Live zebrafish expressing GFP- and RFP-neurons, imaged with Nikon’s latest research stereo microscope, the SMZ25 (fluorescence and OCC). Image courtesy of Joe Fetcho, Ph.D., Cornell University.
Discover a New Evolution
Giant Step Forward in Stereo Microscopy

Traditional boundaries between scientific fields such as molecular biology and developmental biology are rapidly disappearing as researchers seek to connect findings at the molecular level to those derived from cellular, tissue, and organismal studies. Fields including molecular biology, cell biology, neurobiology, embryology, developmental biology and systems biology have increasing needs for imaging systems that span spatial scales from single cells to whole organisms.

With these demands in mind, Nikon has developed an all new stereo microscope that features a large zoom ratio of 25:1, high resolution and exceptional fluorescence transmission capability.

This latest edition to the SMZ series represents a landmark in stereo microscope evolution – one that guarantees your research will be elevated to the next level.

World’s largest zoom range and highest resolution in the SMZ series

- First stereo microscope to offer a 25:1 zoom range (SMZ25)
- Both eye paths boast numerical apertures (NA) of up to 0.156, using the SHR (Super High Resolution) Plan Apo 1x objective and SMZ25 zooming body

Bright and high contrast fluorescent images

- Fly eye lens ensures uniform brightness over the entire field of view even at the lowest magnifications
- Breakthroughs in optical design result in significantly improved signal to noise ratio and crystal clear fluorescent images

Automation and digital imaging

- Motorized focus and zoom operation (SMZ25)
- Imaging Software NIS-Elements enables the use of multiple imaging, processing and analysis modalities including z-stack capture, time-lapse imaging, and the generation of EDF images

Easy to use

- User-friendly remote control (SMZ25)
- Easy-to-operate slim LED DIA base with OCC illumination
- Wide range of illuminators and accessories accommodate a variety of observation methods
World’s largest zoom range and incredible resolution

Dynamic zoom ratio of 25:1

An innovative optical system known as Perfect Zoom System provides the world’s first zoom ratio of 25:1 (zoom range: 0.63x - 15.75x). Even with a 1x objective lens, the SMZ25 captures the entire 35mm dish and simultaneously delivers microscopic details.

Auto Link Zoom (ALZ) supports seamless viewing at different scales

ALZ automatically adjusts the zoom factor to maintain the same field of view when switching objective lenses. This function enables seamless switching between whole organism imaging at low magnifications and detailed imaging at high magnifications.

Offers the highest zoom ratio thanks to Nikon’s Perfect Zoom System

A breakthrough in stereoscope design, Perfect Zoom System dynamically change the distance between the two optical axes as the zoom factor is changed. This change in optical axis distance enables maximization of light entry into the optical system at every magnification. The result is an uncompromised, large zoom range, high resolution in both eye paths, and minimal aberrations over the entire zoom-range. Furthermore, this breakthrough in optical design enables all of these desirable features to be housed in a compact zoom body, resulting in an ergonomic instrument design.

Higher NA in both eye paths coupled with a superior zoom ratio provides seamless viewing on the macro and micro levels.

Superior resolution never before seen on a stereomicroscope

Nikon’s SMZ25 series offers superior NA of 0.156 on the SHR Plan Apo 1x and 0.312 on the SHR Plan Apo 2x. Traditionally, researchers have had to switch to a higher magnification microscope to view microscopic details after using a stereo microscope to view or manipulate macroscopic structures. Nikon’s SMZ25/18 eliminates this need by providing both macroscopic and microscopic imaging capabilities. For example, the SHR Plan Apo 2x objective allows for visualization of structures as small as a few microns in size, which was once considered to be impossible on a stereo microscope. Apochromatic correction is maintained in both the objective lens and the optical zoom system, virtually eliminating color aberrations.

Newly developed high-performance objective lens

Nikon’s newly developed objective lens series, the SHR Plan Apo series, offers a high resolution of 1100LP/mm (Observed value, using SHR Plan Apo 2x at maximum zoom). The new SHR Plan Apo series of lenses deliver brilliant images with true-to-life colors.

Individual olfactory nerve cells in a drosophila expressing a GFP-membrane marker are clearly resolved as black bodies encircled by fluorescent membranes (see circled area). This image demonstrates the SMZ25’s incredible high resolution as the olfactory cells are typically only ø5μm in diameter.

A single motor neuron expressing clusters of GFP-glycine receptors (resolved as individual puncta along the cell body and processes) imaged in a live zebrafish

Arthromacra sp.
(Using SHR Plan Apo 1x with SMZ25)
Image courtesy of Japan Insect Association

Adult Drosophila
Pebbled-Gal4 drive membrane-bound GFP expression in partial cells (with SMZ25)
Image courtesy of Hokto Kazama, Ph.D. Laboratory for Circuit Mechanisms of Sensory Perception RIKEN

Arthromacra sp.
(Using SHR Plan Apo 1x with SMZ25)
Image courtesy of Japan Insect Association

Drosophila brain (GFP)
(Using SHR Plan Apo 2x at zoom magnification of 15.75x with SMZ25)
Image courtesy of Tetsu Kawai Ph.D., Laboratory for Circuit Mechanisms of Sensory Perception RIKEN

Zebrafish (GFP and OCC)
(Using SHR Plan Apo 2x at zoom magnification of 15.75x with SMZ25)
Image courtesy of Joe Fetcho, Ph.D., Cornell University

Comparison of resolution by resolution chart

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**Bright and high contrast fluorescent images**

**Enhanced brightness and uniform illumination in low magnification range**

Even at low magnification, the SMZ25 series captures the entire 35mm dish with equal brightness over the whole field of view*, making these new stereo microscopes ideal for live screening of developmental models such as *C. elegans*, drosophila, zebrafish, and mice to identify and select mutants. The SMZ25 series also allows brilliant images to be captured even with low excitation light levels, minimizing photo-bleaching and photo-toxicity which is harmful to live cells and organisms. *Using SMZ25/SHR Plan Apo 1x*

**Fly eye lens ensures uniform brightness over the entire field of view**

The SMZ25 series is the first stereo microscope in the world to use a fly eye lens on an epi-fluorescence attachment. This innovative design ensures bright and uniform illumination even at low magnifications, resulting in uncompromised uniformity in brightness across a large field of view.

**Time-lapse imaging of developing *C. elegans* embryos expressing RFP-histones and GFP-membrane markers**

allows researchers to screen for cytokinesis mutants prior to selection for downstream applications. *Using SMZ25/SHR Plan Apo 1x*

**Fly eye lens uniformly illuminates the entire field of view**

**Newly developed epi-fluorescence attachment captures clear fluorescence images.**

**Improved S/N ratio and crystal clear fluorescent images thanks to an improved optical system**

Nikon’s newly developed optical system offers a drastic improvement in S/N ratio even at high magnifications. This improved S/N ratio makes it possible to capture cell division, which is difficult using conventional stereo microscopes, and samples with low excitation light.

**Mouse whole-brain slice (YFP)**

(Using SHR Plan Apo 1x at zoom magnification 1.3x with SMZ25)

Image courtesy of: Tadatsune Iida, MD., Ph.D. and Shigeo Okabe, M.D., Ph.D. Department of Cellular Neurobiology, Graduate School of Medicine and Faculty of Medicine, the University of Tokyo

12.5 days old mouse embryo, Red: Nucleus (Using SHR Plan Apo 1x at zoom magnification 1.3x with SMZ25)

Image courtesy of: Kazuo Yamagata, Ph.D. Center for Genetic Analysis of Viral Pathogenesis, Research Institute for Microbial Diseases, Osaka University

**Conventional epi-fluorescence attachment**

Poor illumination coverage

**New epi-fluorescence attachment**

Fly eye lens uniformly illuminates the entire field of view

**Nikon has succeeded in improving the signal and reducing noise in fluorescent images by using a short wavelength, high transmission lens. Combined with an innovative epi-fluorescence attachment, the SMZ218/25 is better able to detect excitation light than conventional fluorescent stereo microscopes.**

**Zoom body with significant improvements in optical performance**
Automation and digital imaging

A wide range of digital imaging capabilities with the Digital Sight series and NIS-Elements imaging software.

User-friendly remote controller

The all new remote controller provides easy access to zoom and focus controls and is designed for both right and left hand use. The remote controller contains an LCD monitor with an adjustable backlight which provides information regarding the zoom factor, objective lens, filter cube, and LED DIA brightness at a glance. The backlight on the LCD monitor can also be turned off to eliminate interference with low-light imaging applications. In addition to the remote controller, the microscope can also be operated through a PC.

Access the information you want quickly and easily

Easily obtain the information you need, such as Z drive position, zoom factor, objective lens, filter cube, and LED DIA brightness by using the Digital Sight series and NIS-Elements or Digital Sight series DS-L4 together with the microscope.

On-axis imaging for digital images

Easily switch between stereo position (stereoscopic view) and mono position (on-axis view) when using the P2-RNi2 Intelligent Nosepiece by simply sliding the objective lens. Digital images with uncompromised clarity can be captured using the mono position.

The brightness of the LCD monitor backlight and LED indicators is adjustable.

Select the perfect camera for your application.

One software for all systems: NIS-Elements which is Nikon’s flagship, cross-platform imaging software can now be used with Nikon’s latest stereomicroscope systems SMZ25 and SMZ18. NIS-Elements enables a wide range of advanced digital imaging capabilities, easily from a PC.

Digital images with uncompromised clarity can be captured using the mono position.

Multichannel (multicolor)

Multiple fluorescent channels can be captured in conjunction with other imaging methods such as OCC or brightfield.

Ca2+ imaging: Time-lapse imaging of GCaMP expressing neurons in an axolotl larva (using SHP/Plan Apo 2x at zoom magnification of 10x with SMZ25) Image courtesy of Hideshi Kakinuma, Ph.D., Laboratory for Developmental Gene Regulation, Developmental Brain Science Group, RIKEN Brain Science Institute

Ca2+ imaging: Time-lapse imaging of GCaMP expressing neurons in an axolotl larva (using SHP/Plan Apo 2x at zoom magnification of 10x with SMZ25) Image courtesy of Hideshi Kakinuma, Ph.D., Laboratory for Developmental Gene Regulation, Developmental Brain Science Group, RIKEN Brain Science Institute

Extended depth of focus (EDF)

Capture multiple high resolution images at different focal depths to create a single extended depth of focus image or quasi-3D image.

Calcium-imaging: Time-lapse imaging of GCaMP expressing neurons inside a live zebrafish shows individual neurons firing at different times (arrowheads). The last time-frame shows a whole cluster of neurons firing (asterisk).

The brightness of the LCD monitor backlight and LED indicators is adjustable.

1.0 sec

2.0 sec

3.0 sec

4.0 sec

5.0 sec

6.0 sec

7.0 sec

8.0 sec

9.0 sec

For more details, see the Digital Sight series catalogues.

Microscope Camera

DS-Ri2

• High-resolution 16.25 megapixels
• Superior color reproduction
• High-speed live display

Monochrome Microscope Camera

DS-Qi2

• High-resolution 16.25 megapixels
• High sensitivity and low noise
• High quantitative capability
• Electronic cooling

Monochrome Microscope Camera

DS-Fi3

• High-resolution 5.9 megapixels
• High sensitivity, low noise
• High-speed live display
• Superior color reproduction

High-resolution 5.9 megapixels

High-resolution 16.25 megapixels

High-speed live display

Electronic cooling

 simplemente instale NIS-Elements L en una tableta PC permite el ajuste y el control de cámaras de microscopio DS-Fi3/DS-Ri2, la visualización de imágenes en tiempo real y la adquisición de imágenes.

* Para obtener información sobre tablets compatibles, contácte con Nikon.
Wide range of available accessories

**Base unit**
Nikon has improved ease of use by moving the controls to the front of the base, including the brightness adjustment dial and on/off switch.

1. **Fiber DIA base**
   - Fiber DIA base features condenser lenses that can be switched between low and high magnifications. Furthermore, the Oblique Coherent Contrast (OCC) illumination system allows high contrast illumination.

2. **Slim bases**
   - The slimmer LED DIA Base and Plain Base help increase efficiency of sample manipulation by bringing the level of the sample closer to the table.

**Example applications**

- **OCC illuminator**
  - The new LED DIA Base with a built-in OCC illuminator generates minimal heat, consumes little power and is long-life. This illuminator can enhance the contrast of uneven surfaces, such as that of an embryo.

- **Zebrafish embryo**
  - Image courtesy of Junichi Nakai, Ph.D., Saitama University Brain Science Institute

**Thermo plate warmer**
**ThermoPlate TPI**
(Manufacturer: Tokai Hit Co., Ltd.)
- The flat plate surface ensures easy operation of the manipulator and easy handling of specimens.

**Focus unit**
- The focus unit is combined with the base unit. Choose from either a manual or motorized focus unit.

**Stand / Focus mount**
**SMZ18**
- SMZ18 can be mounted on various compact stands using a focus mount.

**Tubes**

- **Choose from two types of tilting trinocular tube and one type of low eyepiece trinocular tube. All tubes have a camera port for seamless integration with the Digital Sight series.**

**Stage**
- The stage features an XY stroke of 6x4* inches (150mm x 100mm) and can be attached to any of the bases, making it effective for capturing large images when used in combination with the imaging software NIS-Elements. A sliding stage and tilting stage are also available.

- **Nosepiece / Focus mount adapter**
  - There is the option of the nosepiece either single or double for purposes of expanding research for changing the magnification range.

**Controller**
- Nikon offers a remote control unit that can be used to operate the microscope and capture images by foot. A footswitch is also offered, allowing the user to operate the microscope and capture images by foot, freeing the hands for sample manipulation.

**SHR Plan Apo series of Objective**
- The SHR Plan Apo series features higher NA, wider field of view, and superior flatness and color aberration correction. These objective lenses can be seamlessly switched because all magnifications have the same parfocal distance. The new bayonet mount design allows lenses to be safely and easily removed.

<table>
<thead>
<tr>
<th>Objective</th>
<th>Maximum NA</th>
<th>Working distance</th>
<th>Correction ring</th>
<th>Wavelength</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHR Plan Apo 0.5x</td>
<td>0.078</td>
<td>71mm</td>
<td>—</td>
<td>380-700nm</td>
</tr>
<tr>
<td>SHR Plan Apo 1x</td>
<td>0.156</td>
<td>60mm</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>SHR Plan Apo 1.6x</td>
<td>0.25</td>
<td>30mm</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>SHR Plan Apo 2x</td>
<td>0.321</td>
<td>20mm</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

- **What is OCC illumination?**
  - The acronym OCC stands for oblique coherent contrast (OCC), which is a form of oblique lighting method developed by Nikon. Compared to conventional diascopic illumination that illuminates directly from below, OCC illumination applies coherent light to samples in a diagonal direction, giving contrast to colorless and transparent sample structures.

- **Zebrafish embryo**
  - Zebrafish embryo (using SHR Plan Apo 1x at zoom magnification of 5x with SMZ18)
  - Image courtesy of Junichi Nakai, Ph.D., Saitama University Brain Science Institute
Wide range of available accessories

**Epi-fluorescence set**
- Motorized epi-fluorescence set
  - The fluorescent turret can be operated using the remote control or imaging software NIS-Elements.
- Manual epi-fluorescence set
  - An easy-to-use manual model for Nikon’s newly developed high-performance epi-fluorescence attachment.

**Fiber illuminator set**
- Flexible double arm fiber illumination set
  - The direction and angle of illumination can be changed to suit the sample by making adjustments with these double arms. The fiber holder position can also be changed to obtain the optimal position for illuminating samples.
- Coaxial illuminator
  - The coaxial light illuminator makes it possible to view light reflected from the surface of a sample, which is ideal for studying shadow-less images of thick samples.

**Ring fiber illumination set**
- This ring fiber illumination set features an episcopic illumination unit that effectively captures images (can be used with 1x and 0.5x objective lenses).
- Ring LED illuminator
  - Ring LED illuminator is equipped with high-intensity and long-life LEDs. The illuminator’s dial adjusts the intensity of the white LED.

**Darkfield observation accessory**
- Darkfield viewing is possible simply by attaching the darkfield unit to the base.

**Polarizing observation accessory**
- The analyzer is attached to the objective and the polarizer to the base or stand to enable polarized viewing.

**Specifications**

<table>
<thead>
<tr>
<th>SMZ25</th>
<th>SMZ18</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Zooming Body</strong></td>
<td></td>
</tr>
<tr>
<td>Optical system</td>
<td>Parallel-optics type (zooming type), apochromatic optical system</td>
</tr>
<tr>
<td>Zoom</td>
<td>Motorized</td>
</tr>
<tr>
<td>Zoom ratio</td>
<td>25:1</td>
</tr>
<tr>
<td>Zoom range</td>
<td>0.63-15.75x</td>
</tr>
<tr>
<td>Aperture diaphragm</td>
<td>Zooming body built-in</td>
</tr>
<tr>
<td><strong>Objectives</strong></td>
<td></td>
</tr>
<tr>
<td>NA, WD (mm)</td>
<td></td>
</tr>
<tr>
<td>- P2-SHR Plan Apo 2x</td>
<td>0.312, 20 (with a correction ring for water 0 to 3mm in depth)</td>
</tr>
<tr>
<td>- P2-SHR Plan Apo 1.6x</td>
<td>0.25, 30</td>
</tr>
<tr>
<td>- P2-SHR Plan Apo 1x</td>
<td>0.155, 60</td>
</tr>
<tr>
<td>- P2-SHR Plan Apo 0.5x</td>
<td>0.078, 71</td>
</tr>
<tr>
<td>Total Magnification (Using 10x objective)</td>
<td>3.15-31.5x (Depending on objective used)</td>
</tr>
<tr>
<td>Eyepieces (P.O.V. mm)</td>
<td>• C-W 10x(B) (25) • C-W 16x (16)</td>
</tr>
<tr>
<td>Tubes (Eyepiece Port)</td>
<td>• P-TEPL 100 Trinocular Tiling Tube (100/-, 100/-)</td>
</tr>
<tr>
<td>Aperture diaphragm</td>
<td>• HG Precentered Fiber illuminator Intensilight C-HGFIE HG/C-HGFI HG (130W)</td>
</tr>
<tr>
<td>Epi-fluorescence light sources</td>
<td>• P2-FL LED Ring illumination Unit</td>
</tr>
<tr>
<td>Epi-fluorescence light sources</td>
<td>• P2-FLM Motorized Epi Fluorescence Attachment</td>
</tr>
<tr>
<td><strong>Episcopic Illuminators</strong></td>
<td>• P2-FL LED Ring illumination Unit</td>
</tr>
<tr>
<td>Episcopic illuminators</td>
<td>Use with Fiber light source</td>
</tr>
<tr>
<td>Observation methods</td>
<td>Bright Field, Epi Fluorescence, Simple Polarizing (with P2-POL Simple Polarizing Attachment), Dark Field (with P2-POL LED Dark Field Unit), Oblique illumination</td>
</tr>
<tr>
<td>Weight (approx.)</td>
<td>32kg (Motorized Epi Fluorescence Attachment configuration with Trinocular Tiling Tube, Motorized Focus Unit, Intelligent Nosepiece, LED Dia base and Objectives 1x and 0.5x)</td>
</tr>
<tr>
<td>Power consumption (approx.)</td>
<td>30W (Motorized Epi Fluorescence Attachment configuration with Trinocular Tiling Tube, Motorized Focus Unit, Intelligent Nosepiece and LED Dia base)</td>
</tr>
</tbody>
</table>

**Wavelength characteristics of each filter cube**

*Compatible with SMZ18 only*
Dimensions

SMZ25
(configured with motorized epi-fluorescence attachment and LED DIA base)

SMZ25
(configured with fiber DIA base)

SMZ18
(configured with epi-fluorescence attachment and LED DIA base)

SMZ18
(configured with plain stand and focus mount)

System diagram