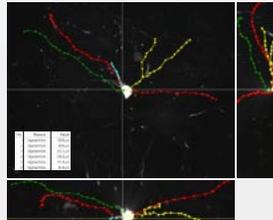


Video capturing



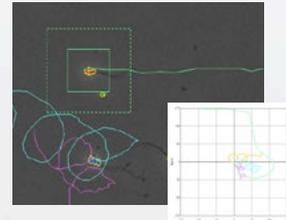
NEW

3D measurement and analysis



NEW

Motion analysis



NEW All-in-One Fluorescence Microscope  
BZ-X800E

Built-in high-sensitivity cooled monochrome camera

## Advanced Observation Delivers High-Resolution Images



### Cooled CCD

Even when a CCD is not exposed to any light, dark current signals are generated and create unwanted noise in an image. This noise is largely temperature-dependent, increasing as a CCD gets warmer. The Peltier-cooled CCD in the BZ-X800E is cooled to 25°C 45°F below the ambient temperature to achieve high-sensitivity imaging with little noise.

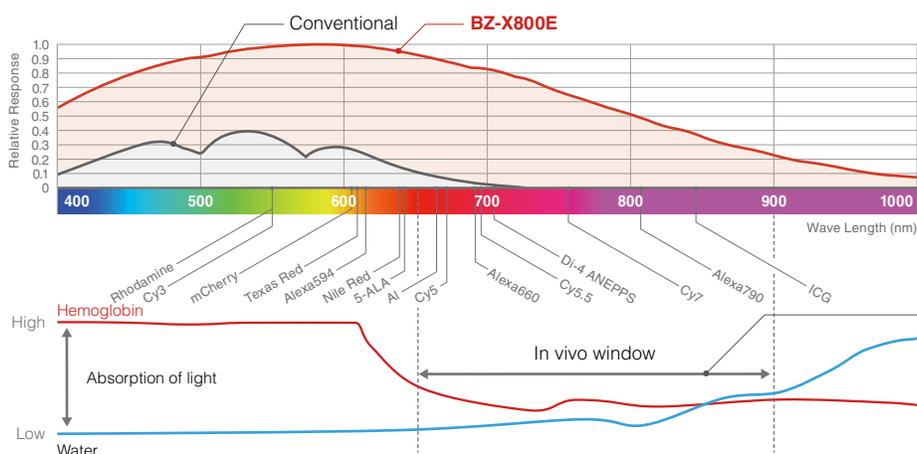
# Bright, High-definition Imaging

## Low noise, high sensitivity

The cooled monochrome camera provides clear images that combine high sensitivity and low noise. This enables clear fluorescence imaging even with low excitation light, minimizing both photobleaching and damage to cells sensitive to phototoxicity.

## High sensitivity across short and long wavelengths

The metal halide light source covers a broad wavelength range from UV to IR. Virtually any fluorophore can be detected simply by changing filters. Combined with the highly sensitive camera, the system is able to easily capture weak signals even in the near-IR wavelength range, such as Cy7. This also allows for easy visualization of faint cellular expression signals in deep tissue layers.



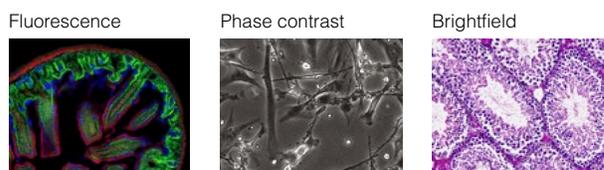
The 650 to 900 nm wavelength range is referred to as the "in vivo window." With low levels of autofluorescence and light scattering in this range, long-wavelength fluorescent dyes are ideal for visualizing deep regions of living tissue.

## One-click monochrome/color switching camera

Switching between color and monochrome imaging modes can be easily performed with just one click. An electronic liquid crystal filter enables high-definition 3CCD imaging with superior color reproducibility. This creates ideal conditions for brightfield applications such as H&E, DAB, and similar dyes.

## High versatility across various samples

The system supports fluorescence, brightfield, and phase contrast imaging. Users can observe various specimens in different vessel types, enabling versatility across a wide range of experiments.

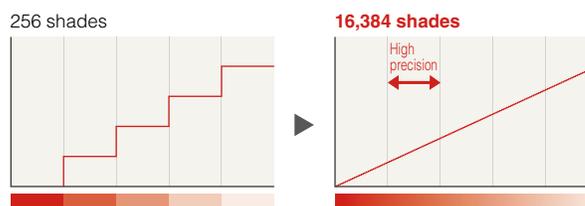


# Accurate Detection for Reliable Data

Unlike color cameras, the CCD element does not use color filters. This eliminates variations in light quantities received on the CCD due to the fluorescence color. This allows for accurate quantification of fluorescence intensity, which is important for evaluating properties such as protein weights.

## 14-bit, high-level gradation

Data capturing with 16,384 gradations allows for accurate measurement of expression levels and precise quantification.



Large motorized stage equipped to observe an entire well plate

## Easy Operation for Dramatically Improved Observation



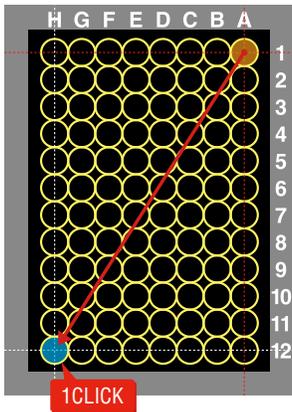
### Anti-vibration construction

The BZ-X800E uses a floating stage structure with anti-vibration dampers to stabilize high-precision imaging. High magnification capture, image stitching, and observation of cultured cells in liquid media can be performed anywhere, unaffected by vibration.

# Easy Navigation

## Stage view

Users simply click a point on the stage map to instantly navigate to that location on the sample. Even with large well plates, users can find regions of interest quickly and easily.



The encoded stage moves instantly to the clicked location

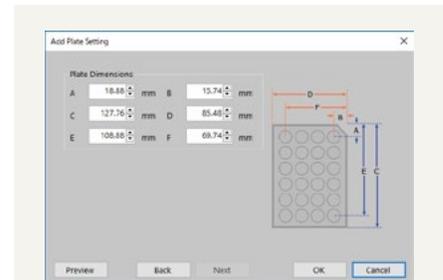
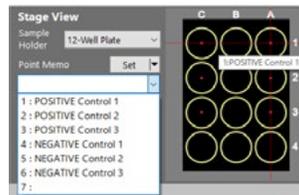


Plate customization function

Create a plate map for proper alignment of custom well plates.

## Point memo

Record coordinates of regions of interest. Click the point memo to instantly return to that location.



## Six-mount electronic lens revolver

Both field of view and focus can be maintained even when changing magnification for easy observation.



### Any combination

Magnification 2-100x

Oil-immersion lenses

Dry lenses

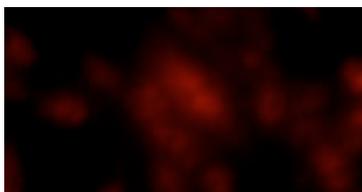
Phase contrast lenses

# Fast and Easy Focusing

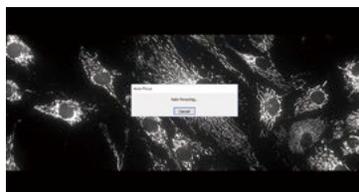
## High-speed auto focus

With a single click, instantly focus on any sample in fluorescence, brightfield, or phase contrast at any magnification. The rapid auto focus uses a high-sensitivity partial scan mode in the Z axis.

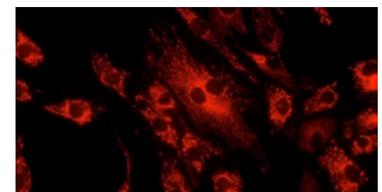
One-click auto focus



High-sensitivity partial scan for high-speed processing



Accurate focus



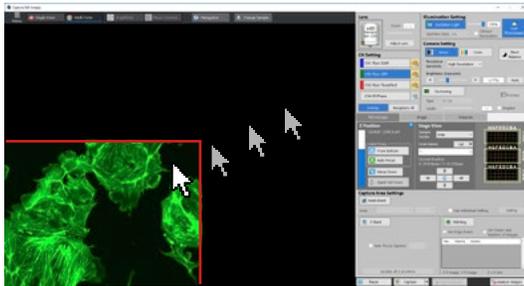
## High-sensitivity partial scan

By combining the CCD's partial reading and binning processing, this mode enables the display of images with even higher sensitivity. Weak fluorescence signals normally require a long exposure time, but this mode makes it possible to read them at high speed for rapid focusing. The BZ-X800E uses a dedicated focus control motor for high-precision control in the Z axis for accurate, user-independent auto focus.

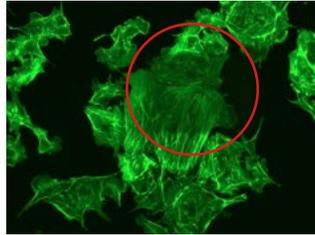
# High-Efficiency Imaging

## Low photobleach mode

When changing the focus or field of view, the excitation light is only pulsed long enough to display an image. The excitation light is then turned off until another adjustment is made, minimizing photobleaching and prolonging the life of the specimen.

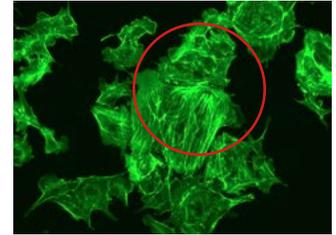


Conventional



Photobleaching during high-magnification observation leads to sample damage with irregularities in brightness

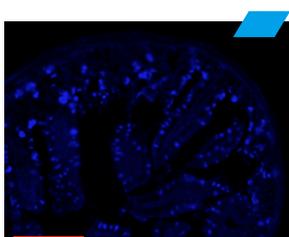
Low photobleach mode



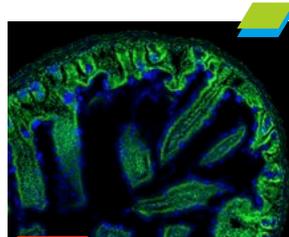
Photobleaching is minimized, resulting in uniform brightness

## Real-time overlay

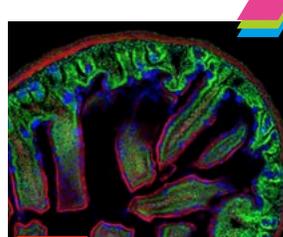
Capture settings such as focus and exposure time on an overlaid image can be viewed and adjusted prior to image capture. On a conventional system, a multi-channel overlay would need to be captured, adjusted, and recaptured to obtain the desired result. The BZ-X800E saves time by providing a real-time overlay prior to image capture.



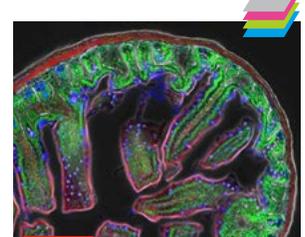
1CLICK CH1/DAPI image



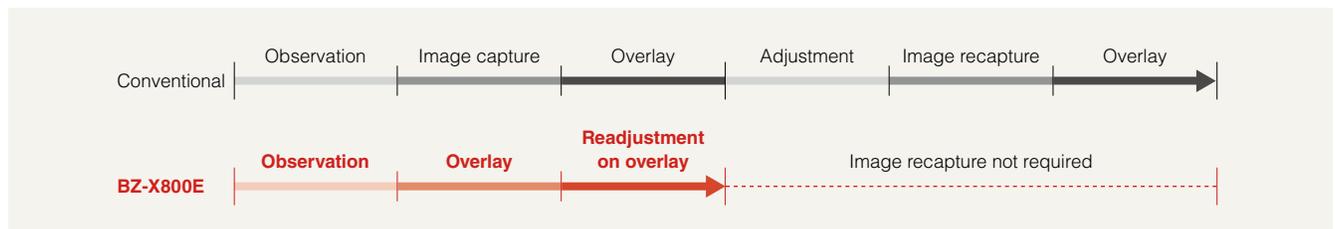
1CLICK CH2/GFP image



1CLICK CH3/TexasRed image

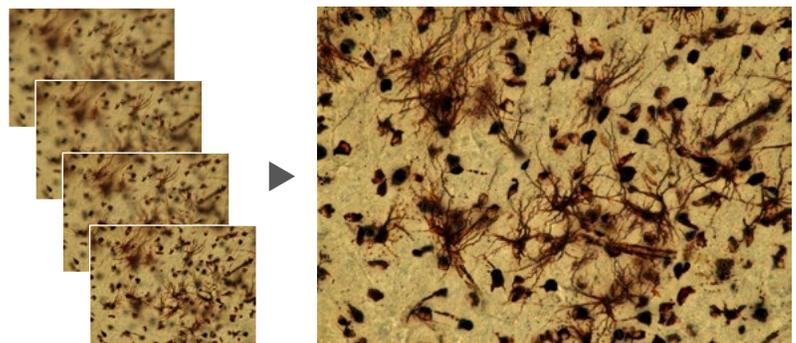


1CLICK CH4/Phase contrast image



## Quick full focus

With a single click, the system automatically scans the height of the sample and creates a fully-focused composite image in real-time. This greatly reduces the time and effort required to interpret several partially-focused images of a thick target.



One-click, automatic scanning

Fully-focused image

Rat brain, Golgi staining  
Sample courtesy of Dr. Seiji Otani, Cell Technology Laboratory

# Capture Condition Reproducibility

## Load capture settings

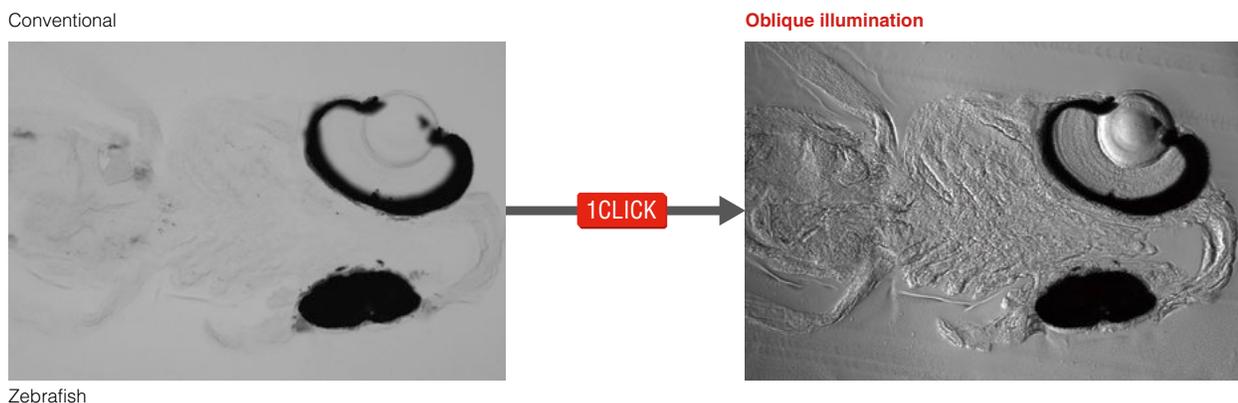
Capture conditions such as the filter settings, magnification, exposure time, and capture position can be read from previous images for easy reproducibility. Any user can capture images using the same conditions, eliminating variability between operators. This also allows for accurate observation of changes over time, with a higher degree of repeatability.



# Enhance contrast of unstained transparent specimens

## Oblique illumination

Observe images similar to those obtained by using differential interference contrast (DIC), but without any additional lenses, prisms, or other hardware. Unlike DIC, this technique can be performed through plastic containers, making it suitable for observing ova and other clear specimens.



Zebrafish

# Enhanced Observation and Analysis

Expandable to support diverse applications while maintaining ease-of-use

The built-in configuration includes all of the hardware required for the optional modules. Upgrades are easy and fast for on-demand expandability. The software interface remains the same as modules are added, allowing users to easily operate the system after upgrading.

## LED transmitted illumination

The long-lifetime LED has little to no change in color temperature over time. This allows for accurate hue representation in brightfield, ideal for quantification.

## Large motorized XY stage

With a movable range of 114 × 80 mm 4.49" × 3.15", an entire well plate can be imaged. The stage can be controlled down to 1 μm for high-precision scanning.

## Excitation lamp

The metal halide lamp provides high intensity illumination for fluorescence imaging. A wide range of fluorescence dyes are supported, from below 350 nm to over 700 nm.

## Electronic filter turret

## Electronic projection element

With a single click, the electronic projection element creates a structured illumination pattern for optical sectioning capture. As opposed to a mechanical component, the electronic element enables high-speed and more customizable projection patterns.

## Six-mount electronic lens revolver

Lenses are positioned to facilitate stable, continuous capture of various points and conditions. With phase contrast and oil-immersion lenses, applications ranging from cultured cells to sectioned tissue can be imaged on a single platform. The lens can be controlled down to a 0.1 μm step size in the Z axis for high-precision 3D analysis.



# Observation and Capture Modules

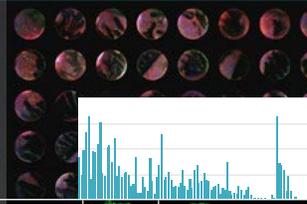
NEW

BZ-H4XI

## Image Cytometer Module

Batch capture and analysis of large amounts of data, including well plates.

▶ p.14

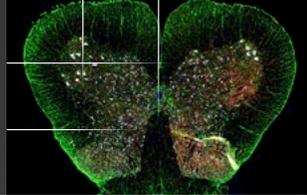


BZ-H4XD

## Advanced Observation Module

High-precision image stitching and Z-stacking for multilayer capture.

▶ p.16

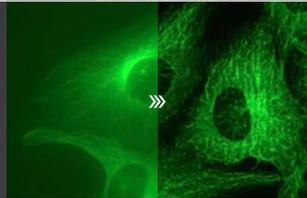


BZ-H4XF

## Sectioning Module

Optical sectioning capture with structured illumination.

▶ p.20

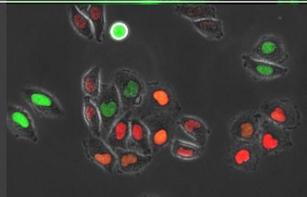


BZ-H4XT

## Time-lapse Module

Automated capture at user-specified intervals for video and time-series measurements.

▶ p.24



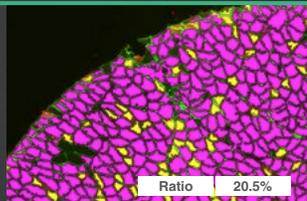
# Analysis Applications

BZ-H4C/BZ-H4CM

## Hybrid and Macro Cell Count

KEYENCE's original algorithm enables accurate quantification of image data.

▶ p.26



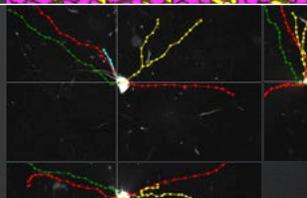
NEW

BZ-H4R

## 3D Application

Creation of 3D images from Z-stack data. 3D measurement of localization and configuration available.

▶ p.30



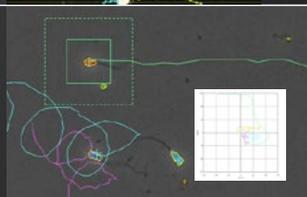
NEW

BZ-H4K

## Motion Analysis Application

Tracking of user-specified targets to measure travel range, speed, and coordinate positions.

▶ p.32

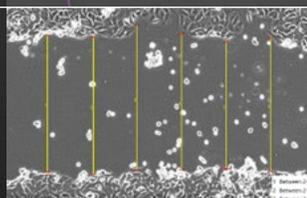


BZ-H4M

## Measurement Application

Manual 2D measurements, including area.

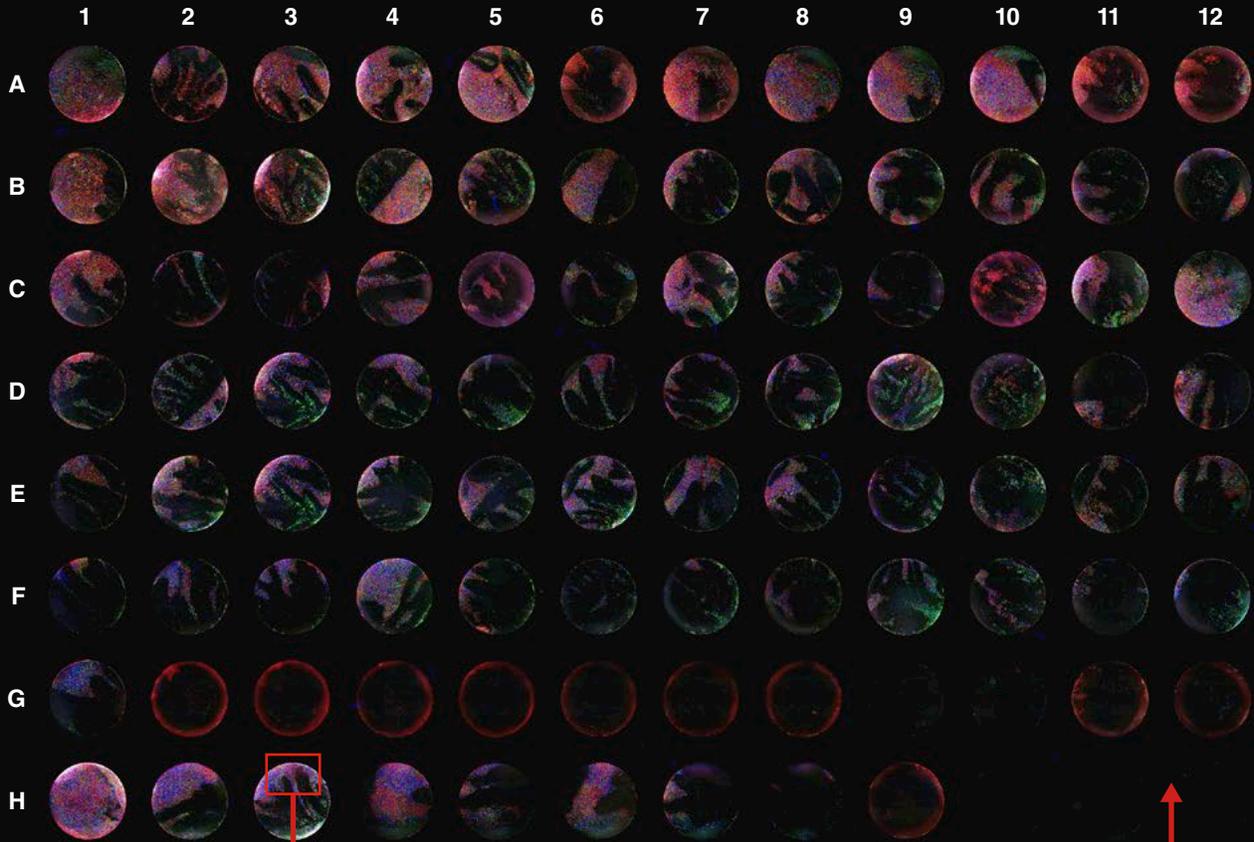
▶ p.33



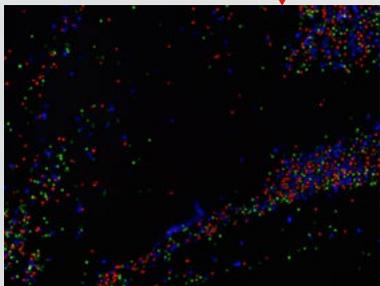
## Image Cytometer Module

# High Throughput for Capture and Analysis

Capture settings in one location can instantly be applied to all fields of view on a well plate. Users can select any or all wells to be scanned with uniform conditions for high reproducibility of data. This work flow can be completed in just three simple steps. The system will then automatically execute the capture without any additional user configuration.



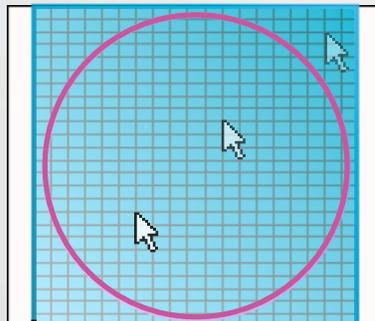
**STEP 1**  
Set capture conditions



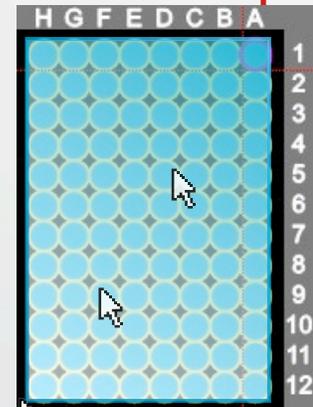
Lens magnification	Exposure time
Channel	Camera settings
Z-stack	Sectioning

etc.

**STEP 2**  
Click and drag to specify the range of capture within a well



**STEP 3**  
Click and drag to specify wells to capture

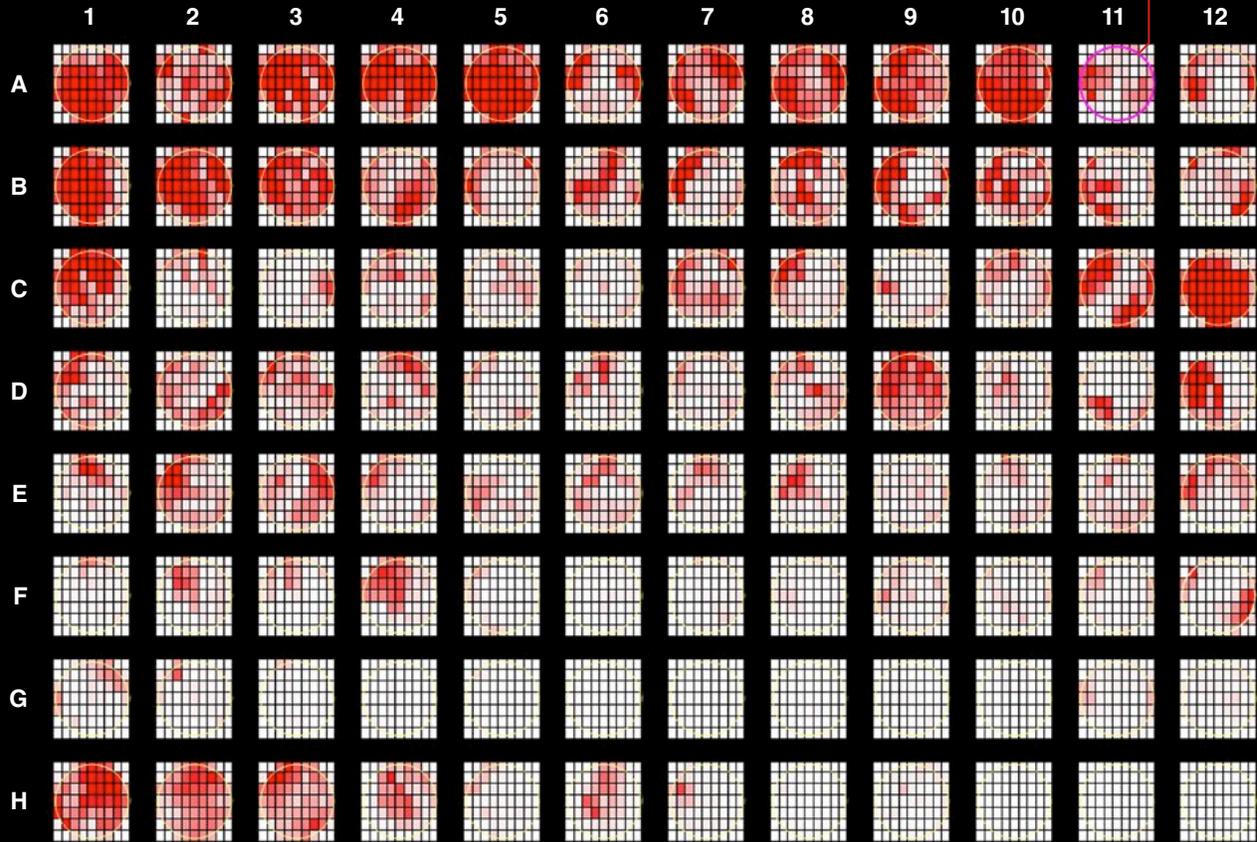
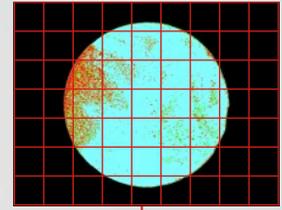


Batch Capture

1CLICK

# Accurate, High-Content Analysis with High-Resolution Images

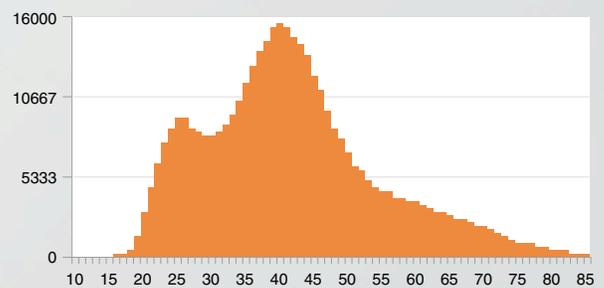
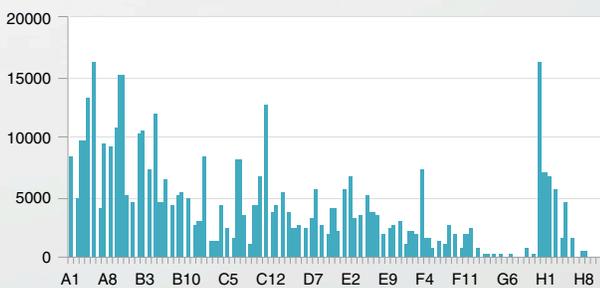
Set analysis conditions for a single image and apply to all data points automatically. This saves time and reduces variability from one image to the next. The BZ-X800E's advanced optics capture high-resolution images, resulting in highly precise data acquisition.



▲ **Heatmap function** Gradated display visually represents different measurement values between fields of view and wells

## Statistical analysis

Create histograms for each measured item, such as counts, areas, and light intensity. Results can be organized by field of view, individual well, and even combined to cover the whole well plate.

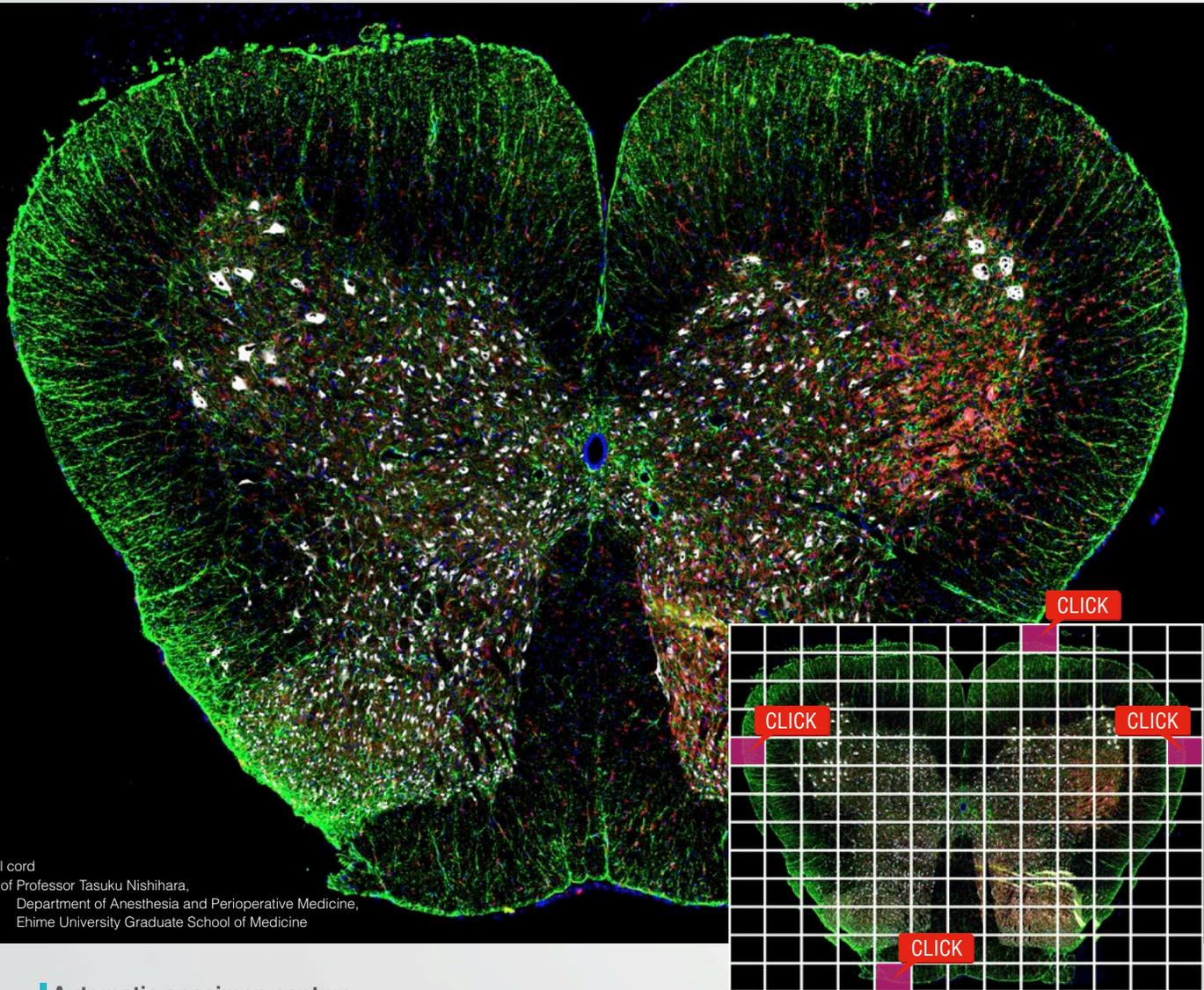


## Image Stitching

# High-Speed Capture of High-Resolution, Wide-Area Images

Viewing a specimen at high-magnification often requires an expansion of viewing area beyond a single field of view. Image stitching allows the user to easily capture an entire specimen at high-magnification, and seamlessly create a single high-resolution image.

Up to 50,000 x 50,000 pixels can be rapidly joined together without stitch lines or brightness variations. A large quantity of images can be captured at a speed that is seven times faster than that of conventional methods.



Rat spinal cord  
 Courtesy of Professor Tasuku Nishihara,  
 Department of Anesthesia and Perioperative Medicine,  
 Ehime University Graduate School of Medicine

### Automatic specimen capture

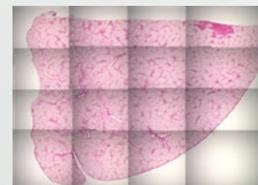
Capture an entire specimen automatically by registering the coordinates of its outermost positions.

### High precision shade correction

Uneven light intensity caused by lens aberration or non-uniform light sources appear as seams in the stitched image. This results in an unnatural appearance and affects the accuracy of quantification.

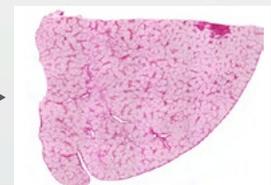
The BZ-X800E eliminates uneven light intensity with its high-precision shade correction algorithm in order to create seamless, high-resolution images.

Conventional stitched image



Uneven light intensity causes  
 stitch lines

BZ-X800E stitched image

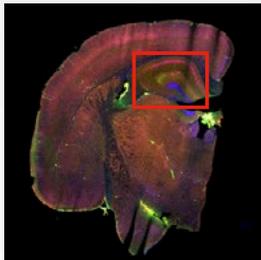
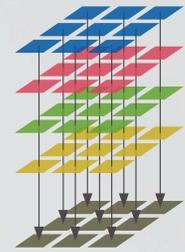


Shade correction eliminates  
 stitch lines

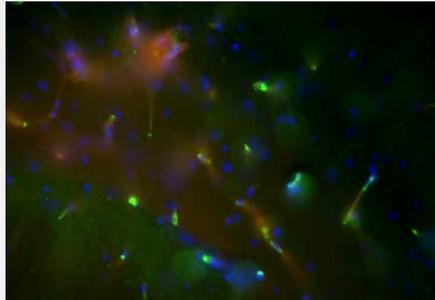
## Full-focus Image Stitching

### Fully-Focused Images of Thick Samples

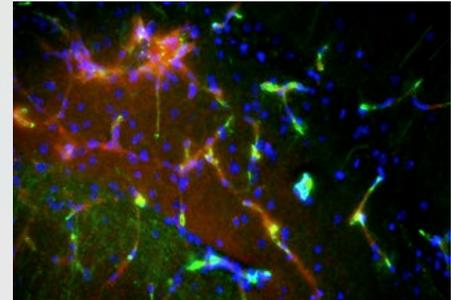
The automated stage captures a Z-stack for each individual field-of-view being stitched. This allows for a fully-focused wide-area image to be obtained for thick or dense samples.



Conventional



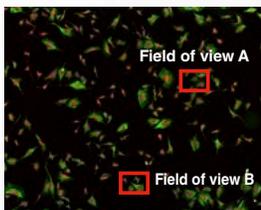
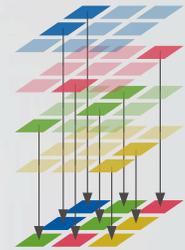
BZ-X800E



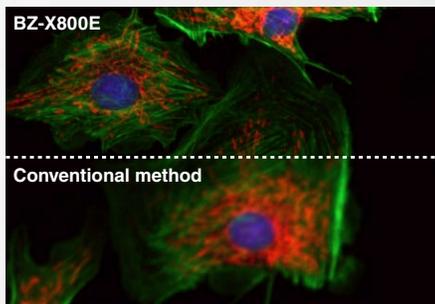
## Auto-focus Image Stitching

### Rapidly Focus Each Field of View

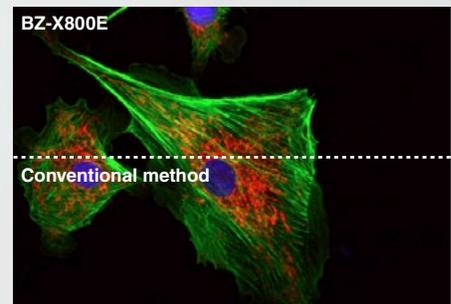
Each field-of-view is auto-focused prior to image capture. Optimally-focused stitched images of samples with height variations, such as an unevenly sliced tissue section, can be captured without user input.



Field of view A



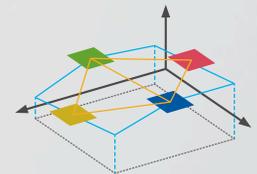
Field of view B



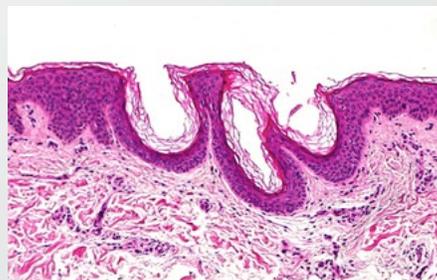
## Edge-focus Image Stitching

### Set Z Point Positions for Fast, Focused Stitching

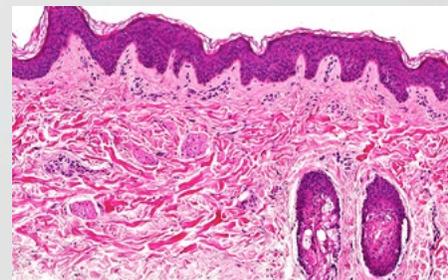
Set the focal plane for a few fields of view and then execute a rapid, single layer stitch with fewer captures. The Z axis will change gradually as the sample is scanned for rapid image stitching and minimal photobleaching.



Field of view A



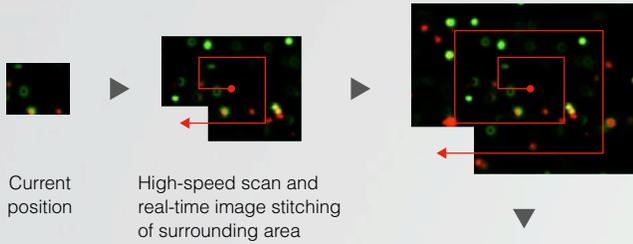
Field of view B



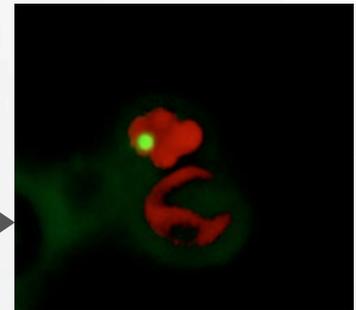
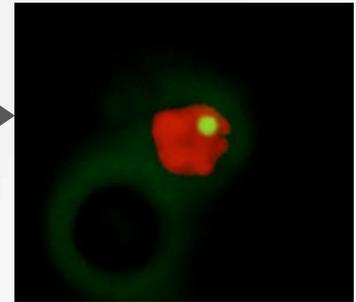
Navigation

# Easily Locate Areas of Interest

With a single click, adjacent fields-of-view are rapidly stitched together to create a navigation image of the entire sample. Clicking anywhere on the navigation screen will immediately move the stage to that location. The current field-of-view is always displayed on the navigation image, so users never lose sight of the relative viewing position, even at high magnifications.



Instantly move to the selected area

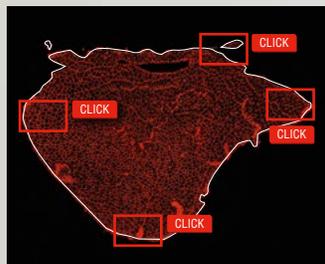


Micronucleus testing (genotoxicity test)

## Image stitching made simple

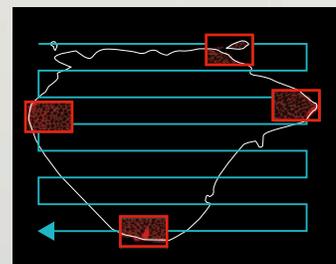
### STEP 1

While viewing the entire image of the specimen on the navigation screen, click the four points on the outside edge of the specimen to register their coordinates.



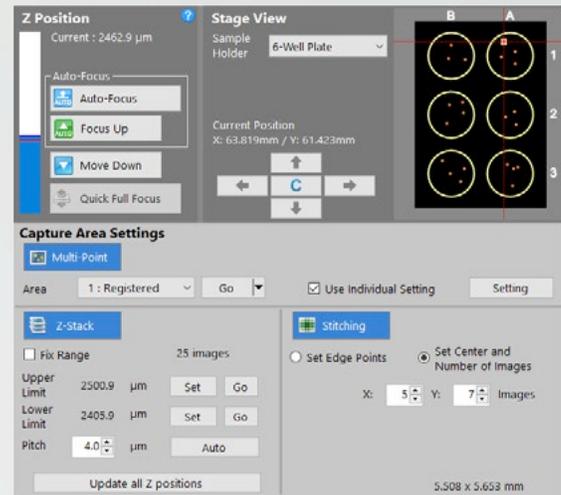
### STEP 2

The stitched image is then captured without missing any part of the specimen. This eliminates the time and effort spent recapturing images due to some areas missing from the stitched image.



## Efficient Image Capture of Multiple Specimens

Up to 999 coordinate points can be recorded. A variety of capture conditions such as magnification, exposure time, Z-stack settings, and image stitching can be set individually for each point. As with normal observation, simply click "Set" to register capture conditions. Multiple points of data can be obtained at the same time, and this function is also useful when performing repeated evaluations of the same location on multiple specimens, such as with sequential sections and well plates.

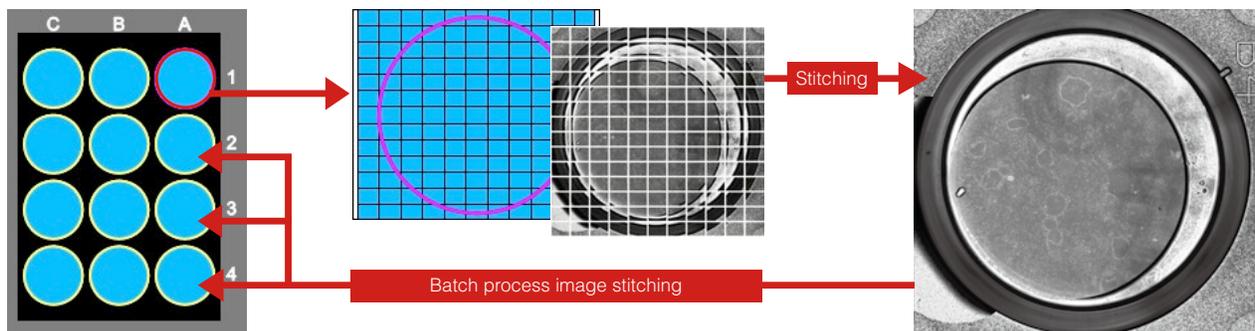


### Batch Process Image Stitching

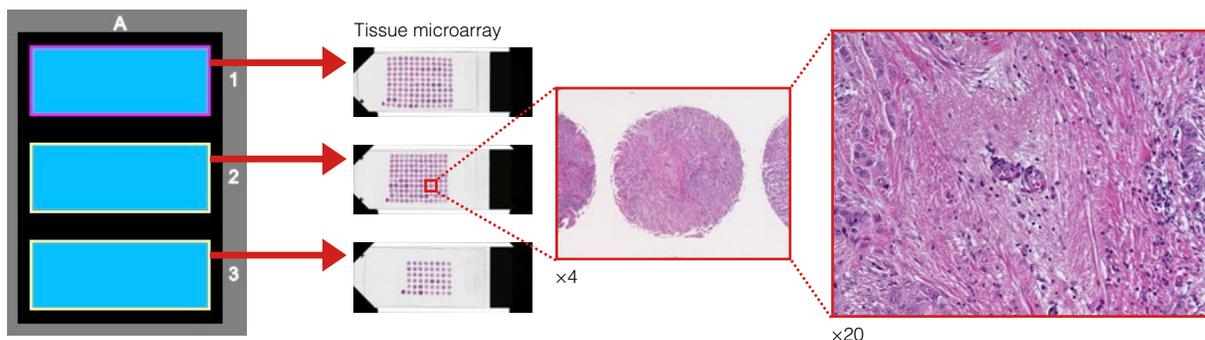
BZ-H4XD × BZ-H4XI × BZ-H4C

## Stitch Multiple Samples

Automatically carry out image stitch processing for multiple wells using macros. Acquire high-quality images without compromising on lens magnification or image resolution.



**Whole slide scans** The BZ-X800E Wide Image Viewer saves uncompressed images with the highest possible resolution, allowing users to observe fine details of large samples.

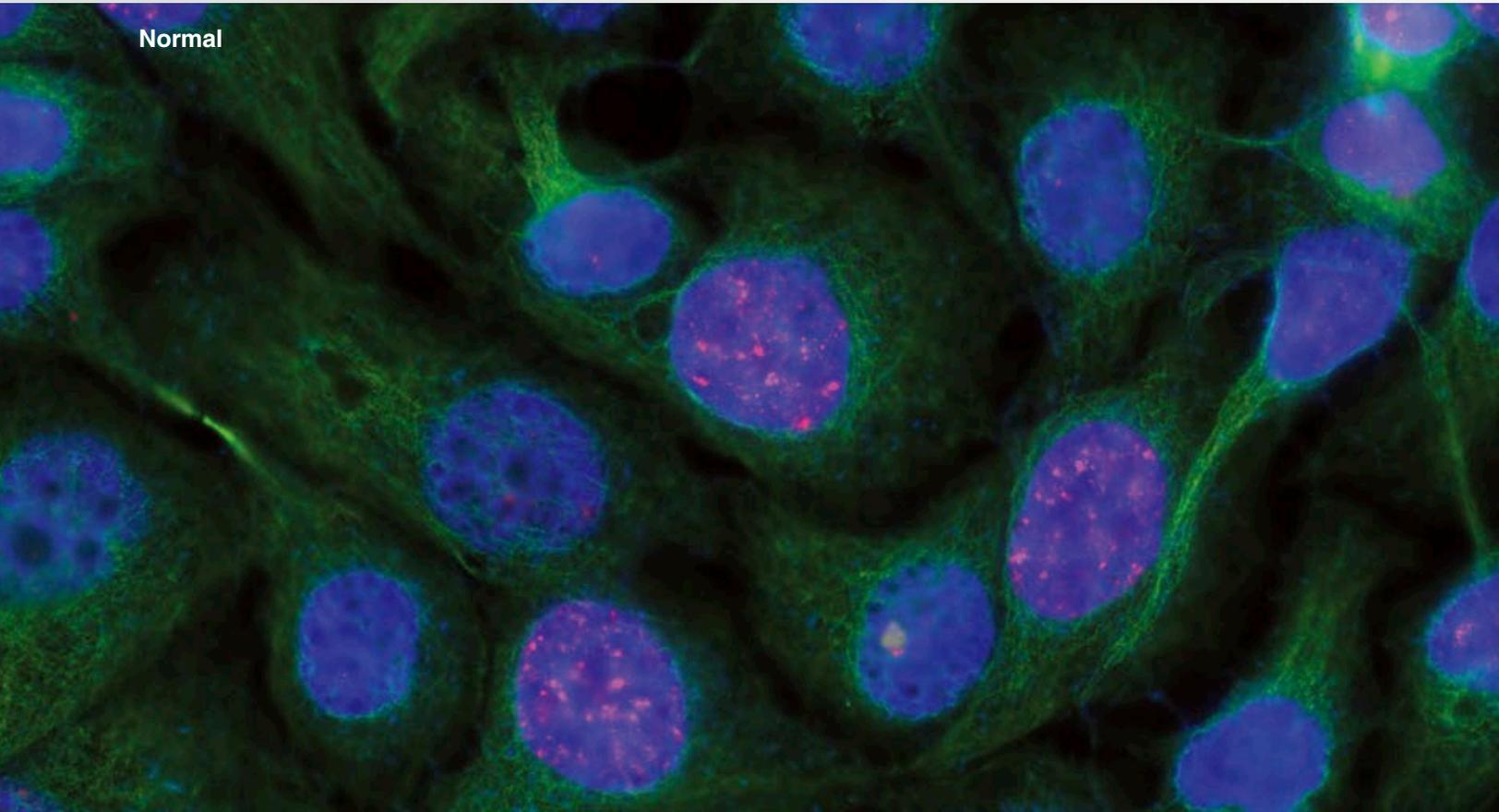


## Optical Sectioning

# Capture Clear Images Without Fluorescence Blurring

Easily capture high-definition images without the blurring caused by out-of-focus signals. The unique optical sectioning technology in the BZ-X800E uses an electronic projection element for structured illumination. Operation is simple and intuitive, allowing even first-time users to capture publication-quality images in seconds.

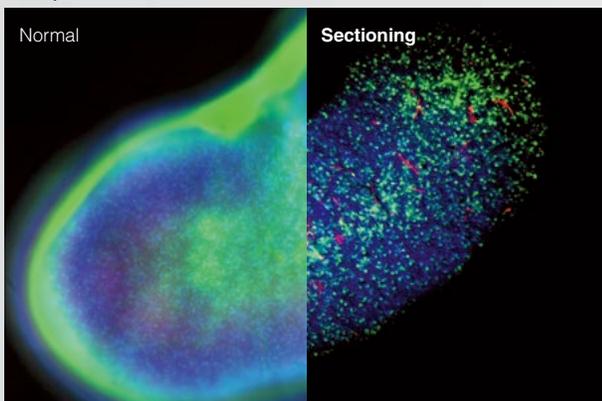
**Normal**



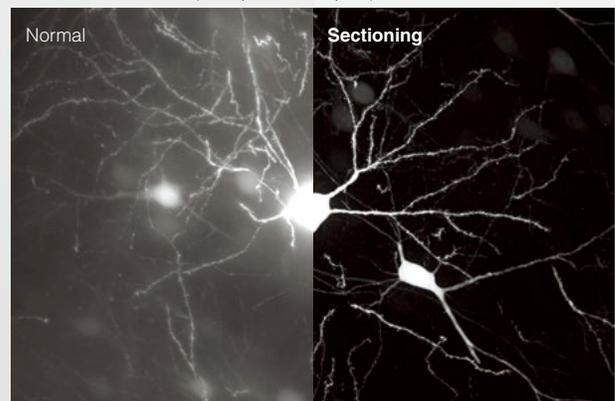
### Clear capture of thick specimens

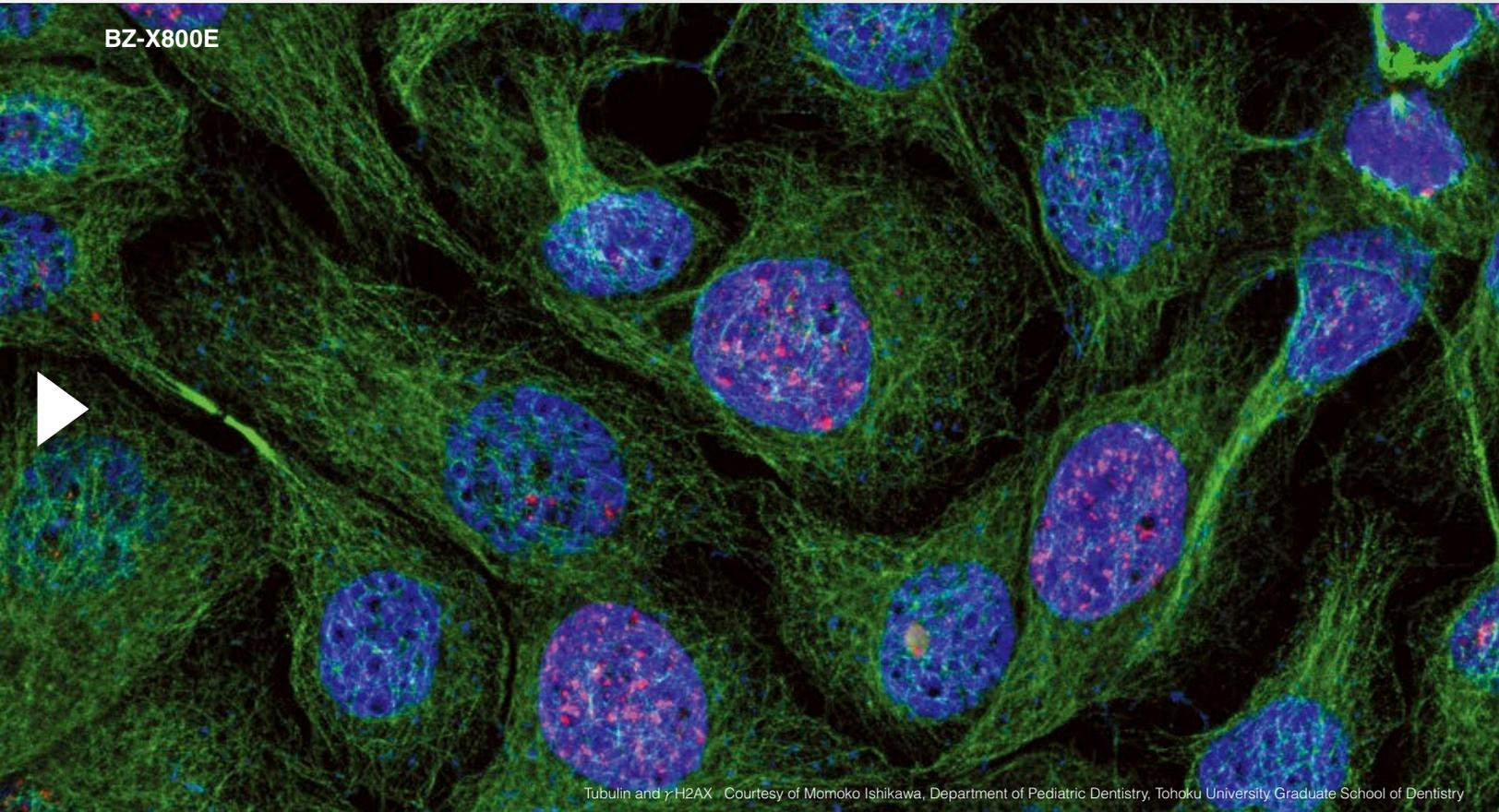
Optical sectioning accurately detects fluorescence signals in the desired focal plane, providing clear optical slices of thick samples. A wide range of samples, including animal cells, plant cells, and cultured tissue can be easily observed.

Kidney, whole mount



Mouse cranial nerves (transparent samples)

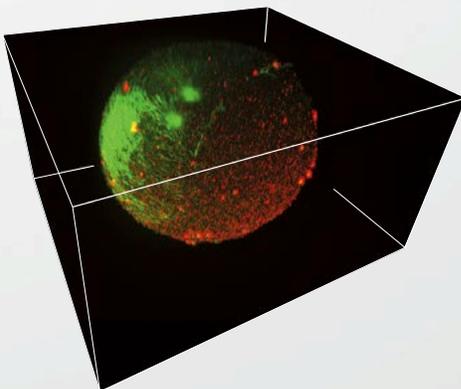




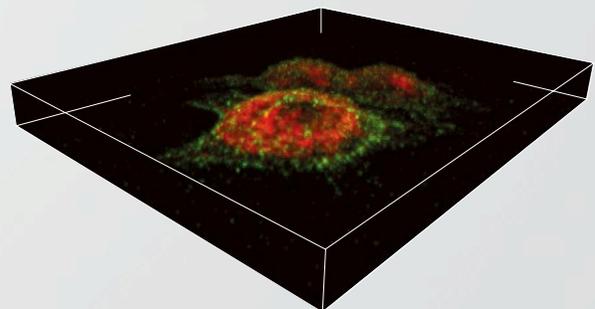
### 3D localization analysis

Optical sectioning provides high-accuracy, cross-sectional images without fluorescence blurring from other focal planes. Clear Z-stacks can then be transformed into realistic 3D renderings, allowing for accurate localization analysis.

Asciacea egg



HEK293 cell



Courtesy of Assistant Professor Taku Uchida, Graduate Student Tsuyoshi Takeishi, Department of Neuroscience, Section of Integrative Physiology, Faculty of Medicine, Graduate School of Medicine, University of Miyazaki

## Sectioning Algorithm

# High-Precision Optical Sectioning Using White Light

The electronic projection element enables a high-speed structured illumination scan. When compared to the effects of lasers, the white light source minimizes damage to the specimen. The use of white light also provides the ability to image over a wide wavelength range, delivering high-precision optically sectioned images.

### Normal image

Thick specimens cannot be captured with conventional widefield microscopes due to scattered light in the Z plane. This fluorescence blurring obscures true signals in the focal plane of interest.

### BZ-X sectioning

#### STEP 1: Pattern projection

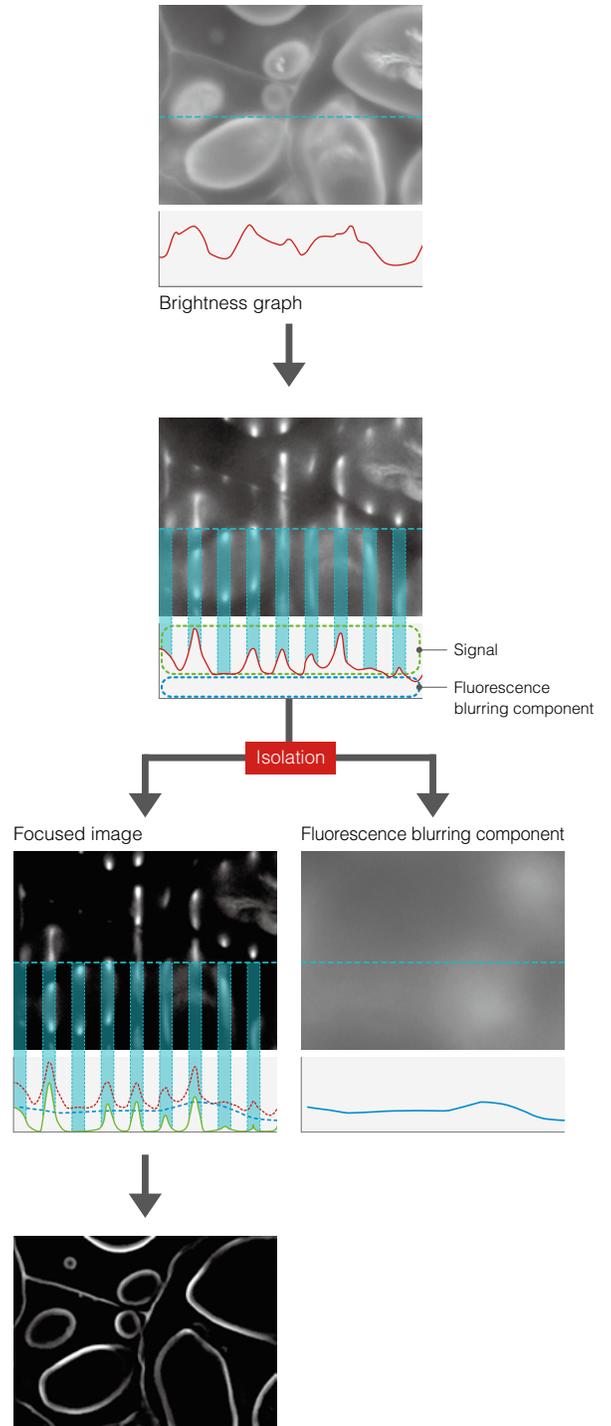
The light passes through the electronic projection element and a structured pattern is projected onto the desired focal plane. Only signals within this focal plane are illuminated by the excitation light.

#### STEP 2: Scan and capture

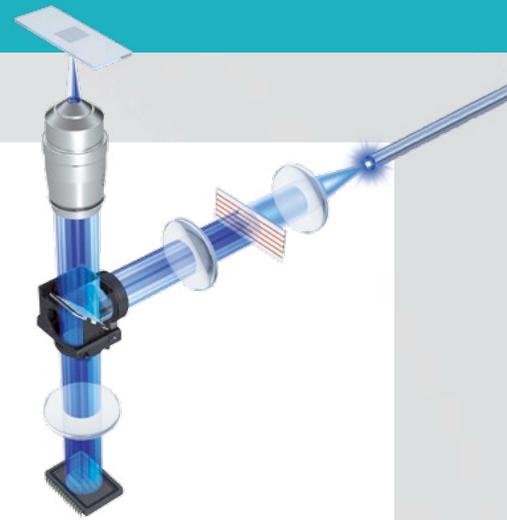
Multiple images are captured while the illumination pattern scans across the sample. Since the brightness of scattered signals does not change significantly as the pattern moves, the fluorescence blurring can be extracted and eliminated.

#### STEP 3: Sectioning image

The fluorescence blurring is eliminated from the multiple images captured. These images are then automatically combined to produce a clear optical section.



# Benefits of Optical Sectioning



## Electronic projection element

The electronic component provides a more rapid, flexible excitation light configuration than a mechanical slit.

### POINT 1

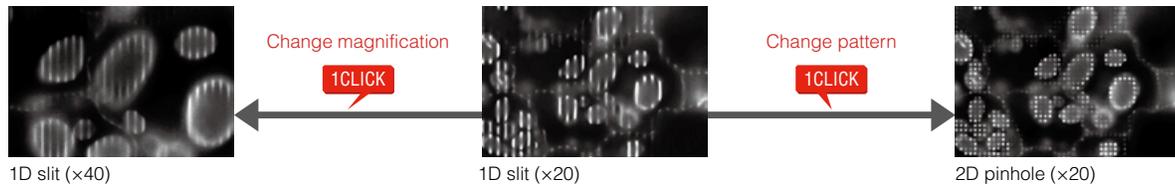
Optimal pattern automatically determined based on magnification.

### POINT 2

Sectioning is optimized with a single click. No complex configuration or special skills needed.

### POINT 3

Pattern width and structure can be easily changed. A 2D pinhole pattern can be used for higher resolution capture.

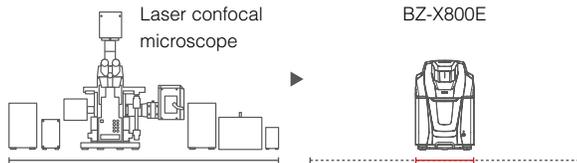


## White light source

Easy for any user to capture high-resolution images, without damaging lasers.

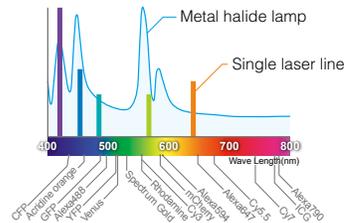
### POINT 1

Simple, compact setup.



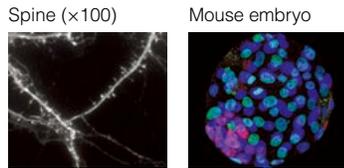
### POINT 2

Simply change the filter to image any wavelength from UV to IR instead of dedicated laser lines.



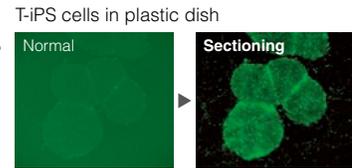
### POINT 3

High-sensitivity detection using a monochrome cooled CCD reduces sample damage and photobleaching.



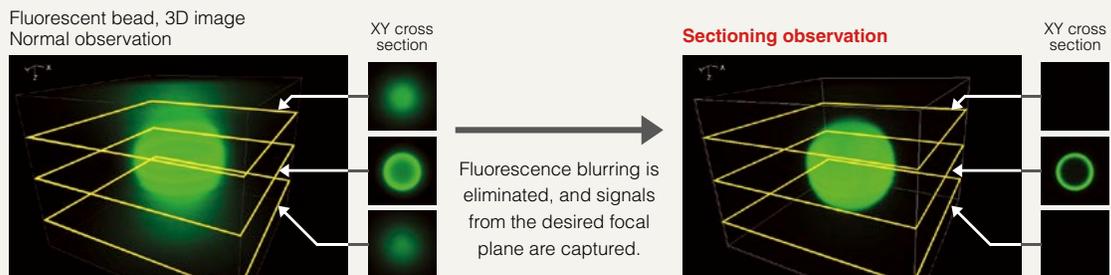
### POINT 4

Capture images in any container, including plastic-bottom multi-well plates. No complex configuration required.



Courtesy of Assistant Professor Kyoko Masuda, Hiroshi Kawamoto Laboratory, Institute for Frontier Medical Sciences, Kyoto University

## More Accurate 3D Analysis Using Sectioning



## Time-lapse

# Temperature and CO<sub>2</sub> Regulation for Live-Cell Imaging

Perform time-series capture of brightfield, fluorescence, and phase contrast images at user-specified intervals. The temperature and CO<sub>2</sub> regulation chamber can hold a variety of vessels, including well plates, to create an ideal environment for specimen during prolonged time-lapse imaging.

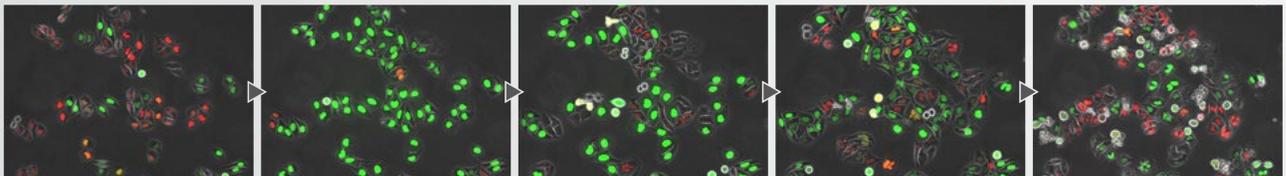


### Time-series Brightness Measurement Function

## Quantify Changes Over Time

This function measures changes in the RGB brightness levels over time. Changes in gene expression can be evaluated quantitatively over the course of the experiment.

FUCCI cell cycle checkpoints



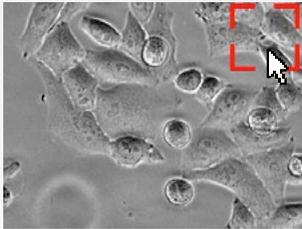
Courtesy of Assistant Professor Atsushi Kaida, Oral Radiation Oncology Department, Tokyo Medical and Dental University



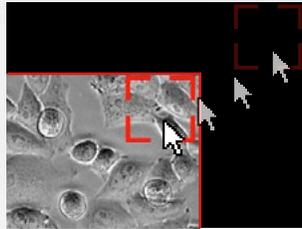
# Position Adjustment During Time Lapse

## Adjust the field of view during time lapse capture

Adjust the capture position in the X, Y, and Z directions during time lapse in response to morphology changes and temperature drift. The function is performed using previously captured images, so sensitive samples are spared from additional light exposure.



The target is about to move out of the viewing area



Readjust the X, Y, and Z capture position

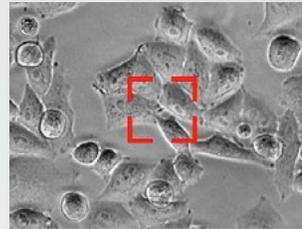
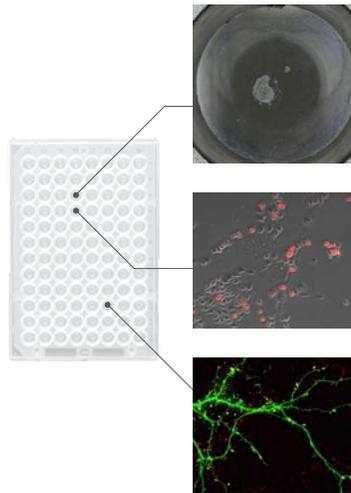


Image capture resumes using the updated position

## BZ-H4XT Time-Lapse Module × BZ-H4XD Advanced Observation Module

### Coordinate-specific condition settings

Different capture conditions such as focal plane, exposure time, lens magnification, filters, and Z-stack width/step size can be set individually for each registered point. Multiple samples with different conditions can be imaged in the same time-lapse experiment for increased efficiency.



#### For colony counting

Lens	Phase contrast 10x
Observation mode	Phase contrast image
Image stitching	7×9 images
Z-stack	N/A
Exposure time	1/70 s

#### For transfection efficiency

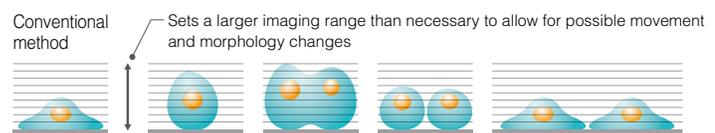
Lens	Phase contrast 20x
Observation mode	Phase contrast + fluorescence overlay
Z-stack	1.5 μ pitch, 8 images
Exposure time	Phase contrast 1/50 s, fluorescence 1/5 s

#### For cultured nerve cells

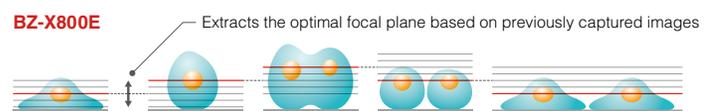
Lens	Oil immersion 60x
Observation mode	Fluorescence 2CH overlay
Z-stack	0.5 μ pitch, 10 images
Exposure time	CH1 1/6 s CH2 1/12 s

### Focus tracking function

The optimal focal plane is automatically selected from Z-stack data. This plane is then set as the center of Z-stack for the next capture to ensure that the sample continues to be in focus. This decreases the number of images captured at each interval, which not only reduces capture time and file size, but also reduces the risk of photobleaching.



- Larger Z-stack means more images captured
- More exposure to excitation light increases risk of photobleaching



- Less images captured for more efficient review and analysis
- Minimizes sample's exposure to excitation light and reduces risk of photobleaching

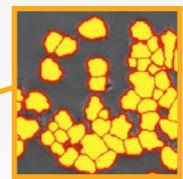
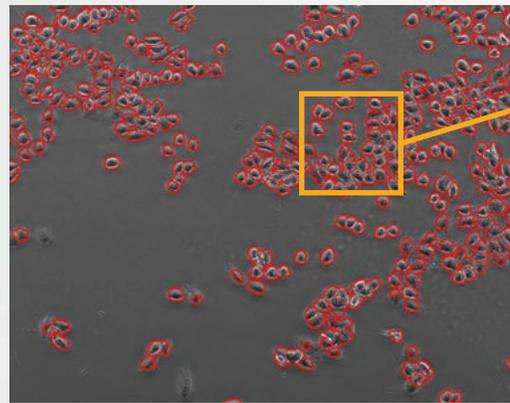
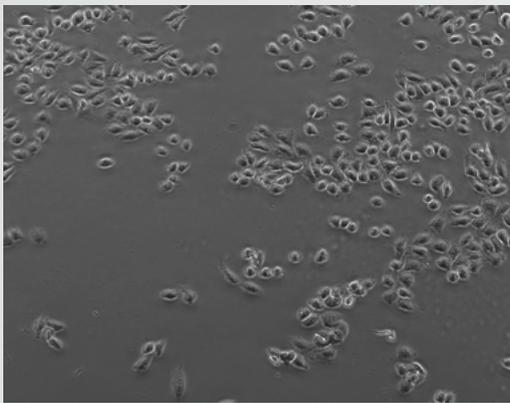
## Hybrid Cell Count

# High Accuracy Quantification Across Various Specimens

KEYENCE's original algorithm provides accurate quantification even for phase contrast images of cultured cells. The area of interest can be extracted and quantified quickly and accurately from phase contrast, brightfield, and fluorescence images. This easy-to-use software produces repeatable, user-independent results.

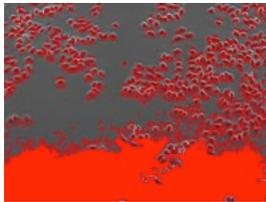
### Phase contrast

With conventional software, it is difficult to automatically count cell images with low contrast between the measurement area and the background. Hybrid Cell Count uses an original algorithm that enables the outlines of cells to be extracted accurately.



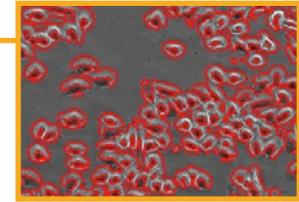
Accurate separation and extraction of adjacent cells

### Cell counting with conventional software

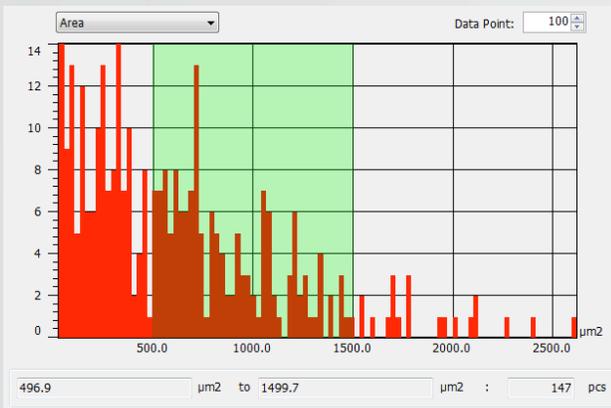


Uneven background brightness prevents cells from being extracted properly.

Low contrast makes it impossible to accurately differentiate and count the cells.



### Data output in spreadsheet format

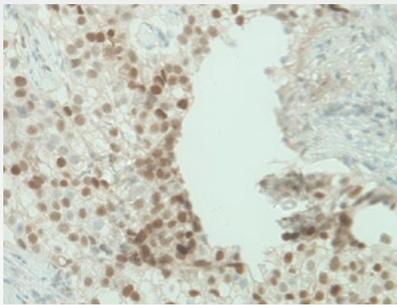


- Area
- Perimeter
- Major axis
- Minor axis
- Brightness (INT/MAX/MIN/AVE)
- RGB brightness (INT/MAX/MIN/AVE)
- Ferret diameter (X/Y)
- Count
- Area ratio, etc.

Count:	1230	Total (area):	5839.3 μm <sup>2</sup>	Area ratio (specified area):	---	%	---	μm <sup>2</sup>	---	Measurement Item...
No.	Area	Perimeter	Major axis	Minor axis	Brightness (INT/MAX/MIN/AVE)	Brightness (INT/MAX/MIN/AVE)	Brightness (INT/MAX/MIN/AVE)	Brightness (INT/MAX/MIN/AVE)		
1	6.1μm <sup>2</sup>	10.9μm	4.7μm	1.9μm	97846.0	845.0	318.0	568.9		
2	0.0μm <sup>2</sup>	0.0μm	0.0μm	0.0μm	427.0	427.0	427.0	427.0		
3	1.7μm <sup>2</sup>	6.1μm	2.2μm	1.5μm	21697.0	571.0	358.0	442.8		
4	0.3μm <sup>2</sup>	2.0μm	0.7μm	0.7μm	6160.0	307.0	399.0	440.0		
5	2.6μm <sup>2</sup>	7.3μm	2.9μm	1.3μm	33719.0	551.0	349.0	435.7		
6	1.0μm <sup>2</sup>	3.3μm	1.2μm	0.9μm	12536.0	364.0	379.0	464.3		
7	0.1μm <sup>2</sup>	1.1μm	0.6μm	0.0μm	1847.0	487.0	433.0	461.8		
Average	4.7μm <sup>2</sup>	6.8μm	2.5μm	1.5μm	81297.7	723.1	340.5	609.9		
Standard D...	10.0μm <sup>2</sup>	6.8μm	2.4μm	1.4μm	228401.2	377.2	54.6	91.9		
Max	118.9μm <sup>2</sup>	37.4μm	21.3μm	11.5μm	2803018.0	2403.0	508.0	1161.4		
Min	0.0μm <sup>2</sup>	0.0μm	0.0μm	0.0μm	356.0	356.0	0.0	336.0		
Total	5839.3μm <sup>2</sup>	8354.2μm	3093.0μm	1882.6μm	99996226.0	889439.0	418849.0	597998.9		

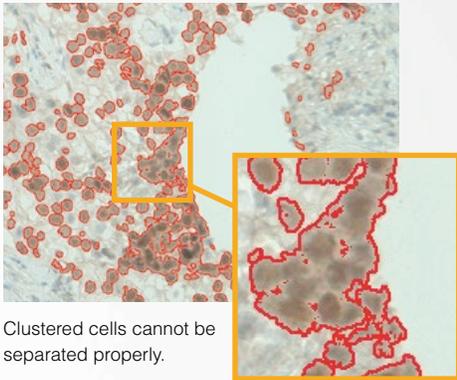
## Color extraction

Cells are extracted based upon hue differences and brightness information. Even clusters of cells can be separated and accurately quantified.



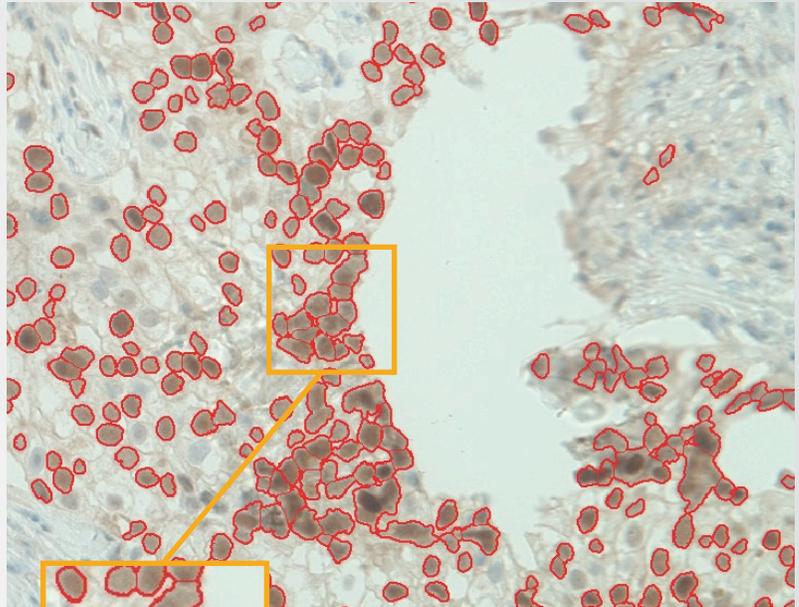
Courtesy of Koji Arihiro, M.D. Ph.D.,  
Department of Anatomical Pathology, Hiroshima University Hospital

Conventional



Clustered cells cannot be separated properly.

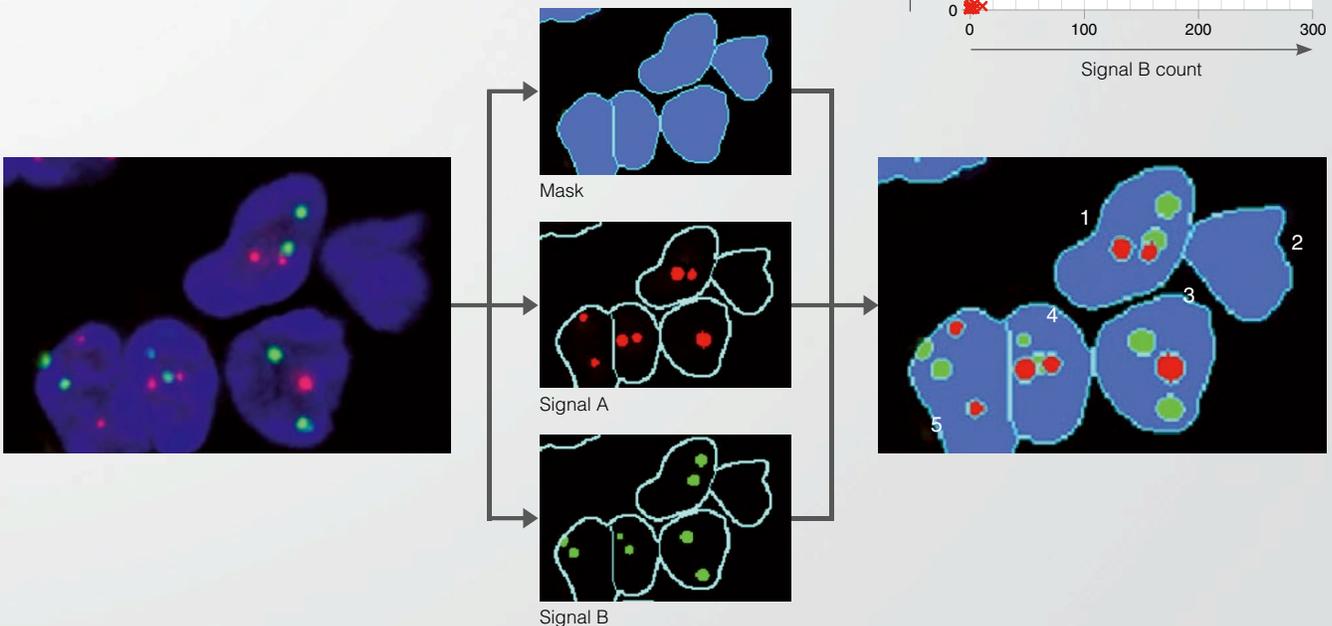
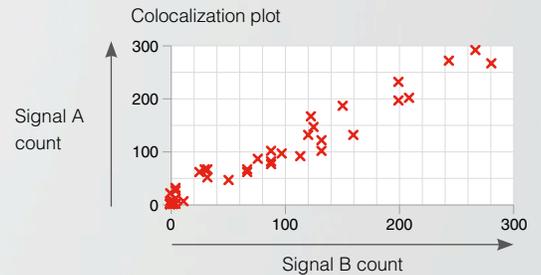
BZ-X800E



Borders of adjacent cells are recognized for separation of individual cells.

## Masking function

Users can specify a mask area from which to extract individual measurement areas. This allows for both individual measurement data and area ratios to be reported with ease. Up to two different extractions can be performed within the same mask area in order to quantify and compare multiple stains or conditions.



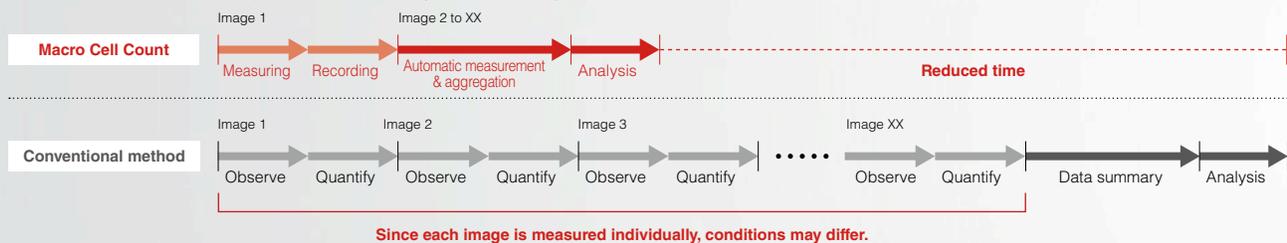
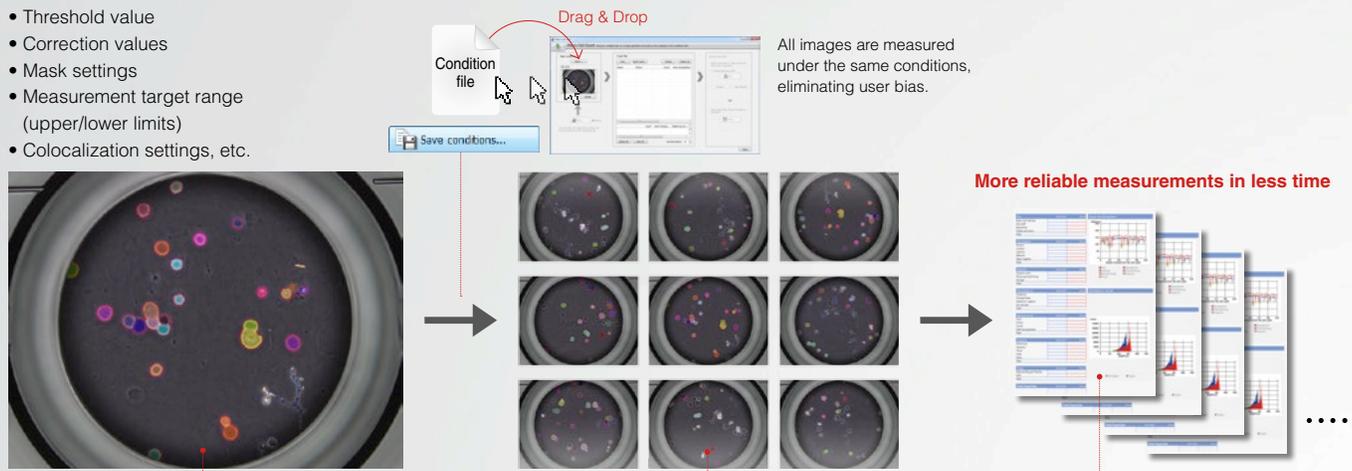
## Macro Cell Count

# Batch Processing for Repeatable Quantification

Once the appropriate measurement parameters are set for a single image, the same conditions can be applied to multiple images. This drastically reduces the amount of time needed for measurement, while improving data reliability by eliminating variations in measurement conditions.

Output conditions

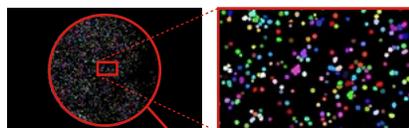
- Threshold value
- Correction values
- Mask settings
- Measurement target range (upper/lower limits)
- Colocalization settings, etc.



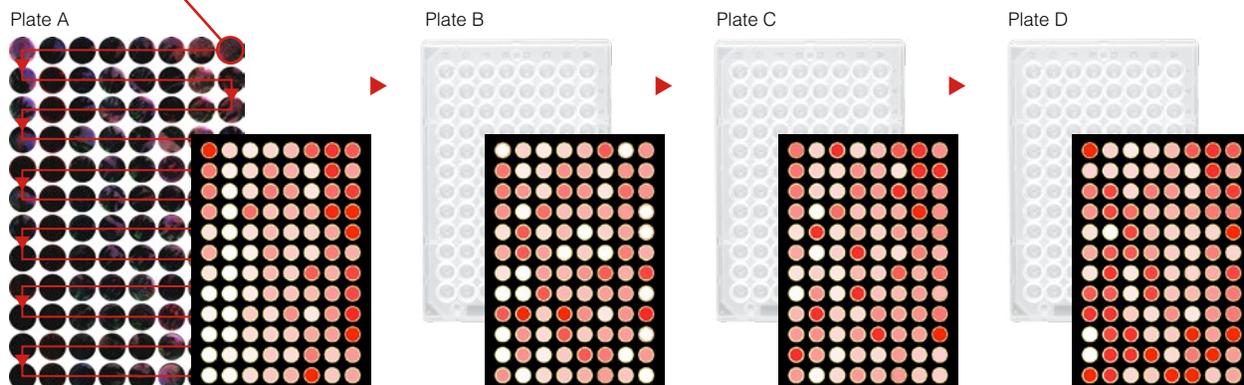
## Batch Analysis of Multiple Plates

BZ-H4C × BZ-H4XD × BZ-H4XI

# High-Content Screening of Multi-Well Plates

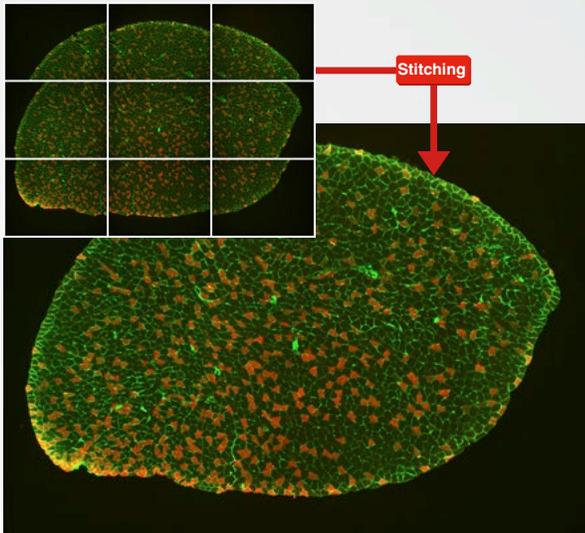


Automate batch processing of multiple well plates based upon specified measurement conditions.

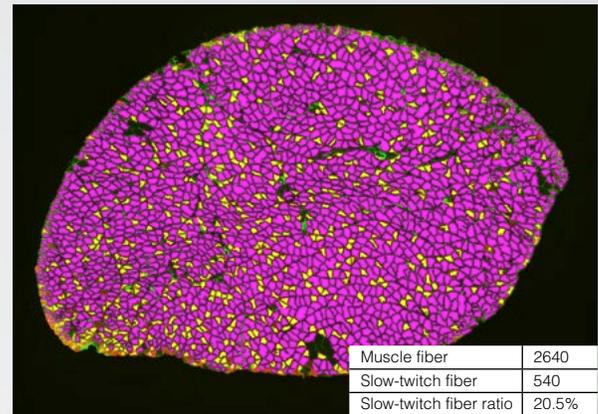


## Hybrid & Macro Cell Count Application Examples

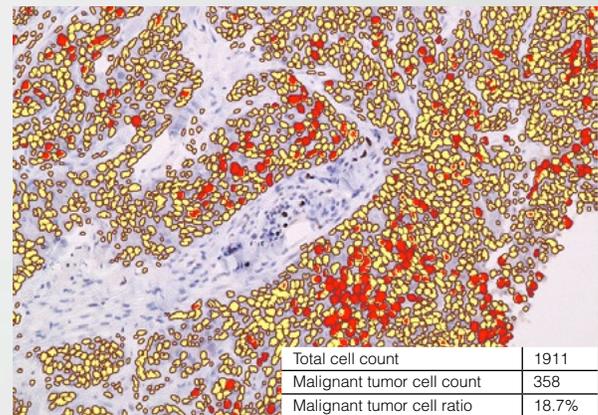
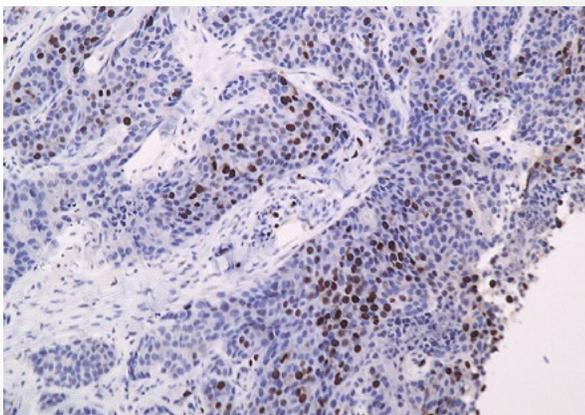
### Slow-twitch skeletal muscle fiber ratio



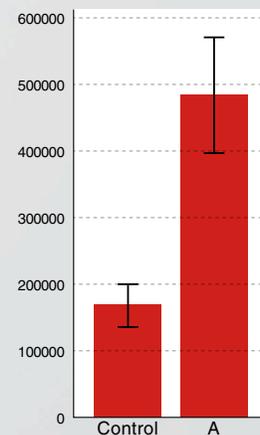
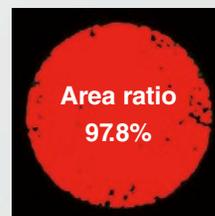
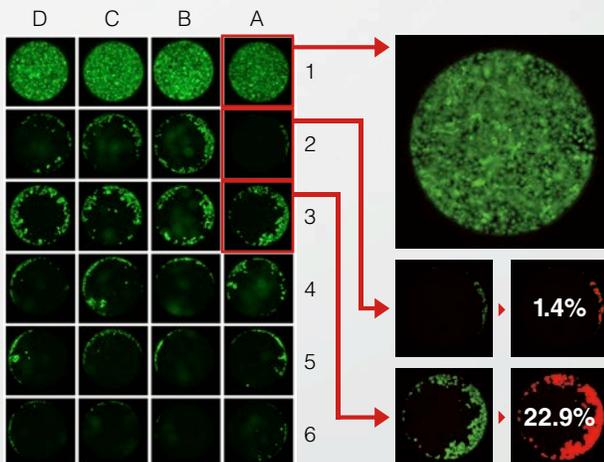
Courtesy of Lecturer Hideki Yamauchi, Division of Physical Fitness, Department of Rehabilitation Medicine, Jikei University



### Malignant tumor cell (MIB-1) count



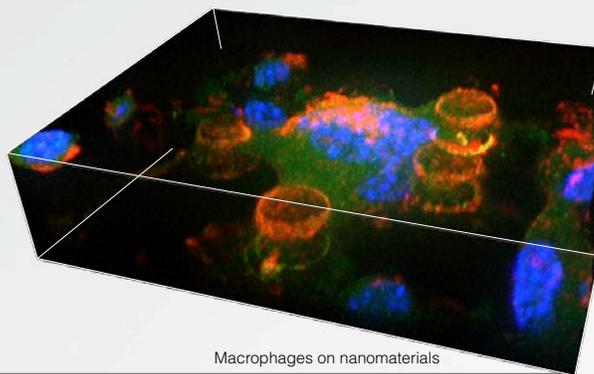
### Cell migration assays using multi-well plates (24 wells)



## 3D Analysis

# Accurate Analysis of 3D Localization

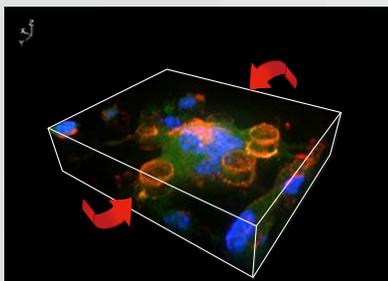
Transform Z-stacks into 3D renderings with a single click to accurately observe three-dimensional structures. Use new 3D measurement functions to quantify features such as shape and localization. Results can then be saved in image or video format for convenient viewing.



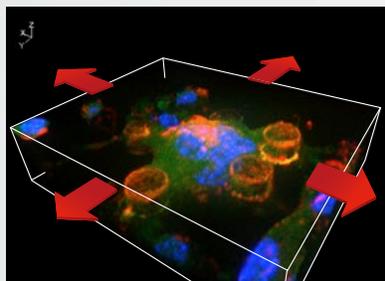
## 3D Display

### Intuitive operation

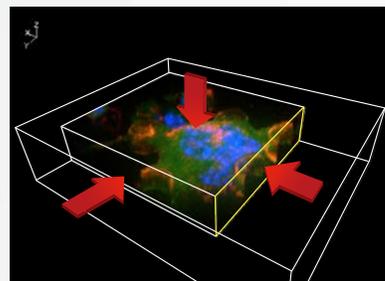
**Rotation/** Click and drag to rotate



**Zoom/** Use the mouse wheel to zoom in/out



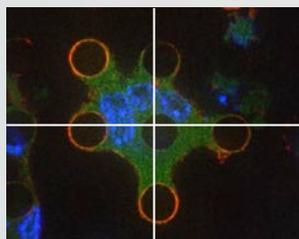
**Sectional view/** Right-click to slice cross sections



### Advanced 3D analysis

XY cross section

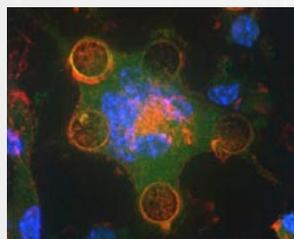
YZ cross section



#### XYZ slicing

An image can be sliced at any XYZ position to observe the cross-sectional view.

XY

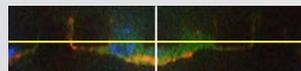


YZ

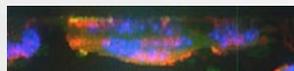


#### Maximum projection

Pixels with the maximum brightness in the Z-axis are combined to display an image with a large depth-of-field.



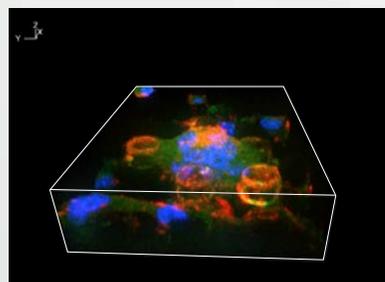
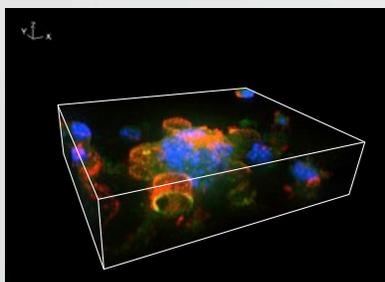
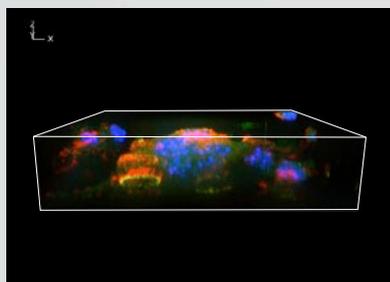
XZ cross section



XZ

### Video creation

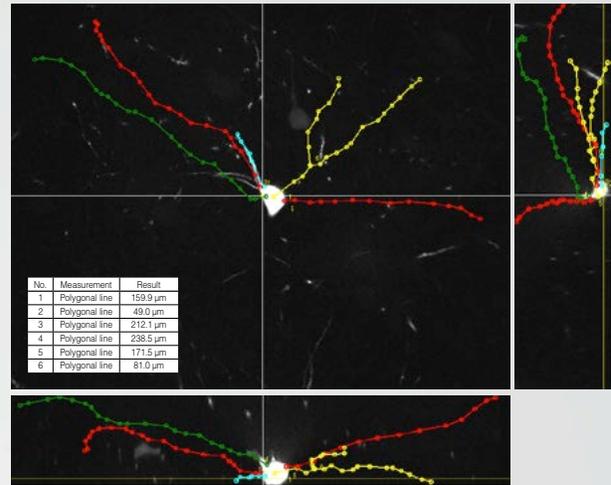
3D images can be saved and played back as a video. Since videos are saved in a standard format, they can be viewed in any standard software and embedded within presentations and other documents.



## 3D Measurement

Click a measurement point on a cross section and scroll through the Z-stack images to accurately measure even complex 3D shapes, such as axons of neurons. The count function enables simple and convenient counting of 3D localization for FISH studies.

### Intuitive measurement menu

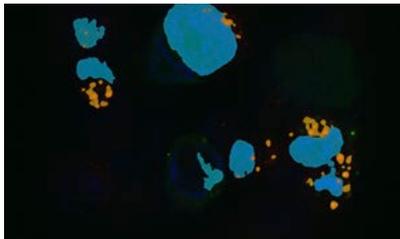


## 3D Cell Count

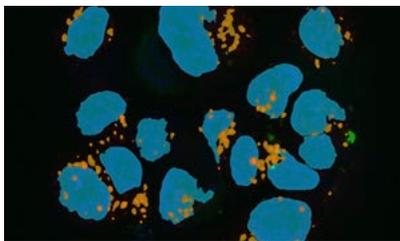
BZ-H4R × BZ-H4C

### One-Step Three-Dimensional Quantification

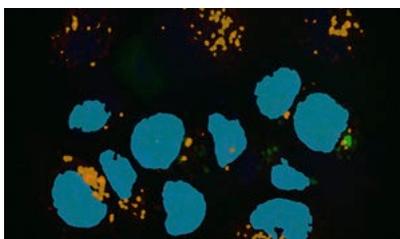
Z-Stack: Plane A



Z-Stack: Plane B

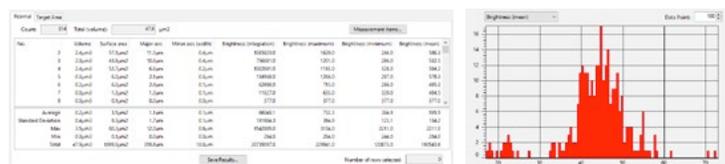
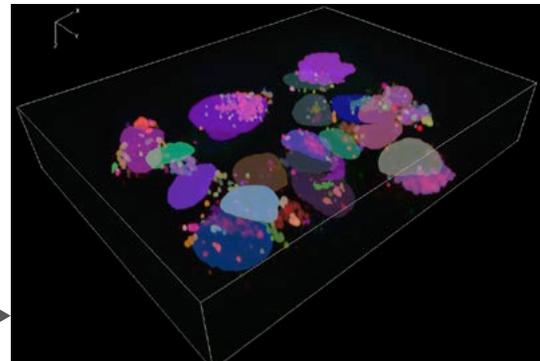


Z-Stack: Plane C



Instantly apply quantification conditions to an entire Z-stack. Quantify features such as volume, surface area, and intensity of extracted areas. Specified measurement conditions are applied to the Z-stack in real-time, allowing users to quickly view and optimize settings.

Measured areas that overlap on the Z axis are automatically integrated.

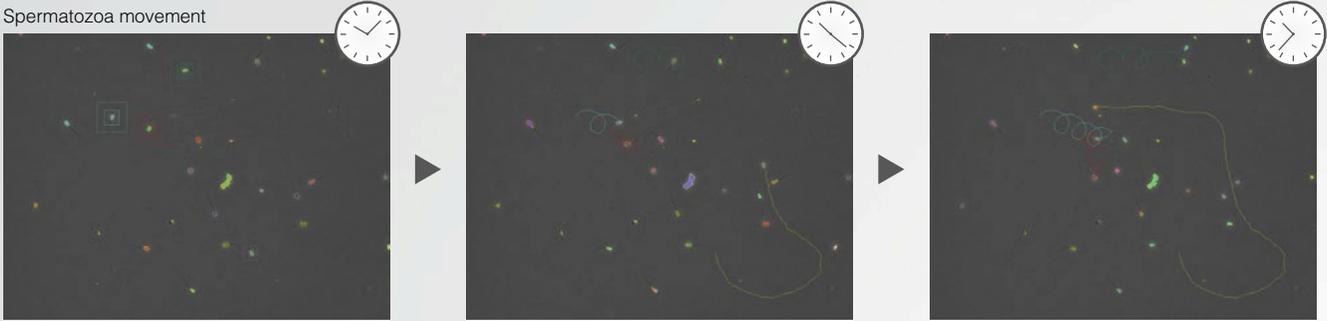


## Motion Analysis

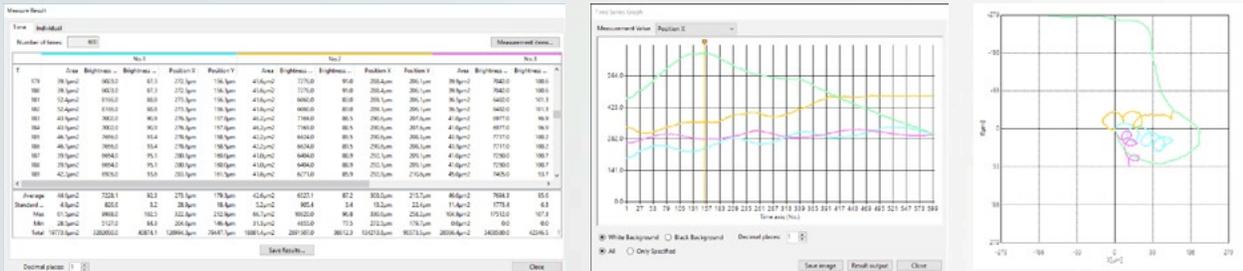
# Track Movement Over Time

Select a target and track it using brightness, hue and appearance information. Automatically record changes in coordinates over time to measure travel range, speed, and movement over time.

Spermatozoa movement



### Time-series data output



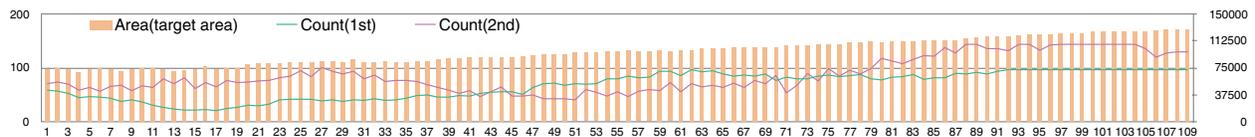
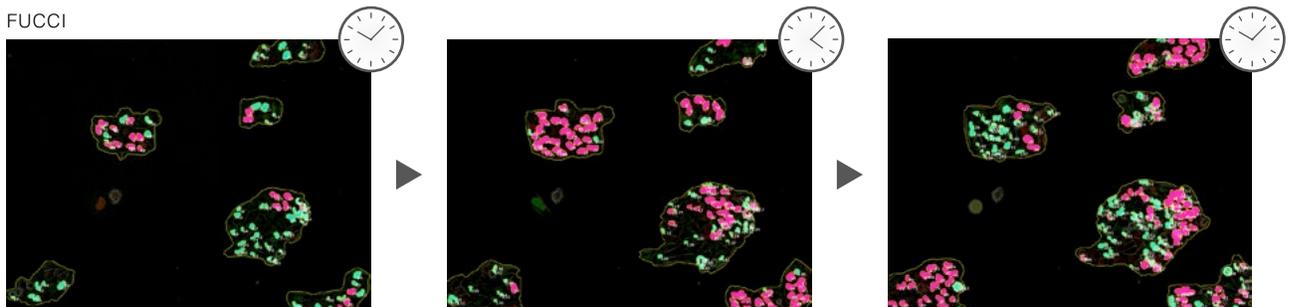
### Time-series Cell Count

BZ-H4K × BZ-H4C

# Quantify Specimen Changes Over Time

Perform batch processing of high-precision quantification for video and time-lapse recordings. Quantify cell counts, surface areas, and signal intensities of extracted targets, and visualize results with time-series graphs. The data can then be exported for more in-depth analysis, such as correlating surface area expansion with changes in signal intensity.

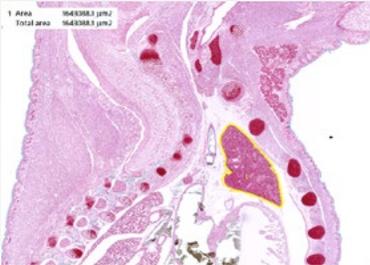
FUCCI



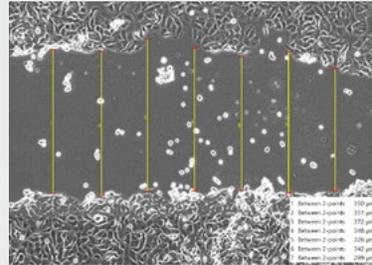
# Measurement

## Perform Point-and-Click 2D Measurements

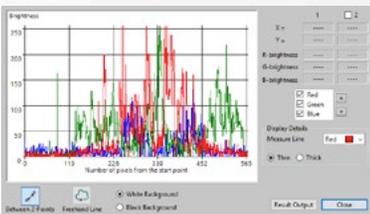
A variety of 2D measurements can be made directly on the image simply by clicking the desired end points. This enables easy and accurate measurement, such as quantifying the axon length of neurons. RGB brightness values can also be quantified and visually displayed on a histogram.



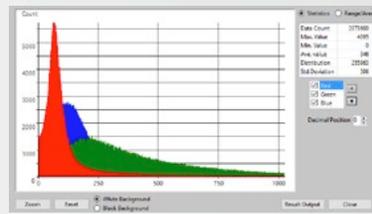
**Area**  
Measures the area of the specified range.



**Distance**  
Measures the total distance between two points or multi-point lines.



**Line profile**  
Quantifies and graphs the brightness level of each pixel between two points.



**Histogram**  
The brightness distribution for a specific area is displayed as a histogram.



**2 points**  
Measure the distance between 2 user-specified points on the screen.



**Radius**  
Measure the radius of the circle determined by 3 points specified on the screen.



**2 centers**  
Measure the distance between the centers of 2 circles specified on the screen.



**Count**  
Count the number of points specified on the screen.



**Angle 1**  
Measure the angle determined by a vertex and 2 points specified on the screen.



**Angle 2**  
Measure the angle between 2 lines specified on the screen.



**Perpendicular line length**  
Measure the length of the perpendicular line drawn from a reference line.



**Distance between parallel lines**  
Measure the distance between a reference line and a line parallel to the reference line.



**Multi-point line length**  
Measure the length from the start to the end of a broken line.



**Free-form line length**  
Measure the length from the start to the end of a free-form line.



**Circle area**  
Measure the area and brightness of a circle.



**Polygon area**  
Measure the area and brightness of a polygon.

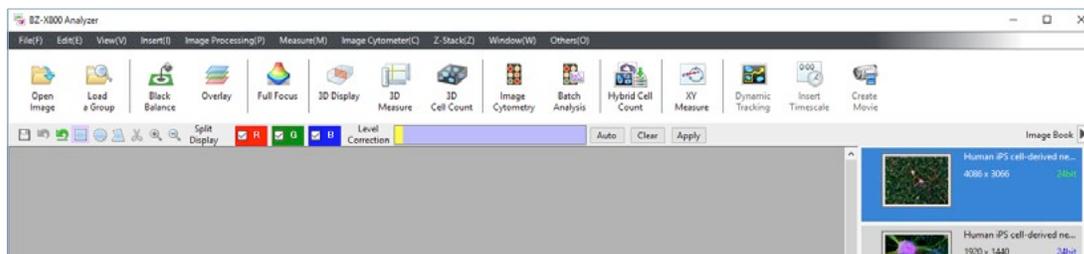


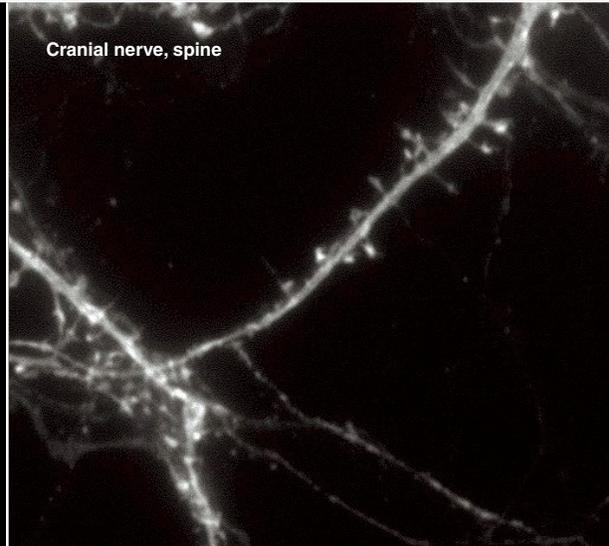
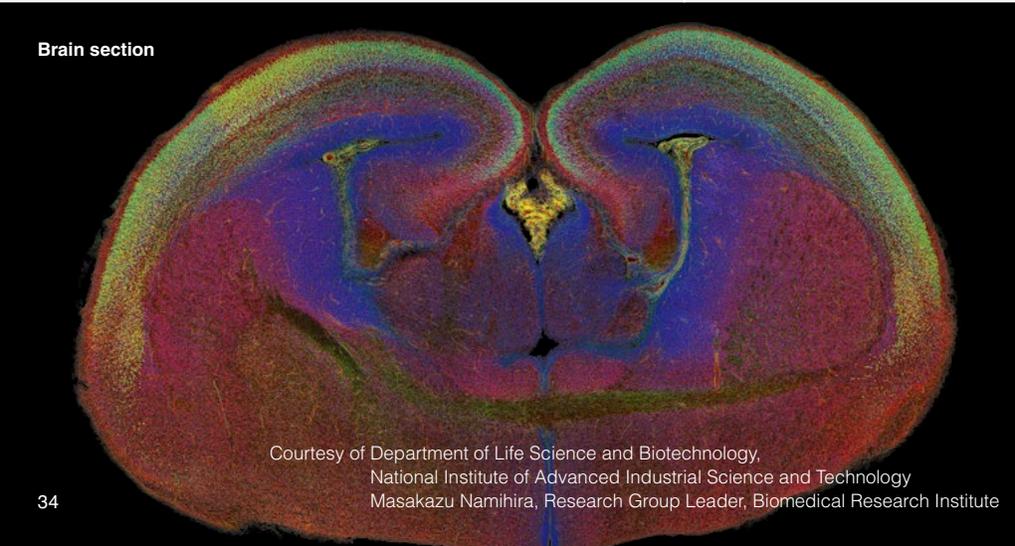
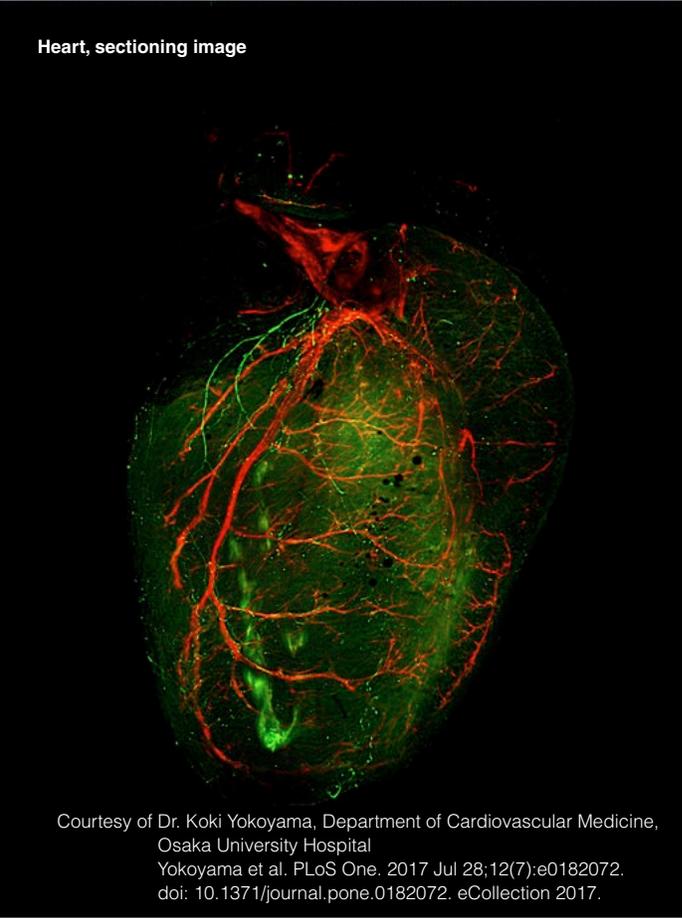
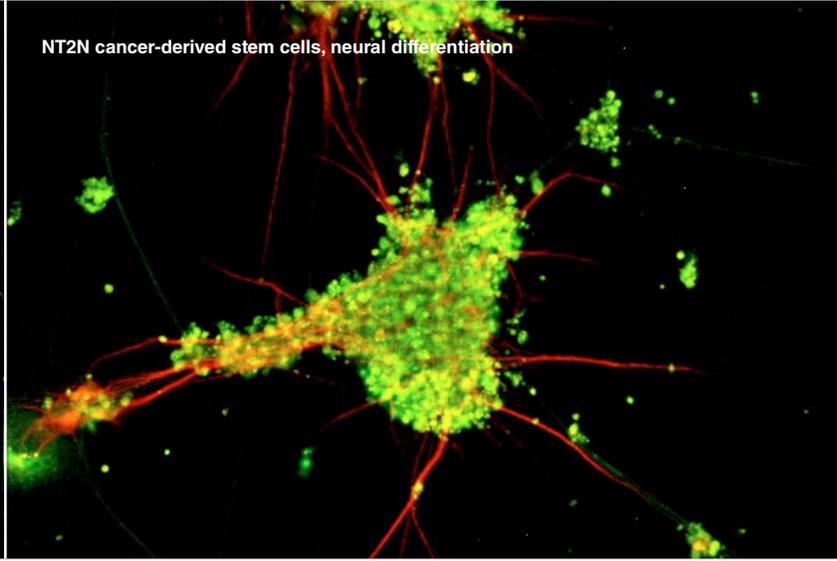
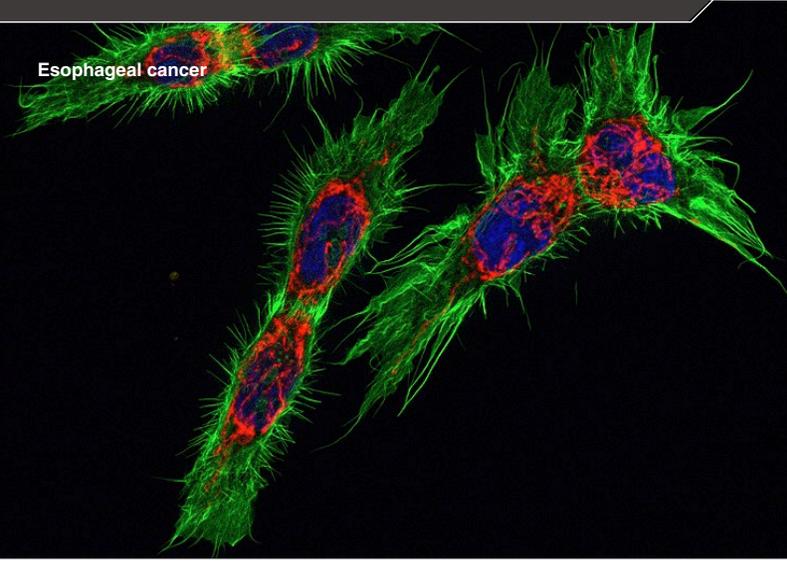
**Free-form shape area**  
Measure the area and brightness of a free-form shape.

### BZ-H4A BZ-X800E Analyzer

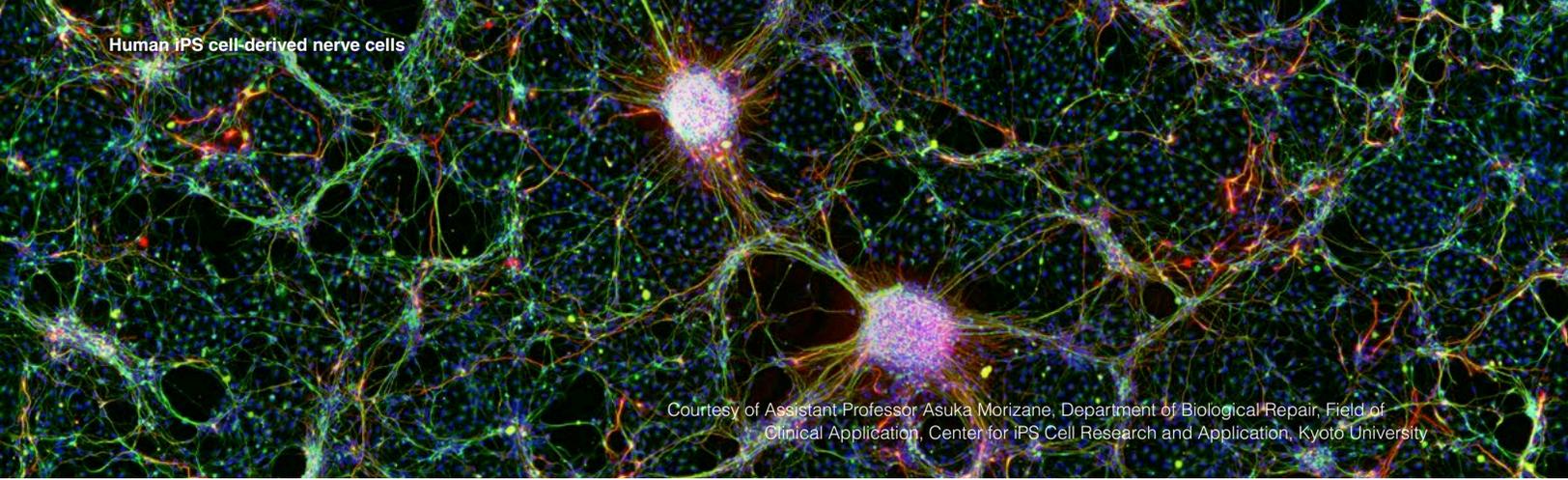
## Advanced Analysis Software

Perform analysis in the easy-to-use BZ-X800E Analyzer. Capture conditions are stored in image metadata for automatic processing of Z-stacks, time-lapse, image stitching, and quantification.



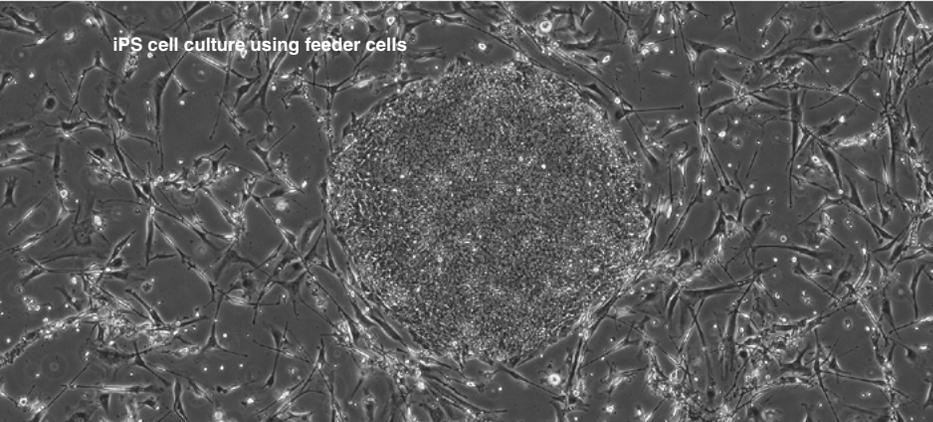


Human iPS cell-derived nerve cells



Courtesy of Assistant Professor Asuka Morizane, Department of Biological Repair, Field of Clinical Application, Center for iPS Cell Research and Application, Kyoto University

iPS cell culture using feeder cells

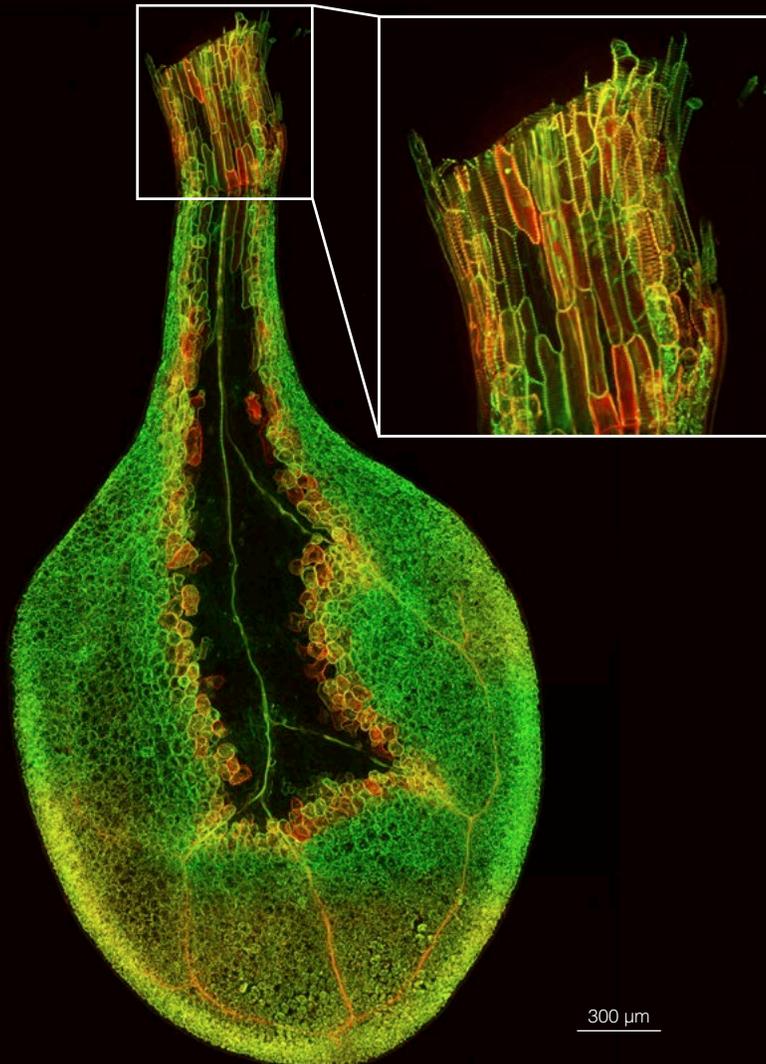


Water flea nerve and muscle, sectioning image



Courtesy of Assistant Professor Yasuhiro Shiga, Laboratory of Environmental Molecular Biology, School of Life Sciences, Tokyo University of Pharmacy and Life Sciences

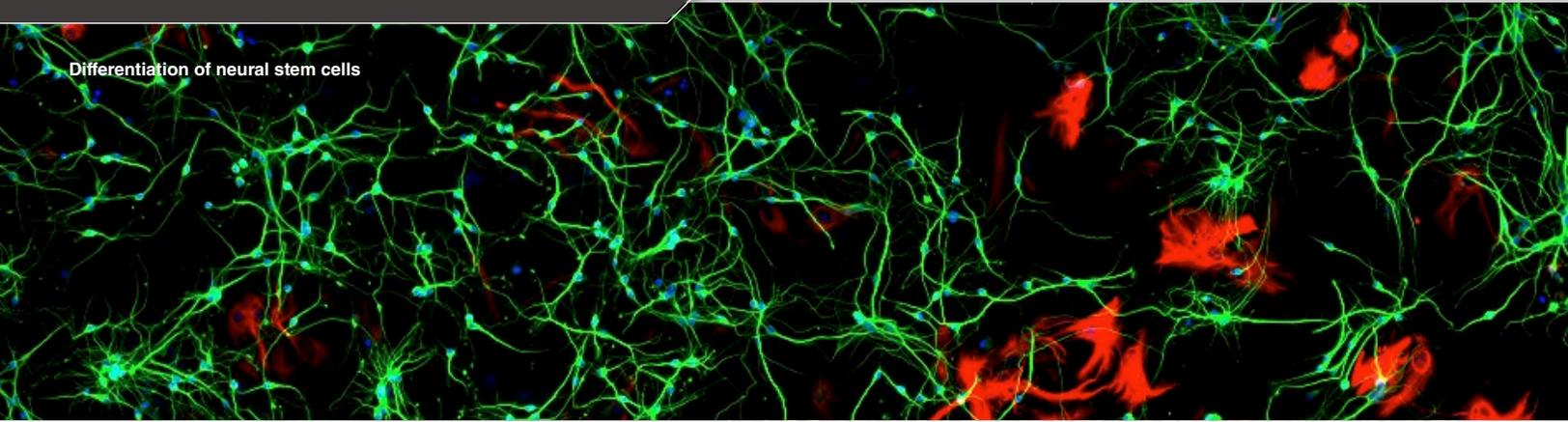
Arabidopsis duct, sectioning image



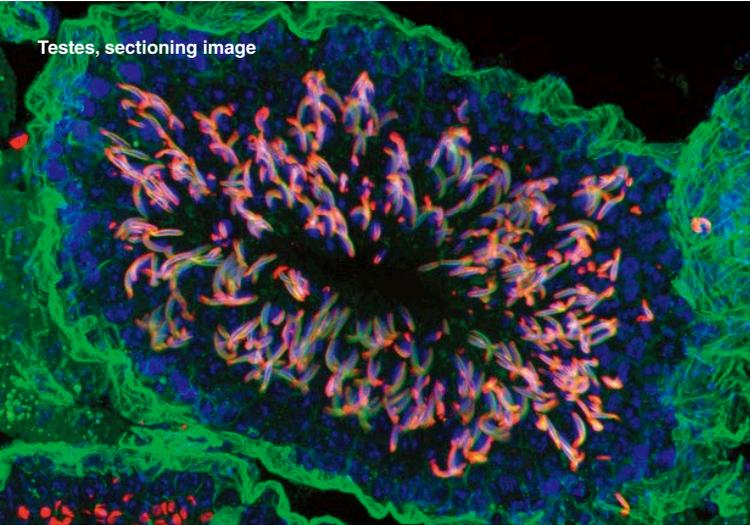
Whole mouse embryo



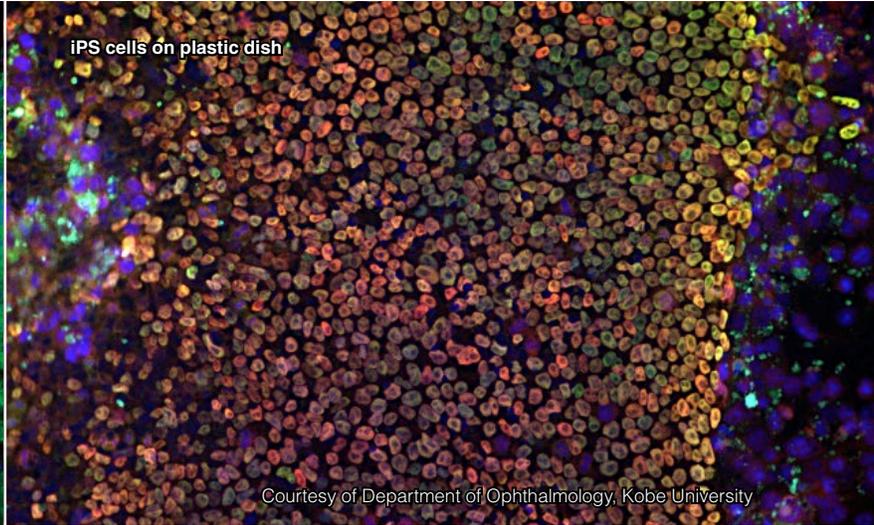
Courtesy of Lecturer Shingo Nakamura, Division of Biomedical Engineering, National Defense Medical College



Differentiation of neural stem cells

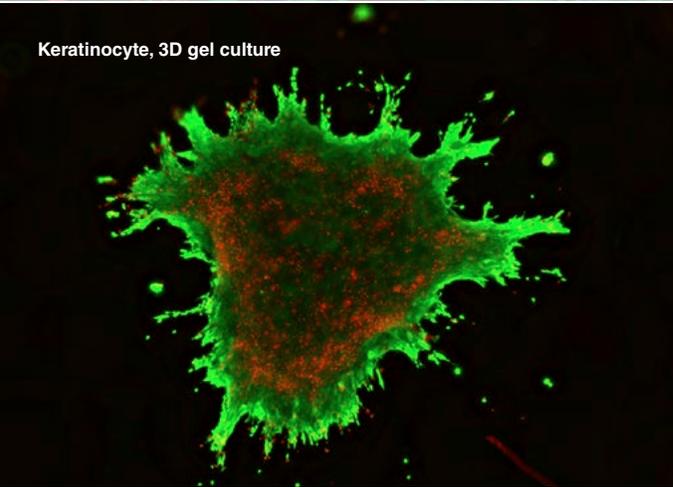


Testes, sectioning image

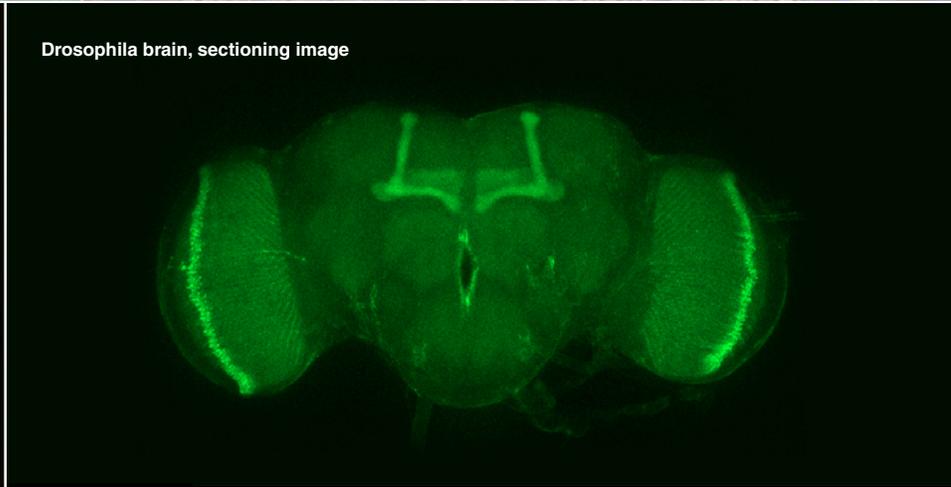


iPS cells on plastic dish

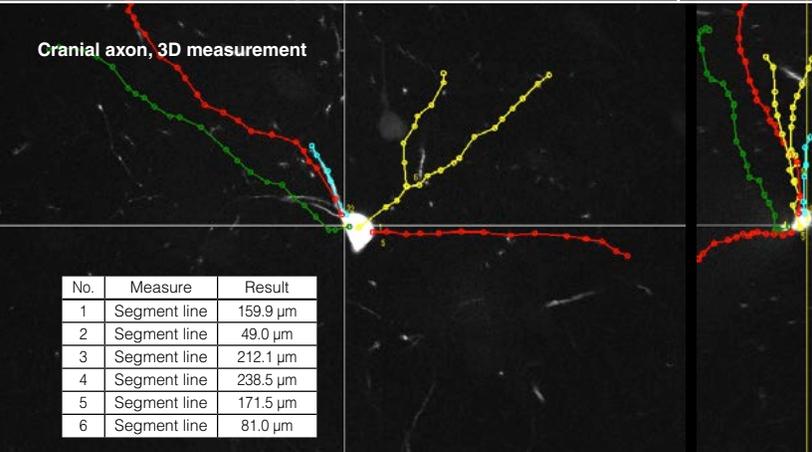
Courtesy of Department of Ophthalmology, Kobe University



Keratinocyte, 3D gel culture

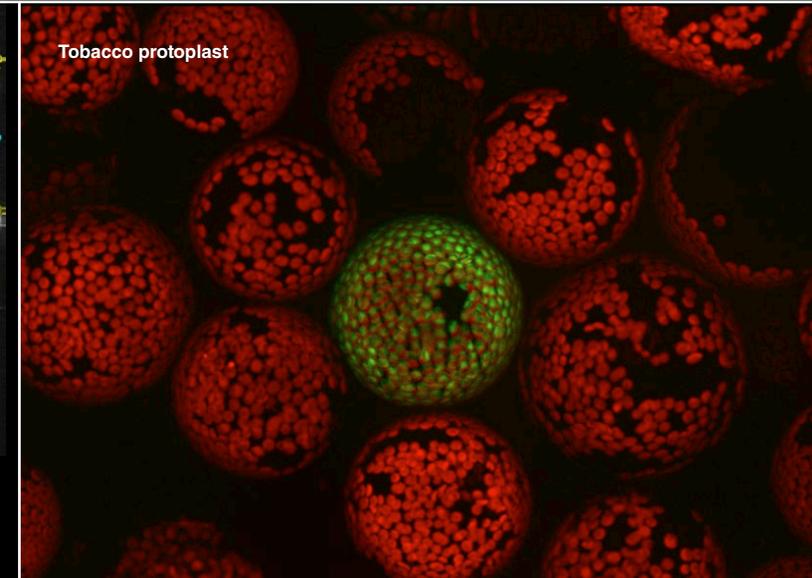


Drosophila brain, sectioning image



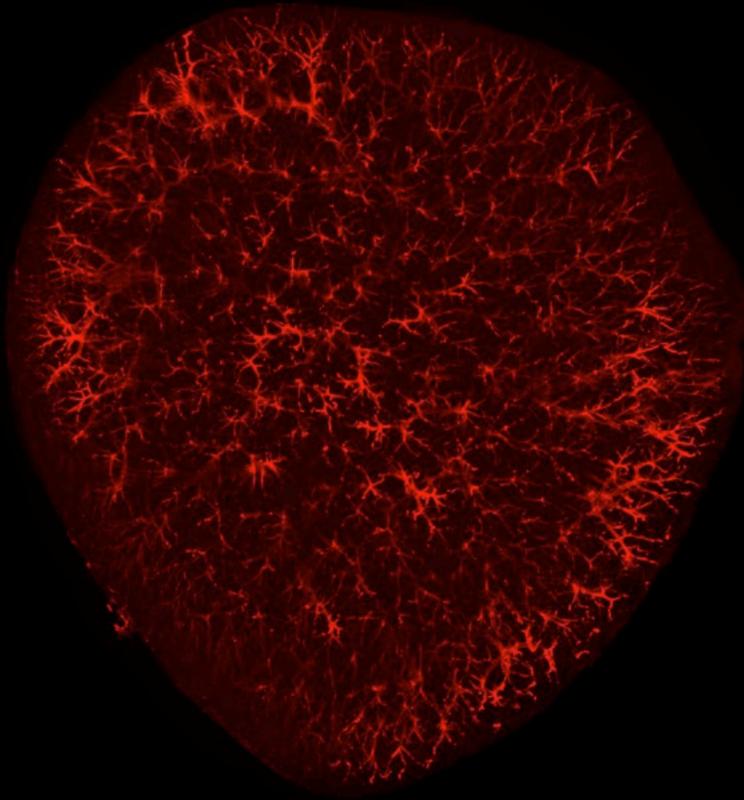
Cranial axon, 3D measurement

No.	Measure	Result
1	Segment line	159.9 $\mu\text{m}$
2	Segment line	49.0 $\mu\text{m}$
3	Segment line	212.1 $\mu\text{m}$
4	Segment line	238.5 $\mu\text{m}$
5	Segment line	171.5 $\mu\text{m}$
6	Segment line	81.0 $\mu\text{m}$

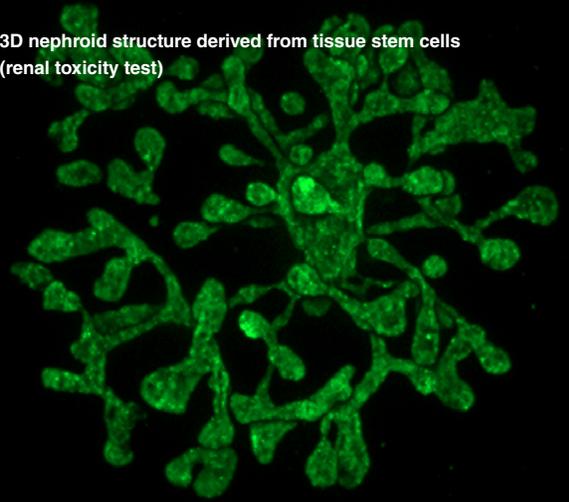


Tobacco protoplast

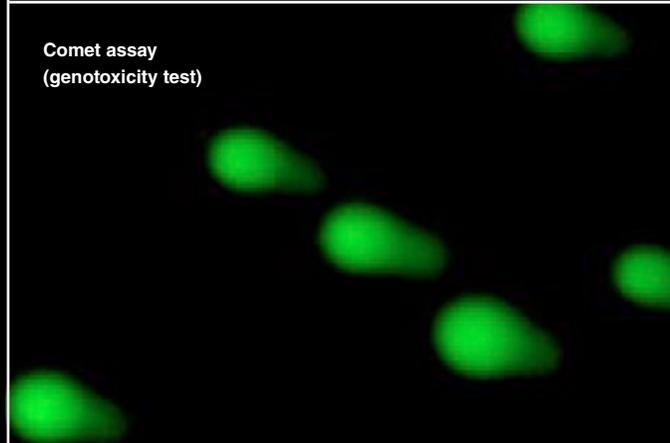
Cleared kidney tissue, whole mount



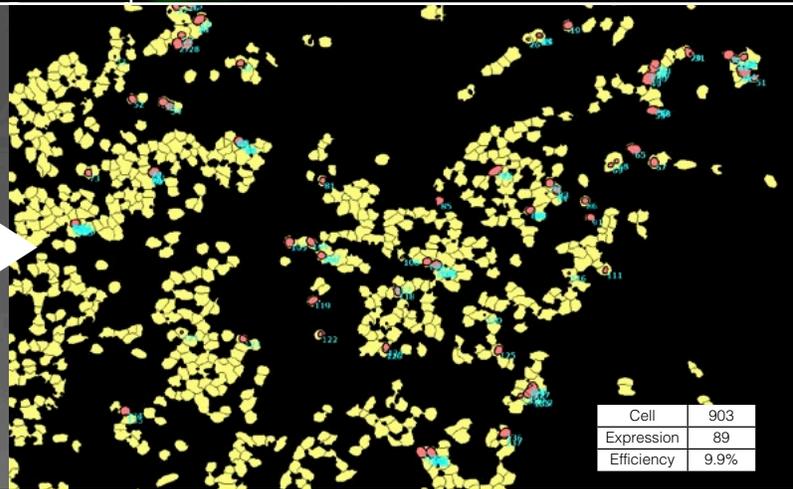
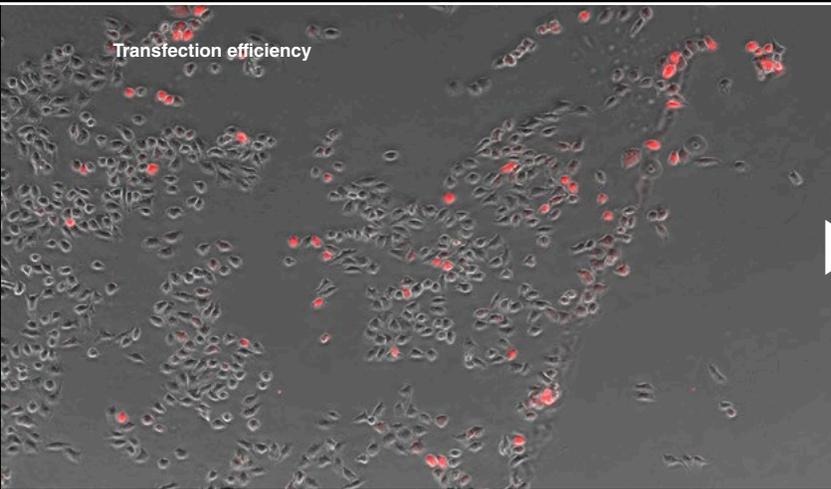
3D nephroid structure derived from tissue stem cells (renal toxicity test)



Comet assay (genotoxicity test)

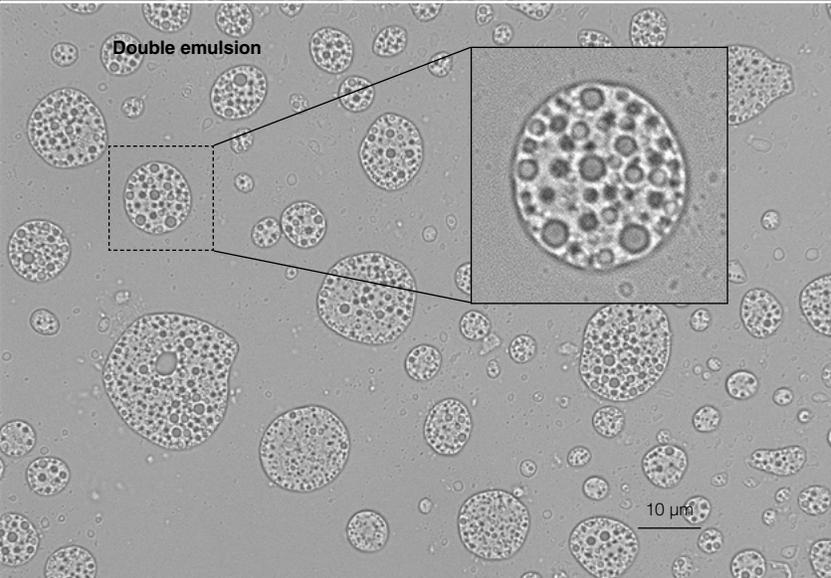


Transfection efficiency



Cell	903
Expression	89
Efficiency	9.9%

Double emulsion



Cortex of hair shaft



## Specifications of Lenses

(1) CFI Plan Apo $\lambda$ 2x	(972029)	NA0.10 WD8.50 mm	0.33*	
(2) CFI Plan Apo $\lambda$ 4x	(972030)	NA0.20 WD20.00 mm	0.79*	
(3) CFI Plan Apo $\lambda$ 10x	(972031)	NA0.45 WD4.00 mm	0.16*	
(4) CFI Plan Apo $\lambda$ 20x	(972032)	NA0.75 WD1.00 mm	0.04*	
(5) CFI Plan Apo $\lambda$ 40x	(972033)	NA0.95 WD0.21 mm	0.008*	
(6) CFI Plan Apo $\lambda$ 60xH	(972036)	NA1.40 WD0.13 mm	0.005*	Oil immersion
(7) CFI Plan Apo $\lambda$ 100xH	(972037)	NA1.45 WD0.13 mm	0.005*	Oil immersion
(8) CFI Plan Fluor 20x	(972069)	NA0.50 WD2.1 mm	0.08*	
(9) CFI Plan Fluor DL 4x	(972081)	NA0.13 WD16.5 mm	0.65*	Phase contrast
(10) CFI Plan Fluor DL 10x	(971936)	NA0.30 WD15.2 mm	0.60*	Phase contrast
(11) S PL FL ELWD ADM 20xC	(971962)	NA0.45 WD8.2-6.9 mm	0.32* to 0.27*	Phase contrast
(12) S PL FL ELWD ADM 40xC	(971963)	NA0.60 WD3.6-2.8 mm	0.14* to 0.11*	Phase contrast



## Options

- BZ-X800E desktop PC **972326**
- 23 inch monitor **972072**
- Temperature and CO<sub>2</sub> regulation chamber (with mixing unit) **972082**
- Temperature and CO<sub>2</sub> regulation chamber (for 5% CO<sub>2</sub> gas) **972083**
- BZ-X metal halide lamp **OP-87768**
- Immersion oil **971806**



BZ-X blank filter cube  
**OP-87767**

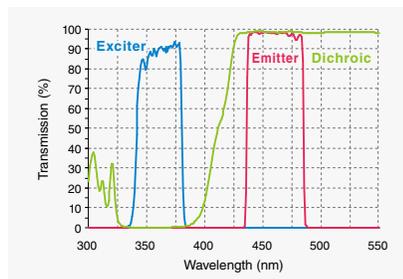
## Specifications of Fluorescence Filter Sets

Units: (nm)

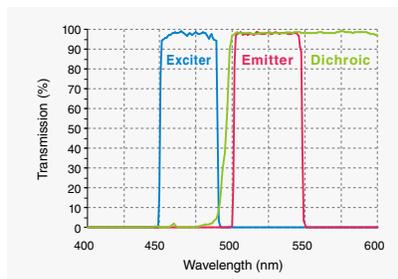
Set name	Model	Excitation wavelength	Emission wavelength	Dichroic mirror wavelength
BZ-X filter DAPI	<b>OP-87762</b>	360/40	460/50	400
BZ-X filter GFP	<b>OP-87763</b>	470/40	525/50	495
BZ-X filter TRITC	<b>OP-87764</b>	545/25	605/70	565
BZ-X filter TexasRed	<b>OP-87765</b>	560/40	630/75	585
BZ-X filter Cy5	<b>OP-87766</b>	620/60	700/75	660

## Spectra of Fluorescence Filters

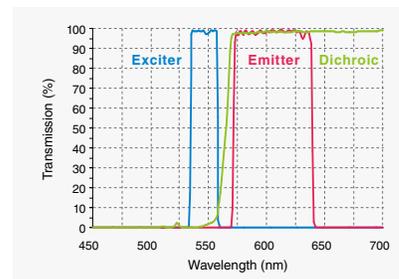
DAPI



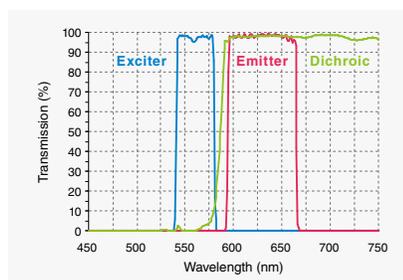
GFP



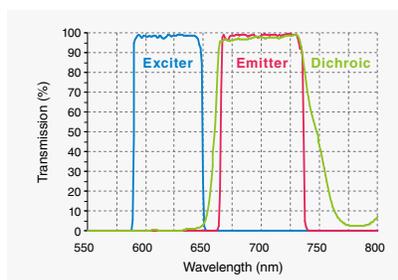
TRITC



TexasRed



Cy5



## Specifications

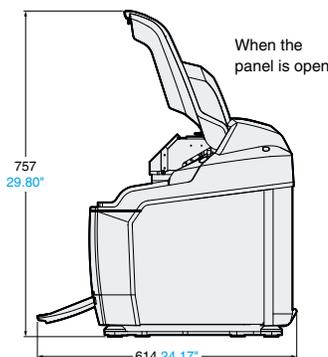
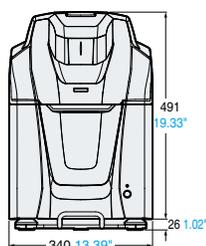
Model		BZ-X800E/BZ-X810
Microscope unit	Basic optical system	Inverted fluorescence phase contrast microscope
	Objective lenses	Nikon CFI60 Series infinite optical system
	Observation modes	Brightfield, Fluorescence (wide-field/sectioning), Phase contrast (PhL, Ph1, Ph2), Oblique illumination
	Objective lens switching	Six-mount electronic revolver
	Image-formation optical system	Fixed image-forming lens, electronic LC filter insertion/removal mechanism
	Motorized XY stage	114 × 80 mm 4.49" × 3.15" stroke, minimum 1 μm pitch min.
	Motorized Z stage	8 mm 0.31" stroke, minimum 0.1 μm pitch min.
	Motorized filter turret	Up to four filters can be mounted. Automatic position recognition and automatic excitation shutdown during filter replacement
	Fluorescent incident illumination	Optical sectioning system
	Fluorescence dimming mechanism	Electronic dimming (0.3%, 5%, 10%, 20%, 40%, 100%)
	Transmitted illumination optical system	Operating distance: 45 mm 1.77", Pop-up mechanism (with automatic lamp shut off function)
	Transmitted illumination mechanism	Electronic brightfield aperture (0%, 20%, 40%, 60%, 80%, 100%)/Phase contrast slit (PhL, Ph1, Ph2)
	Transmitted light source	3.7 W LED
Fluorescent light source	80 W metal halide lamp	
Specimen enclosure	The stage is fully contained in a built-in darkroom	
Camera unit	Image receiving element	2/3 inch, 2.83 million pixel monochrome CCD (colorized with LC filter)
	CCD cooling mechanism	Peltier cooling: 5°C 41°F (Reduction amount: 25°C 45°F)
	Output signal, gradations	14-bit/8-bit monochrome, 8-bit R/G/B
	Frame rate	15 fps for monochrome recording (up to 95 fps with binning), 8.5 fps for color recording
	Binning	On-chip binning (2 × 2, 3 × 3, 4 × 4, 8 × 8, 12 × 12)
	Number of pixels in recorded image	4080 × 3060 max (12.5 megapixel, high-quality interpolation)
	Video capture	8-bit monochrome: 15 fps for 1280 × 960 With binning: 28 fps for 960 × 720, 40 fps for 640 × 480, 50 fps for 480 × 360, 75 fps for 240 × 180, 95 fps for 160 × 120 Color: 8.5 fps for 1280 × 960
		Electronic shutter
	Auto exposure method	User-specified area, average/peak
	Gain	0 dB, +6 dB, +12 dB, +18 dB
	White balance	Push-set, manual
	Black balance	Push-set, manual
	Observation software	Multi-color image capturing, Auto focus, Quick full-focusing, Scale display, Electronic revolver control, Electronic stage control
Controller	Applicable OS	Windows 10® Professional 64 bit
	PC interface	USB2.0
	Ambient temperature	+15 to 35°C 59 to 95°F
	Relative humidity	35 to 80% RH (No condensation)
	Dimensions	Head: 517 (H) × 340 (W) × 496 mm (D) 20.35"(H) × 13.39"(W) × 19.53"(D) <sup>*1</sup> Controller: 227.5 (H) × 125 (W) × 403 mm (D) 8.96"(H) × 4.92"(W) × 15.87"(D)
	Weight	Head: 33 kg, Controller: 4.8 kg
	Power supply	100 to 240 VAC ± 10%, 50/60 Hz
	Power consumption	250 VA
	Overvoltage category	II
	Pollution degree	2
Functional Modules	BZ-H4XF/Sectioning Module	Optical sectioning image mode
	BZ-H4XD/Advanced Observation Module	Navigation, Image stitching, Z-stack, Coordinate-specific condition setting
	BZ-H4XI/Image Cytometer Module	Batch capture (user location specified/all locations specified/random location specified) *BZ-H4XD required/Image cytometer analysis, batch analysis *BZ-H4C required
	BZ-H4XT/Time-lapse Module	Time-lapse imaging, Video capturing, Time-series brightness measurement
Analysis Applications	BZ-H4A/Advanced Analysis Software	Image stitching, Haze reduction, Full focus
	BZ-H4M/Measurement Application	Dimension measurement, Area measurement, Brightness measurement (line profile, histogram)
	BZ-H4R/3D Application	3D display, 3D measurement, XYZ slicing, Maximum projection, Video saving, (with addition of BZ-H4C) 3D cell count
	BZ-H4K/Motion Analysis Application	Motion tracking, Motion analysis, (with addition of BZ-H4C) Time-series cell count
	BZ-H4C/Hybrid Cell Count	Cell count (Phase contrast, Brightfield, Fluorescence), Mask cell count
BZ-H4CM/Macro Cell Count	Macro cell count (Batch analysis of multiple images)	

\*1 Panel closed • Windows 10® is a registered trademark of Microsoft Corporation in the United States.

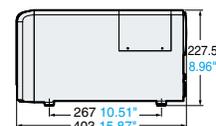
## Dimensions

Units: mm inch

Head unit  
BZ-X810



Controller unit  
BZ-X800E





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1 - 8 8 8 - 5 3 9 - 3 6 2 3

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**SAFETY INFORMATION**

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