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

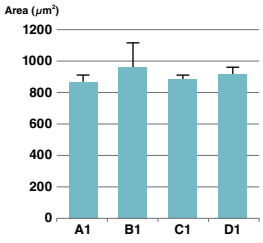
No complicated configuration required
With a single click, any user can capture publication-quality images

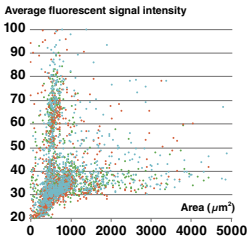
Batch Analysis of Large Data Sets

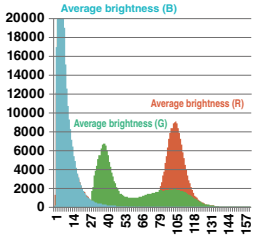
Capture and analyze in dramatically shorter time frames than with conventional microscopes
The image cytometer module reinforces testing reliability

NEW Image cytometer module ▸p.14

Copying settings enables bulk observation and analysis in one operation







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

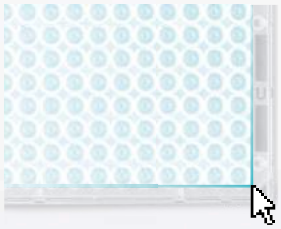
All operations controlled within an easy-to-use software
High-reproducibility, user-independent imaging

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

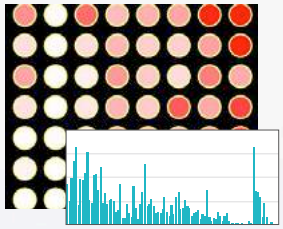
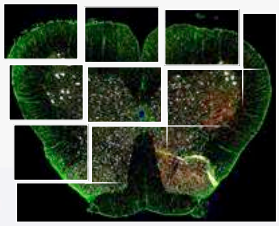
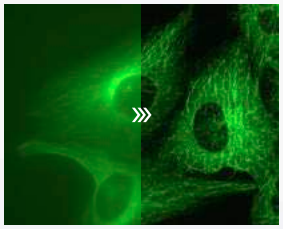


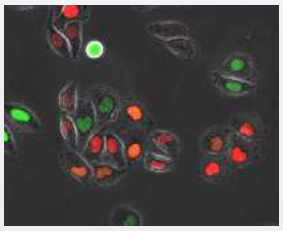
Image stitching



Optical sectioning

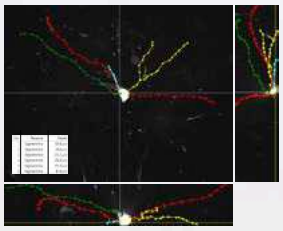


Live cell imaging

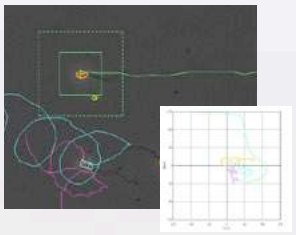


Video capturing

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.

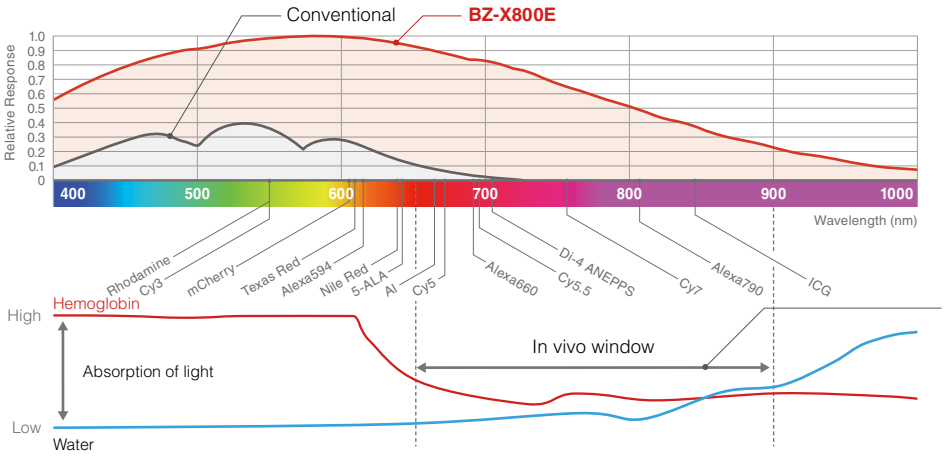
Bright, High-definition Imaging

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.

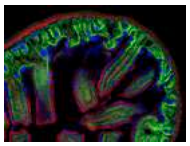
One-click monochrome/color switching camera

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.

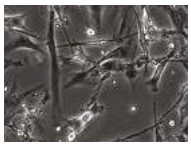
High versatility across various samples

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.

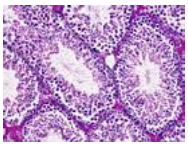
Fluorescence



Phase contrast



Brightfield

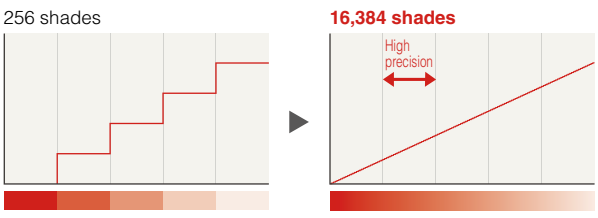


Accurate Detection for Reliable Data

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.

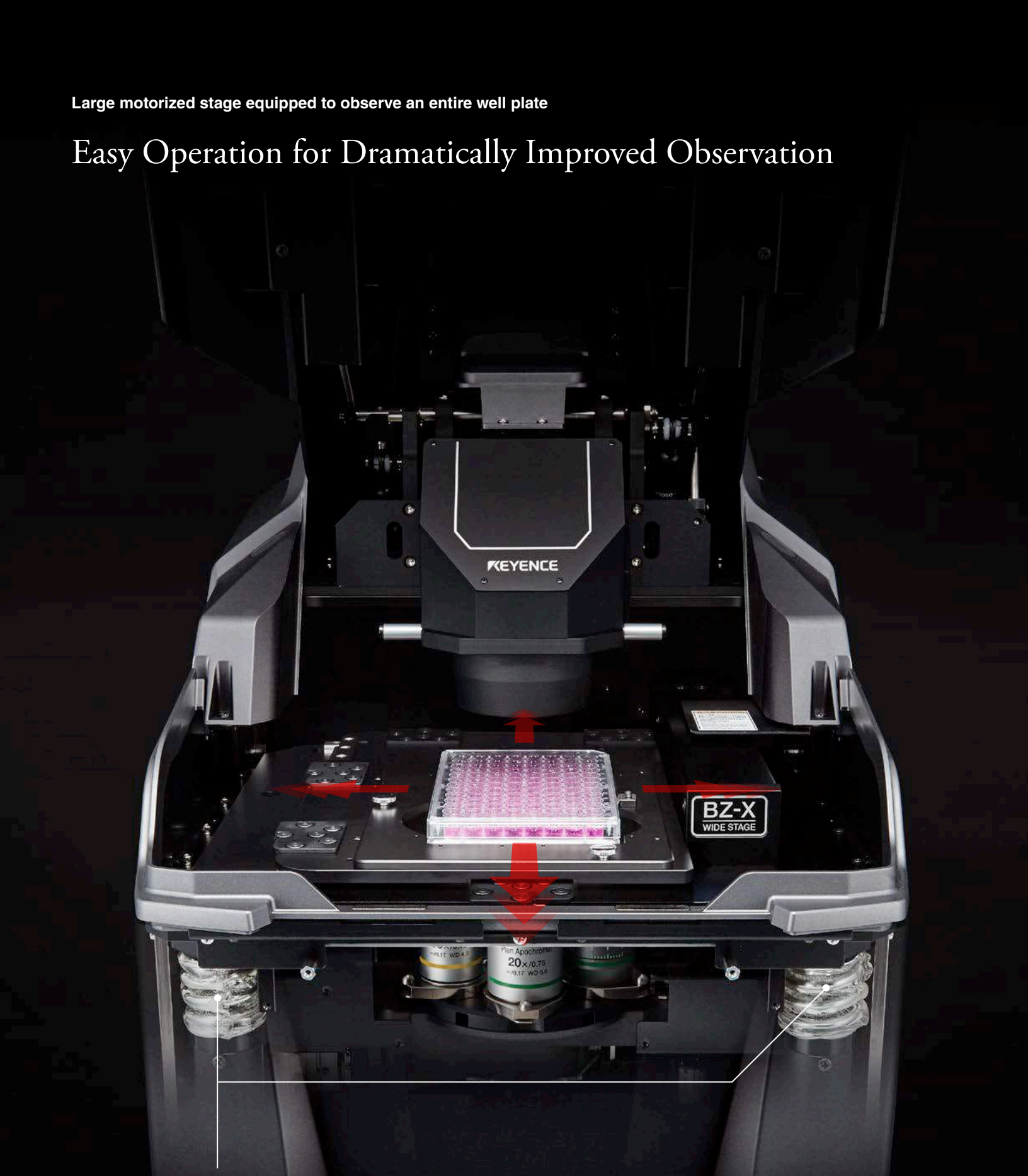
14-bit, high-level gradation

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



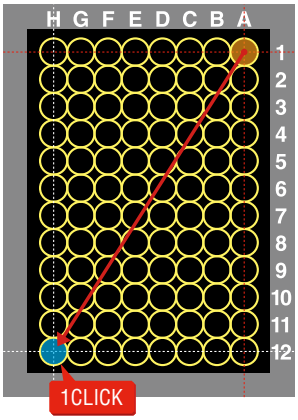
Anti-vibration construction

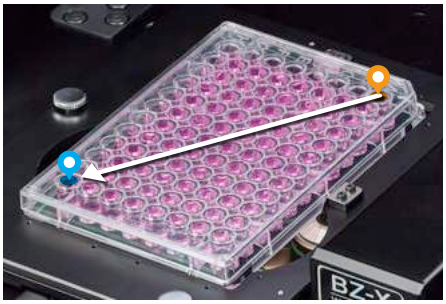
The BZ-X800E uses a floating stage structure with anti-vibration dampers to stabilize high-precision imaging. High magnification capture, image stitching, and observation of cultured cells in liquid media can be performed anywhere, unaffected by vibration.

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

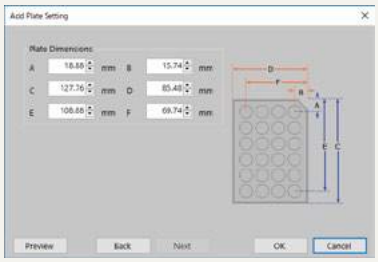
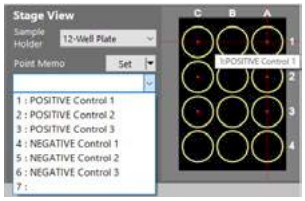


Plate customization function

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

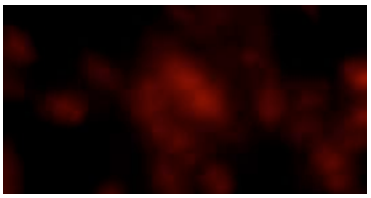
Magnification 2–100× | Oil-immersion lenses | Dry lenses | Phase contrast lenses

Fast and Easy Focusing

High-speed auto focus

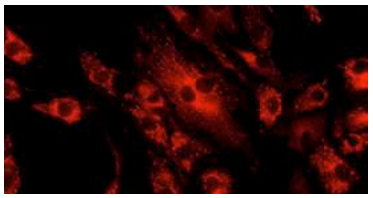
With a single click, instantly focus on any sample in fluorescence, brightfield, or phase contrast at any magnification. The rapid auto focus uses a high-sensitivity partial scan mode in the Z axis.

One-click auto focus



High-sensitivity partial scan for high-speed processing

Accurate focus



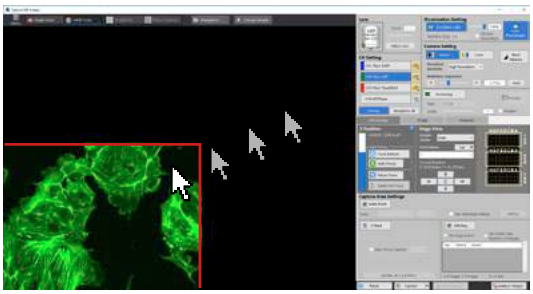
High-sensitivity partial scan

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.

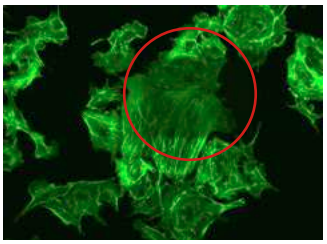
High-Efficiency Imaging

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.

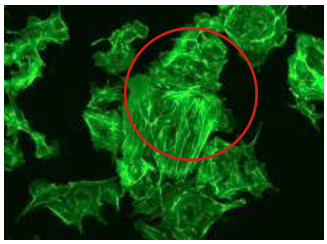


Conventional



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

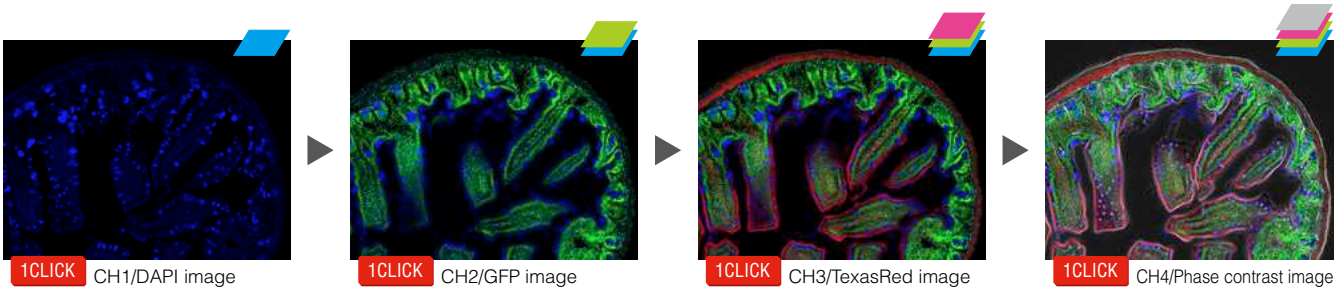
Low photobleach mode

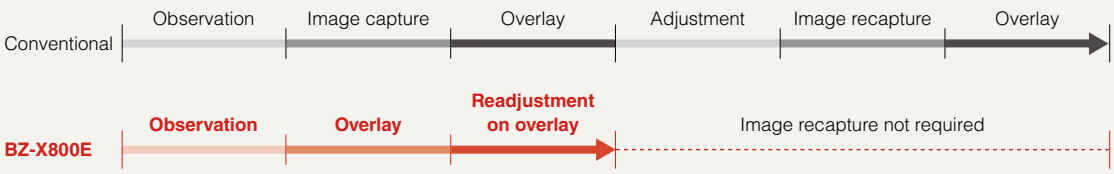


Photobleaching is minimized, resulting in uniform brightness

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.

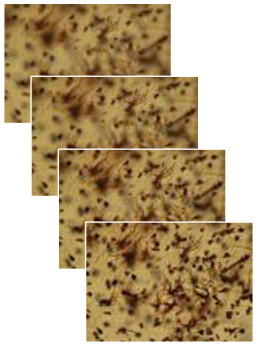




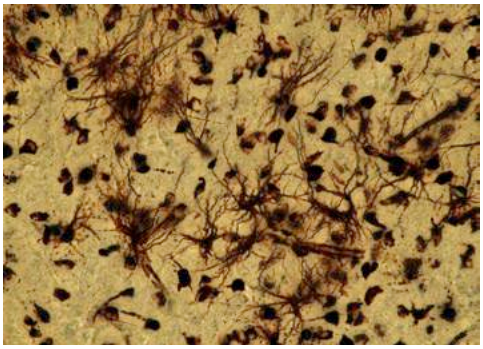
Quick full focus

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.

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



One-click, automatic scanning

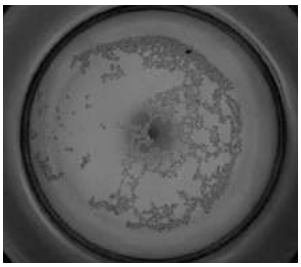


Fully-focused image

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.



Live cell capture

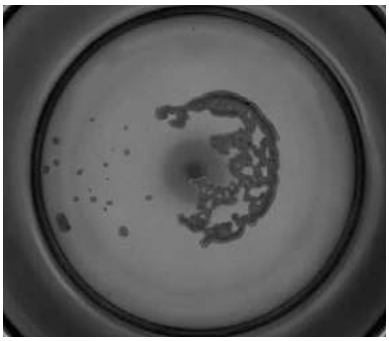
Return to incubator

Recapture

Conventional

Manual location search | Manual condition reproduction | Less accurate image capture

Users must keep track of what settings were used, such as the location coordinates and exposure time, and then manually reproduce them in future captures. This takes time and decreases accuracy.



BZ-X800E

Load setting | Accurate, fast capture | High reproducibility, saves time

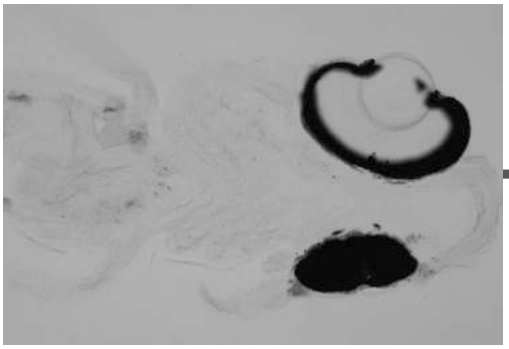
Every setting such as location coordinates, exposure time, imaging channel, and magnification are automatically saved with each image. These conditions can then be loaded directly from an image, saving time and ensuring experiment accuracy.

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.

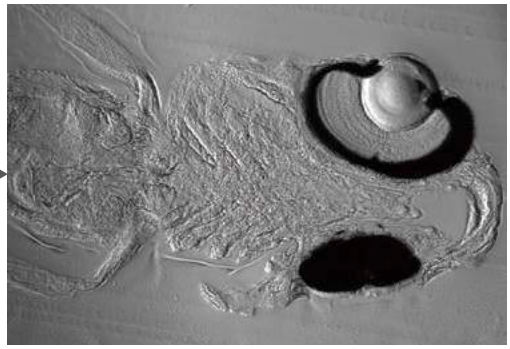
Conventional



Zebrafish

1CLICK

Oblique illumination



Enhanced Observation and Analysis

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

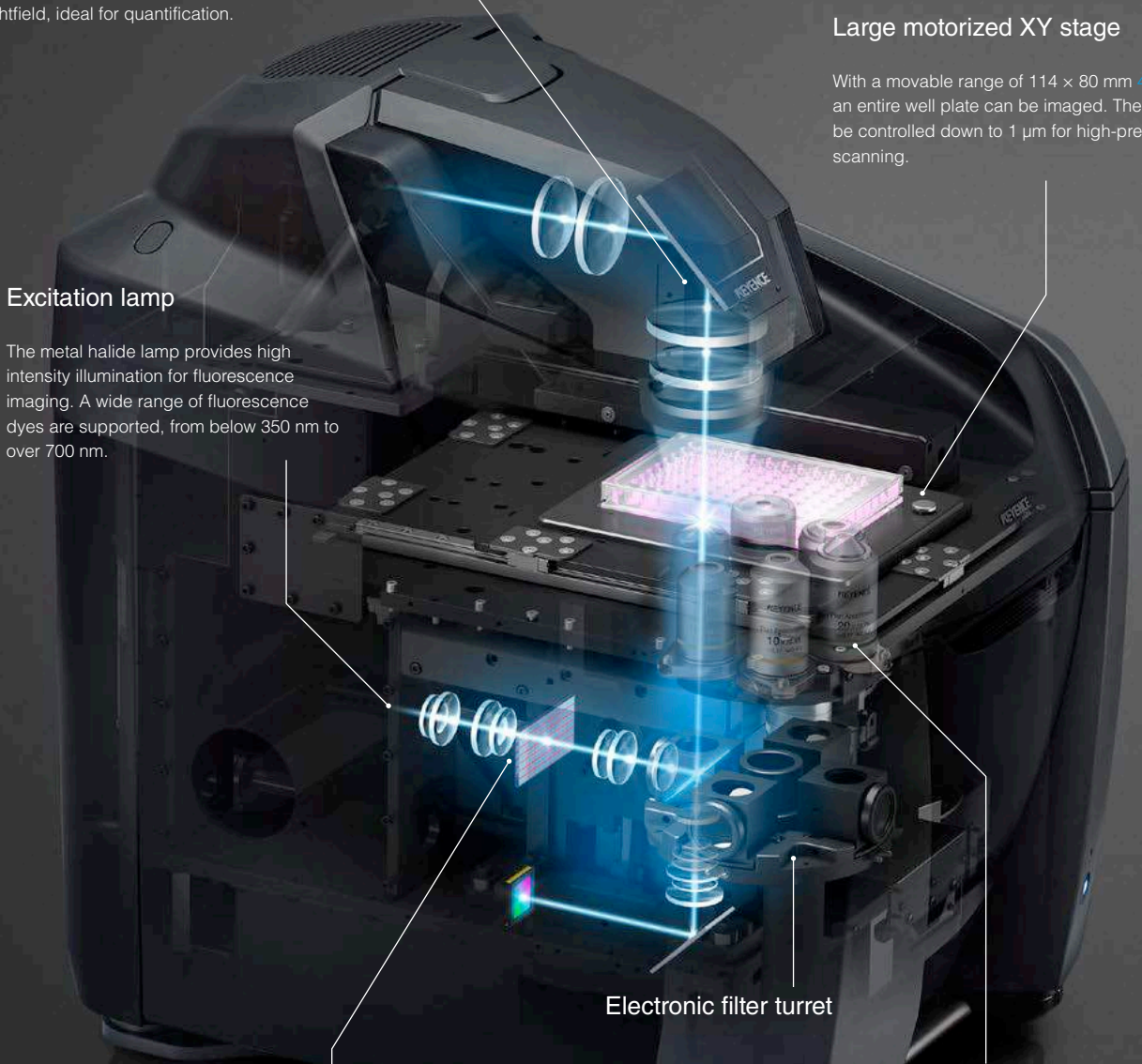
The built-in configuration includes all of the hardware required for the optional modules. Upgrades are easy and fast for on-demand expandability. The software interface remains the same as modules are added, allowing users to easily operate the system after upgrading.

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

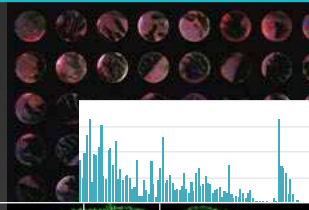
NEW

BZ-H4XI

Image Cytometer Module

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

▶ p.14

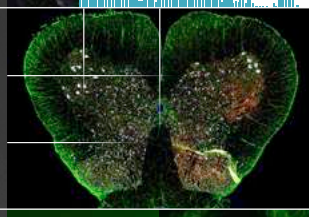


BZ-H4XD

Advanced Observation Module

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

▶ p.16

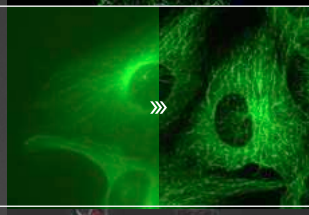


BZ-H4XF

Sectioning Module

Optical sectioning capture with structured illumination.

▶ p.20

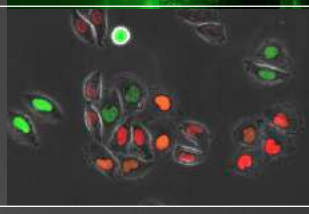


BZ-H4XT

Time-lapse Module

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

▶ p.24



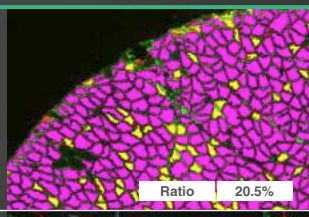
Analysis Applications

BZ-H4C/BZ-H4CM

Hybrid and Macro Cell Count

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

▶ p.26



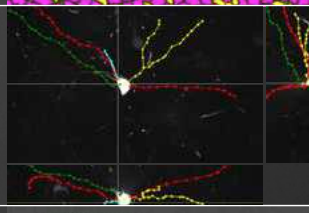
NEW

BZ-H4R

3D Application

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

▶ p.30



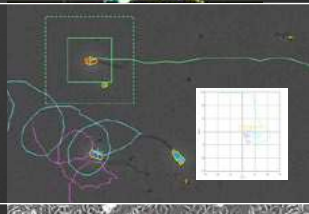
NEW

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

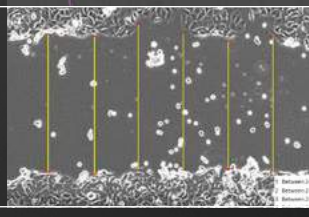
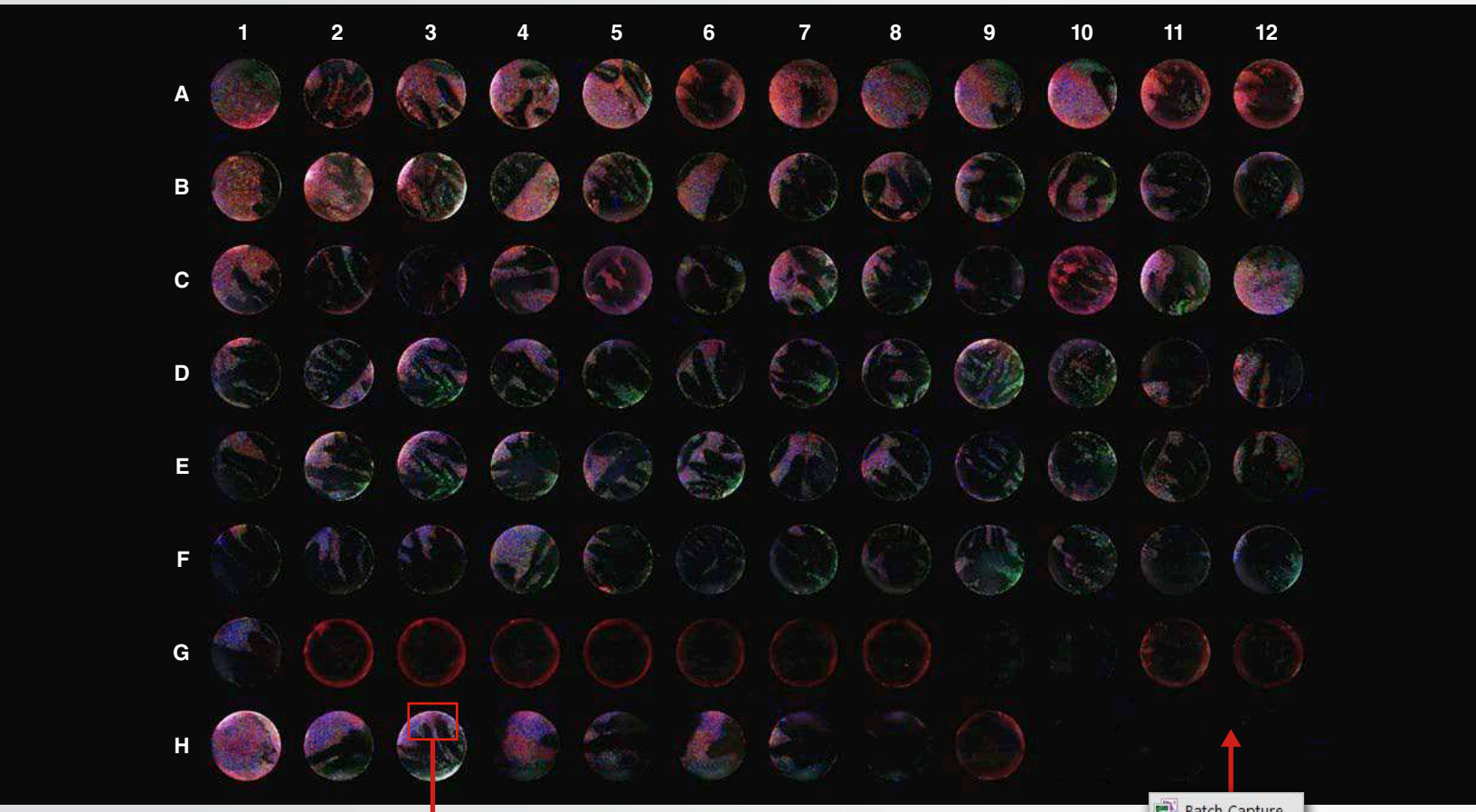


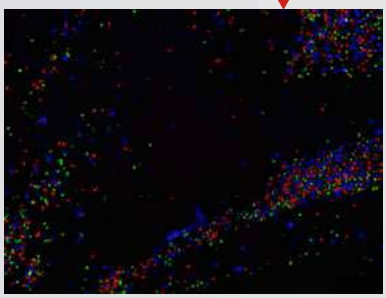
Image Cytometer Module

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.



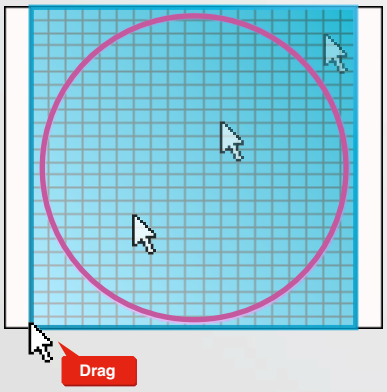
STEP 1
Set capture conditions



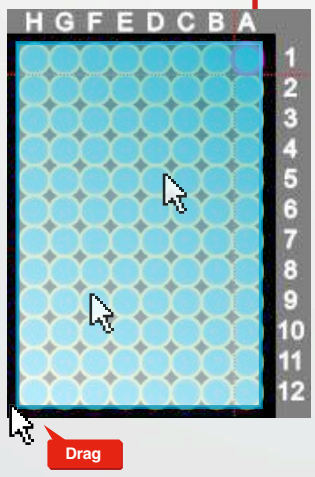
Lens magnification	Exposure time
Channel	Camera settings
Z-stack	Sectioning

etc.

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

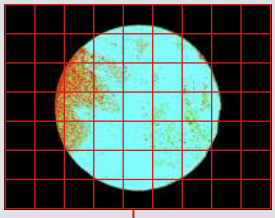


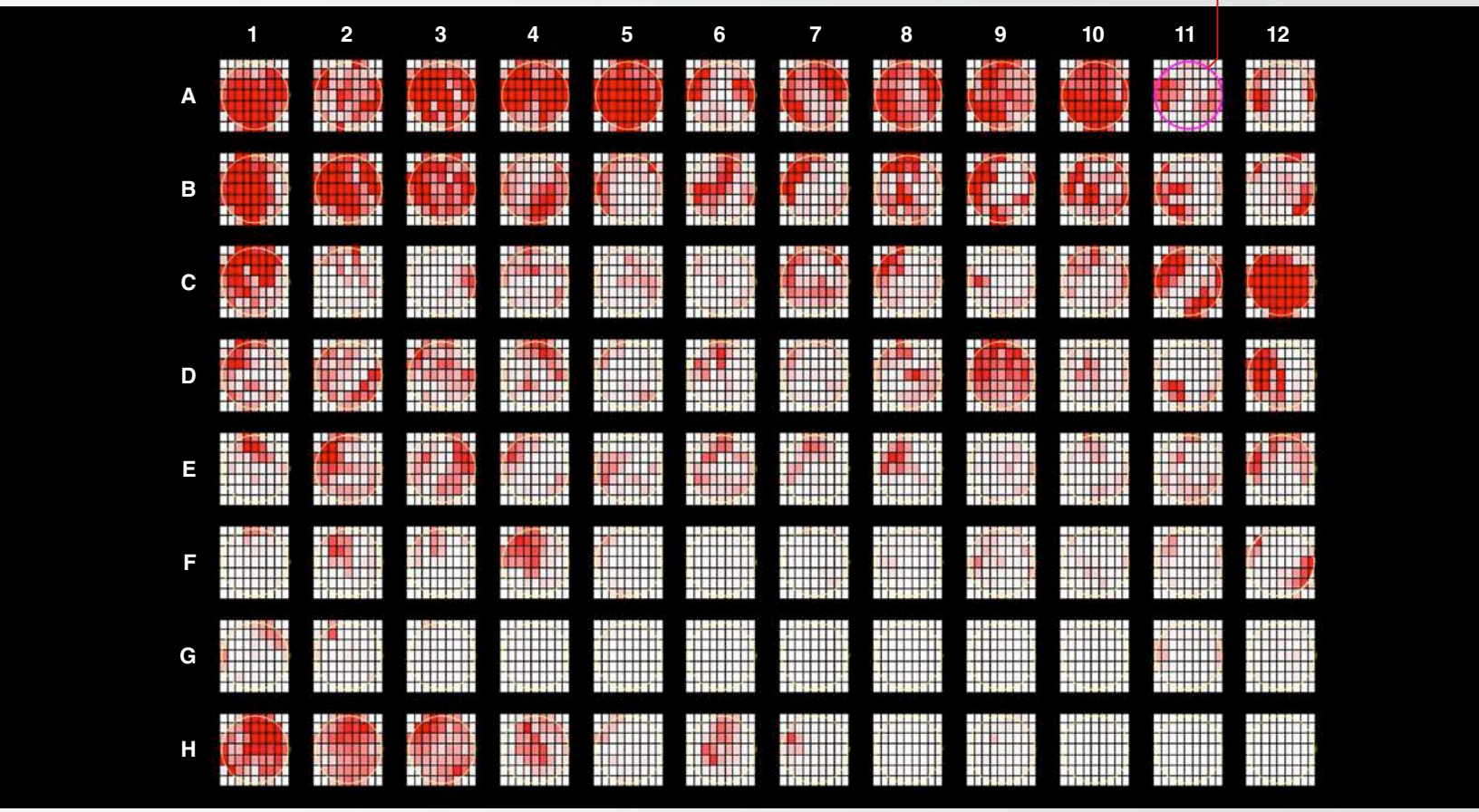
STEP 3
Click and drag to specify wells to capture



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.

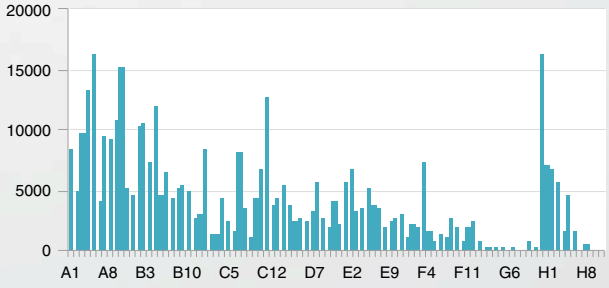




▲ **Heatmap function** Gradated display visually represents different measurement values between fields of view and wells

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.



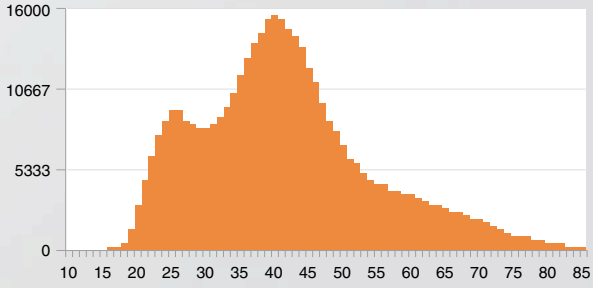
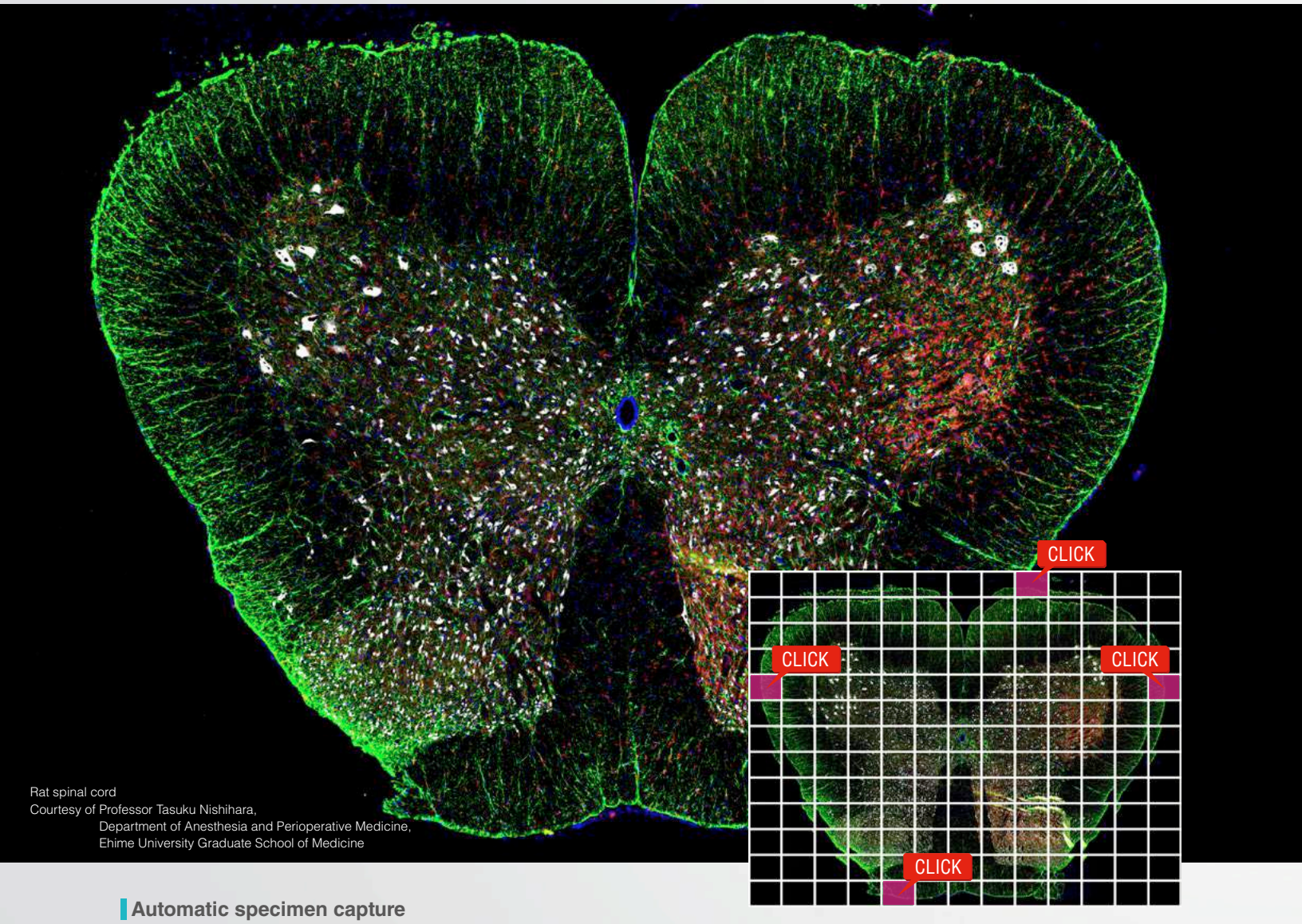


Image Stitching

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

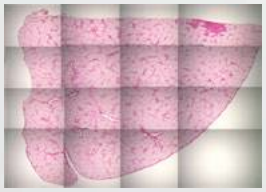
Automatic specimen capture

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

High precision shade correction

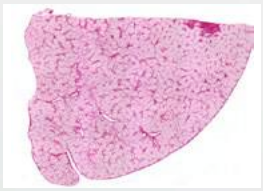
Uneven light intensity caused by lens aberration or non-uniform light sources appear as seams in the stitched image. This results in an unnatural appearance and affects the accuracy of quantification.
The BZ-X800E eliminates uneven light intensity with its high-precision shade correction algorithm in order to create seamless, high-resolution images.

Conventional stitched image



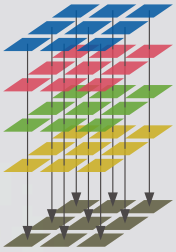
Uneven light intensity causes stitch lines

BZ-X800E stitched image



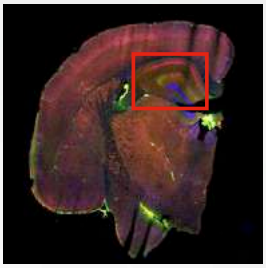
Shade correction eliminates stitch lines

Full-focus Image Stitching

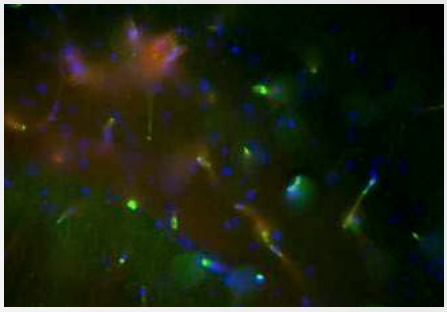


Fully-Focused Images of Thick Samples

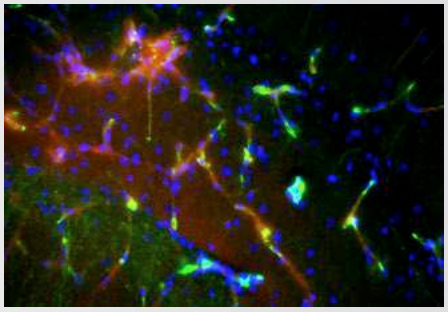
The automated stage captures a Z-stack for each individual field-of-view being stitched. This allows for a fully-focused wide-area image to be obtained for thick or dense samples.



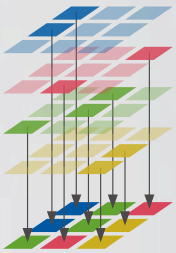
Conventional



BZ-X800E

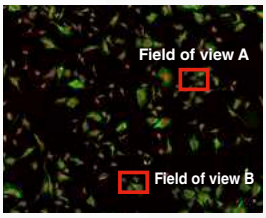


Auto-focus Image Stitching

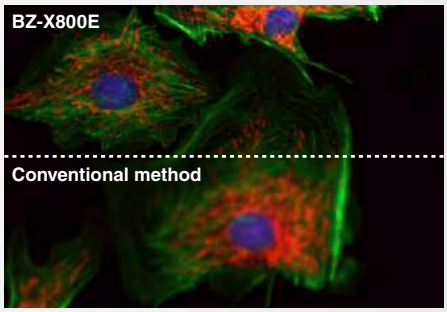


Rapidly Focus Each Field of View

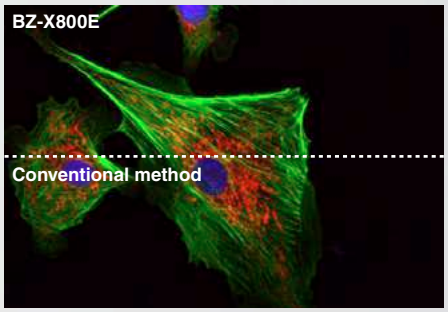
Each field-of-view is auto-focused prior to image capture. Optimally-focused stitched images of samples with height variations, such as an unevenly sliced tissue section, can be captured without user input.



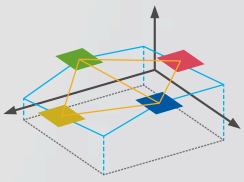
Field of view A



Field of view B



Edge-focus Image Stitching

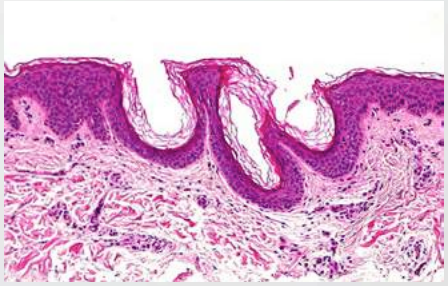


Set Z Point Positions for Fast, Focused Stitching

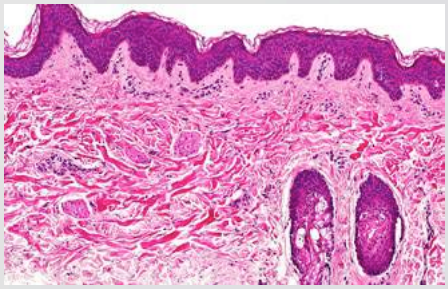
Set the focal plane for a few fields of view and then execute a rapid, single layer stitch with fewer captures. The Z axis will change gradually as the sample is scanned for rapid image stitching and minimal photobleaching.

Field of view A Field of view B

Field of view A



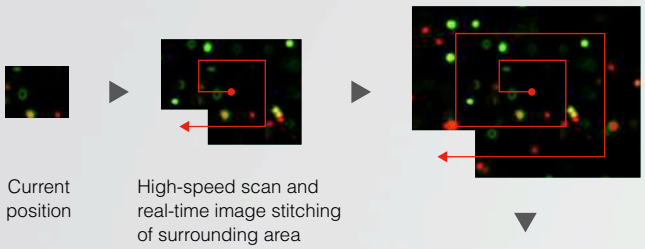
Field of view B



Navigation

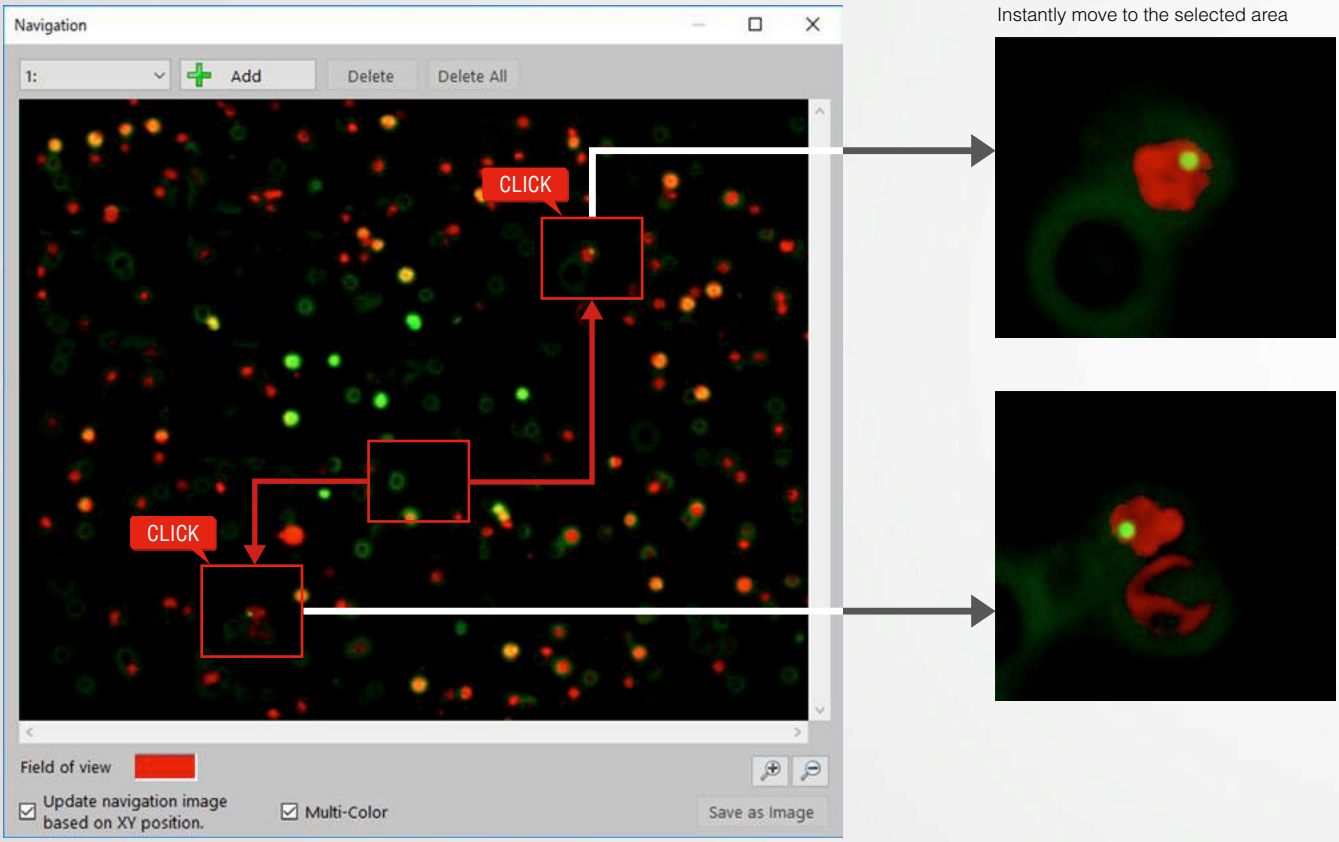
Easily Locate Areas of Interest

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.



Current position

High-speed scan and real-time image stitching of surrounding area



Micronucleus testing (genotoxicity test)

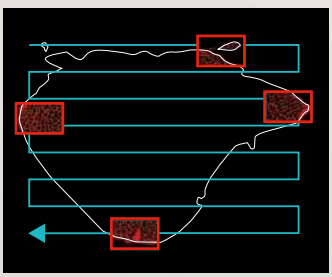
Image stitching made simple

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.



Multi-point & Multi-condition Capture

Efficient Image Capture of Multiple Specimens

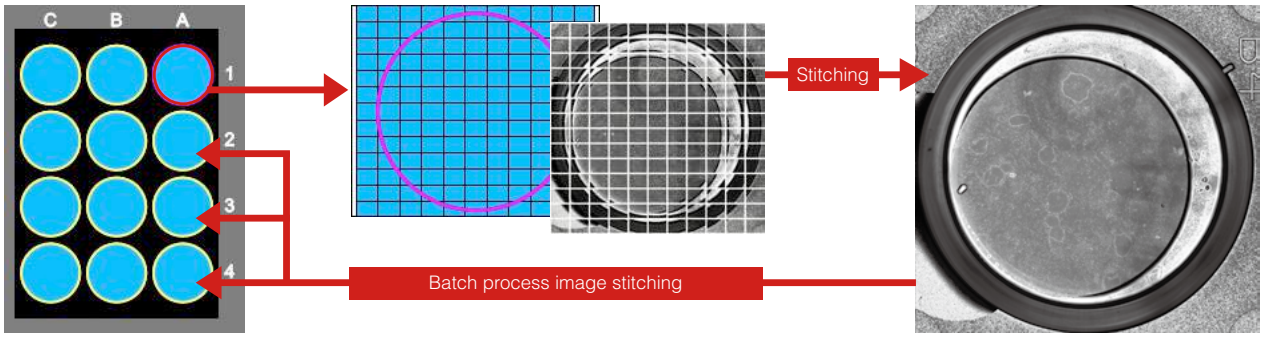
Up to 999 coordinate points can be recorded. A variety of capture conditions such as magnification, exposure time, Z-stack settings, and image stitching can be set individually for each point. As with normal observation, simply click "Set" to register capture conditions. Multiple points of data can be 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

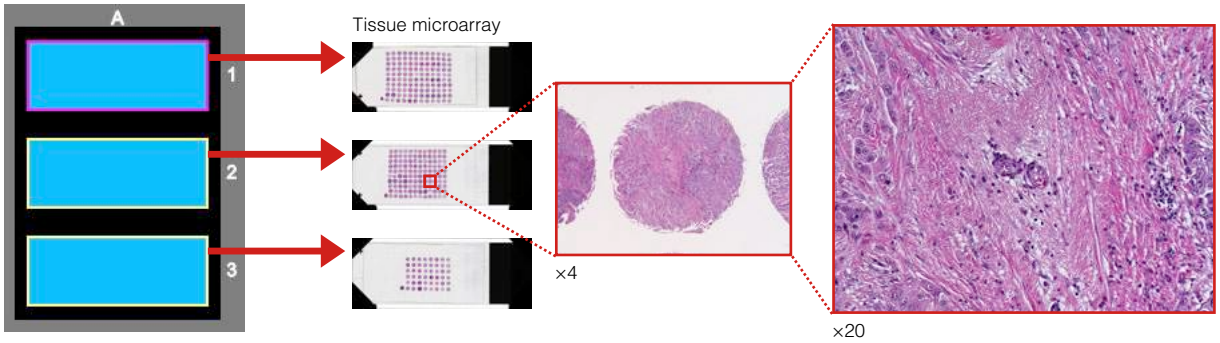
BZ-H4XD × **BZ-H4XI** × **BZ-H4C**

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.



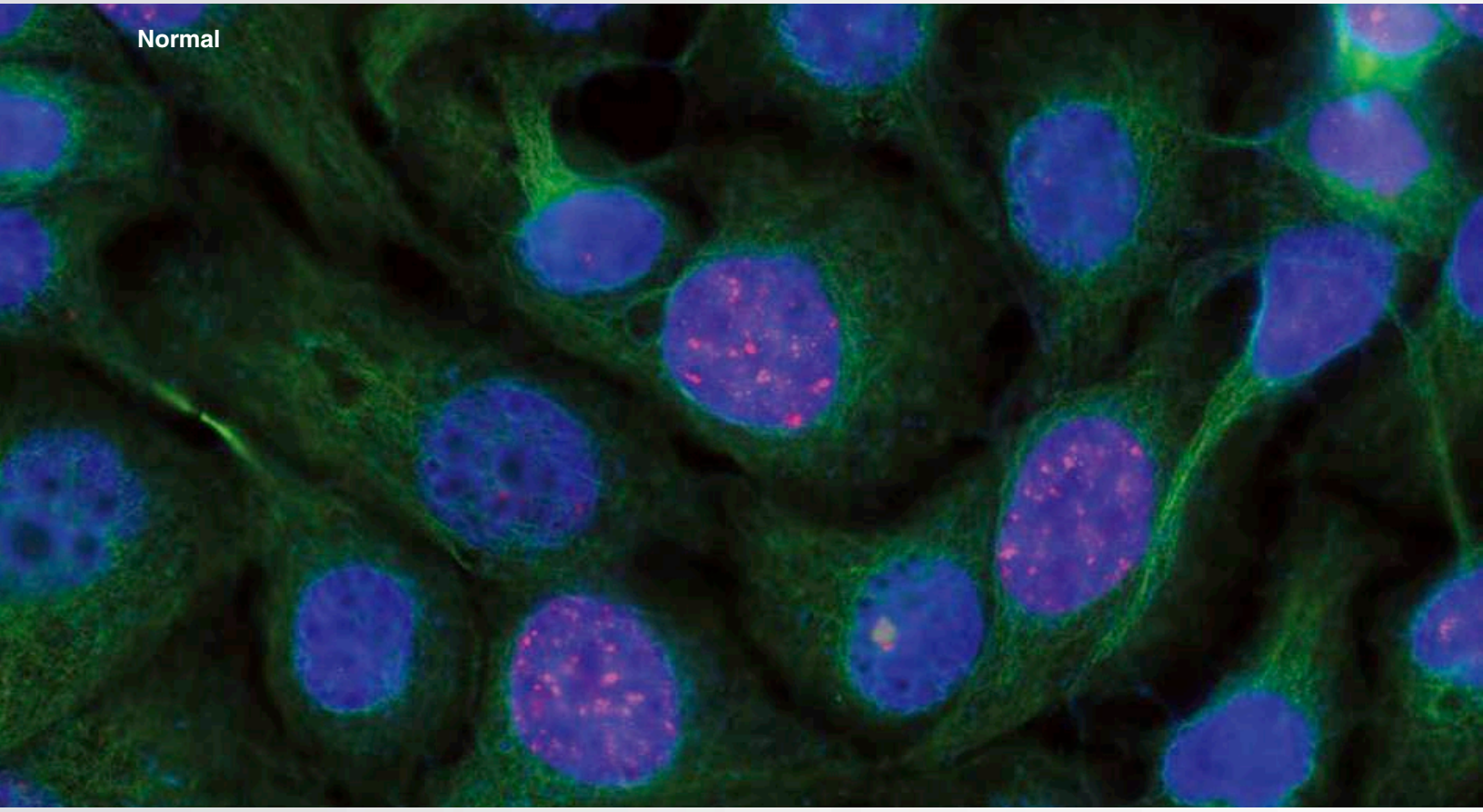
Whole slide scans The BZ-X800E Wide Image Viewer saves uncompressed images with the highest possible resolution, allowing users to observe fine details of large samples.



Optical Sectioning

Capture Clear Images Without Fluorescence Blurring

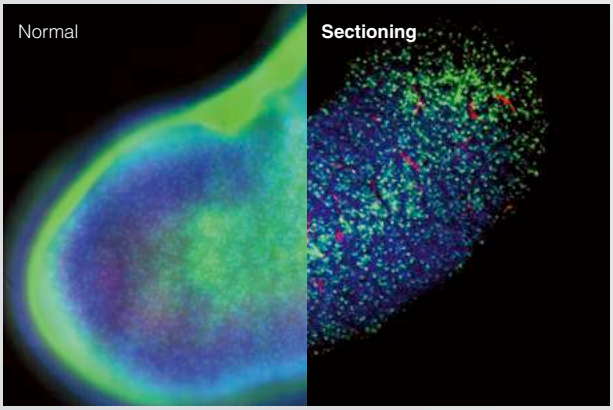
Easily capture high-definition images without the blurring caused by out-of-focus signals. The unique optical sectioning technology in the BZ-X800E uses an electronic projection element for structured illumination. Operation is simple and intuitive, allowing even first-time users to capture publication-quality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



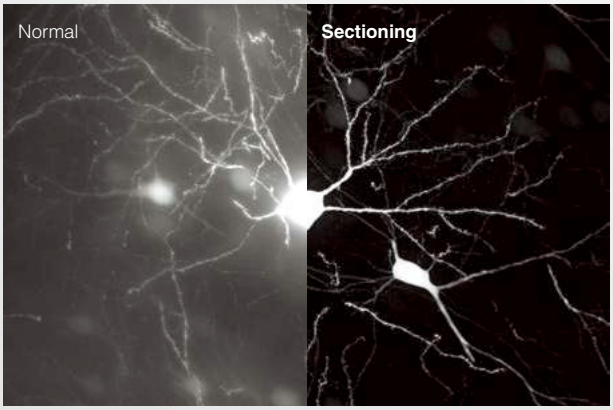
Clear capture of thick specimens

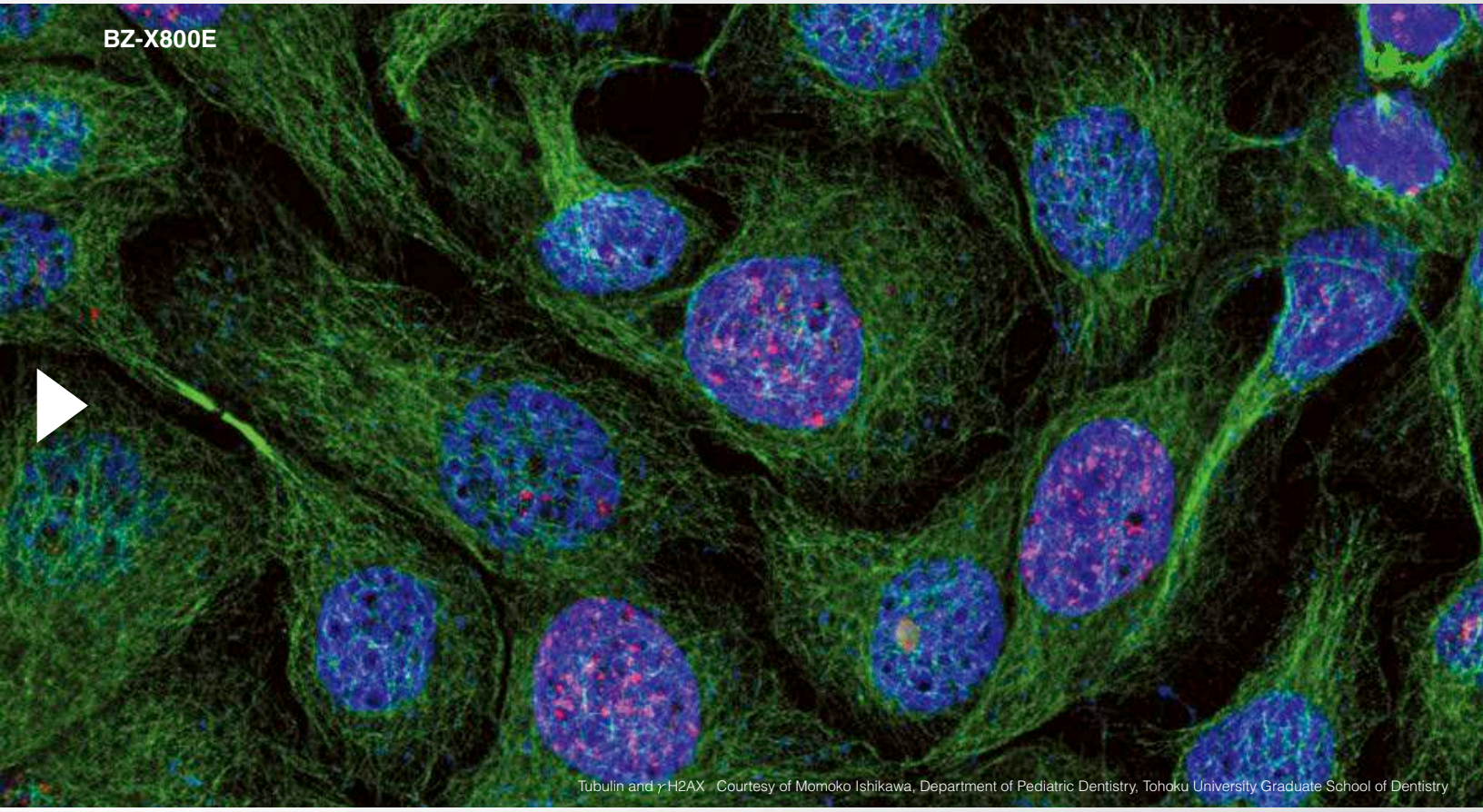
Optical sectioning accurately detects fluorescence signals in the desired focal plane, providing clear optical slices of thick samples. A wide range of samples, including animal cells, plant cells, and cultured tissue can be easily observed.

Kidney, whole mount



Mouse cranial nerves (transparent samples)



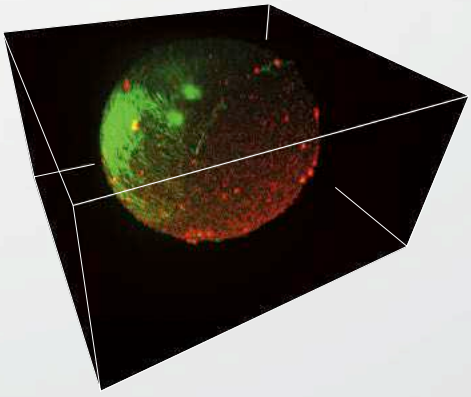


Tubulin and γH2AX Courtesy of Momoko Ishikawa, Department of Pediatric Dentistry, Tohoku University Graduate School of Dentistry

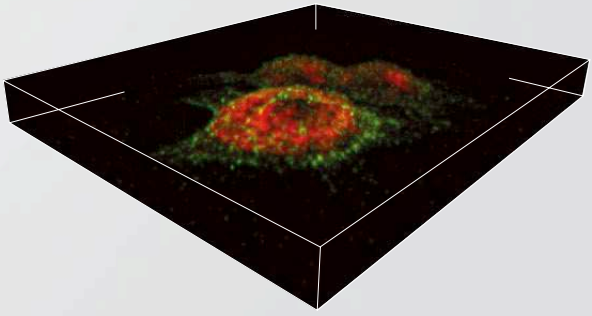
3D localization analysis

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.

Ascidiacea 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

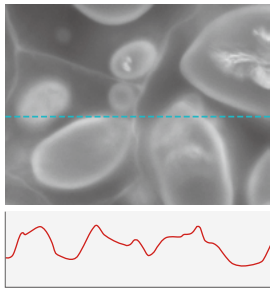
Sectioning Algorithm

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

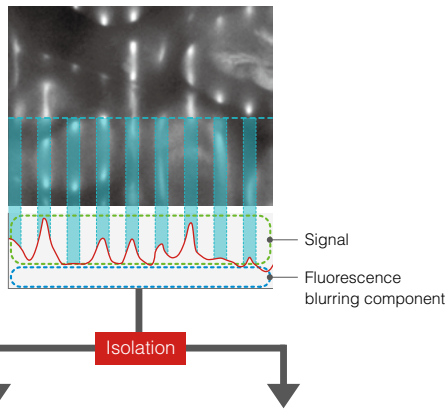
Thick specimens cannot be captured with conventional widefield microscopes due to scattered light in the Z plane. This fluorescence blurring obscures true signals in the focal plane of interest.



BZ-X sectioning

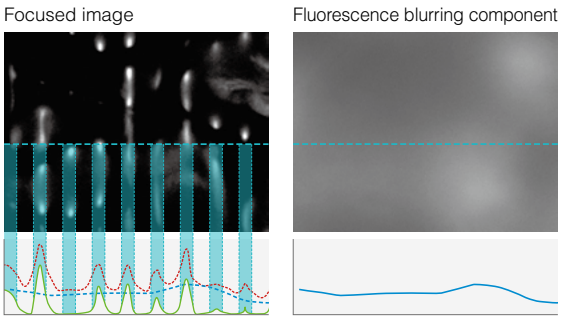
STEP 1: Pattern projection

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.



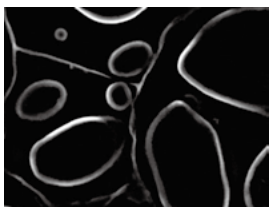
STEP 2: Scan and capture

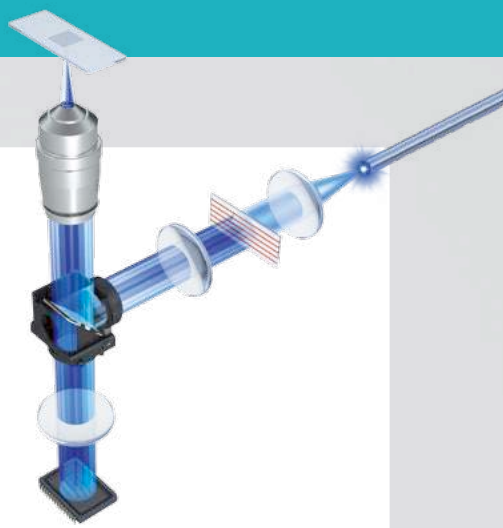
Multiple images are captured while the illumination pattern scans across the sample. Since the brightness of scattered signals does not change significantly as the pattern moves, the fluorescence blurring can be extracted and eliminated.



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.

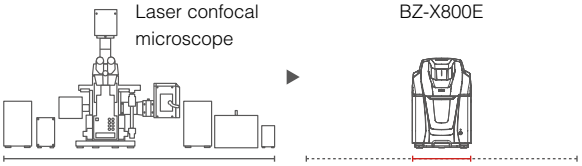
POINT 3
Pattern width and structure can be easily changed. A 2D pinhole pattern can be used for higher resolution capture.

1D slit (×40) 1D slit (×20) 2D pinhole (×20)

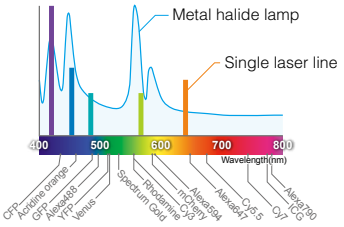
White light source

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

POINT 1
Simple, compact setup.

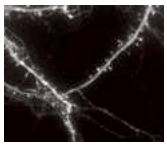


POINT 2
Simply change the filter to image any wavelength from UV to IR instead of dedicated laser lines.

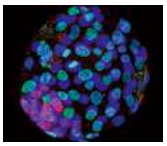


POINT 3
High-sensitivity detection using a monochrome cooled CCD reduces sample damage and photobleaching.

Spine (×100)

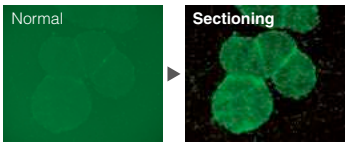


Mouse embryo



POINT 4
Capture images in any container, including plastic-bottom multi-well plates. No complex configuration required.

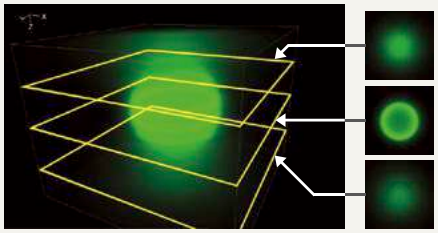
T-iPS cells in plastic dish



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

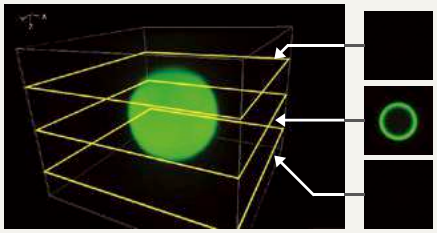
More Accurate 3D Analysis Using Sectioning

Fluorescent bead, 3D image
Normal observation



Fluorescence blurring is eliminated, and signals from the desired focal plane are captured.

Sectioning observation



Time-lapse

Temperature and CO_2 Regulation for Live-Cell Imaging

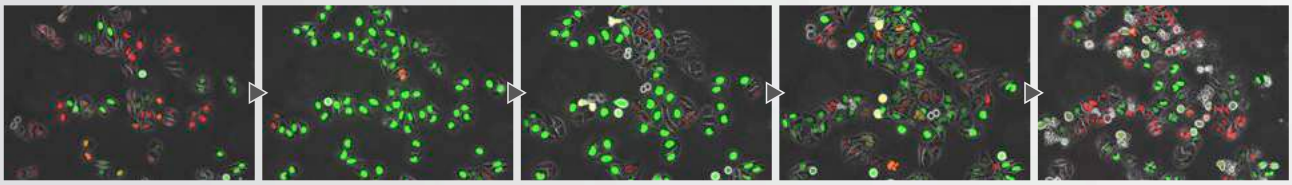
Perform time-series capture of brightfield, fluorescence, and phase contrast images at user-specified intervals. The temperature and CO_2 regulation chamber can hold a variety of vessels, including well plates, to create an ideal environment for specimen during prolonged time-lapse imaging.

Time-series Brightness Measurement Function

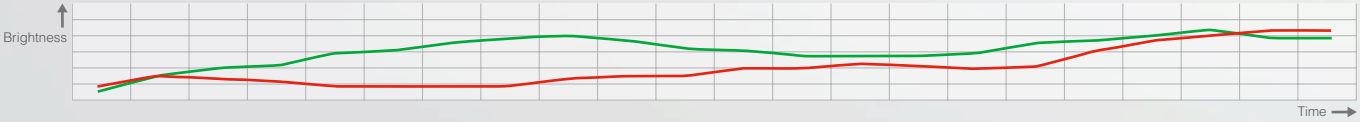
Quantify Changes Over Time

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



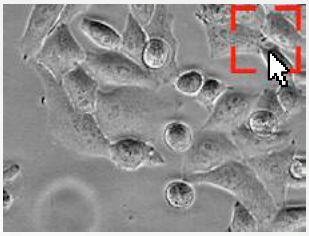
Courtesy of Assistant Professor Atsushi Kaida, Oral Radiation Oncology Department, Tokyo Medical and Dental University



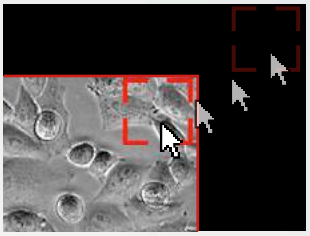
Position Adjustment During Time Lapse

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

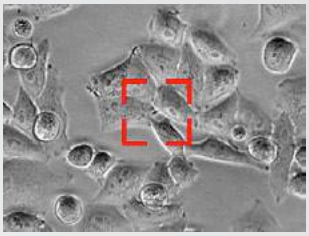
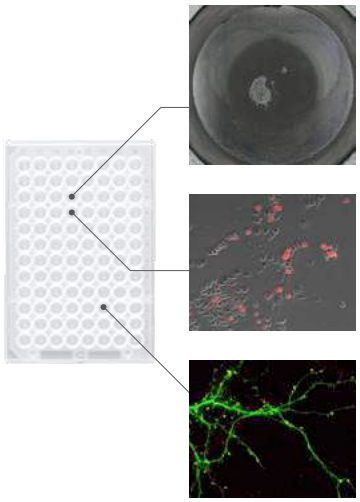


Image capture resumes using the updated position

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

For transfection efficiency

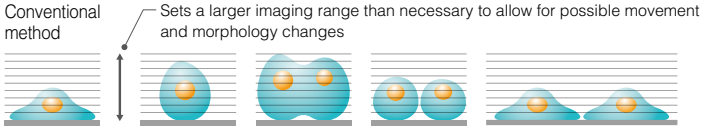
Lens	Phase contrast 20×
Observation mode	Phase contrast + fluorescence overlay
Z-stack	1.5 μ pitch, 8 images
Exposure time	Phase contrast 1/50 s, fluorescence 1/5 s

For cultured nerve cells

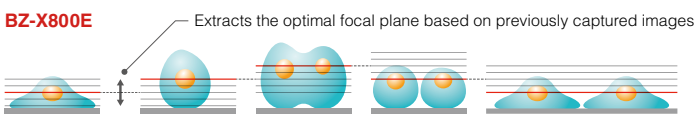
Lens	Oil immersion 60×
Observation mode	Fluorescence 2CH overlay
Z-stack	0.5 μ pitch, 10 images
Exposure time	CH1 1/6 s CH2 1/12 s

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

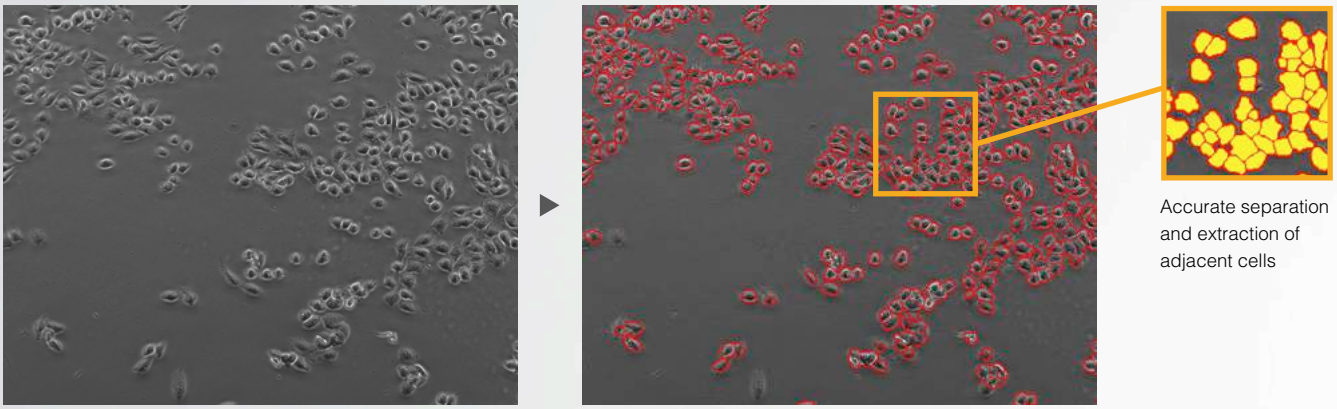
Hybrid Cell Count

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.

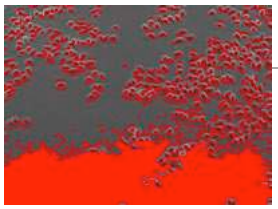
Phase contrast

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.



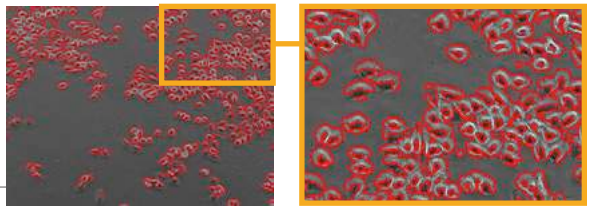
Accurate separation and extraction of adjacent cells

Cell counting with conventional software

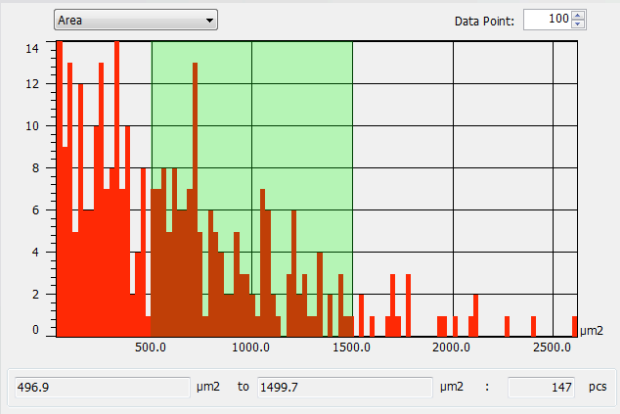


Uneven background brightness prevents cells from being extracted properly.

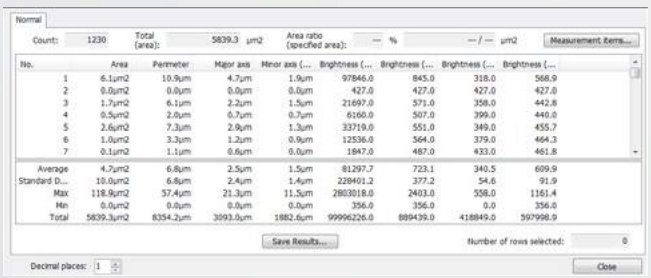
Low contrast makes it impossible to accurately differentiate and count the cells.



Data output in spreadsheet format

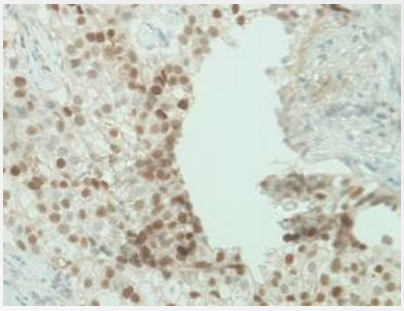


- Area
- Perimeter
- Major axis
- Minor axis
- Brightness (INT/MAX/MIN/AVE)
- RGB brightness (INT/MAX/MIN/AVE)
- Ferret diameter (X/Y)
- Count
- Area ratio, etc.



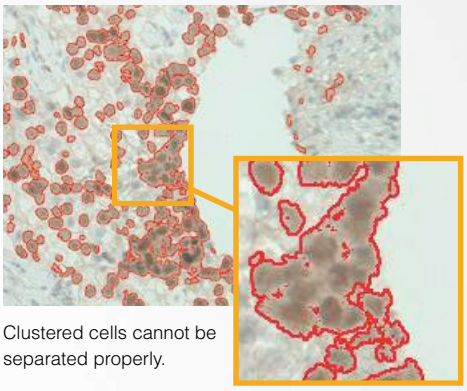
Color extraction

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



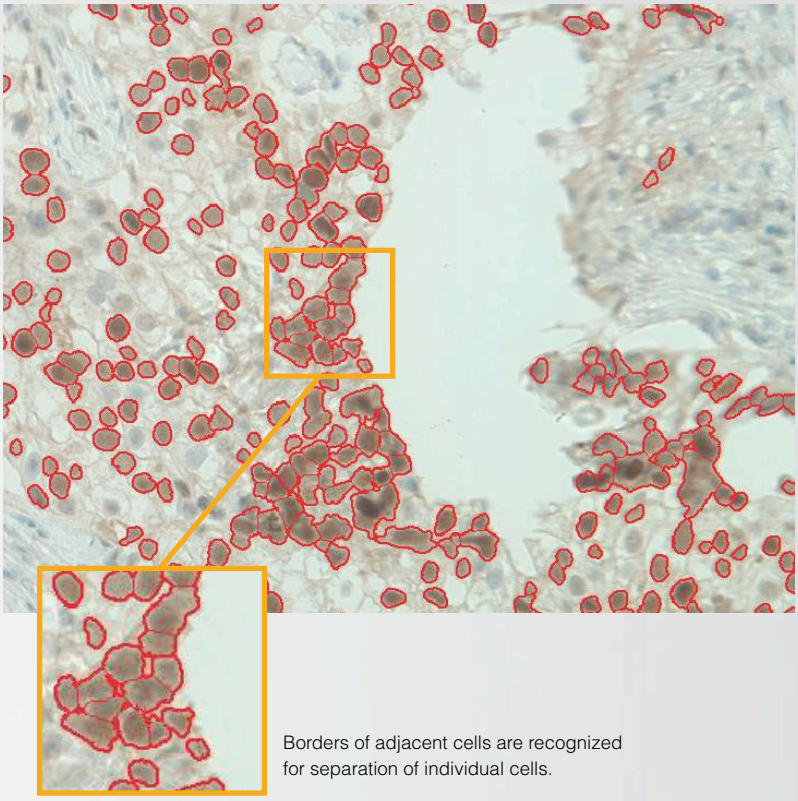
Courtesy of Koji Arihiro, M.D. Ph.D.,
Department of Anatomical Pathology, Hiroshima University Hospital

Conventional



Clustered cells cannot be separated properly.

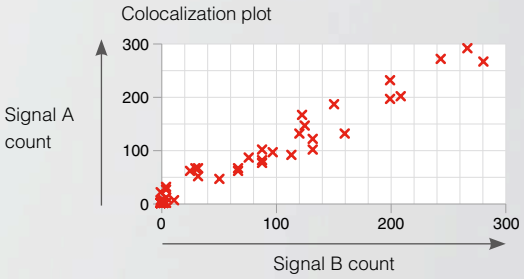
BZ-X800E

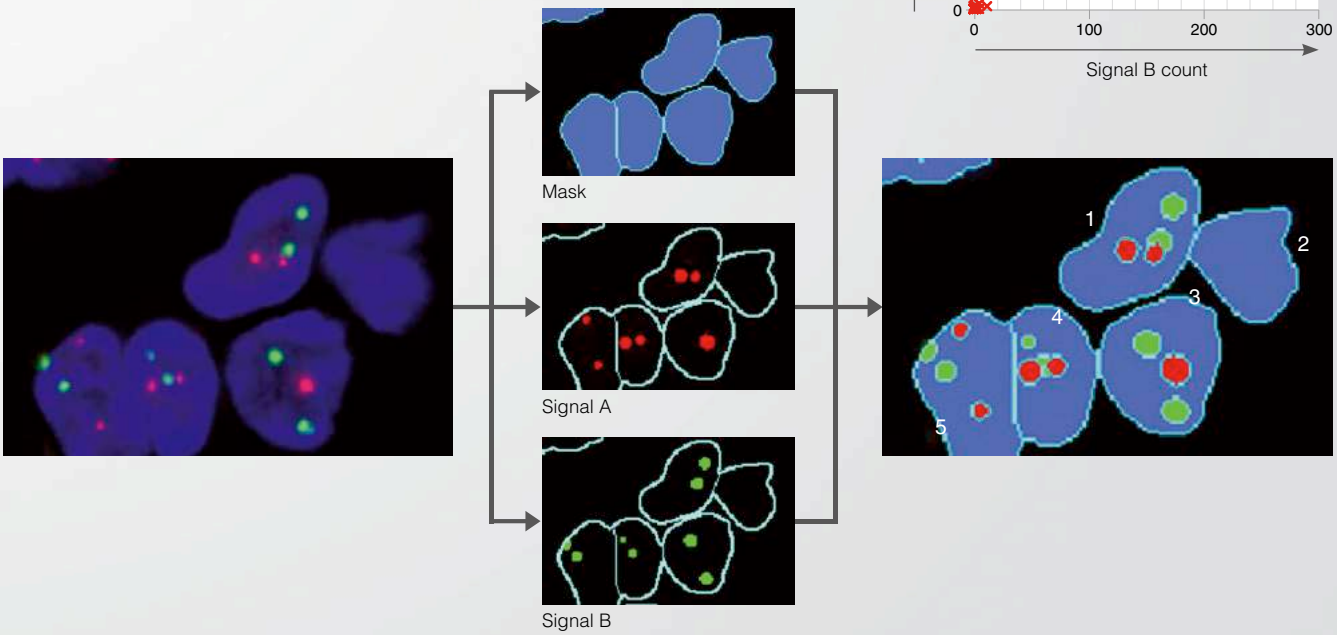


Borders of adjacent cells are recognized for separation of individual cells.

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.





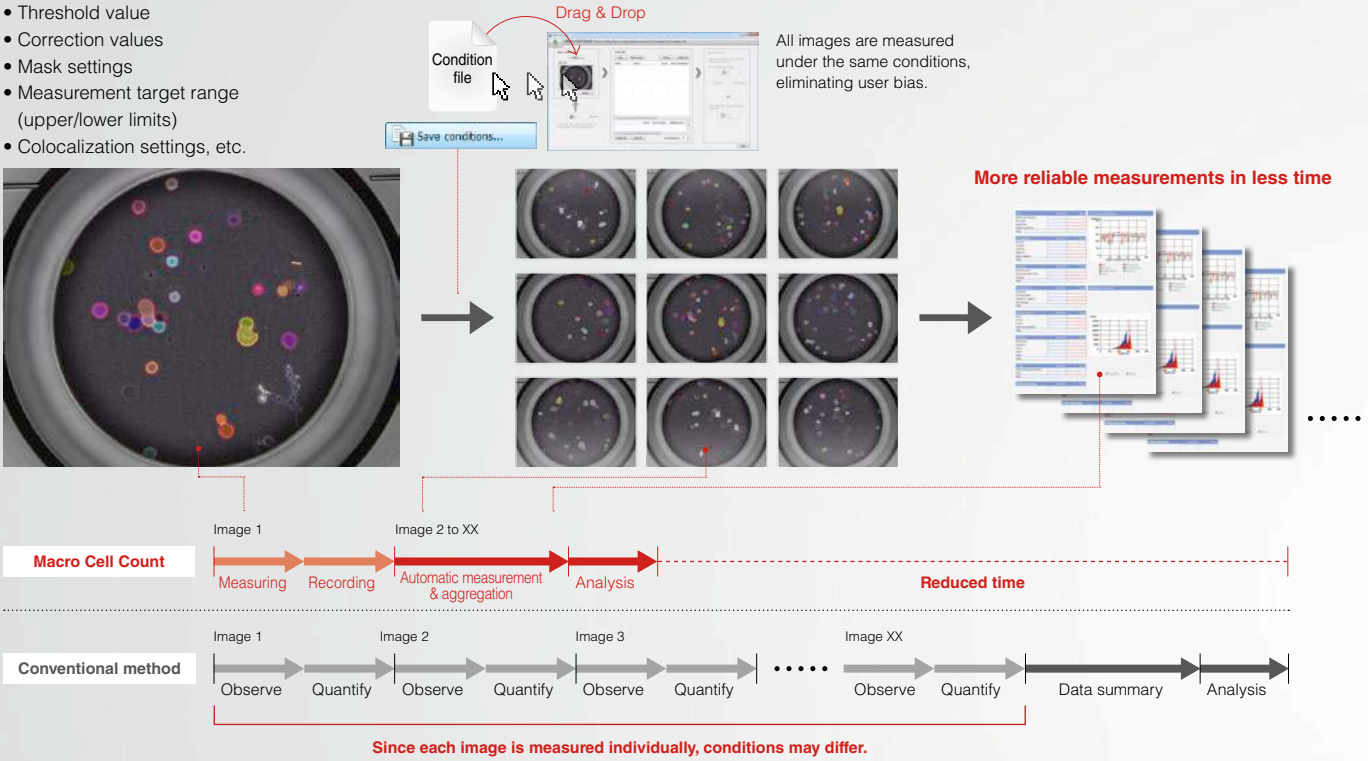
Macro Cell Count

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

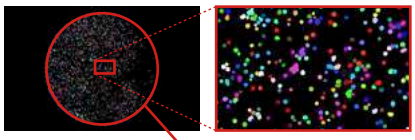
- Threshold value
- Correction values
- Mask settings
- Measurement target range (upper/lower limits)
- Colocalization settings, etc.



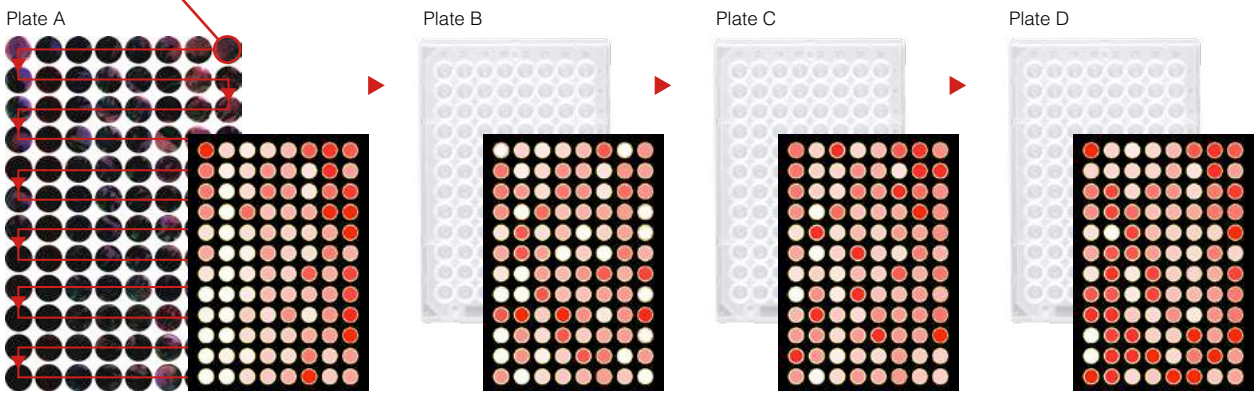
Batch Analysis of Multiple Plates

BZ-H4C × BZ-H4XD × BZ-H4XI

High-Content Screening of Multi-Well Plates

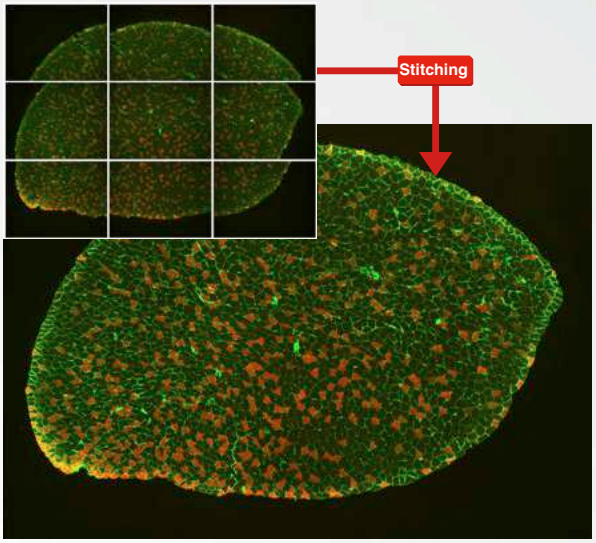


Automate batch processing of multiple well plates based upon specified measurement conditions.

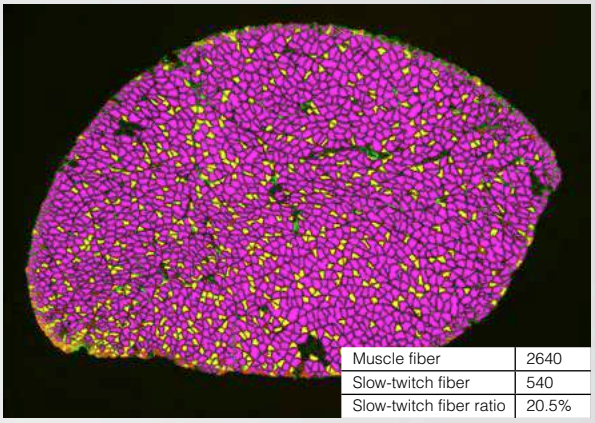


Hybrid & Macro Cell Count Application Examples

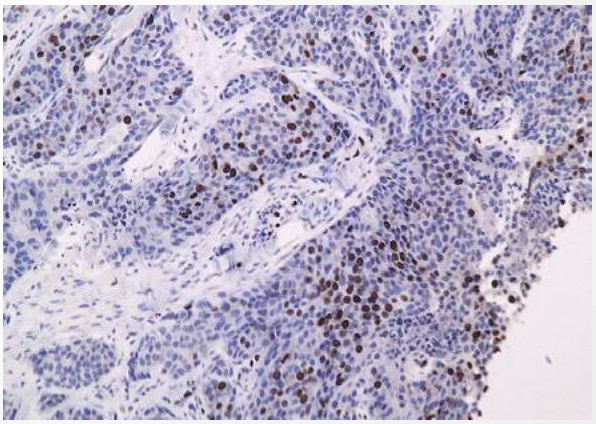
Slow-twitch skeletal muscle fiber ratio

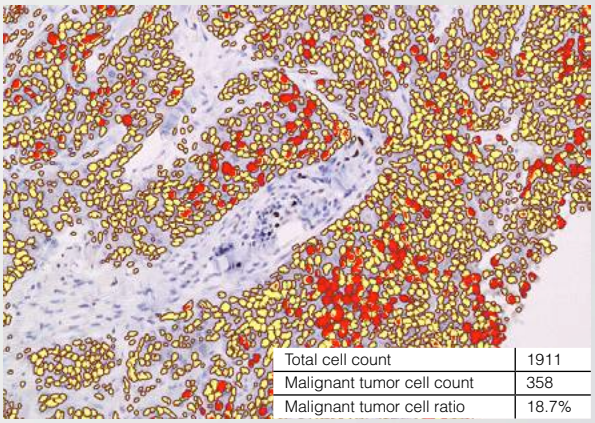


Courtesy of Lecturer Hideki Yamauchi, Division of Physical Fitness,
Department of Rehabilitation Medicine, Jikei University

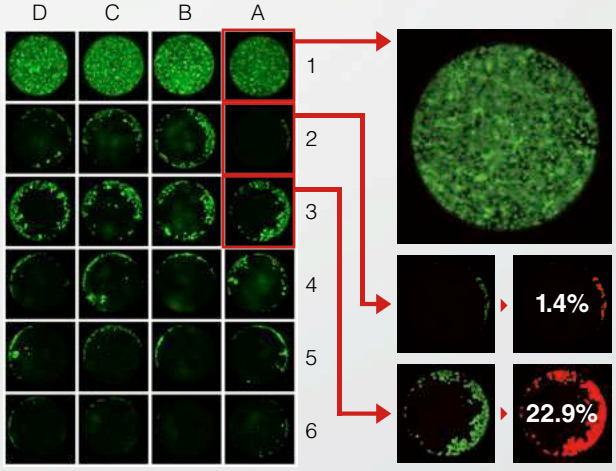


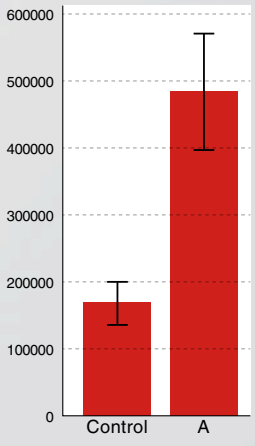
Malignant tumor cell (MIB-1) count





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

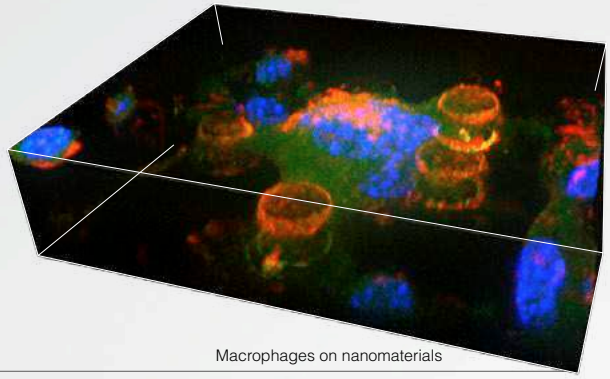




3D Analysis

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.

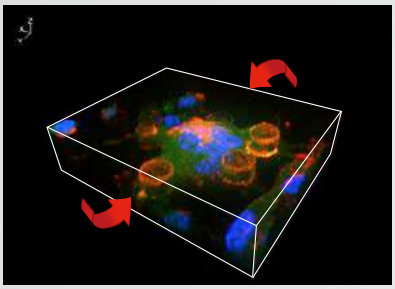


Macrophages on nanomaterials

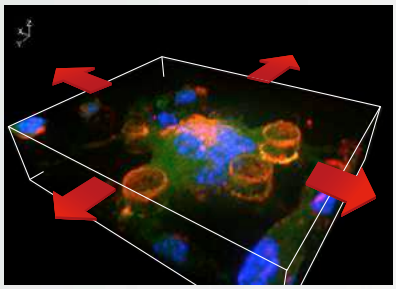
3D Display

Intuitive operation

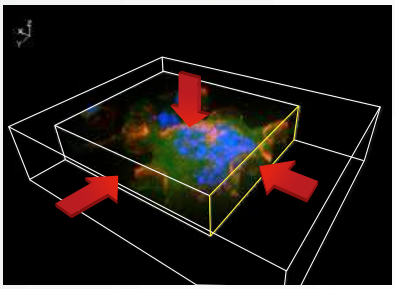
Rotation/ Click and drag to rotate



Zoom/ Use the mouse wheel to zoom in/out



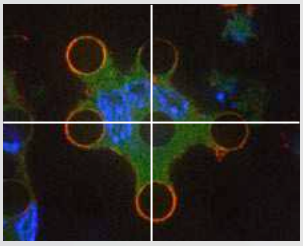
Sectional view/ Right-click to slice cross sections



Advanced 3D analysis

XY cross section

YZ cross section



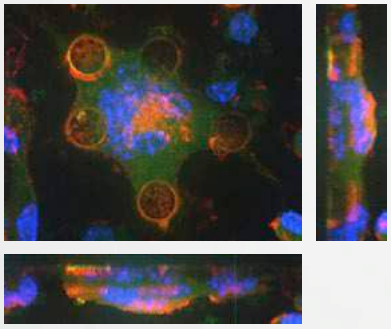
XZ cross section

XYZ slicing

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

XY

YZ



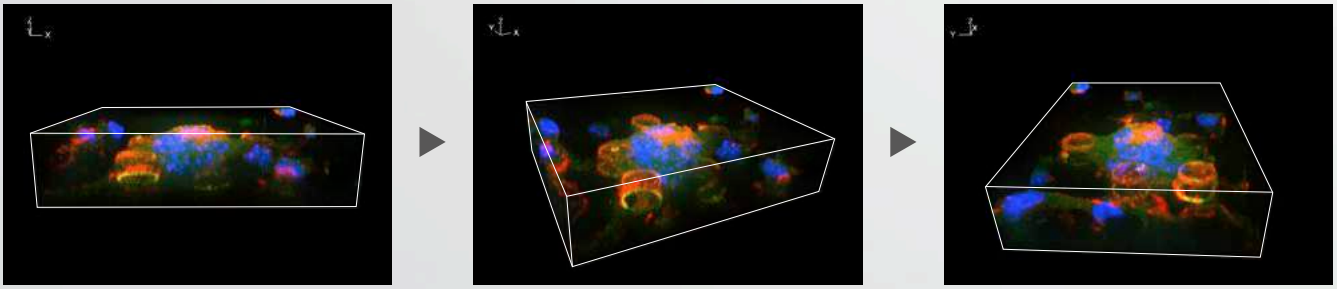
XZ

Maximum projection

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

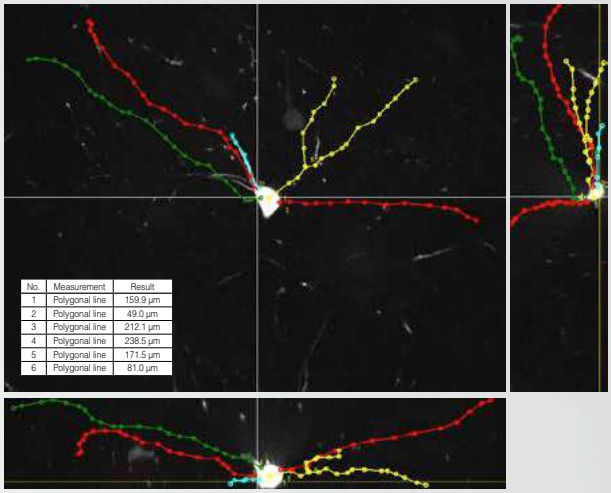
Video creation

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.



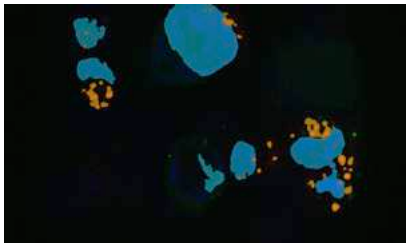
Intuitive measurement menu

3D Cell Count

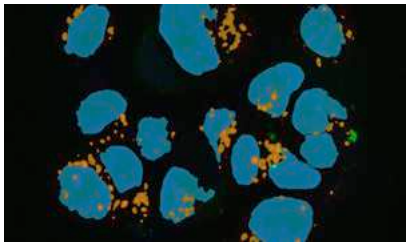
BZ-H4R × BZ-H4C

One-Step Three-Dimensional Quantification

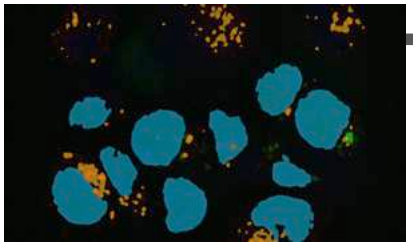
Z-Stack: Plane A



Z-Stack: Plane B

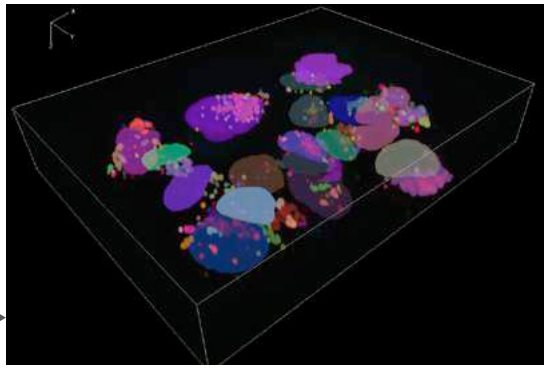


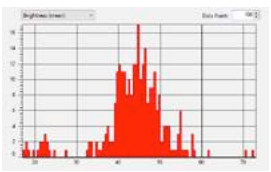
Z-Stack: Plane C



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.



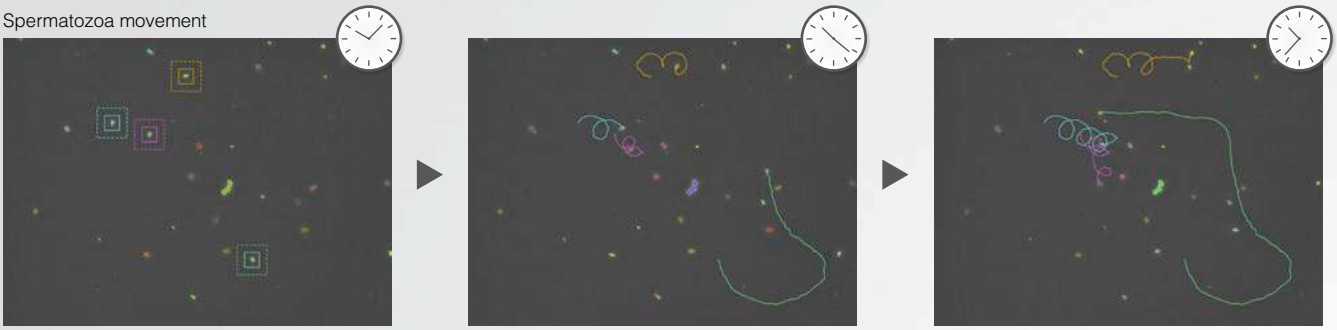


Motion Analysis

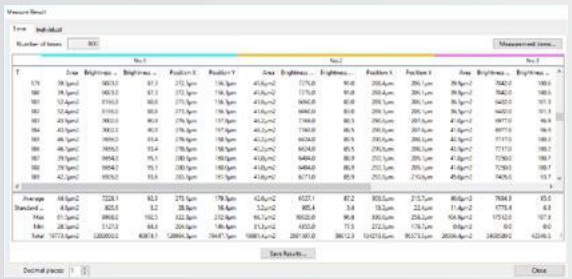
Track Movement Over Time

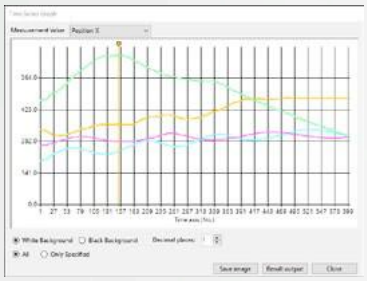
Select a target and track it using brightness, hue and appearance information. Automatically record changes in coordinates over time to measure travel range, speed, and movement over time.

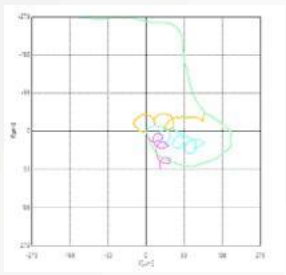
Spermatozoa movement



Time-series data output







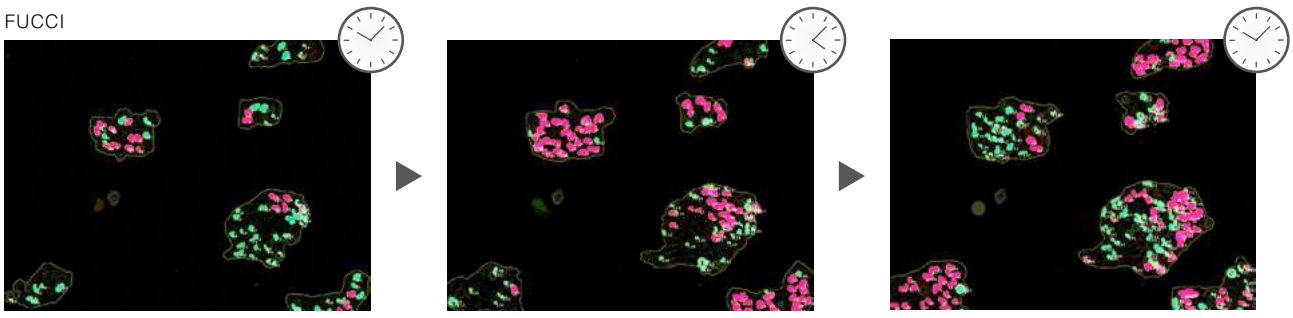
Time-series Cell Count

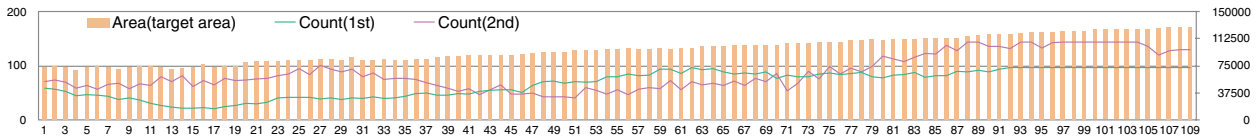
BZ-H4K × BZ-H4C

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

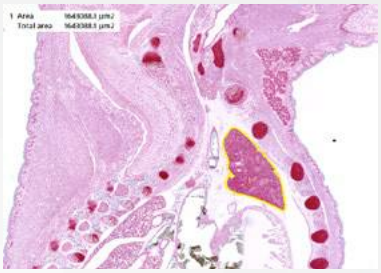




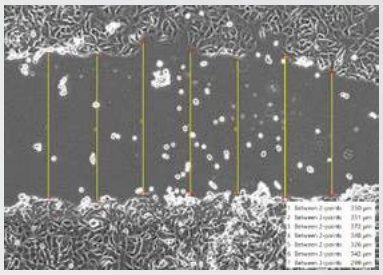
Measurement

Perform Point-and-Click 2D Measurements

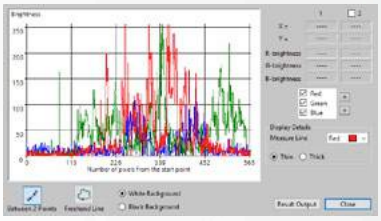
A variety of 2D measurements can be made directly on the image simply by clicking the desired end points. This enables easy and accurate measurement, such as quantifying the axon length of neurons. RGB brightness values can also be quantified and visually displayed on a histogram.



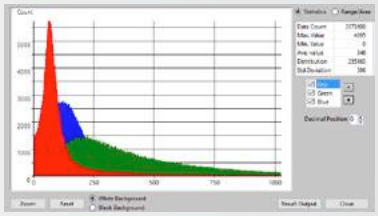
Area
Measures the area of the specified range.



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.

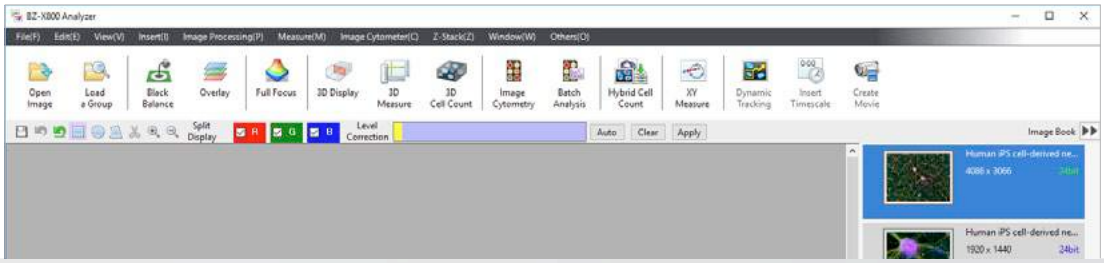
Polygon area
Measure the area and brightness of a polygon.

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

BZ-H4A BZ-X800E Analyzer

Advanced Analysis Software

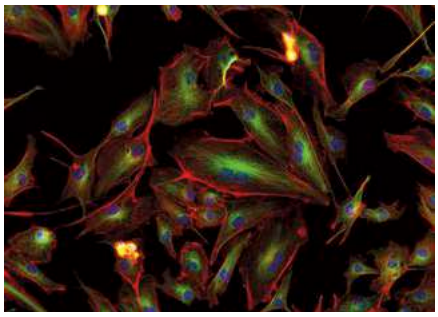
Perform analysis in the easy-to-use BZ-X800E Analyzer. Capture conditions are stored in image metadata for automatic processing of Z-stacks, time-lapse, image stitching, and quantification.



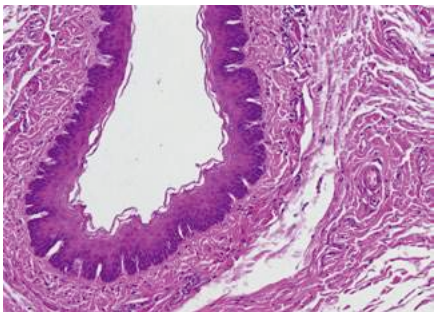
Bright and Clear
All-in-One Fluorescence Microscope Lenses

Bright and clear with a wide wavelength

The wide wavelength range from ultraviolet to near-infrared yields a high transmission ratio.
You can clearly observe both fluorescence and brightfield images.
Ideal for live cell imaging as bright fluorescence images can be obtained even with weak excitation light, minimizing damage to the cells.

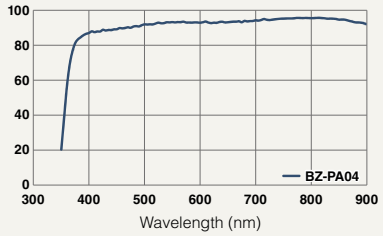


Skin cells inside the pulmonary artery of a cow



Esophagus

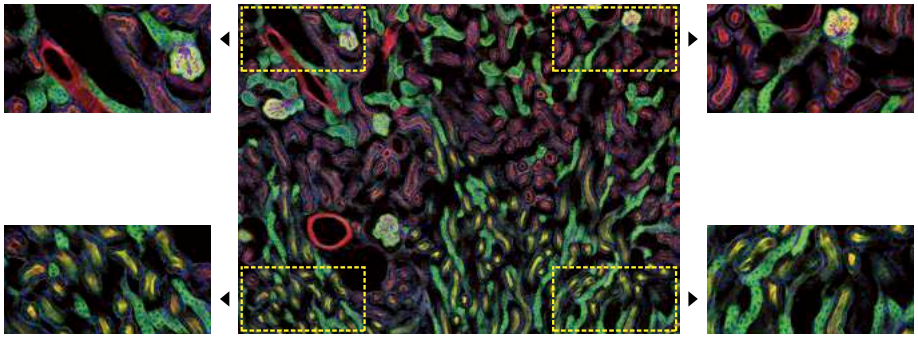
The wide wavelength range from ultraviolet to near-infrared yields a high transmission ratio.



With low phototoxicity due to minimal light diffusion and absorption by organic materials, the lenses have been greatly improved to handle the wavelength range of 650–900 nm, indispensable for deep observation and live imaging.

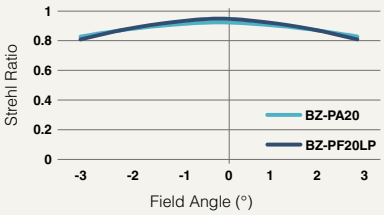
High-grade optical design that minimizes distortion at the periphery of the field of view

Thoroughly corrects color and screen field curvature aberrations to respond to all capture conditions, from low magnification to high magnification, and from ultraviolet to near-infrared. Maintains high level of flatness extending to the periphery of the field of view. Can easily capture natural, vivid, multi-colored stitched images seamlessly.



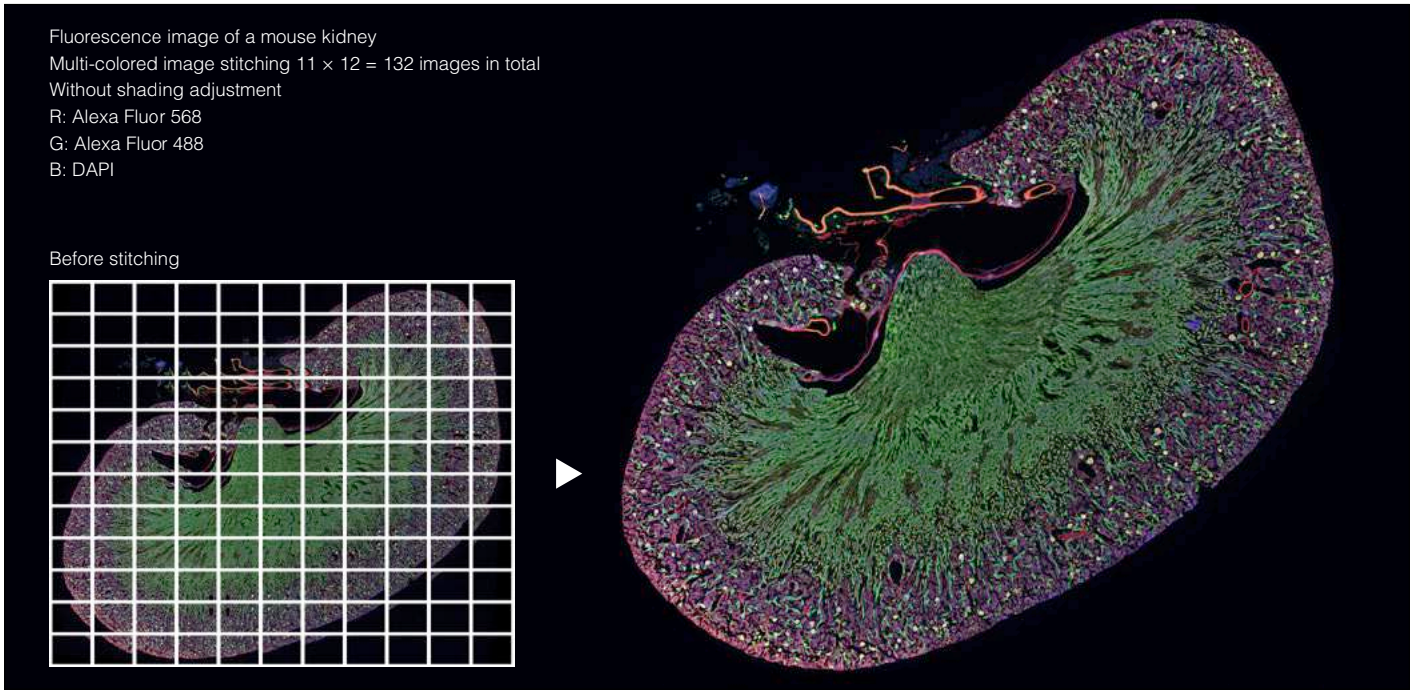
Mouse kidney

Achieves a high Strehl ratio from the center of the optical axis to the periphery

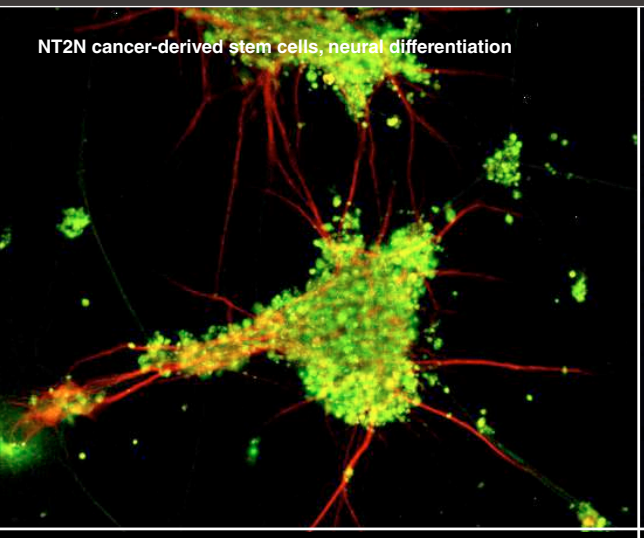


What is the Strehl ratio?

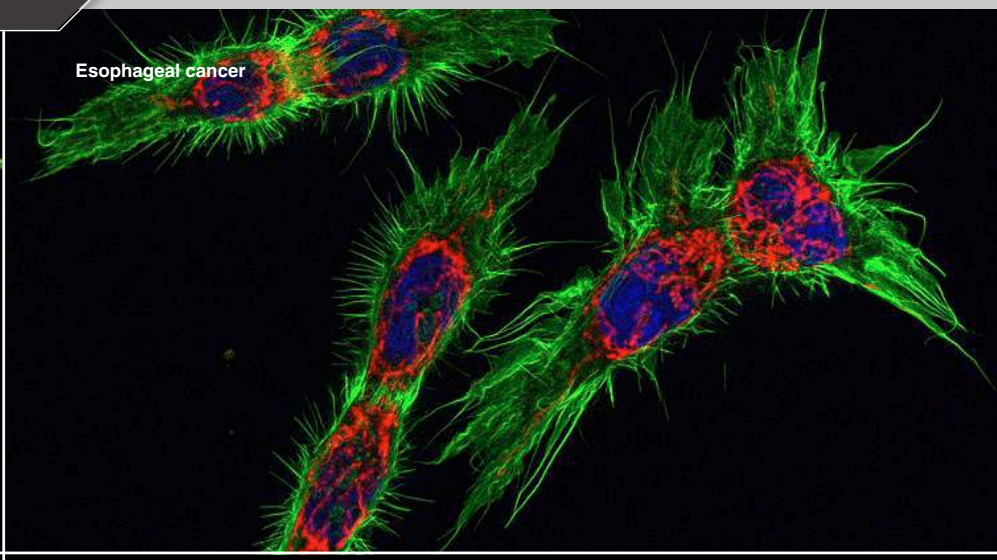
The Strehl ratio is the ratio of actual light intensity when compared to the maximum light intensity of the point source in an ideal optical system with absolutely no aberrations. It is generally preferable for objective lenses to have a ratio of 80% or higher.



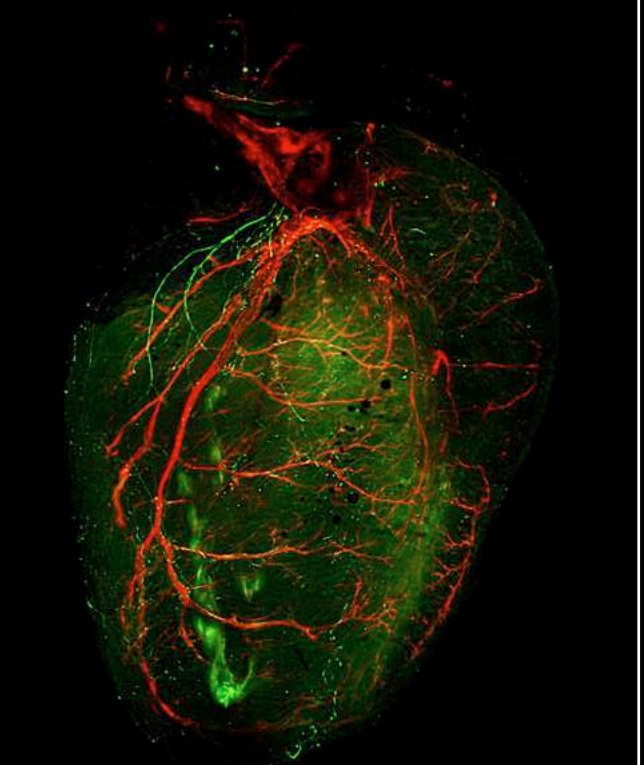
NT2N cancer-derived stem cells, neural differentiation



Esophageal cancer



Heart, sectioning image

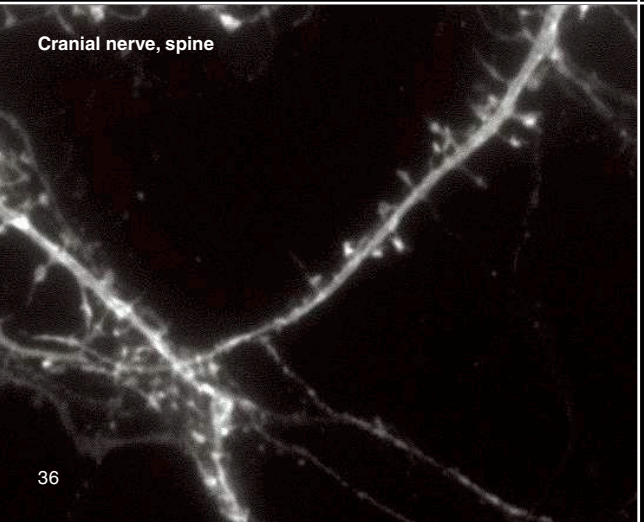


Courtesy of Dr. Koki Yokoyama, Department of Cardiovascular Medicine, Osaka University Hospital
Yokoyama et al. PLoS One. 2017 Jul 28;12(7):e0182072. doi: 10.1371/journal.pone.0182072. eCollection 2017.

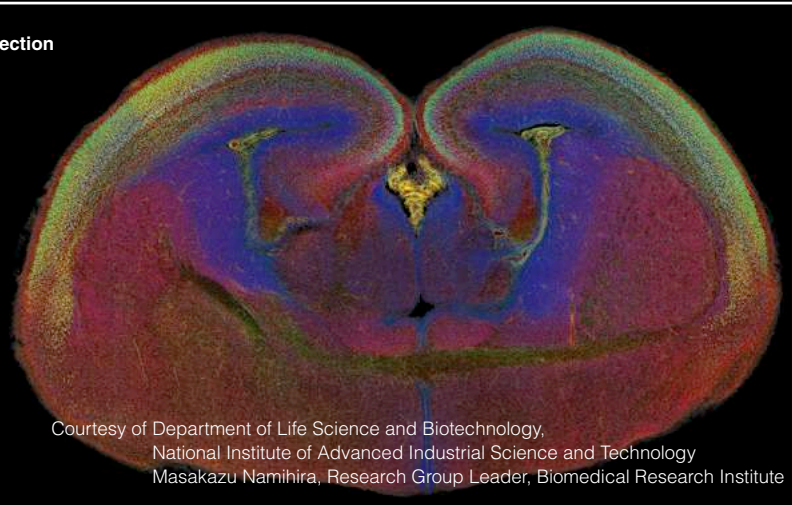
Mouse retina flat mount, angiogenesis

Courtesy of Professor Shigeki Higashiyama, Department of Biochemistry and Molecular Genetics, Ehime University Graduate School of Medicine

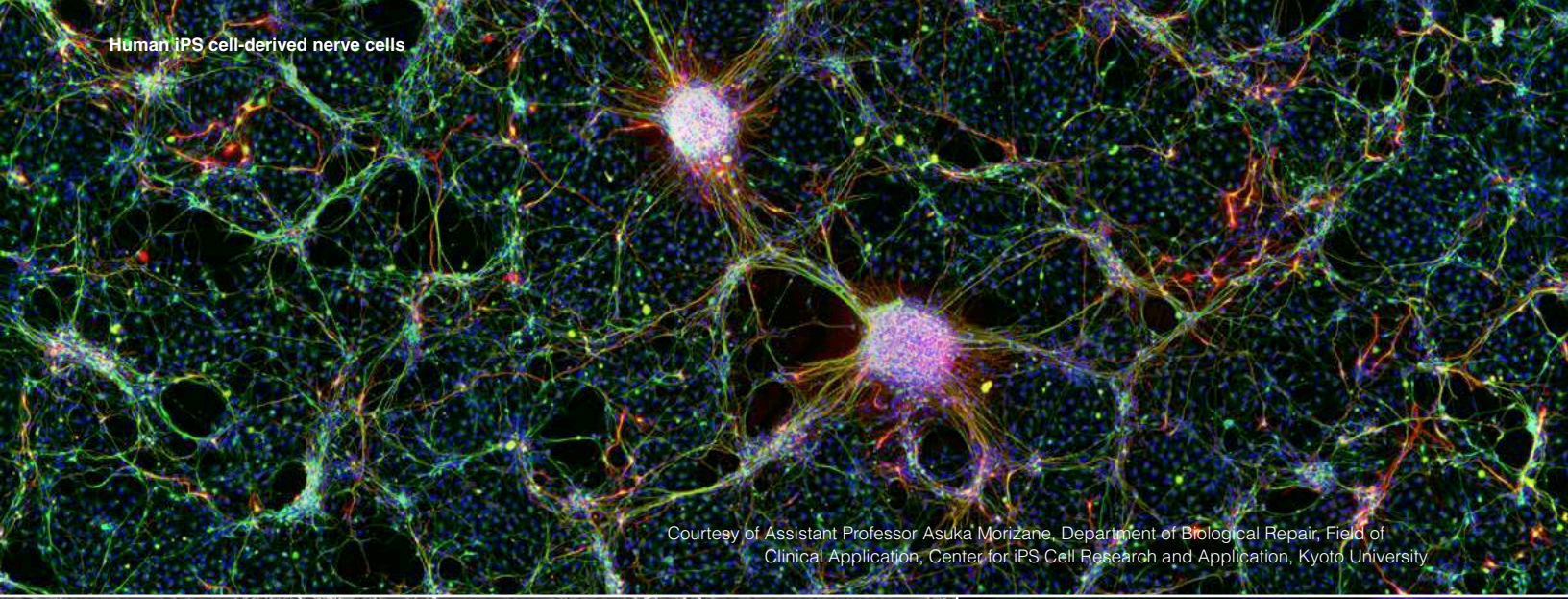
Cranial nerve, spine



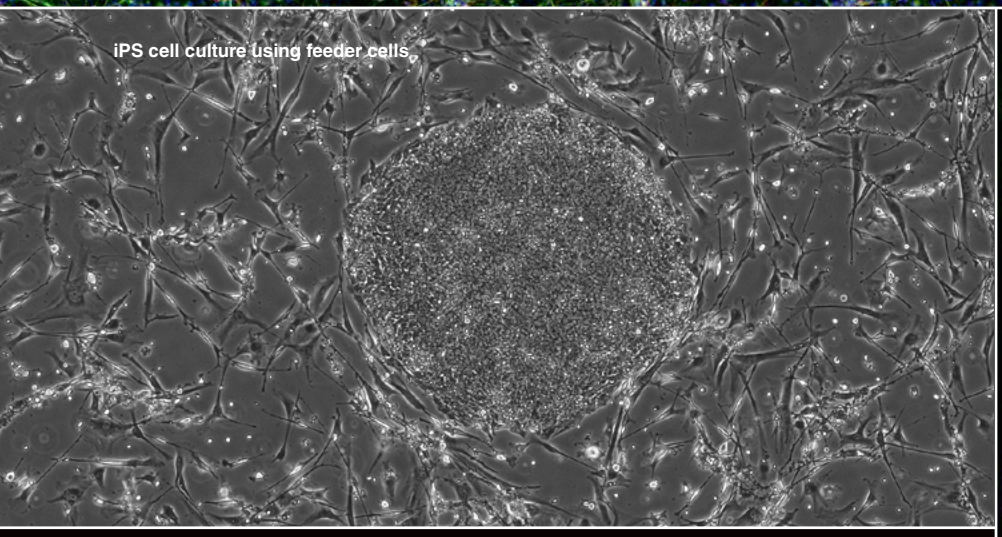
Brain section



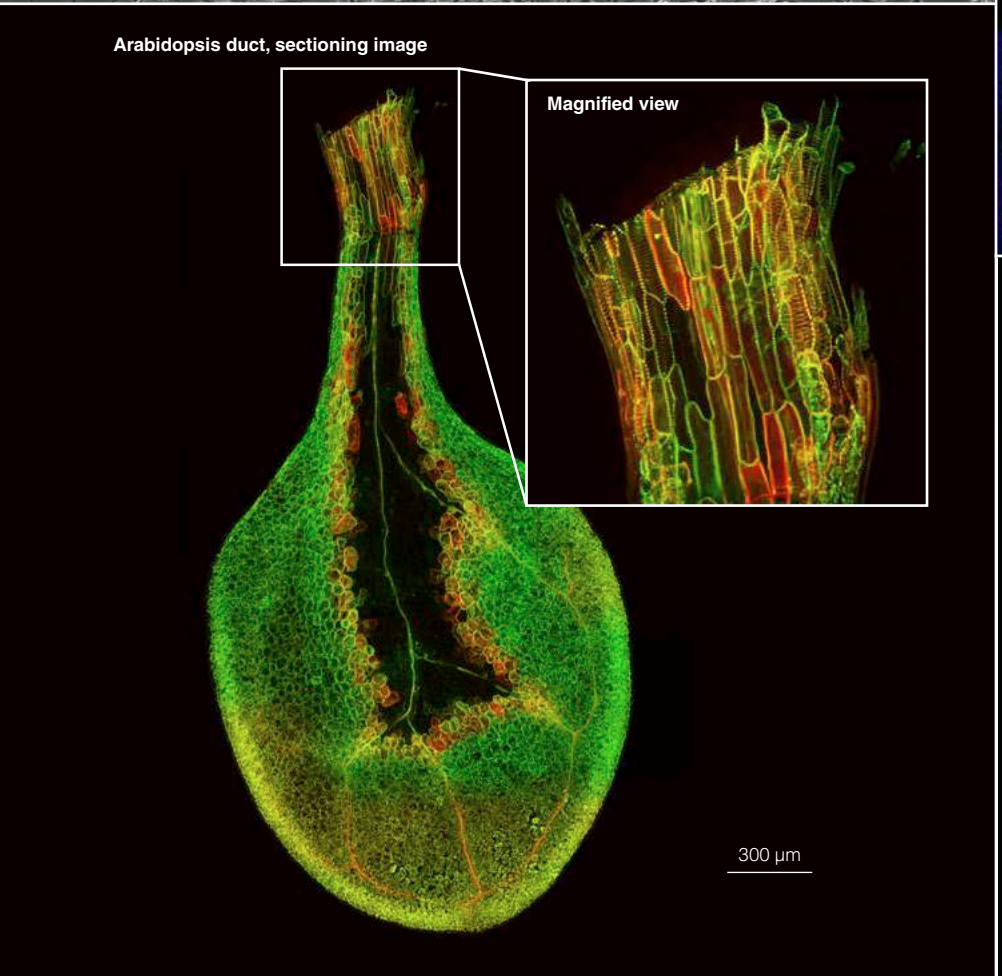
Courtesy of Department of Life Science and Biotechnology, National Institute of Advanced Industrial Science and Technology
Masakazu Namihira, Research Group Leader, Biomedical Research Institute

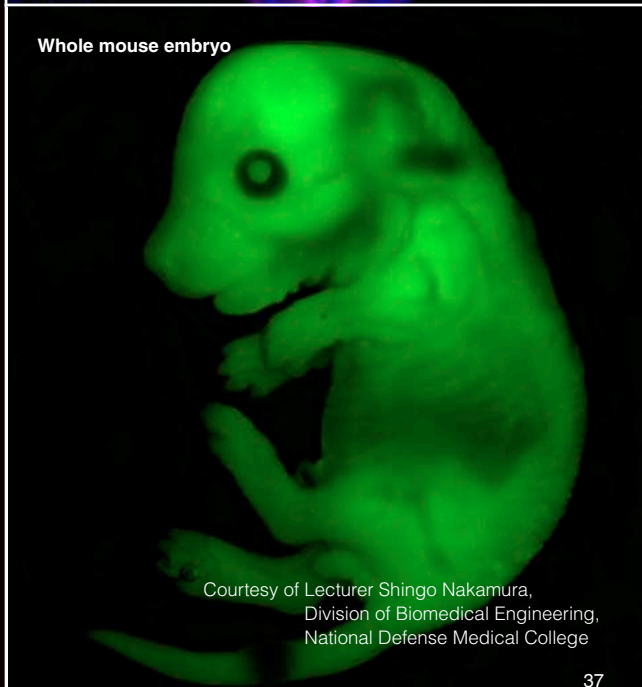


Courtesy of Assistant Professor Asuka Morizane, Department of Biological Repair, Field of Clinical Application, Center for iPS Cell Research and Application, Kyoto University

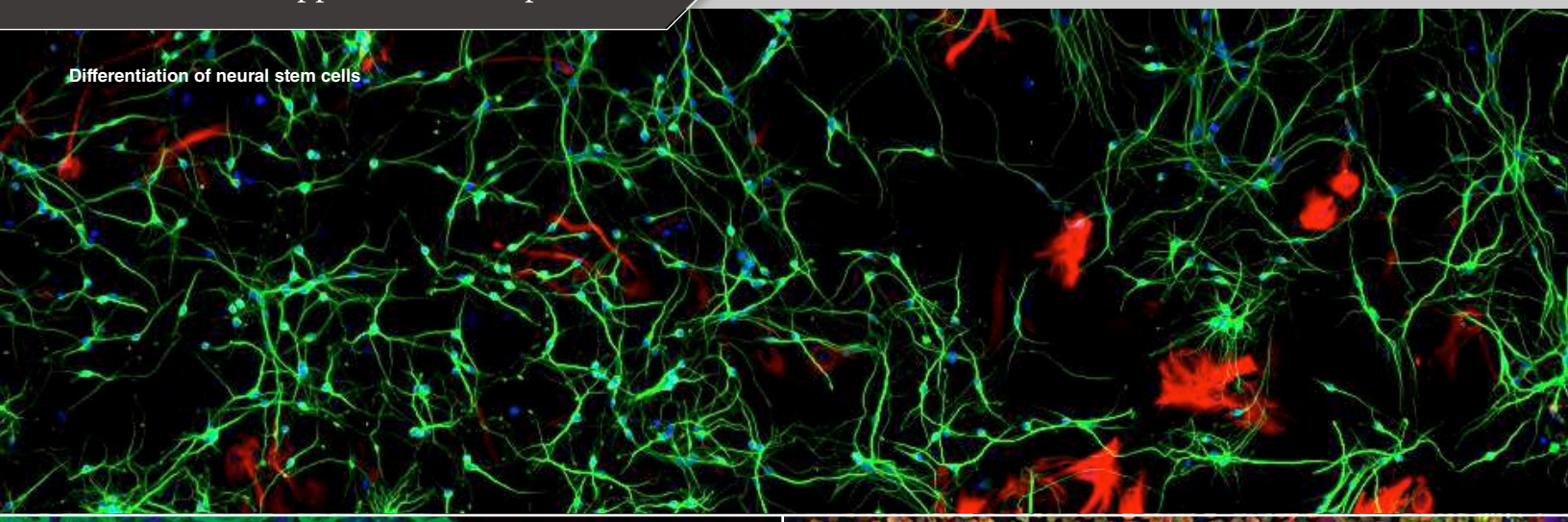


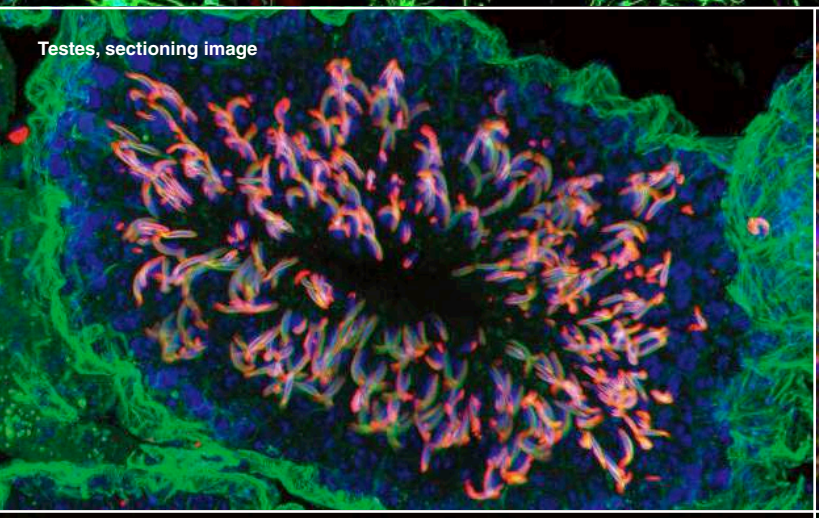
Courtesy of Assistant Professor Yasuhiro Shiga, Laboratory of Environmental Molecular Biology, School of Life Sciences, Tokyo University of Pharmacy and Life Sciences

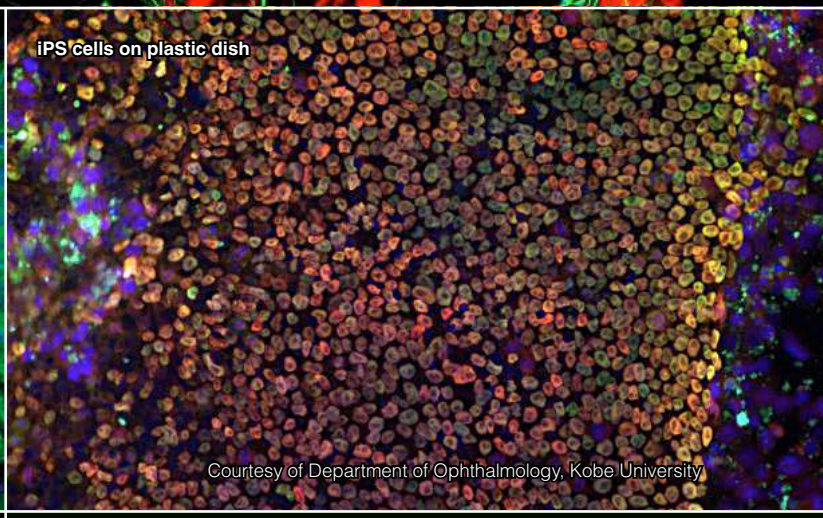




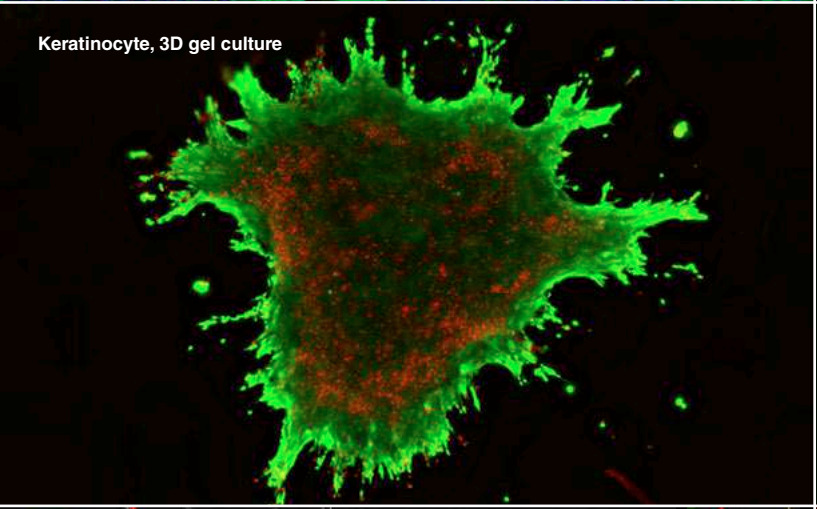
Courtesy of Lecturer Shingo Nakamura, Division of Biomedical Engineering, National Defense Medical College


Differentiation of neural stem cells

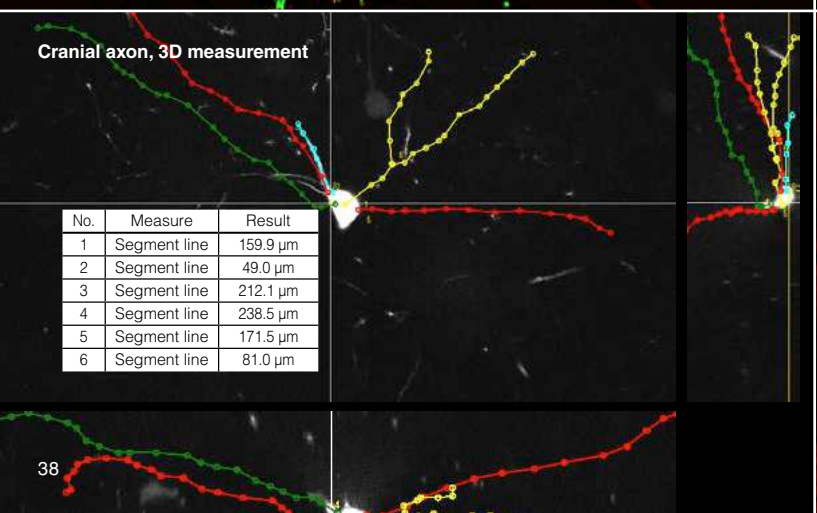

Testes, sectioning image


iPS cells on plastic dish

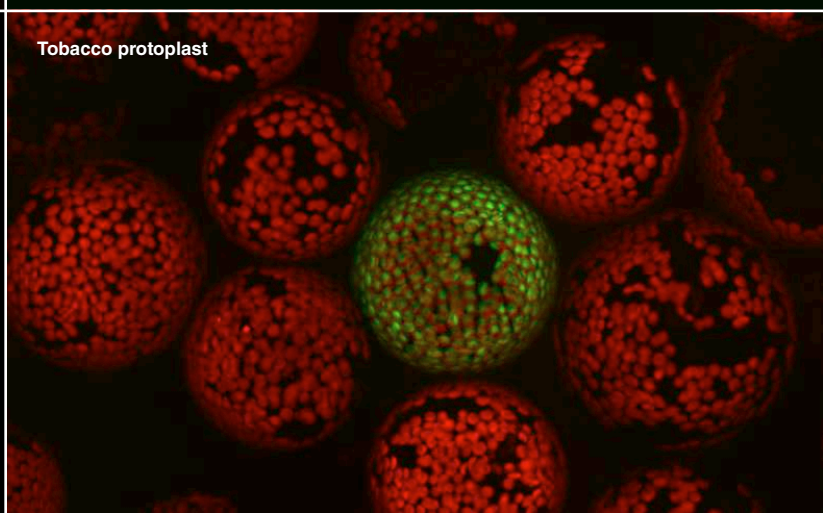
Courtesy of Department of Ophthalmology, Kobe University

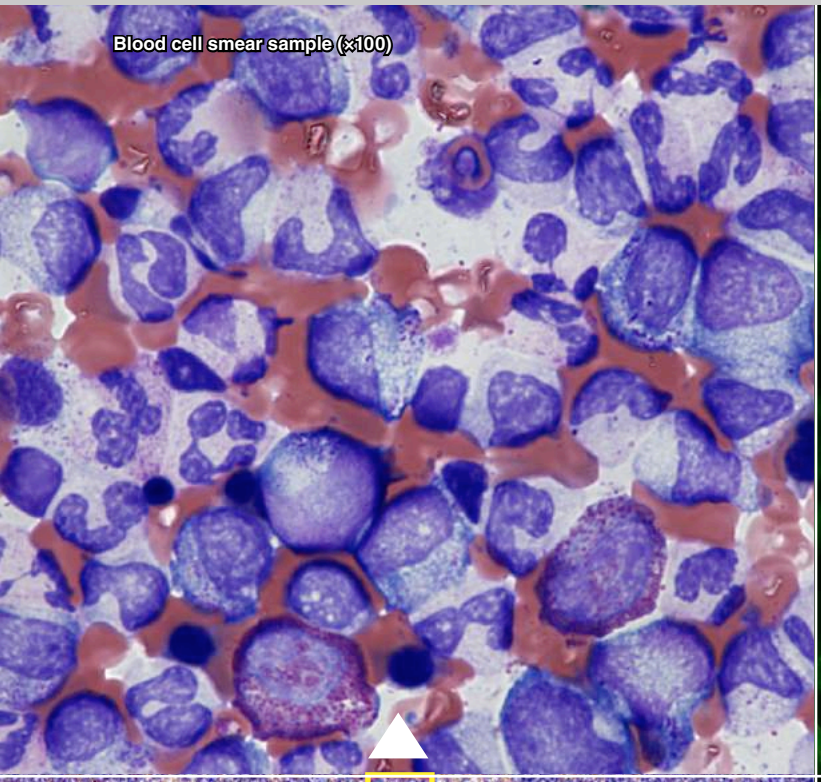

Keratinocyte, 3D gel culture

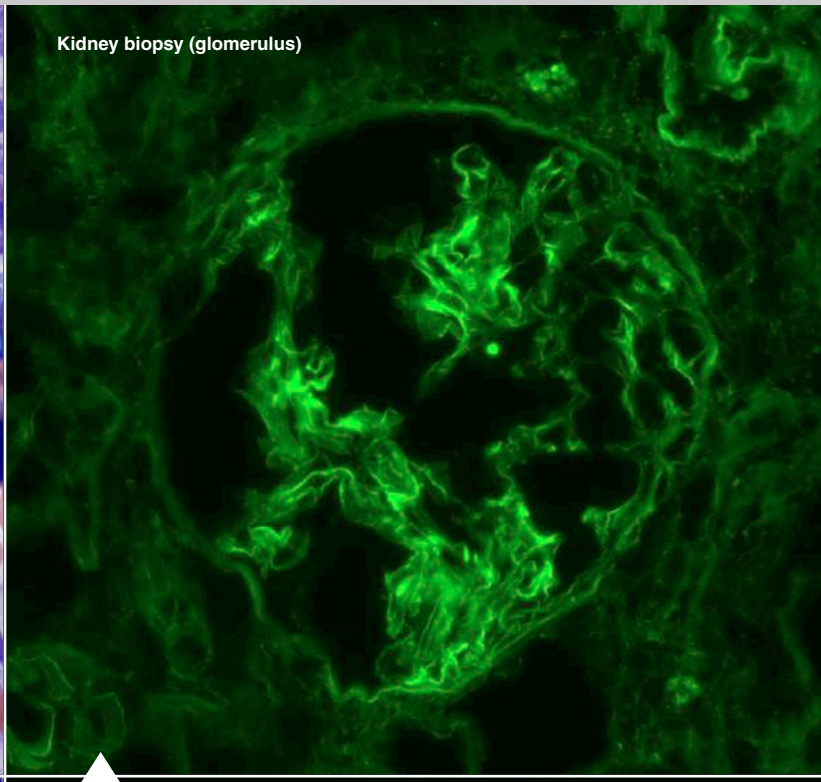

Drosophila brain, sectioning image

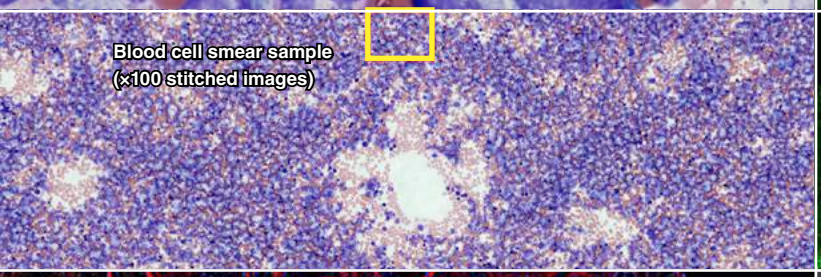

Cranial axon, 3D measurement

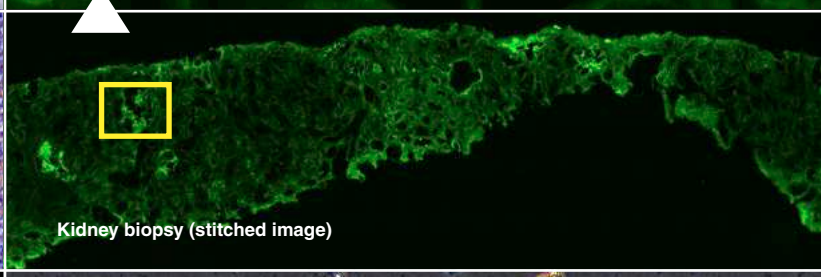
No.	Measure	Result
1	Segment line	159.9 µm
2	Segment line	49.0 µm
3	Segment line	212.1 µm
4	Segment line	238.5 µm
5	Segment line	171.5 µm
6	Segment line	81.0 µm

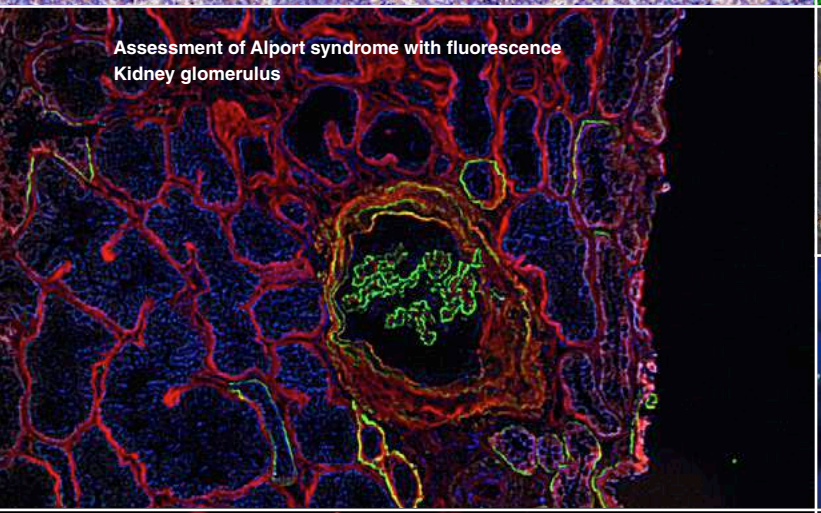

Tobacco protoplast

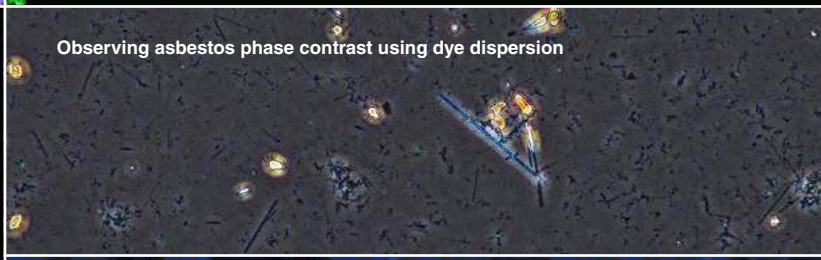

Blood cell smear sample (×100)

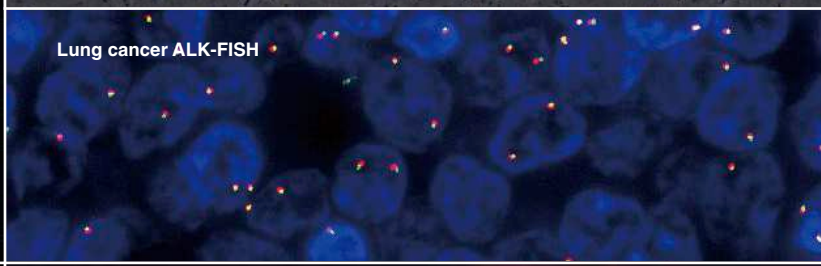

Kidney biopsy (glomerulus)

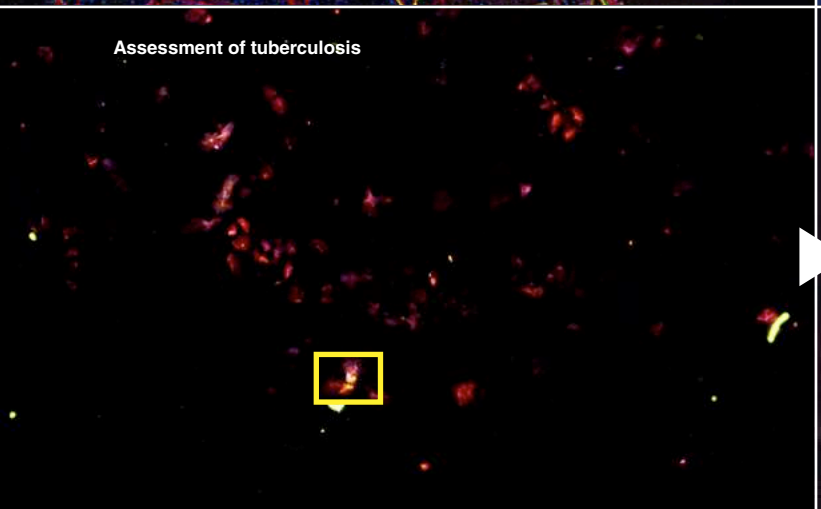

Blood cell smear sample
(×100 stitched images)


Kidney biopsy (stitched image)


Assessment of Alport syndrome with fluorescence
Kidney glomerulus

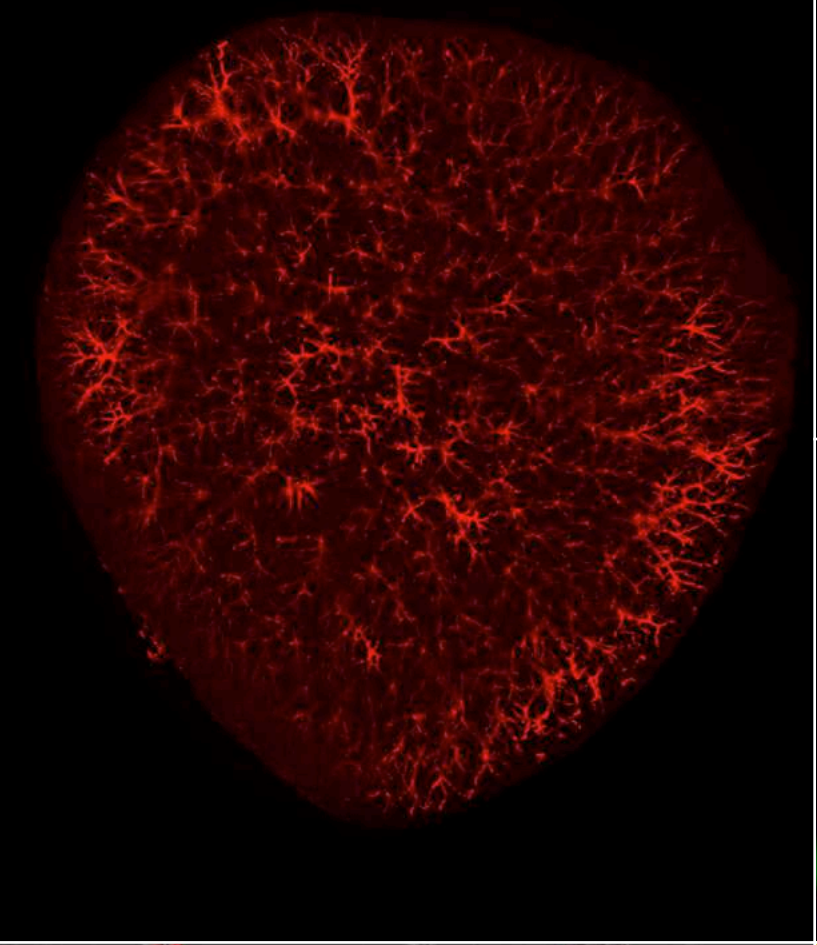

Observing asbestos phase contrast using dye dispersion


Lung cancer ALK-FISH

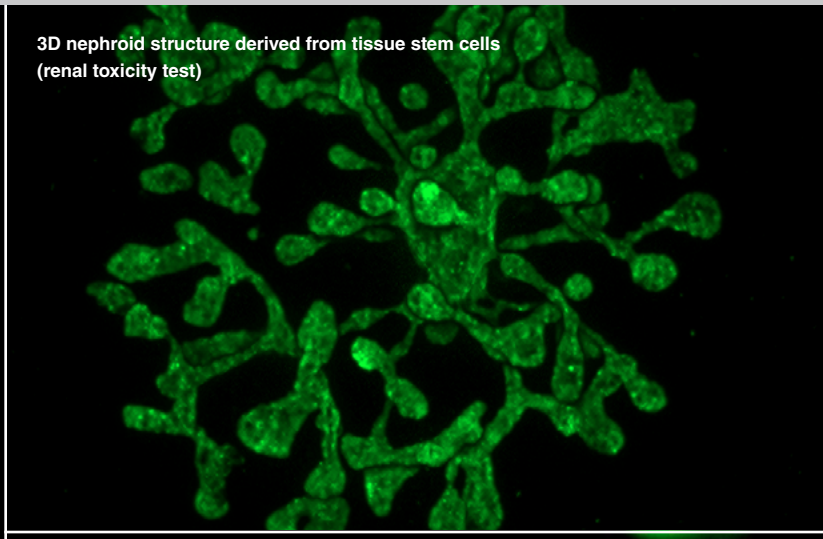

Assessment of tuberculosis


Acid-fast bacteria

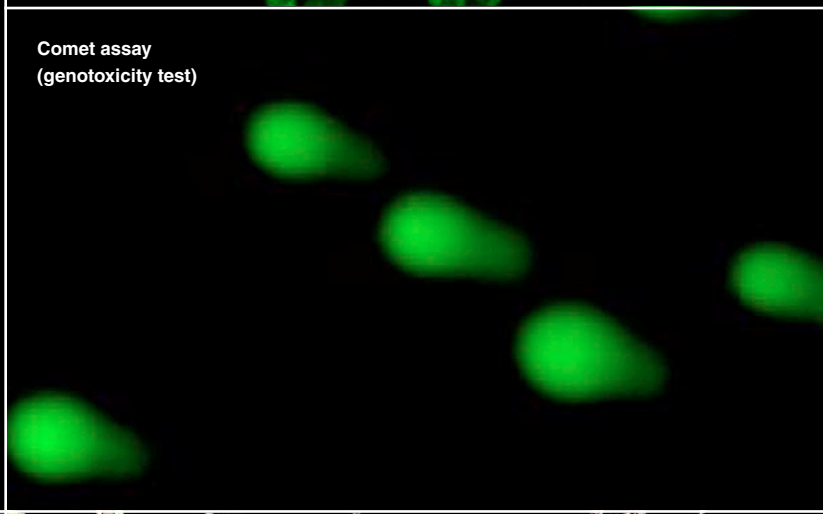
Cleared kidney tissue, whole mount



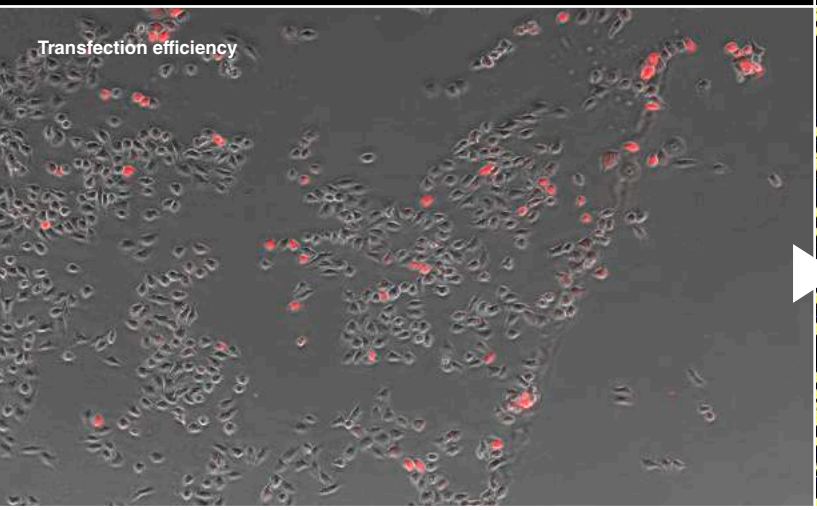
3D nephroid structure derived from tissue stem cells
(renal toxicity test)

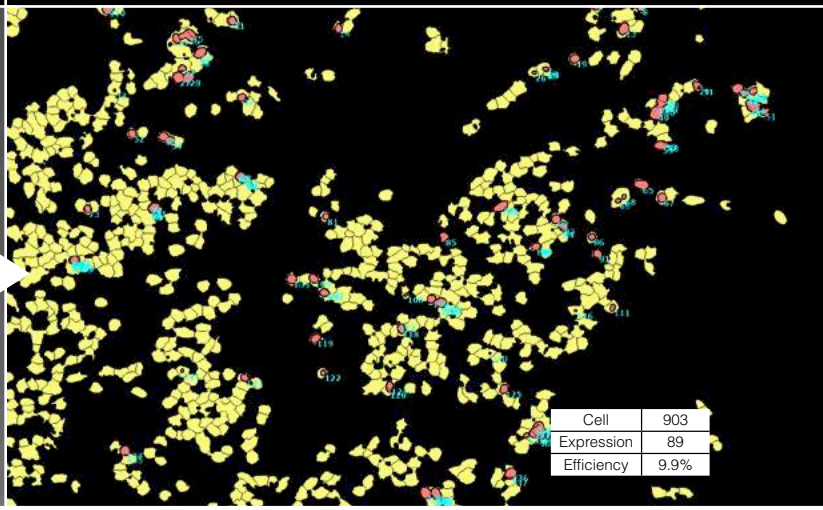


Comet assay
(genotoxicity test)

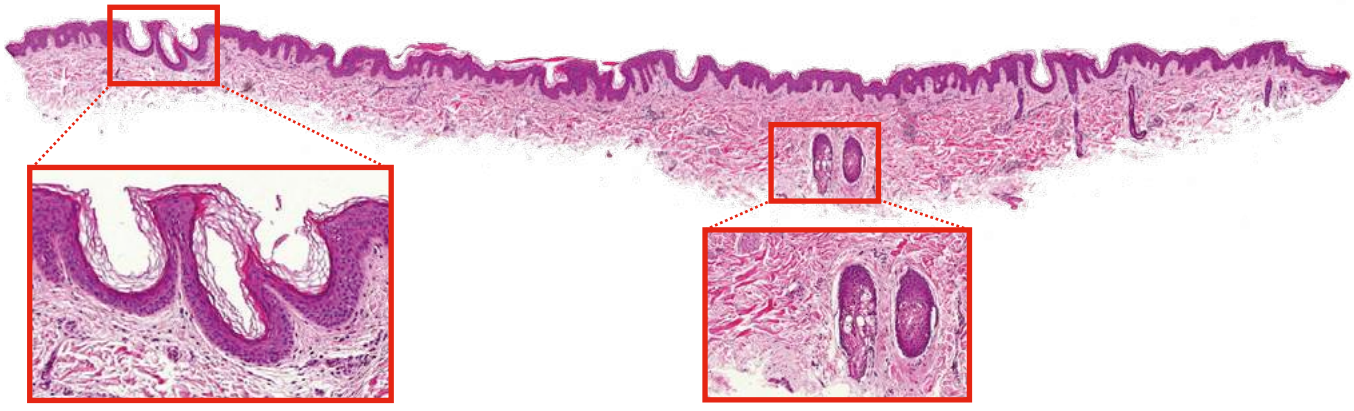


Transfection efficiency

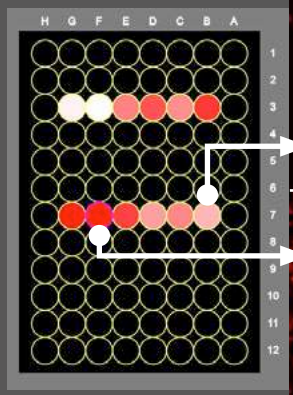


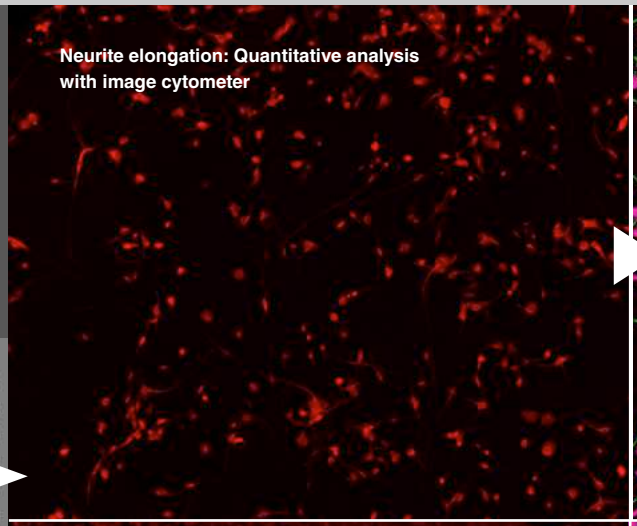


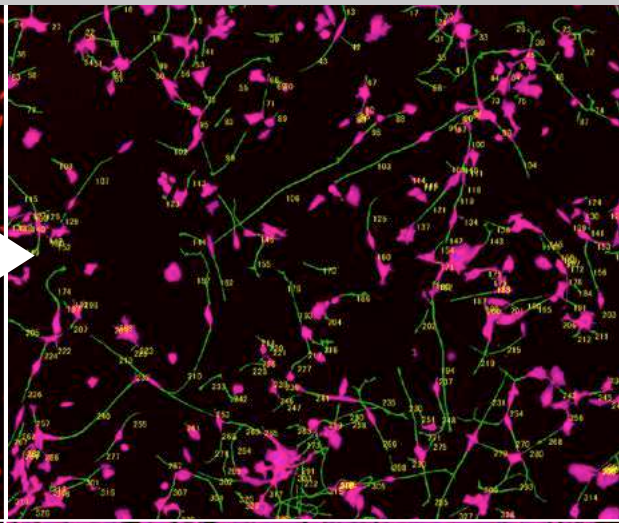
UV-damaged parts of the epidermis

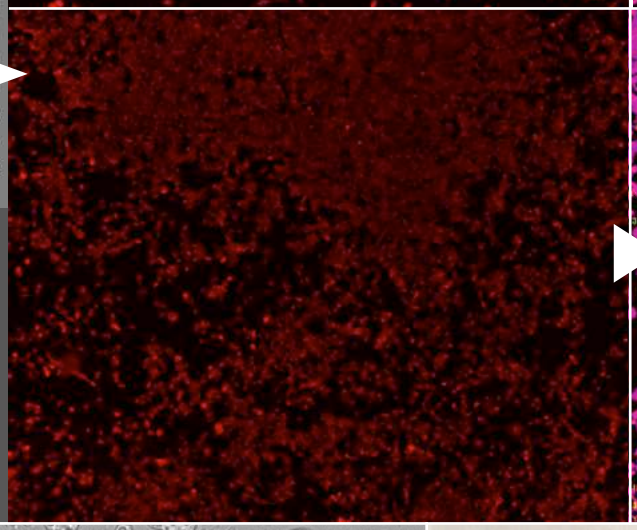


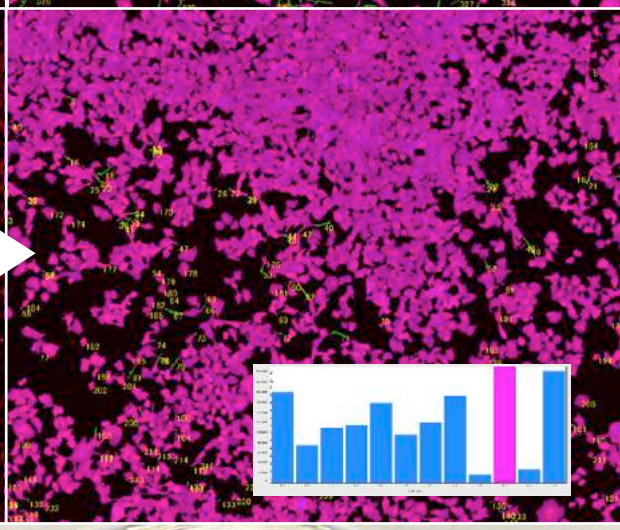
Neurite elongation: Quantitative analysis with image cytometer



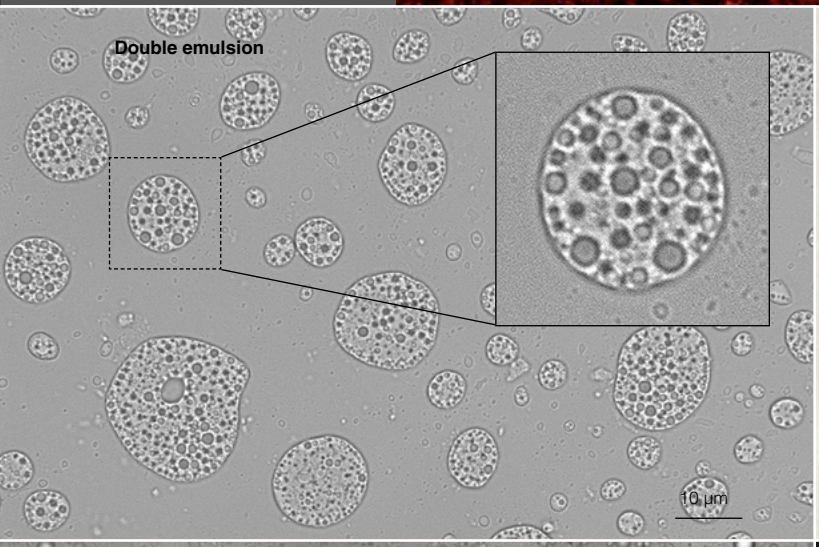






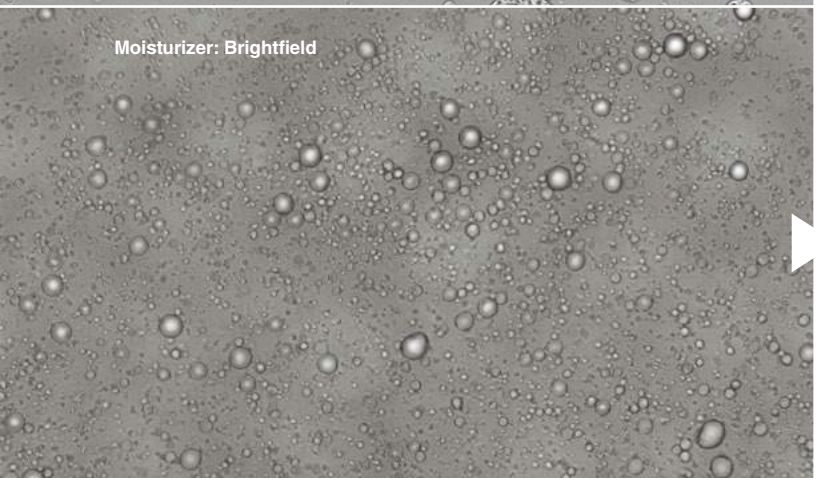


Double emulsion

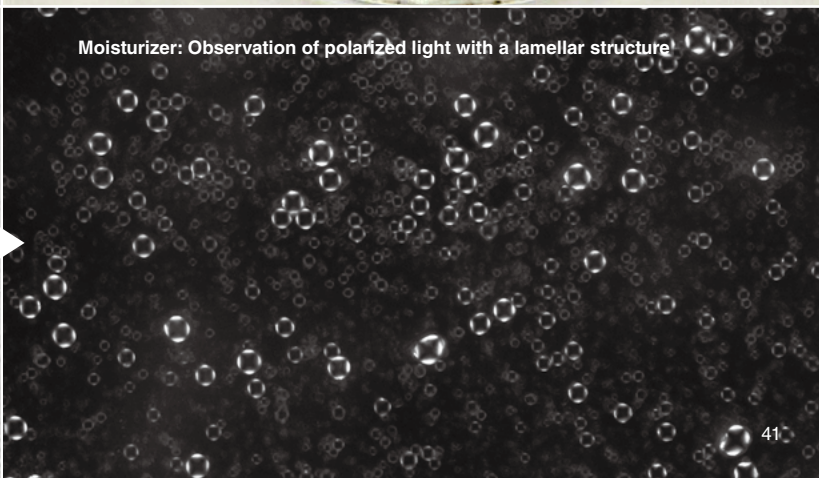


Cortex of hair shaft

Moisturizer: Brightfield



Moisturizer: Observation of polarized light with a lamellar structure



Specifications of BZ Lens

(1) Plan Apochromat 2X	BZ-PA02	NA 0.10	WD 8.5 mm 0.33"	
(2) Plan Apochromat 4X	BZ-PA04	NA 0.20	WD 20.0 mm 0.79"	
(3) Plan Apochromat 10X	BZ-PA10	NA 0.45	WD 4.0 mm 0.16"	
(4) Plan Apochromat 20X	BZ-PA20	NA 0.75	WD 0.6 mm 0.02"	
(5) Plan Apochromat 40X	BZ-PA40	NA 0.95	WD 0.25–0.17 mm 0.010" to 0.007"	
(6) Plan Apochromat 60X Oil	BZ-PA60	NA 1.40	WD 0.13 mm 0.005"	Oil immersion
(7) Plan Apochromat 100X Oil	BZ-PA100	NA 1.45	WD 0.13 mm 0.005"	Oil immersion
(8) Plan Fluorite 4X PH	BZ-PF04P	NA 0.13	WD 16.5 mm 0.65"	Phase contrast
(9) Plan Fluorite 10X PH	BZ-PF10P	NA 0.30	WD 14.5 mm 0.57"	Phase contrast
(10) Plan Fluorite 20X LD PH	BZ-PF20LP	NA 0.45	WD 8.8–7.5 mm 0.35" to 0.30"	Phase contrast
(11) Plan Fluorite 40X LD PH	BZ-PF40LP	NA 0.60	WD 3.3–2.2 mm 0.13" to 0.09"	Phase contrast

Options

- BZ-X800E desktop PC **972326**
- 23 inch monitor **972072**
- Temperature and CO_2 regulation chamber (with mixing unit) **972082**
- Temperature and CO_2 regulation chamber (for 5% CO_2 gas) **972083**
- BZ-X metal halide lamp **OP-87768**
- Immersion oil **971806**

BZ-X blank filter cube
OP-87767

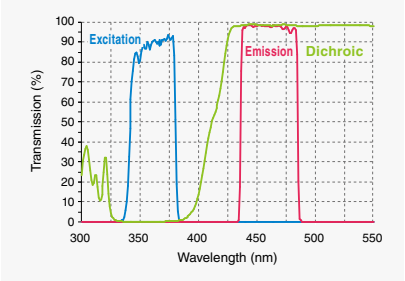
Specifications of Fluorescence Filter Sets

Units: (nm)

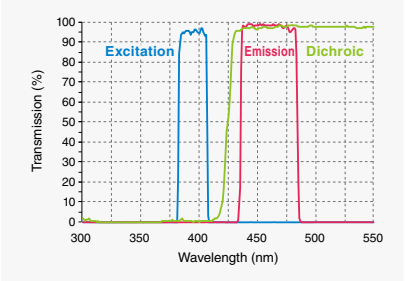
Set name	Model	Excitation wavelength	Emission wavelength	Dichroic mirror wavelength
BZ-X filter DAPI	**OP-87762**	360/40	460/50	400
BZ-X filter DAPI-V	**OP-88359**	395/25	460/50	425
BZ-X filter GFP	**OP-87763**	470/40	525/50	495
BZ-X filter TRITC	**OP-87764**	545/25	605/70	565
BZ-X filter TexasRed	**OP-87765**	560/40	630/75	585
BZ-X filter Cy5	**OP-87766**	620/60	700/75	660

Spectra of Fluorescence Filters

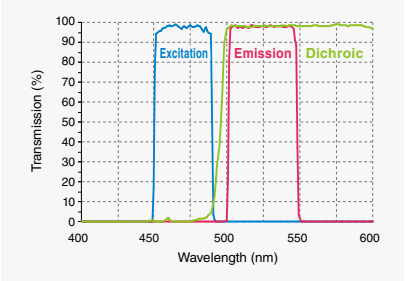
DAPI



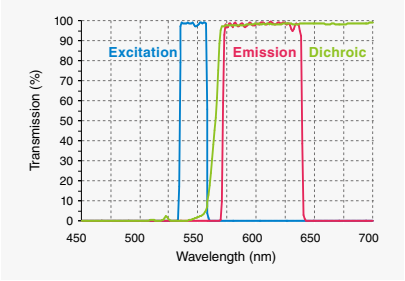
DAPI-V



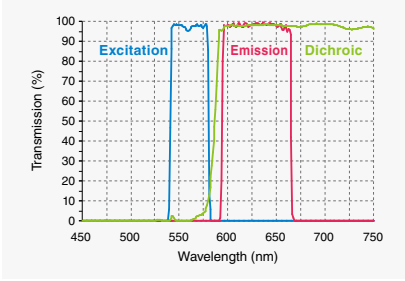
GFP



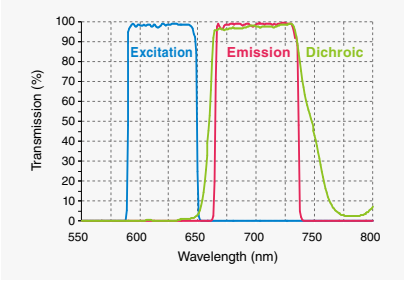
TRITC



TexasRed



Cy5



Specifications

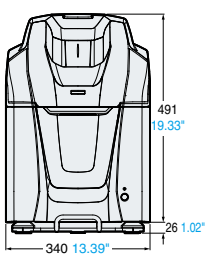
Model		BZ-X800E/BZ-X810
Microscope unit	Basic optical system	Inverted fluorescence phase contrast microscope
	Objective lenses	BZ Series infinite optical system
	Observation modes	Brightfield, Fluorescence (wide-field/sectioning), Phase contrast (PhL, Ph1, Ph2), Oblique illumination
	Objective lens switching	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: 29 fps for 960 × 720, 40 fps for 640 × 480, 50 fps for 480 × 360, 75 fps for 240 × 180, 100 fps for 160 × 120 Color: 8.5 fps for 1280 × 960
	Electronic shutter	Auto; 1/7500 to 60 sec. (77 increments)
	Gain	0 dB, +6 dB, +12 dB, +18 dB, +24 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)*1 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)

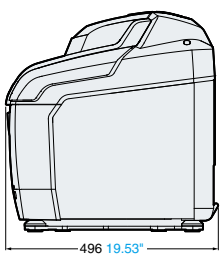
*1 Panel closed • Windows 10® is a registered trademark of Microsoft Corporation in the United States.

Dimensions

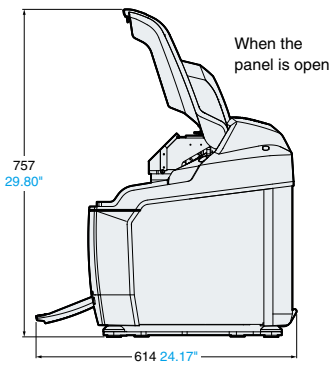
Units: mm inch

Head unit
BZ-X810

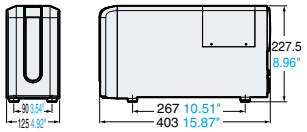




When the panel is open



Controller unit
BZ-X800E



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