

ILLUMIN8

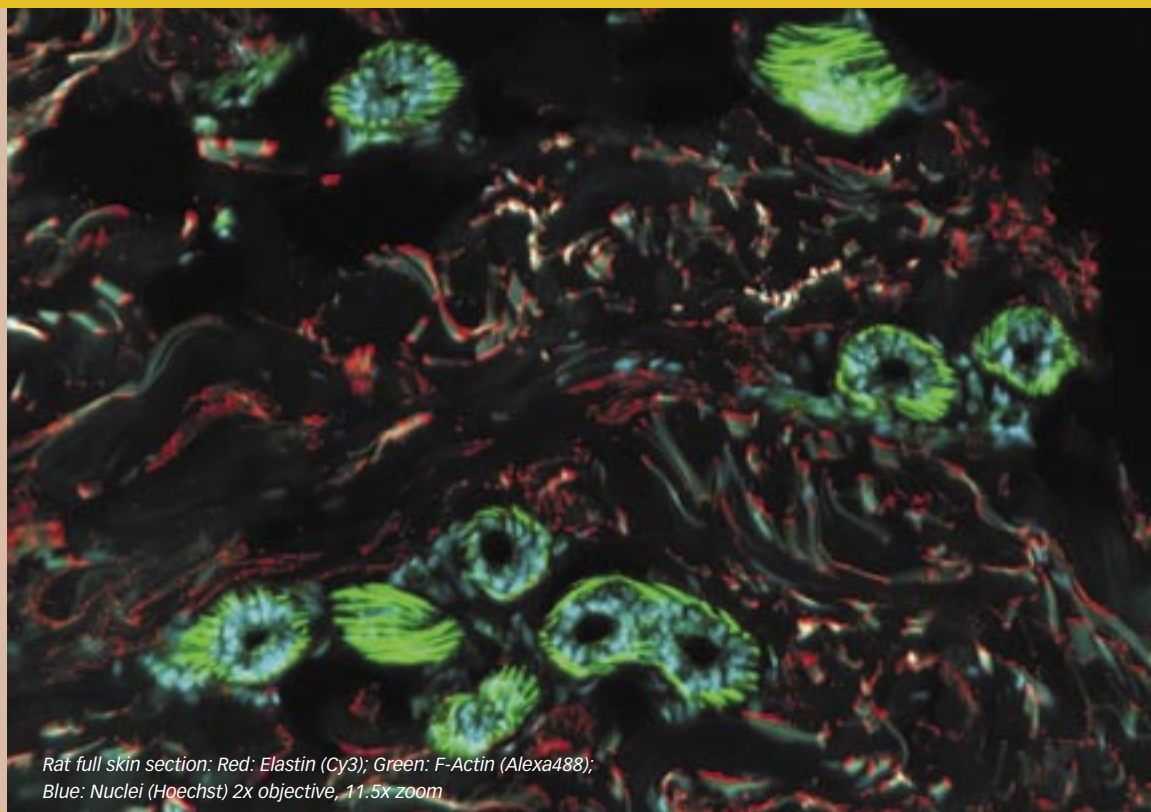
The newsletter for microscope users

Welcome

This issue of Illumin8 is specifically focusing on what could be called 'Macroscopy'. For future issues we would like to know what you want to read about. Moreover if you are doing any interesting research, or have a great microscopy tip, then send an email to

microscopy@olympus.uk.com

or fill in the reply paid card. You can also use these to request your own copy of 'Illumin8' as well as the handy leaflet and poster series available. We hope you enjoy this issue and don't miss our competition to win a pair of 'Olympus 10-30x25 Zoom PC 1' binoculars.



Rat full skin section: Red: Elastin (Cy3); Green: F-Actin (Alexa488); Blue: Nuclei (Hoechst) 2x objective, 11.5x zoom



Stereo Hi-Fis

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- **Stereo Hi Fi**

We take a look at the new SZX2 stereo microscope series

- **Zoom zoom zoom**

A new concept in compound fluorescence microscopy - the MVX10 Macroview

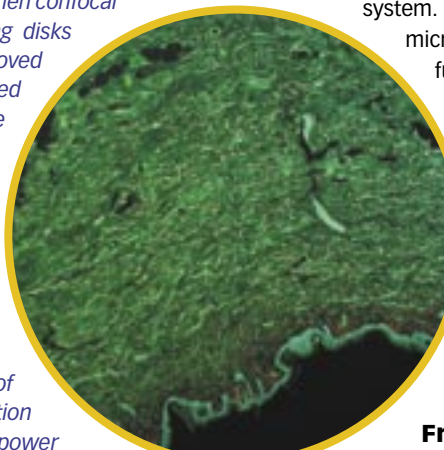
- **MICROSCIENCE 2006**

A look back at 'The' microscopy exhibition

- **Stereo types**

There is more than one type of optical system used for stereo microscopy

For many years upright and inverted microscopes have been at the forefront of developments in microscopy – firstly came conventional fluorescence, then confocal techniques including spinning disks produced greatly improved images. Soon after, lasers started to provide more precise illumination and confocal laser scanning microscopy was born, providing amazing new insights into cellular processes. Further developments included new optical systems (such as the Olympus UIS2), which increase the range of effective illumination/detection wavelengths and reduce the power needed to excite fluorophores. Now, these advances are being applied to the lower powered realm of stereo microscopes. With the new Olympus SZX2 series, low power magnification does not mean low resolution.



A new resolution

The SZX2 series is designed using the parallel light paths of the Galilean (or telescope) optical system. The SZX16 research stereo microscope takes this one step further with its larger lenses made from specialised glass, enabling significantly increased numerical apertures (NA). This also enables a maximum resolution of 900 line-pairs per millimetre (NA=0.3) for the SZX16 – effectively two points only 1.11 µm apart can be easily resolved.

From all to small

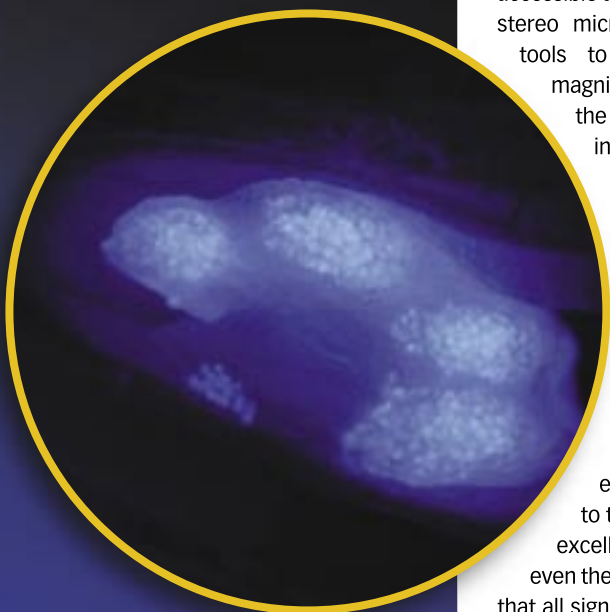
Whilst this optical system has improved the clarity of the images, it has also extended the zoom range, enabling much greater flexibility. With a zoom ratio of 16.4:1 and a large range of stereo parfocal objectives, the SZX16



can zoom from 3.5x to 230x magnification without the need to interrupt the user's view of the sample. This accelerates the ability to find regions of interest and focus in on them quickly producing time savings. The ComfortView eyepieces incorporated into the microscopes allow a stereo image to be formed and maintained across a larger range of eye movements, enabling more comfortable long term use.

The return of physiology

With fluorescence techniques now more accessible across a wider range of applications, stereo microscopes are becoming powerful tools to visualise fluorescence at low magnifications. For example, visualising the distribution of neuronal markers in the nematode *Caenorhabditis elegans* requires a view of the entire organism, with the ability to zoom in or out for specific localisation and identification. The high NAs produced by the new optical components combine with features such as low autofluorescence, improved antireflection coatings and long working distances (WDs), which enable functional analyses unique to the SZX16. This has resulted in an excellent stereo system for collecting even the faintest fluorescence, meaning that all signals can be detected easily from anywhere within the sample.



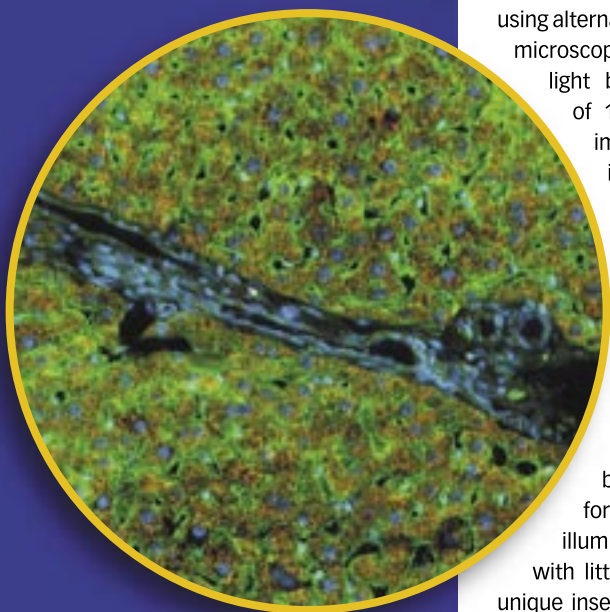
A stamen showing pollen autofluorescence

Very illuminating

The SZX16 utilises a perpendicular fluorescence illumination pathway and, as a result, avoids the artefacts generated when using alternative methods. For general stereo microscopy, the new slim, LED transmitted light base, houses an advanced array of 144 ultra-bright white LEDs. More importantly, there is also a carousel in this base enabling normal brightfield, enhanced contrast brightfield, darkfield and oblique illumination. This offers excellent flexibility, ergonomics and robustness for both experienced and first time users.

All-rounder

This 'all-rounder' base provides bright and even illumination suitable for all specimens requiring transmitted illumination. For transparent samples with little or no natural contrast features, unique inserts have been designed to provide finely adjustable oblique illumination and enhanced brightfield. To achieve this, a special coating is used on the insert glass which causes the light to exit at an oblique angle. A knob on the front of the stand changes the angle of the oblique illumination insert, providing excellent control of the resulting contrast. Whatever the level of contrast generated by the LEDs and



Rat liver section: Red - PMP70 (Cy3); Green: SE1 (Alexa488); Blue: Nuclei (Hoechst) 2x objective, 11.5x zoom

glass insert, it is completely even across the entire field of view. The LEDs have a very long life and produce a high quality pure white light and therefore colour reproduction is excellent. This also means that there is no need for white balancing in imaging and there are no bright spots. Since LEDs emit no heat, there are no unwanted temperature changes to the microscope base or the sample.

Captured

Olympus produces a range of colour and black & white digital cameras for every purpose. At the head of these is the new Olympus DP71 CCD camera designed as a multi-use solution for all imaging requirements. Its live mode is based on the same technology as the next generation of television – HDTV. This provides very high resolution and ultra-fast image transfer giving true colour, full-frame (1360 x 1024) live images. For advanced fluorescence, the custom monochrome mode allows the user to enhance individual signals. Additionally the sensitivity can be increased using 2x2 or 4x4 pixel binning for faint signal collection.



Hand in hand

Even the best camera can only image what the microscope optics produce. With a small shift of the revolving nosepiece, the objective is moved slightly to produce a perpendicular monoscopic image with optimal resolution. This represents exactly the same frame as viewed in stereo. As a result, the SZX2 microscopes are suited to both optical and digital use, making excellent macro-to-micro imaging systems.

In conclusion

Whether you require an advanced routine stereo microscope for sorting cells or a fully featured fluorescence stereo capable of advanced procedures and documentation, the SZX2 range of microscopes has everything you need. The modular 'optical bench' concept employed by Olympus enables the addition of a number of tools such as cameras, illumination systems, environmental control and imaging software either immediately or at a future date.

To find out more about the Olympus SZX2 stereo microscopes, please fill in the reply paid card or email microscopy@olympus.uk.com

Zoom Zoom **ZOOM**

Stereo microscopes are sometimes used for quick screening processes to see if a sample is worth transferring to a compound microscope for more detailed observation. This is true also for ever more popular fluorescence techniques. Olympus has developed a microscope capable of performing both screening and fully detailed investigations, effectively eliminating the need to switch between a stereo microscope and a compound microscope during fluorescence screening procedures. The MVX10 MacroView combines excellent detection sensitivity at the lowest magnifications with a high magnification zoom for fine detail resolution within small organisms, organs, tissues and even cells. This enables researchers to clearly see fluorescent images from whole organisms, right down to the cellular level with good levels of brightness, clarity and precision. With its advanced optical components, the MVX10 can display 1200 line pairs/mm enabling the resolution of two points only 0.8 μm apart.

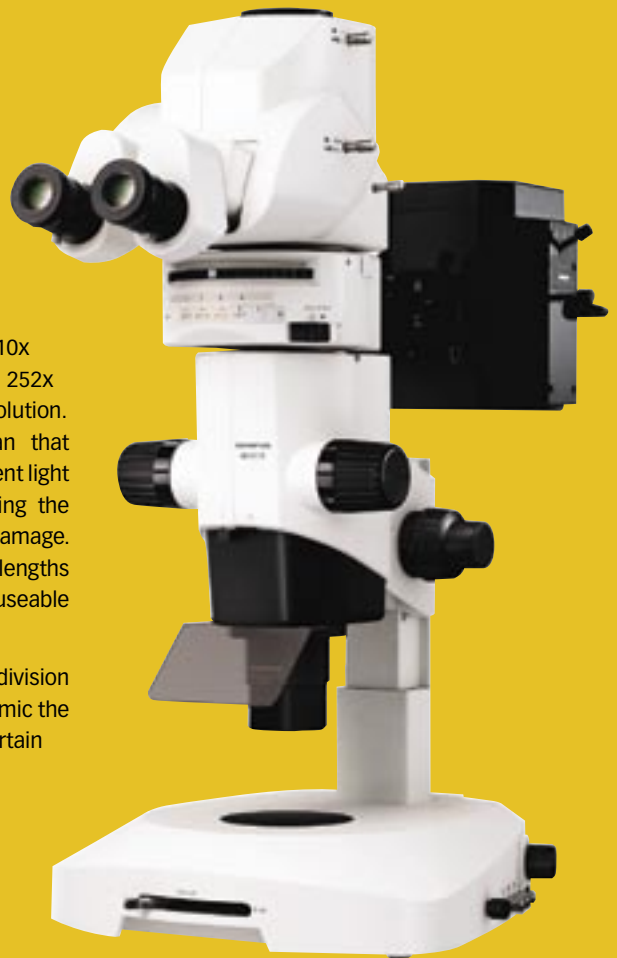
The MVX10 is a mono-zoom microscope that uses a single, large-diameter optical path optimised to collect the weak light generated by fluorescence at all magnifications. Together with the extremely high numerical aperture, this results in greatly improved signal-to-noise (S/N)

ratios, ensuring excellent contrast for the observation of even faint fluorescence signals.

The MVX10 is ideal for low magnification confirmation as well as detailed observation for a wide range of fluorescence techniques. Furthermore, the smooth, stepless 10x zoom and maximum magnification of 252x produce enhanced brightness and resolution. Together, these advances also mean that specimens can be exposed to fluorescent light for shorter periods, thereby minimising the risk of photo bleaching, or even cell damage. This is also true at near-infrared wavelengths effectively increasing the range of useable fluorophores.

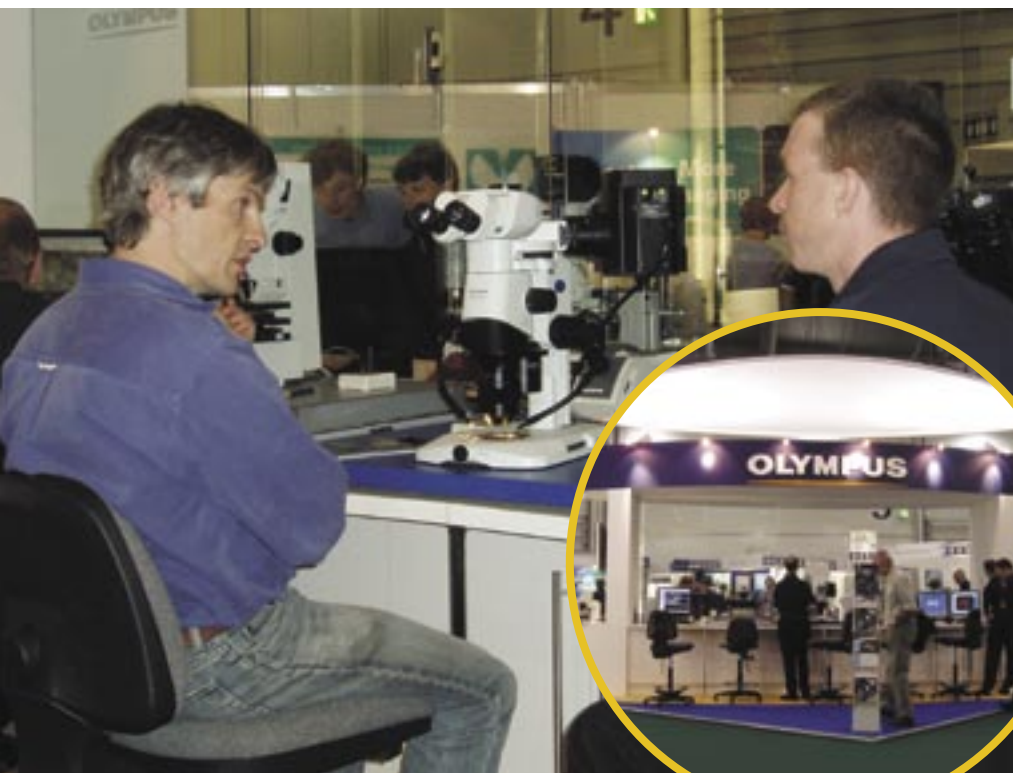
The MVX10 also features a pupil division mechanism in its light path that can mimic the effect of stereomicroscopy when a certain amount of image depth is required.

To find out more about MVX10, please fill in the reply paid card and return. Alternatively, email microscopy@olympus.uk.com



The MVX10 Macroview

MICROSCIENCE 2006



Every two years microscopists of all disciplines from across Europe, gather at MICROSCIENCE - the pre-eminent event dedicated to the microscopic world. This years event, held at ExCeL in London's Docklands, was bigger and better than ever. Olympus, as usual, supported and exhibited at the event providing equipment for the Learning Zone and speakers for the workshops. The new exhibition stand proved a big hit with its open and approachable design. On the exhibition stand were: CellCut Laser Microdissection system, FV1000 laser confocal scanning microscope (LSCM), LEXT metrology LSCM, cell[^]R live cell imaging system, SZX16 research stereo and the MVX10.

The Royal Microscopical Society (RMS) organise the event and Allison Winton, Exhibitions Manager for the RMS said, "Numbers of exhibitors, workshops, conference registrants, and exhibition visitors were all well up on previous MICROSCIENCE events. There was a real 'buzz' in the exhibition hall. We're now building on this to organize an even bigger and better MICROSCIENCE event in 2008."

To discover more about any Olympus microscope or system, please fill in the reply paid card or email

microscopy@olympus.uk.com

Win a pair of Olympus 10-30x25 Zoom PC I Binoculars

Microscopes or binoculars

Did you know that by removing the objective lens from a Galileian stereo microscope, you have a very powerful pair of binoculars? Obviously this isn't very practical, but Olympus also produces a whole range of binoculars which are designed to be used as such. We are giving you the chance to win a pair of the 'Olympus 10-30x25 Zoom PC I' binoculars. These multi-use, compact and lightweight (315g) binoculars boast a 10-30x zoom, with multicoated UV protecting lenses. To be in with a chance of winning them, you will need to answer the three questions below correctly on the reply paid card and return it to us by the 2nd October 2006.

Question 1: Which Olympus stereo microscope has a world leading zoom ratio of 16.4:1?

Question 2: What is the maximum resolution (in line pairs/mm) of the Olympus MVX10?

Question 3: Which stereo optical system offers the greatest flexibility?

Congratulations to Dr Judith Cartwright at St George's Hospital, London, for winning the Olympus μ [mju:] 720SW from the last issue of Illumin8.

Stereo types

It is an often forgotten fact that there are two different types of stereo optical system – the basic Greenough system (as per the Olympus SZ2 series) and the more flexible Galileian (or telescope) system (as per the Olympus SZX2 series). In fact it is quite important to know which type you need or use.

In image 'a' (right), it can be clearly seen that the Greenough system consists of two inwardly inclined pathways converging at the object stage, with separate optical components perpendicular to the light paths. This type of system provides very compact microscopes, excellent for investigation of samples with plenty of depth information, such as insects or embryos. For samples with less depth information e.g. materials surface analysis, a Greenough system is not ideal.

The Galileian system (image 'b'), on the other hand, is much more complex. As soon as the light paths enter the front of the single

common objective lens, they are refracted to travel in parallel through the rest of the objective lens, the zoom body and into the observations tube. The parallel nature of the light enables the addition of intermediate tubes, such as coaxial reflected light and fluorescence illuminators, beam splitters, eyepoint adjusters, discussion tubes and aperture diaphragms, amongst others. In the observation tube, a series of prisms change the separation distance and convergence angle of the lightpaths to put the images through the eyepieces. This type of stereo is very good across all applications.



SHORT TIPS

Take a **squint** at this

One of the challenges of using a stereo microscope is to get the image to stay in focus as you zoom in on the specimen. Follow these simple procedures and you'll have squint-free, sharp images all the time.

- First make sure the eyepieces (oculars) are not already adjusted. Look at each one, and if there is a focusing ring (dioptr control) adjust it to "0".
- Now set the intraocular distance first by moving the eyepiece tubes wide apart, then looking down them and at the same time move them together. Once a single circular image is achieved, stop! Avoid setting the eyepieces too close together as this will cause eye strain.
- Set the zoom control to the lowest magnification and focus on a specimen, choosing a fine feature near the centre of the field.
- Zoom to the highest magnification and refocus the microscope.
- Move the zoom back to the lowest power and check the focus. Make any necessary adjustments by turning the individual focus controls on the eyepiece tubes. If there is a focus control on just one side, refocus the microscope for the other one first and then adjust the focussing eyepiece.
- Finally zoom to the top magnification again and check it stays in focus. If not a further fine adjustment will be needed.

Some research-level stereomicroscopes have high magnifications and utilise a fine focus control, which makes accurate focusing easier.

If a camera is fitted then it too will need to be made parfocal with the two eyepieces. First adjust the microscope as above then use the focusing control on the camera adaptor (possibly a recessed screw head) to bring the camera image into focus.



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- (1) _____
(2) _____
(3) _____

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