OLYMPUS

Your Vision, Our Future

Research Microscopes

BX51/BX61

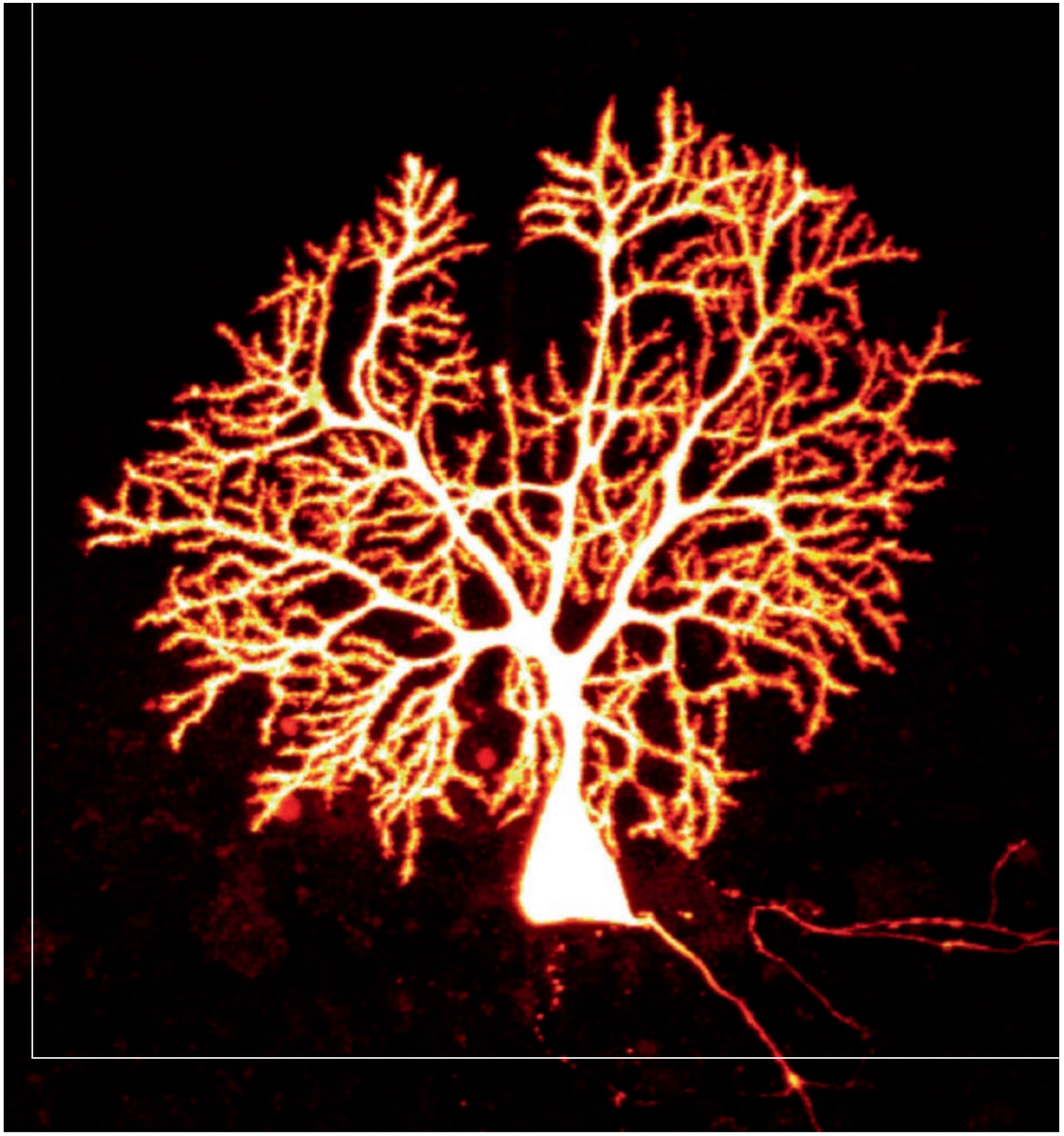
BX2 Series

Proven Excellence – Microscopy and Beyond

STRONG FOUNDATIONS FOR A BRIGHT FUTURE

Unmatched reliability and versatility

As our understanding of the world around us increases, we develop firm foundations from which we can advance our knowledge further still. These foundations need to be highly dependable yet flexible to cope with the progress made. This is especially true for science, where a research platform can become integral to the whole arena of research. This is the case with Olympus microscopes, which have become synonymous with reliability and versatility in many different fields. New features and accessories continue to extend this, ensuring that these unique platforms are the perfect foundations for all applications of optical microscopy.



REMAINING IN CONTROL

Maximising research output

Research microscopy is about more than just the microscope, as each investigation requires a unique set-up. As a result, the microscope must not only be highly flexible, but also be able to excel at a great multitude of protocols and processes. The Olympus BX2 microscopes are just such instruments, offering excellent modularity embedded in a flexible imaging system environment, ensuring that whatever the task, the researcher will always remain in control.

Your future success

Olympus is dedicated to making state-of-the-art microscopes, accessories and imaging system solutions to support your work on all levels. We have therefore worked closely with customers to produce the ultimate in flexible microscopy – the BX2 range. As a result, our goal is your success, both now and in the future.

THE BEST WAY FROM A TO Z

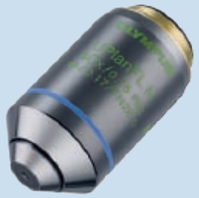
Data – a researcher's currency

Scientists need to extract as much information as possible from every sample in each experiment and therefore their instrumentation needs to be of the highest quality. Microscopes form integral parts of many protocols and processes, including simply checking samples before examination, recording images for feature analysis and even controlling various aspects of the experiment (e.g. photoactivation of specialised fluorescent dyes). They must therefore be highly flexible and capable of forming any desired system solution to enable the scientist to find the best way from A to Z.

A UPlanSApo 40x
Spectral apochromat objective

B UPlanFLN 40x objective
Fluorite objective

C UPlanFLN 40x Ph
Fluorite phase-contrast objective



D LUCPlanFLN 40x
Long working distance fluorite objective

E Olympus UIS2
Superior optical system

READY FOR ANYTHING

At the heart of any light microscope is the optical system; a series of lenses, prisms and filters designed to magnify the target area of a sample whilst resolving more detail from it. This is far more complex than this basic overview portrays, since as well as enabling samples to be imaged they also allow the introduction and control of light and the projection of images to the eyes (or to a camera). On top of all of this are a range of optical aberrations that can affect microscopy if not properly corrected for. The Olympus UIS2 optical components have been developed to provide the perfect optical system; setting a new standard in precision and clarity.

Correct – from start to finish

The Olympus UIS2 optical system is more than just a range of objectives and filters. It is an optical concept developed specifically for microscopy, with an extensive number of features balanced perfectly with the requirements of the application, be that routine or highly original and groundbreaking science.

Spectral apochromat and fluorite

A–E Life science researchers will benefit from the extensive fluorite and exquisite spectral apochromat (SAPO) objective series. The Olympus UIS2 fluorite objectives provide high quality across the extensive range, which also includes specially developed models for the observation of living cells in vessels, for example. The spectral apochromat objectives represent the cutting edge of high-end microscope optics. They fully compensate for both spherical and chromatic aberrations (including Z-shift) from the near-UV to the near-infrared regions. For quality and performance, they offer an unbeatable solution to every kind of digital imaging.

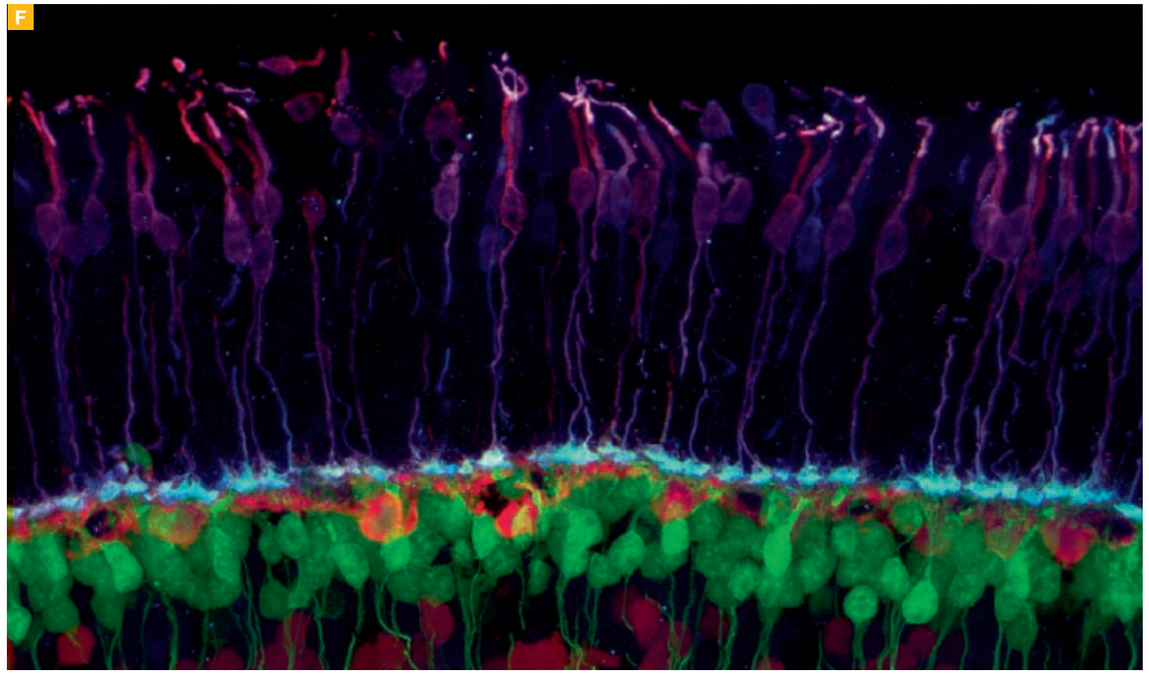


Image F: Multi-colour confocal image of cortical cell layers of mouse brain: axon and dendrite morphogenesis during neuronal maturation. Courtesy of Josh Morgan, group of Dr Rachel Wong, Department of Anatomy and Neurobiology, Washington University School of Medicine, St. Louis, United States

Full-on fluorescence

Olympus UIS2 optics are particularly well suited to fluorescence imaging, ensuring the entire optical path – from the sample to the eyes (or camera) – is optimised for multi-wavelength analysis.

Maximum signal/minimal noise – it's a system thing

By using carefully selected raw materials for the glass, and applying advanced ultra wide-band (UW) multi-coatings technology, Olympus has reduced objective autofluorescence and thereby significantly improved the S/N ratio. Numerical apertures have also been maximised across the entire series to ensure that as much signal as possible is collected from the sample. Furthermore, the new immersion oil has been engineered to have very low autofluorescence for excellent contrast and optimised viscosity for easier handling. Moreover, Olympus quality standards guarantee minimal batch-to-batch variations over the entire product range. As a result, the Olympus UIS2 system provides flawless fluorescence for all steps in the process: excitation, emission signal collection, magnification and image capture.

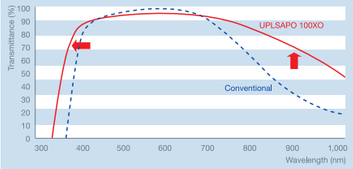
Flat field with high transmission

G H Olympus UIS2 objectives not only yield flat images across the entire field of view (FOV) but also minimise Z-shift between different wavelengths. These, coupled with high transmission over a wide wavelength range (from UV to IR), ensure the best performance for even the most complex multicolour fluorescence microscopy.

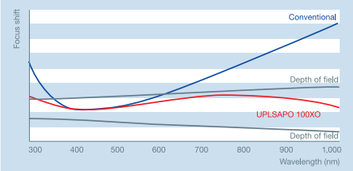
And that's not all!

I As well as the objectives, the UIS2 filter range has been optimised for high-quality imaging. Steep cut-off slopes ensure the highest transmissions and excellent colour separation, while the low autofluorescent glass materials further improve the S/N ratio. These, coupled with the excellent image flatness, bring the UIS2 optical system to perfection.

G Transmittance
UIS2 and conventional objective

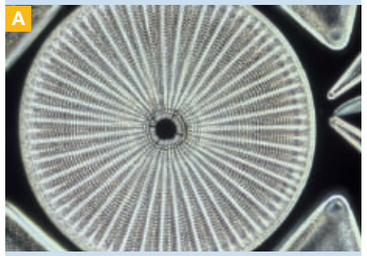


H Chromatic aberration
UIS2 and conventional objective



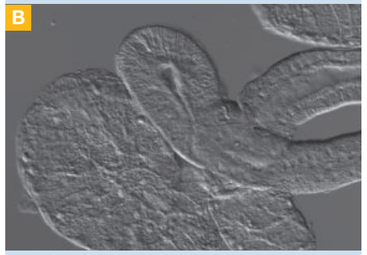
I UIS2 fluorescence filters
Superior signal separation

A



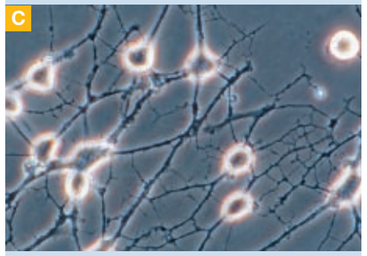
Darkfield

B



DIC

C

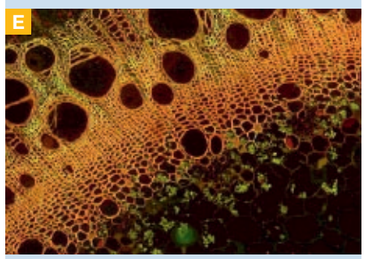


Phase contrast

D

Polarisation

E



Fluorescence

TO SEE OR NOT TO SEE, CONTRAST IS THE ANSWER!

To see things requires contrast. At the microscopic level though, biological samples tend not to have inherent contrast, such as colour variations, visible under brightfield illumination. As a result, a number of different ways of generating contrast have been developed. These can be split into two categories: optical contrast methods and sample contrast methods. Whatever the source of contrast, the Olympus BX2 range and UIS2 optical components perform peerlessly, providing sharp and clear images.

An optical toolbox – optical contrast methods

A–D Darkfield, DIC (differential interference contrast), phase contrast and polarised light all rely on the management of light to produce distinct images. Of these, DIC provides the finest morphological detail by introducing contrast in essentially transparent specimens, rendering differences between features as height information. Olympus has developed three DIC solutions: high-resolution DIC is ideal for thick samples such as *Caenorhabditis elegans* where multiple cell layers can hinder clarity by producing unwanted noise and glare. High-contrast DIC is aimed at low-contrast specimens such as thinly spread cells on a slide, where the sample possesses very little contrast. The universal DIC solution balances the effect for samples where there is a wide variation in sample thickness, such as tissue slices.

C Phase contrast is the standard method used to observe cells in culture and has the capabilities to visualise dynamic events. In effect, the phase-contrast technique employs an optical mechanism to convert minute variations in phase shift in the light passing through transparent specimens into corresponding changes in amplitude, which can be visualised as differences in image contrast.

D Polarised light can be used to illuminate birefringent samples, within which the various features alter the polarisation differently, leading to visible contrast. Darkfield microscopy is different again: samples are illuminated obliquely, such that no directly reflected light is observed. Instead, only light that has been significantly refracted by the sample is collected and visualised.

Cell colouring – Sample contrast methods

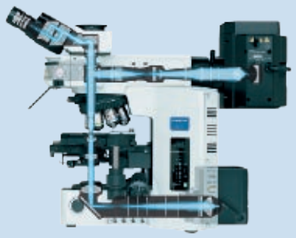
E For many years, immunohistochemistry (IHC) proved itself to be an excellent method for generating contrast and enabling component differentiation at the subcellular level. Offering greater flexibility than IHC, fluorescence microscopy has become an extremely important technique in the advancement of science and medicine, and in 2008 the Nobel Prize in chemistry was awarded for the “discovery and development of the green fluorescent protein, GFP”. Fluorescence microscopy not only includes a range of basic and advanced imaging protocols, but also complete experimental procedures such as FRAP and FRET. In brief, fluorescence dyes emit light of one wavelength once excited by a slightly shorter wavelength. As a result, a microscope system has to provide the perfect excitation and emission properties, which is where the UIS2 optical system comes into its own. With high transmission from UV to IR and broad aberration correction, as well as low autofluorescence, a full range of fluorescence protocols can be completed on the BX2 microscopes.

MANY SOLUTIONS: ONE MICROSCOPE

Whatever the imaging methods used, the Olympus BX2 microscope range and UIS2 optics can be combined with the correct arrangement of filters, polarisers, condensers and prisms to ensure high-level imaging every time. Add the flexibility and dependability of the Olympus microscopy digital imaging cameras, illuminators and cell* software family, and a whole new world of imaging and analysis emerges.

A **BX2**

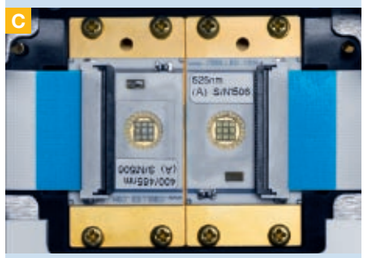
Optimised lightpaths



B **PrecisExcite**

High-power fluorescence LED illumination system

C



Proprietary LED array design

TRIPPING THE LIGHT FANTASTIC

A With Olympus UIS2 optical components providing the perfect for both illumination and visualisation, it is essential to make the most of this with a range of carefully selected lighting options. Here, the Olympus BX2 series microscopes again excel in terms of flexibility, from brightfield through to advanced multiphoton illumination.

Out in the LED

LEDs emit light within defined wavelength bands, enabling very precise illumination of fluorescent dyes. Excitation wavelengths can be switched much quicker with LEDs than with any mechanical wavelength switching system. Experiments employing multiple excitation wavelengths to analyse cellular dynamics, such as FRET, will benefit directly from the increased time resolution. LEDs can also be switched on and off very quickly, resulting in maximum specimen protection. Furthermore, LEDs offer excellent lumen maintenance over their entire lifetime. This means that during an experiment (however long) the light intensity will hardly change, which means that LEDs provide highly reproducible results and the ability to be fully quantitative.

Controlled

B C For the precisExcite fluorescence LED system, 11 different single LED array modules (LAMs) and 5 double LAMs are now available, enabling up to four wavelengths to be controlled at once. PrecisExcite is also the first LED fluorescence system to feature an exact 490 nm wavelength module, which is perfect for experiments using FITC. PrecisExcite is the only LED illumination system on the market to use a specially developed, proprietary LED array design, optimised for microscopy and a cooling system which enable it to attain intensities not possible on other systems.

Routine

For more routine protocols, the FluoLED transmitted fluorescence LED system provides very cost-efficient solutions featuring single-colour units with fixed or variable intensity control as well as a three-wavelength unit with variable intensity control.

Gentle

With LED illumination come two very important benefits for fluorescence applications – the reduced phototoxic effect on live specimens and the reduced bleaching tendency. Because the LEDs emit light of very defined wavelengths and can be switched on and off very quickly, the specimens are only illuminated for the amount of time needed for the protocol.

Controlled transmission

D LEDs are ideal for transmitted brightfield illumination as well, where they offer easy intensity control, with a constant colour temperature over the entire intensity range. Olympus has therefore introduced the LightManager, which ensures an excellent level of control for transmitted LED illumination. The LightManager system provides an easy-to-use interface for setting and automating brightness levels associated with each different objective for up to four different illumination techniques, reducing the fine adjustments usually performed by the user with each objective or technique change.

Managing light

It is an optical fact that different magnifications and different techniques require different illumination intensities to keep the same brightness in the field of view. Furthermore, when viewing a sample, it is not unusual to move up and down through the available objectives. This also means changing the light intensity with each turn of the nosepiece to keep the same brightness. The Olympus LightManager is an optional accessory that works in collaboration with the LED transmitted light source and a nosepiece sensor, which automatically determines the objective in use. It enables the light intensity levels used for each objective in a nosepiece to be set for up to four different illumination methods. Therefore, as a user moves between objectives, the light levels will be automatically adjusted to the preset intensities. When switching to a different imaging technique, e.g. from brightfield to DIC, the user can make single change on the LightManager control box to provide their preset intensities for that technique. As a result, once set the LightManager enables excellent time savings and makes microscopy much more efficient. LED lightsources make this possible since they do not require white balancing as they maintain the same “colour” whatever the intensity level.

What is more, the LightManager can also provide a readout of the objective in use, so that software imaging tools such as Olympus cell* programs can automatically record the correct magnification data for each image. This makes documentation and consistency much simpler.

Dividends

With the improved control of LED illumination comes a number of other benefits. These include exceptionally easy handling, since LEDs are robust and completely alignment-free. They have excellent longevity, greatly exceeding the lifetime of all other light sources and making them almost maintenance-free. LEDs are good for the environment too, with significantly lower power requirements and no disposal issues.

D **LightManager**

High-quality transmitted light LED illumination

E **BX51 with precisExcite**

High-power LED fluorescence illumination

A Mercury/xenon Arc burner

For MT fluorescence illumination systems

MERCURY MAKEOVER

Mercury arc burners have been the stalwarts of fluorescence microscopy for many years and are still the most commonly used method of excitation. Recent advances have ensured that they are capable of meeting the demands of the modern researcher. Olympus has incorporated a number of advanced burner-based illuminators into its BX2 research solutions to make them suitable for all fluorescence methods; from routine to real-time.

Real-time and spectral microscopy

A **B** The MT10 and MT20 real-time systems have fully computer-controllable filter and attenuator wheels, as well as a high-speed shutter. They can be fitted with either 150 W mercury or mercury/xenon burners to provide the correct illumination wavelengths for all research. As a result, these illumination solutions are ideal for advanced live cell imaging applications, such as cell growth and metabolic transport, multi-colour time-lapse imaging, Z-sectioning, multidimensional imaging, ion imaging, FRET, TIRF, etc.

C For the ultimate in speed, the Polychrome V monochromator provides wavelength changes of up to 400 nm/ms. The Polychrome V uses a 150 W xenon burner with 3,000 h lifetime covering UV to visible red wavelengths. It can also be fitted with an optional 10-level attenuator to provide more precise control over the output intensity.

B MT20

Fluorescence illumination system

C Polychrome V

Monochromator

D X-Cite exacte

Closed-loop feedback fluorescence illumination system

HIGH STABILITY

D–**F** **The X-Cite 120 range, and the new exacte model, provide the same fluorescence spectrum and similar intensities as a standard mercury burner, but ensure an additional level of consistency and safety, making them excellent options for a broad range of requirements. The X-Cite range uses alignment-free metal halide burners, and the unique metal halide technology ensures much of the tungsten eroded during "burning", is recycled back to the electrodes. This slows down the widening of the arc gap, which in turn decreases the rate of intensity reduction. This, coupled with the electronic control gear (ECG), which ensures that as the gap between the electrodes grows, the correct voltage is used to generate a consistent arc, greatly extends the life of the burner.**

Safety first

The unique IntelliLamp™ system monitors and maintains the optimum lamp temperature to ensure consistently safe operation, and even prevents hot-striking. Lamp usage is tracked and the ECG system ensures that lamp voltage is regulated to compensate for intensity loss over its lifetime, and once the voltage reaches an upper limit, it shuts the system down safely, greatly decreasing the risk of dangerous lamp explosions.

Increased repeatability

The X-Cite exacte takes mercury burner technology one step further with the addition of a unique calibration system and closed-loop feedback stability technology. The calibration unit ensures that light output can be calibrated in absolute (watts) or relative (%) units, ensuring that research is truly repeatable. Closed-loop feedback constantly monitors the light output, adjusting the iris to ensure that any small changes are compensated for. Further advances in the exacte model include a DC- powered burner for more stable lamp output, a 100-step (1% increment) intensity adjustment, a pre-light guide bandpass filter to remove deep-UV and IR wavelengths, a high-speed shutter, TTL and USB inputs and a light guide detection safety feature.

E Collimator

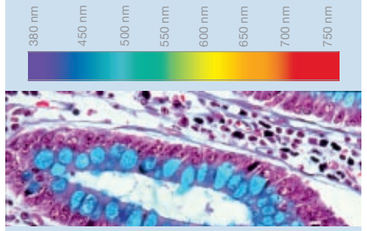
For X-Cite fluorescence illumination systems

F Pre-aligned burners

For X-Cite fluorescence illumination systems

A Human vision

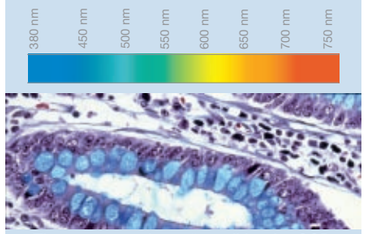
"Optical spectrum" 380–750 nm



Typical specimen as seen through human eyes on an Olympus microscope

B Camera vision

"Optical spectrum" 500–710 nm

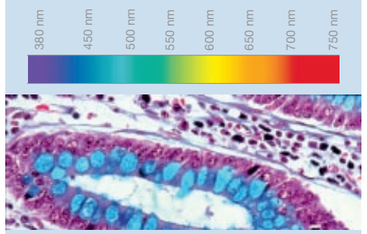


The same specimen "seen" by the CCD sensor of a digital camera

OTC

C Your display

"Optical spectrum" 380–750 nm



Monitor display of the image (image taken by an Olympus CCD camera, after the application of the OTC algorithm)

THE FLEXIBILITY OF CHOICE

It is always preferable to have a choice, and this is definitely true when it comes to matching your digital imaging requirements to your project work. For brightfield applications you'll want dazzling colour fidelity and for fluorescence you'll need the perfect black and white capture. There are also those occasions when you would like a microscope camera that can do both. Add to this selection the ability to pick from a range of image sizes and resolutions, and the Olympus digital microscope camera range really does offer you the flexibility of choice.

Perfect colour fidelity

A–**C** The unique Olympus True Colour (OTC) colour optimisation algorithms ensure that the Olympus ultra colour (UC) and excellence colour (XC) microscope cameras present the colours in a sample with the highest possible fidelity. Similar capabilities are ensured via a specific processor board in the DP72 universal camera. The OTC system uses internal International Color Consortium (ICC) reference profiles to ensure consistency between the input and output colours at every stage of the imaging process. These profiles are even applied in live mode to ensure the best-possible colour representation at the highest speed.

Enhanced functionality

Once you have found the perfect image, the next challenge is to capture it accurately. But what if you need to alter the parameters? When using the Olympus cell* software alongside your camera, all of the function controls that you require are situated on-screen next to the image. The Olympus Camera Control (OCC) enables effortless and flexible control of all aspects of acquisition, from the storage and retrieval of specific camera settings to direct access to advanced acquisition functions. Even the most complex imaging tasks become simple; making digital microscopy cameras easy for everyone to use.

The colour specialist

D The Olympus XC50 colour camera offers a 5-megapixel resolution and is Peltier-cooled to provide a wide dynamic range along with a number of different frame rates using pixel binning and partial readout modes. These make the XC50 a versatile colour camera with excellent sensitivity and flexible operation. The 2,576 x 1,932-pixel CCD chip used in the XC50 offers 12 bits per colour channel and can be used for variable exposure times between 1 ms and 160 s. These features, along with the high sensitivity, OTC colour fidelity, superior contrast and an extraordinary signal-to-noise ratio, make the XC50 a great universal high-resolution colour camera.

The ultimate in black and white

E The Olympus XM10 black-and-white camera offers all of the properties required to provide dependable fluorescence microscopy images: high resolution, extremely fine sensitivity, a cooled CCD chip, variable exposure times and an optional external trigger function. The XM10 uses a 1,376 x 1,032-pixel CCD chip cooled to 10 °C (at 25 °C ambient) with a 12-bit dynamic range. It offers three binning modes: 2x, 4x and 8x, resulting in increased sensitivity and frame rates of up to 72 fps in live mode. This makes it easier to focus and locate areas of interest on samples while conserving highly sensitive fluorescence samples. At full resolution, the XM10 is ideal for all fluorescence acquisitions since it is extremely sensitive, low in noise and supports long integration times of up to 160 seconds. The XM10 is available with optional TTL trigger functionality and also in an IR-optimised version for fluorescence dyes in the infrared region. With an excellent balance of features, the XM10 is ideal for recording all fluorescence images – from the brightest to the faintest signals.

The master of flexibility

F With the new Olympus DP72 camera, it is no longer necessary to compromise on any aspect of imaging: supreme sensitivity, speed, resolution and colour fidelity are all included in this ground-breaking colour and black-and-white camera. With microscopists expecting ever higher resolution from their imaging systems, the DP72 does not disappoint. The outstanding 12.8-megapixel resolution will show your images in their finest detail, with natural colours as seen through the microscope eyepieces. The DP72 is therefore an excellent all-rounder, suitable for broad range of applications.

Extended versatility

G The Olympus BX2 microscope range is available with a broad range of camera adapters, offering the versatility to incorporate specialised imaging solutions that are not available from Olympus. For example, some experimental protocols require specialised cameras, such as electron-multiplying CCDs (EM-CCDs) or liquid nitrogen-cooled CCDs, which offer unique properties to maximise signal to noise ratios by enhancing photon collection or by eliminating electrical noise. Furthermore, video cameras may be needed for documentation in television programmes or films. Support for such third-party equipment is also often incorporated into the Olympus cell* software, ensuring that integration into the whole system is seamless.

D XC50

Colour camera

E XM10

Black-and-white camera

F DP72

Universal camera

G Camera adaptation

Broad range of C-mount adapters

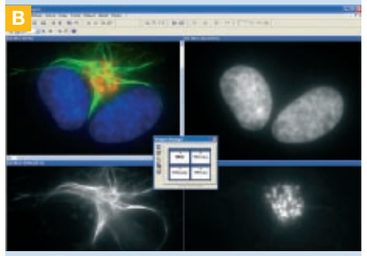
A Olympus cell*

Software family for life science

A BETTER WAY TO DISCOVER MORE

A With carefully selected microscope optics, illumination system and camera, a researcher can produce fantastic images on an Olympus BX2 microscope. But connecting all of these features together with software control not only makes imaging and analysis more efficient and precise, but also opens up new channels of investigation and maximises the capabilities of both the microscope imaging solution and the scientist. Today's applications are so multifaceted that a single image analysis system is simply not enough to satisfy the diverse needs of users in various areas. In recognition of this, Olympus has developed the cell* family – a comprehensive series of mutually compatible imaging products offering a uniquely appealing blend of superior performance and user-friendly operation.

B



cell^B basic software

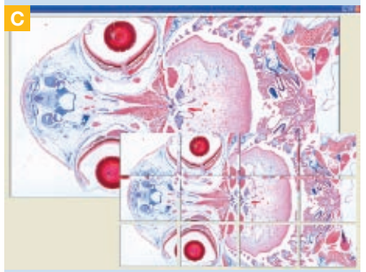
Documentation and routine

B cell^R and cell^B are cost-efficient, entry-level imaging software programs for image acquisition, reporting and archiving in standard, life science applications.

Documentation and Control

C cell^D is a state-of-the-art system for image acquisition, archiving and documentation in biological microscopy. It offers a more advanced set of functions, such as the rapid acquisition of image sequences (monochrome or colour). The new Workflow Assistant offers the convenience of intuitive routine documentation and image acquisition tasks. cell^D also contains a number of predefined workflows for acquiring panorama images, images with infinite depth of focus or for acquiring fluorescence images.

C



cell^D panorama function

Fluorescence and complex procedures

D cell^F and cell^P have been developed for fluorescence imaging and analysis applications. In comparison to cell^D, they have expanded feature sets for acquisition, documentation, processing visualisation of multichannel fluorescence images and much more. Spectral unmixing algorithms guarantee enhanced spectral resolution of multichannel images. cell^P enables users to remove out-of-focus image blur and to scan microtitre plates via a motorised microscope. Complex analyses and calculation sequences can be defined and executed with reduced effort and in less time using automation profiles.

D

cell^F fluorescence imaging

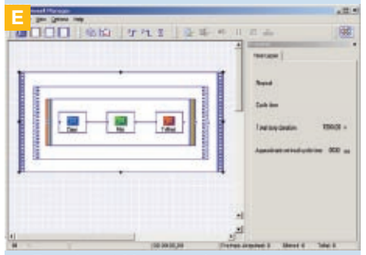
Integrated imaging systems

E F Olympus cell^M and cell^R are integrated, multi-device imaging stations for sophisticated fluorescence applications and high-speed live cell experiments. Key to these systems are the all-in-one MT10 and MT20 illumination modules for wavelength switching, attenuation and shuttering. They are specifically designed to meet the experimental requirements for multicolour fluorescence time-lapse image acquisition. The specialised hardware control boards increase imaging speed considerably in comparison with systems driven by software alone. The intuitively structured Experiment Manager is a user-friendly graphical drag-and-drop interface that makes setting up even the most complex experiments exceptionally quick and easy.

Data back under your control

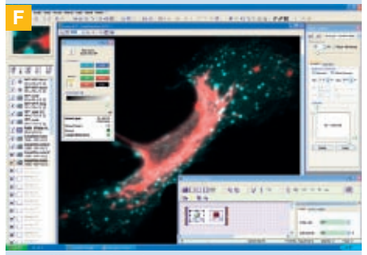
With the plethora of hardware available for your BX2 system solution, the correct cell* software package puts you back in control of your data – your currency.

E



Experiment Manager: drag-and-drop programming for the design and execution of experiments

F

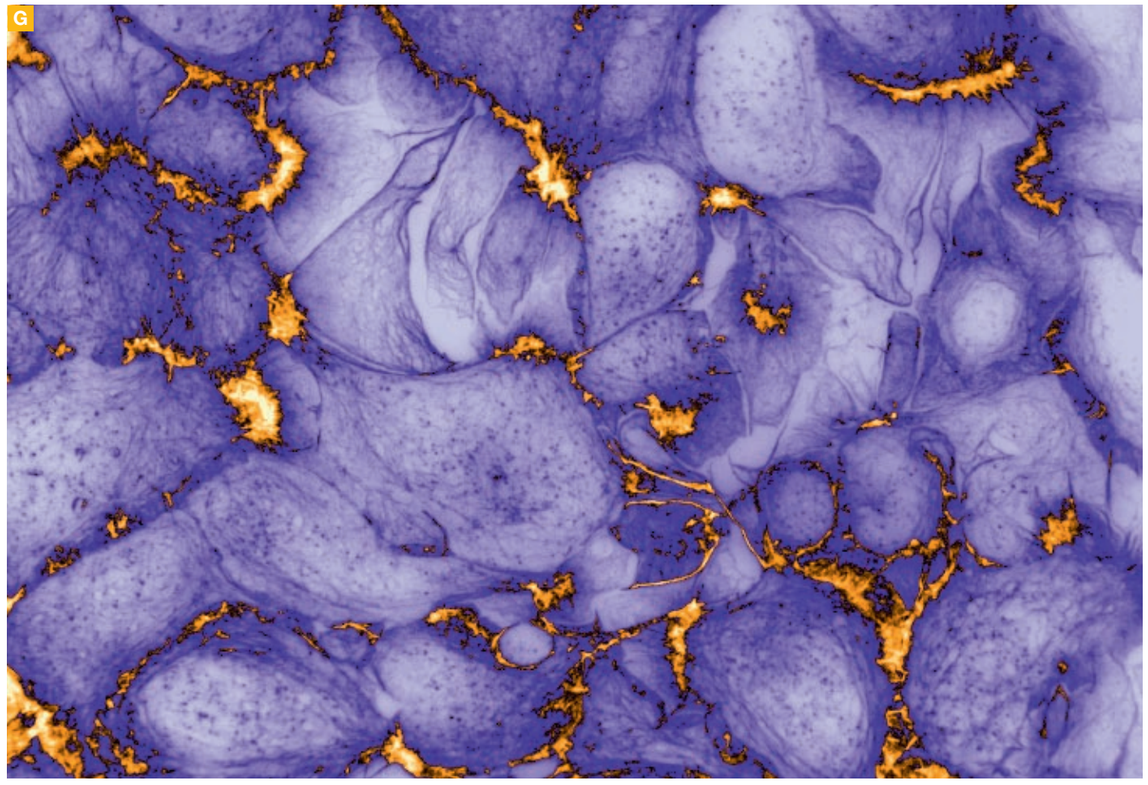


cell^R real-time imaging system solution

G Direct uPAR interaction with the extracellular matrix induces actin rearrangement and cell migration task: urokinase plasminogen activator receptor (uPAR) is closely associated with tumour malignancy and metastasis. Its morphological changes are dependent on direct interaction with the extracellular matrix protein vitronectin.

Image courtesy of Chris D. Madsen and Dario Parazzoli, FIRC Institute of Molecular Oncology Foundation (IFOM-IEO-Campus), Milan, Italy

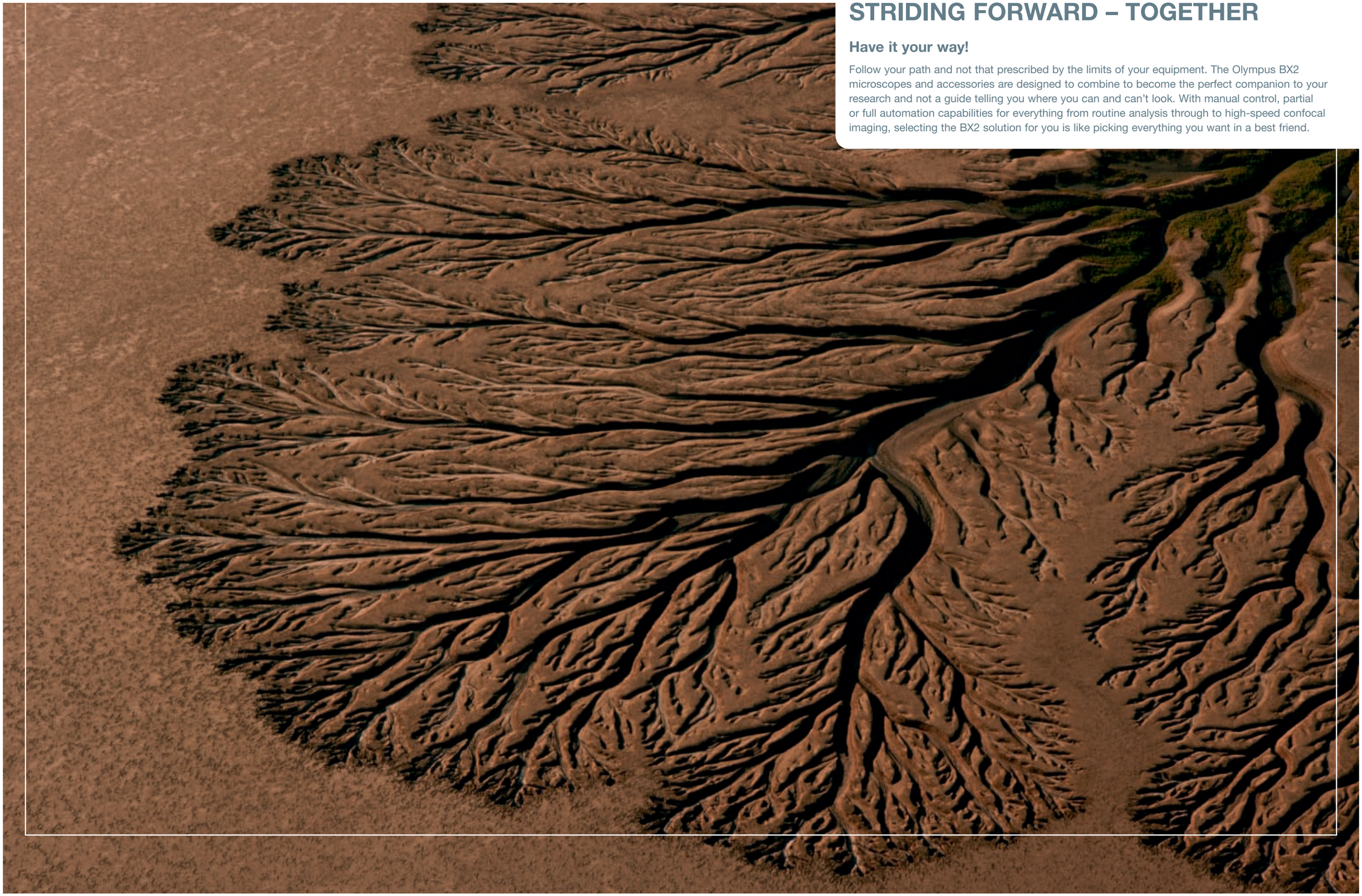
G



STRIDING FORWARD – TOGETHER

Have it your way!

Follow your path and not that prescribed by the limits of your equipment. The Olympus BX2 microscopes and accessories are designed to combine to become the perfect companion to your research and not a guide telling you where you can and can't look. With manual control, partial or full automation capabilities for everything from routine analysis through to high-speed confocal imaging, selecting the BX2 solution for you is like picking everything you want in a best friend.



A BX2 microscope
With Y-shaped frame

PLUG AND PLAY

A If modularity could be embodied then it would take the form of the Olympus BX2 microscope series. With the joint appeal of being both a timeless classic and cutting-edge technology, the BX2 series enables a level of plug-and-play not normally associated with scientific instrumentation. Whichever system you create using your BX2, it will be perfect for the research you are carrying out now and will adapt to everything you do in the years ahead.

BX51

With the powerful UIS2 optical system on board, the BX51 is the ideal choice for various observation methods and especially for fluorescence or DIC microscopy. Based around a well-proven Y-shaped frame, an extensive range of high-performance digital cameras, accessories and objectives can be used. This ensures a flexible and modular configuration even for specialised high-end research applications. The addition of a range of optional motorisation modules takes the BX51 to the next level, enabling easier and more efficient user interaction with the microscope.

BX61

The BX61 shares the same powerful UIS2 optical system but provides full motorisation. With the internal high-accuracy Z-drive, for example, the BX61 is the best platform for the complete range of automated microscopy applications. The control software makes it simple to set up even for complex experimental routines, while the modular design allows users to customise and upgrade the system to meet their needs.

Accessories

With myriad different imaging methods and their associated components, such as condensers, prisms, phase inserts, polarisers, specialised objectives, filters etc., as well as the numerous illumination sources, cameras and other modules, it is a good job that the Olympus BX2 microscopes are able to cope with them all. Whether you need a dedicated DIC system for recording, documenting and analysis, a multi-talented all-round microscope system solution, or a multidimensional imaging station, with the correct accessories and a perfectly balanced BX2 microscope everything is possible.

ORCHESTRATING CAPABILITIES

In music, bringing together the abilities of a number of different instruments provides a much richer sound with the capability to perform more advanced compositions. Similarly, adding the correct balance of modules and accessories to a microscope enables a greater range of imaging processes and consequentially more advanced experimentation. Key accessories include motorisation and automation tools, which provide the microscope user with the freedom to fully investigate their samples. For the BX51 user, a range of modular solutions help the microscope to grow with their research. The BX61 is fully motorised, providing the researcher with a superior system for the most demanding of applications.

Building the orchestra

Different forms of music require unique balances of instruments; so do different microscopy techniques. With the broad range of motorisation and automation components available, the BX51 and BX61 can be equipped to perform whatever is required.

Intensity management

B For example, when moving up and down through the available objectives to image a sample, light intensity needs to be adjusted to maintain the brightness of the field of view. The Olympus LightManager works in collaboration with the LED transmitted light source and enables users to set the light intensities for each objective. Therefore, as they move from one objective to another, the LightManager automatically adjusts the light intensity of the LED light source to the preset level. What is more, the intensity for each objective can be preset for up to four different techniques. This means that when changing from brightfield to DIC, for example, the user can simply press a button on the LightManager control box and load the desired light intensity presets. This not only makes the whole process simpler, but also much more efficient.

Magnification management

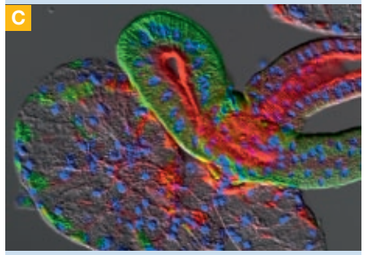
C Motorising the nosepiece has the advantage that the objective can be changed using either the remote control handset or from the PC software control. This is of importance for example, if the microscope is positioned in a radioactive chamber (or similar situation) where the user needs to avoid touching the microscope. Also, the more advanced imaging techniques may require the use of multiple magnifications, and with a motorised nosepiece and cell* software, the whole process can be automated. A further benefit is that the correct objective is selected every time and the magnification is recorded with each image.

B LightManager
Transmitted light LED illumination system

C Motorised nosepiece
Full magnification control

A Fluorescence illuminator
Motorised, with 8 positions

B Fluorescence filter wheel
Motorised



C

D Motorised stage
For BX2 microscope

Contrast management

Changing transmitted light techniques means ensuring the correct arrangement of ND filters, polarisers/analysers and condensers as well as using the correct objectives. For situations where a single user or group of users change techniques very regularly, Olympus can provide motorised components to ensure the proper management of contrast. The 8-position universal condenser even moves the top swing-out lens to ensure the full magnification range is available. The transmitted filter wheel ensures that ND filters and polarisers can be selected easily. Automating these via the cell* software further increases the efficiency of contrast management.

Spectral management

A **B** With the ever-increasing number of fluorescent dyes, more researchers are in need of efficient fluorescence microscopes, but do not always need everything motorised. Some of the core components to motorise are the excitation and emission filter wheels and the mirror turret. As a result of the increasing number of fluorescence dyes, experiments have become more complex and can utilise a number of dyes at once. MFISH (multiple fluorescence *in situ* hybridisation), for instance, can use up to five fluorescent probes in one specimen. Therefore it is important that the microscope can not only switch between the different dichroic mirrors and filters quickly, but that it can also hold enough to make use of the broad range of dyes. Olympus has therefore incorporated optional 6 and 8-position motorised mirror turrets and 6-position excitation and emission filter wheels into its BX2 microscope range.

Lights, filters, action!

C Being able to motorise multiple components ensures that both routine and complex imaging techniques can be automated. For example, many fluorescence images are displayed alongside a DIC version to integrate functional (fluorescence) with morphological (DIC) data. Capturing this requires the correct transmitted light and optical components to be in place for the DIC image, changing light sources and condensers, adding the correct reflected light filters and dichroic mirrors for the fluorescence image as well as actually taking the images. There may also be multiple fluorescence images to be taken, so further filter and mirror changes are required. Automating this makes it very quick and easy to perform, leaving the researcher more time to study their results.

Stage management

D Another component that can be motorised is the XY stage. This not only enables easier sample navigation, but also advanced imaging processes. For example, using the cell* software, a user can navigate a sample and set multiple areas of interest to be imaged. They could then determine what imaging techniques should be used for each (e.g. DIC and two different fluorescence wavelengths). The whole series of images will then be captured automatically without any further user input.

SYMPHONIC EXCELLENCE

Sometimes experiments can become very complex, or require experimental programming that reduces the amount of a researcher's time available for actually doing the experiment. In these situations, automating every aspect of the microscope enables the user to efficiently concentrate on generating the right data from each experiment and analysing it properly – this is where the BX61 comes into its own.

Focal point

E **F** As well as offering motorisation of all the filter wheels, condensers, nosepiece and stage as standard, the BX61 also provides a high-precision Z-drive with motorised focus. This not only enables fine focusing control via the remote hand switch and computer, but also provides another dimension to automated imaging. Furthermore, techniques such as optical sectioning and extended focal imaging (EFI) are possible, providing users with a complete array of imaging techniques.

Automation expert

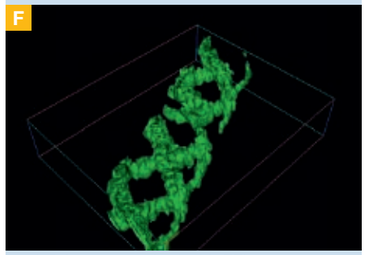
G The BX61 offers a superb level of flexibility in automation, with six specifiable frame keys. These can be set via the cell* software to initiate any automated protocol, from simply taking an image of the sample in view using the attached camera to starting a full multidimensional imaging protocol. This means that researchers have the versatility to use the microscope system in many different ways.

Integrating modules

Along with the motorised microscope components, a full range of accessories are available and form an important part of automated imaging systems. These include digital cameras and advanced arc-burner and LED-based fluorescence illuminators. These add further flexibility to research imaging and can all be fully automated, providing smooth and efficient system integration. For example, all the settings for the Olympus digital microscopy cameras are controlled via the software, ensuring that the perfect image can be captured every time. High-speed live cell imaging requires external fluorescence illumination with extremely quick shutters and filters. The Olympus MT20, for example, integrates with the BX61 via the cell^R software and a specialised PC control board, ensuring full parallel control of the light source settings.

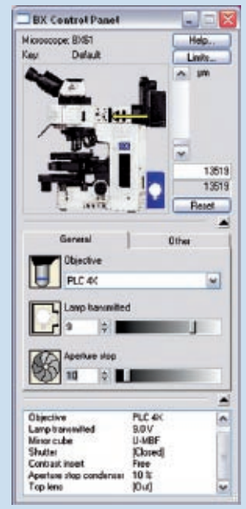
E BX61
Superior research microscope

F



3-D image acquired with EFI

G Microscope control
In cell* software



A **Workflow Assistant**
Intuitive control

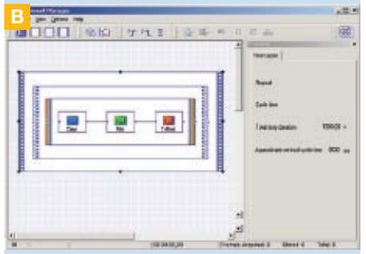
CONDUCTING THE ORCHESTRA

Just as an orchestra needs overall direction and control from a conductor, microscope system automation relies on software to control the microscope components and accessories. This not only eases the burden of routine or highly repetitive tasks, but also makes it easier to coordinate entire experiments, where experimental programming can become too time-consuming. As well as providing the key functions and control capabilities, the cell* family of imaging programs have a number of user interface-oriented tools. These not only make operation of individual components of systems easier, but also ensure their full integration for intricate experiments and analyses.

Workflow Assistant

A In the cell^{D}, cell^{F} and cell^{P} software programs, recurring steps can be defined as so-called workflows via the Workflow Assistant. The application-specific fields in the Workflow Assistant guide the user systematically through the acquisition and analysis process with just a few logical clicks of the mouse. Thanks to the intuitive usability of these workflows, even inexperienced users can obtain the desired image result in just a few steps. Depending on which version of the cell* family is in use, various workflows are available. cell^{D}, for example, contains a number of workflows for image acquisition, including ones for panoramic images, images with infinite depth of focus, and for capturing fluorescence images. In addition to the predefined workflows, there are application-specific and user-defined workflows which are easy for users to create and save themselves.

B

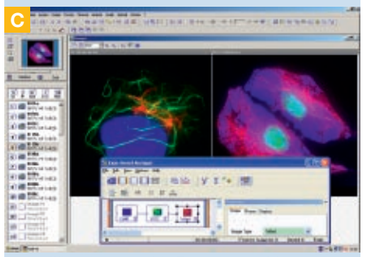


cell* Experiment Manager: drag-and-drop programming for the design and execution of experiments

Experiment Manager

B **C** In the real-time systems cell^{M} and cell^{R}, the highly intuitive Experiment Manager tool allows the visual assembly of experiment plans. The system uses icons representing simple commands, groups of commands or entire sub-experiments and these can be dragged and dropped within the experiment area and joined to each other to form complete experiments. Individual exposure times, attenuation values and ROIs can be set for each image acquisition command. Experiment plans are automatically stored together with the image data in the database. In this way it is possible to automatically obtain experimental data in 6 dimensions without having to touch anything once the experiment has been started – a true feat in the control and application of automation for microscopy.

C



cell* software with Experiment Manager

PINPOINT ACCURACY

D **Fluorescence microscopy has been at the heart of many great scientific discoveries and has generated a whole series of investigative processes and even complete experimental platforms. The key objective of fluorescence illumination is to only excite fluorophores in the part of the sample that is in focus within the field of view. This represents a very small and thin section and is a difficult goal since light can only be applied from outside the sample and must therefore always pass through other parts of it. Confocal and confocal-like systems approach this through the use of optical and/or mathematical processes on the emitted light path to effectively remove the out-of-focus blur and thus produce high-resolution images with amazing clarity. Olympus has integrated a number of confocal solutions into its BX2 range to provide every researcher with the pinpoint accuracy most suited to their work.**

Structured illumination

E Optigrid M uses a combination of physical and mathematical processing to produce near-confocal-quality images. This is achieved by using a one-dimensional optical grid mounted on a piezoelectrically driven actuator to project a line pattern onto the specimen. The grid is moved perpendicularly to the grid lines, in steps 1/3 of its length so that three grid movements cover one optical section. This process has a similar role to the fine light beam in confocal imaging, and returns a strong signal wherever focus is sharp and a weak signal where focus is soft.

Doing the maths

These optically clear image portions are recombined using a specially developed deconvolution algorithm, which ensures that only in-focus pixels are used and that the overlapping sections of each image portion line up. This results, in most cases, in clear images without any out-of-focus blur.

A great result

A Z-stack taken through a sample can be combined to create a haze-free, ultra sharp composite image. Furthermore, the image stacks can also be used to produce 3-D reconstructions using post-processing software.

D

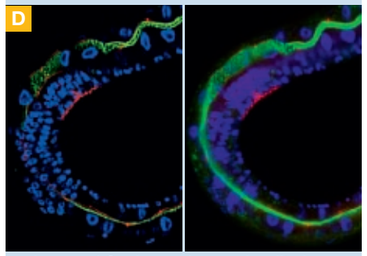


Image of *C. elegans* hermaphrodite in the early L4 stage, acquired with an OptiGrid M system (left image) and without (right).

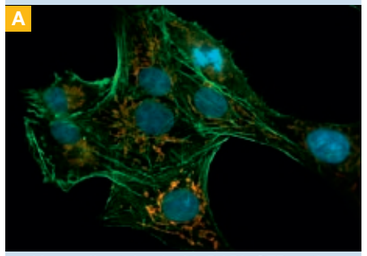
Image courtesy of Prof. Hajnal, Institute of Zoology, University of Zurich

E **Optigrid M**
Structured illumination insert

F **Optigrid M**
Control box

G **Optigrid M**
Structured illumination system

A



Vero cells stained with DAPI, GFP-actin and MitoTracker® Red. Image taken with DSU.

B

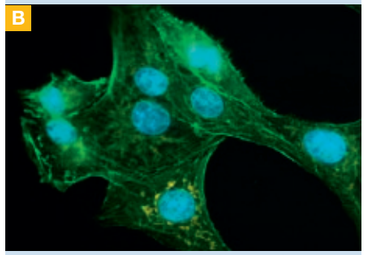


Image of the same cells taken without DSU

EXPLORING NEW FRONTIERS

One of the main principles governing confocal imaging is that the emission light path passes through a pinhole to remove out-of-focus light. Olympus has taken the two main confocal imaging system concepts – spinning disk and laser scanning – further, creating unique experimental platforms with excellent flexibility.

Putting a new spin on things

A–C The Olympus DSU system exploits the power of the spinning disk concept by varying slit width, and optimising its spacing for the different objective numerical apertures and specimen thicknesses, ensuring that the best image is obtained from every sample over the entire magnification range, from 10x to 100x.

Super operator

Spinning disk confocal is excellent for high-speed confocal imaging, offering up to 50 frames per second, making it an ideal solution for live cell imaging. The high-precision Z-motor in the Olympus BX61 ensures that 3-D image stacks can be acquired quickly and easily. The Olympus cell* software programs enable coordinated control of the DSU, motorised microscope and cooled CCD camera, resulting in a complete microscopy, imaging and analysis system solution.

A lighter alternative

Utilising a stabilised arc burner illumination source, such as the X-Cite exacte, ensures that images are not only exceedingly sharp and consistent, but that fluorescence excitation characteristics can be flexibly changed according to the user's needs by the addition of new wavelength filters and dichromatic mirror sets.

C **Disk-scanning unit DSU**

High-speed confocal system

D **FluoView FV1000**

Spectral scanning confocal system

A SPECTRAL GENIUS

The Olympus FluoView FV1000 confocal laser scanning microscope (CLSM) platform, with its unique SIM scanner concept, incorporates two independent, fully synchronised laser scanners in a single compact design for simultaneous laser light stimulation and high-resolution confocal observation. Furthermore, the unique spectral detection system of the FV1000 provides superior linear spectral resolution of 2 nm throughout the complete wavelength range, from 400 to 800 nm.

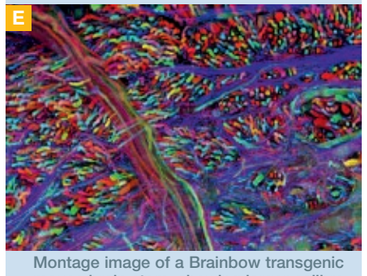
The leader of the pack

D The FV1000 optical concept and the high-sensitivity detection system allow efficient fluorescence detection, which minimises the damage to living cells. The FV1000 really gets to grips with the fine detail in each sample via its excellent lateral resolution and UIS2 optical components. Up to eight different wavelengths can be fitted to the system at any one time via the the multi-laser combiner, which can be fitted with a broad range of laser diode- and/or gas-based lasers. Furthermore, the carefully developed optics within the multi-laser combiner enables the implementation of a second fibre so that the SIM scanner has access to the same wavelengths as the main scanner. As a result, it is possible to use the same wavelength for both imaging and manipulation of the specimen simultaneously.

Unsurpassed control and modularity

With very easy-to-use software, the FV1000 makes CLSM imaging more accessible and ensures that the full functionality of the system and the available modules can be utilised more efficiently. For example, a TIRFM (total internal reflection fluorescence microscopy) module can be added to enable advanced cell membrane and cell-cell interaction investigations, and all the controls needed for this are included in the software. The Olympus FV1000 system also forms the basis of the three advanced Olympus multiphoton solutions providing high-resolution imaging deep into tissues.

E



Montage image of a Brainbow transgenic mouse brain stem, showing larger calibre axons of the auditory pathway.

Image courtesy of Jean Livet, Harvard University, Cambridge, MA, USA.

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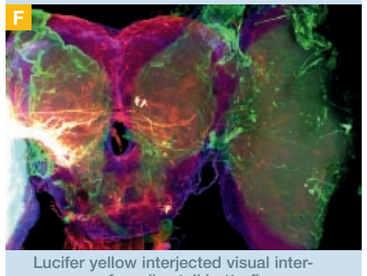
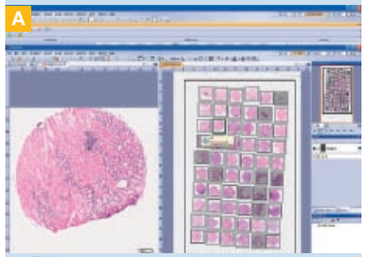


Lucifer yellow interjected visual interneurons of swallowtail butterfly.

Image courtesy of Mituyo Kinoshita and Prof. Kentaro Arikawa, Laboratory of Neuroethology, Graduate School of Integrated Science, Yokohama City University.

VIRTUAL IMAGE: REAL MICROSCOPY

Life science research has relied heavily on advances in microscopy to move our knowledge forward. The VS110 system represents such a step forward, offering excellent throughput for extensive image analysis and superb documentation of tissue sections, cell cultures and even tissue microarrays. The VS110 system creates a virtual image of the sample at high resolution, enabling multiple researchers all over the globe to simultaneously navigate the file as if it were the actual sample.

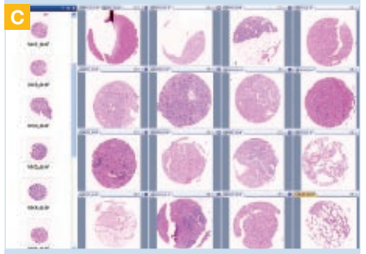


A

TMA cores can be selected by simply clicking on the overview image. The corresponding metadata is displayed along with the image.

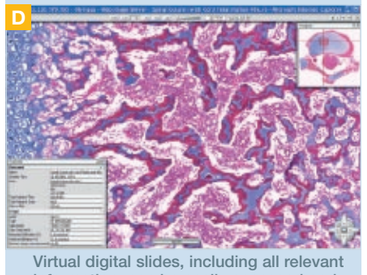
B

Scan Wizard



C

Gallery view and multi-image display*



D

Virtual digital slides, including all relevant information, can be easily accessed and viewed simply with an Internet browser.

Tissue microarrays

A The functionality of the VS110 system can be expanded with a dedicated TMA software module, facilitating acquisition and simple analysis of tissue microarrays. This module enables documentation of each core separately, accurately recording its slide and core reference for traceability, and automatically storage and upload to the Net Image Server SQL database. This will allow you to perform effortless analysis of the TMA and metadata, as well as to visually select a single core from the TMA overview slide image for maximum versatility!

Scan it right

B With the VS110, you will be guided through the virtual slide acquisition process step-by-step by an intuitive Scan Wizard. This graphical user interface (GUI) features large control icons and enables even inexperienced users to immediately produce the perfect image results they require – in just a few steps!

View it right

C–D With the new VS110, you can scan multiple large specimens in up to 15 horizontal or Z-planes. Virtual Z allows you to simply focus through the specimen, as well as examine regions of interest in different dimensions. This enables better observation from any location, as well as the ability to discuss the sample with colleagues and peers whether they are local or remote. Furthermore, with improved contrast and image quality, virtual slide images appear highly defined and even clearer than before!

Access and security

The innovative, versatile Net Image Server (NIS) SQL expands the capabilities of the VS110 with a client-server database and allows you to manage any kind of image in a simple and convenient way. What is more, the system is designed to work across multiple sites, offering not only a local multi-site system, but also one that can be run throughout a region or around the globe. This powerful tool will enable your scanned images to be automatically uploaded to the database, making them readily available for immediate remote access and multiple keyword queries. NIS SQL also supports multiple file repository systems to allow secure, easy networking between different scanning units within one database.

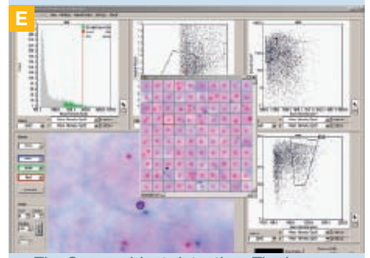
* Images A and C courtesy of Universitätsklinikum Schleswig-Holstein, Institut für Pathologie, Prof. Dr med. A.C. Feller

Multifunctional microscope

The VS110 system comprises a research-level microscope with colour-perfect digital camera and advanced software. This means that it is not limited to functioning solely as a virtual slide system, giving great flexibility especially where space and funding are at a premium. Furthermore, the microscope can be extended with a range of accessories, from new objectives to polarising filters.

Specialised analysis

E The VS110 software enables simple measurements such as circumferences, distances and areas without the need for scaling. With additional software tools, a number of analysis functions are available to aid in the rapid investigation of the virtual slides. For example, the cell* family of software or the advanced Scope image analysis module of scan^R, which combines a cytometry-oriented concept with image processing, can be set to identify particles that fulfil a series of criteria such as size, shape and intensity.

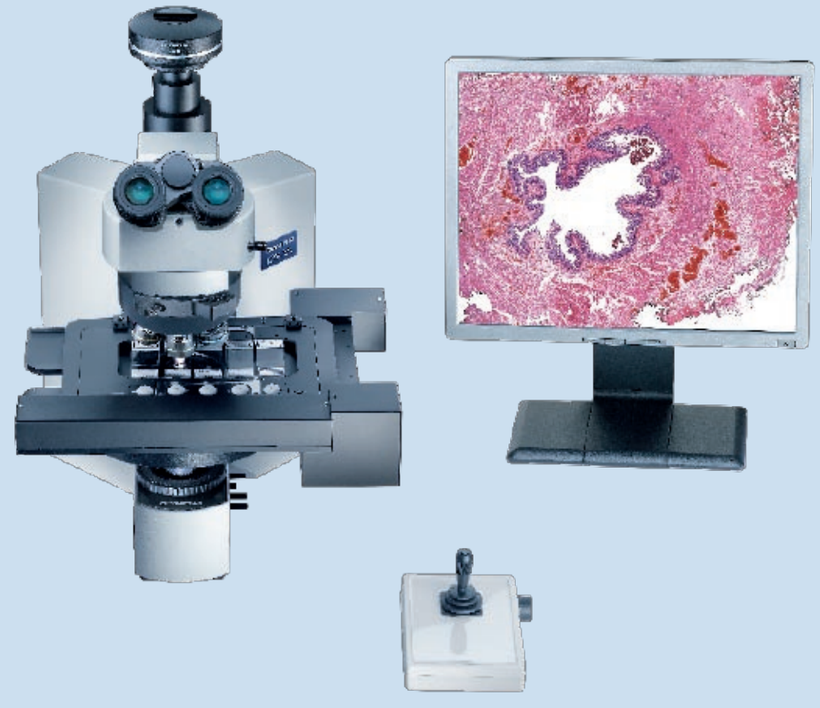


E

The Scope object detection: The image derived parameters are plotted in 1-D or 2-D histograms.

F VS110-S5

The system can hold up to five standards slides or two 2x3" slides



1 Condensers

- **U-AC2** Abbe condenser
- **U-SC3** Swing-out condenser
- **U-AAC** Achromatic aplanatic condenser
- **U-ULC** Ultra low magnification condenser
- **U-PCD-2** Phase/darkfield condenser
- **U-POC-2** Polarising condenser
- **U-DCD** Dry darkfield condenser
- **U-DCW** Oil darkfield condenser
- **U-UCDTP530** Tint plate slider
- **U-UCD8-2** Universal condenser with eight positions
  - **U-TLO** Oil immersion front lens
  - **U-TLD** Dry front lens
  - Optical inserts
- **U-UCD8A-2** Motorised universal condenser with eight positions

2 Stages

- **U-FMP** Object guide
- **U-SRG-2** Rotatable stage
- **U-SRP** Precision-rotatable stage
- **U-SP** Plain stage
- **U-SHG** Ergo Grip, 1 mm thickness
- **U-SHGT** Ergo Grip, 5 mm thickness
- **U-CST** Centring specimen
- **U-HLD-4, U-HLDT-4** Double specimen holder
- **U-HRD-4, U-HRDT-4** Double specimen holder
- **U-HLS-4, U-HLST-4** Single specimen holder
- **U-SVRO** Oil mechanical stage with right-hand controls
- **U-SVLO** Oil mechanical stage with left-hand controls
- **U-SVRB-4** Mechanical stage with right-hand controls
- **U-SVLB-4** Mechanical stage with right-hand controls

Eyepieces *▲

* **WHN10X-1-2, WHN10X-H-1-2, CROSS WHN10X**
Eyepiece
U-CT30
Centring telescope

* **35WHN10X-1-2**
Eyepiece

▲ **SWH10X, SWH10X-H, CROSS SWH10X,**
Eyepiece
U-CT30
Centring telescope

3 Nosepieces and inserts

- **U-P4RE** Centrable nosepiece
- **U-GAN** Gout analyser
- **U-D6RE** Sextuple nosepiece for DIC/simple polarisation
- **U-D7RE** Septuple nosepiece for DIC/simple polarisation
- **U-P6RE** Centrable sextuple nosepiece
- **U-5RE-2** Pentuple nosepiece
- **U-D6REM-1-5** Motorised sextuple revolving nosepiece for DIC/simple POL
- Objectives for polarised light observation
- Objectives
- **U-ANT** Analyser for transmitted light
- **U-DICT** Nomarski interference insert, transmitted-light objective
- **U-TAD** Adapter for compensators
- **U-ANT** Analyser for transmitted light
- Compensators
- **U-DICTS** Nomarski DIC insert with shift function, transmitted light
- **U-DICTHR** High-resolution Nomarski DIC insert, transmitted light
- **U-DICTHC** High-contrast Nomarski DIC insert, transmitted light

Blue coloured illustrations indicate motorised units

- **BX51TF-5** BX51 frame for transmitted light
- **BX51TRF-5** BX51 frame for transmitted and reflected light
- **BX-ARM**
- **BX61TRF-1-5** BX61 frame for transmitted and reflected light
- **U-LH100-3-5** 100 W halogen lamphouse
- **U-RMT-1-5** Extension cord
- **U-POT** Polariser
- **U-FC** Filter cassette
- Filter (ø 45)
- **U-FWT-1-5** Transmitted light filter wheel
- **BX-UCB-1-5** BX control box
- **U-HSTR2-5** Hand switch
- **BX2BSW** Control software
- PC
- **U-ZBCB2-5** Z control board

4 Fluorescence illumination

- **U-FWO-1-5** Observation filter wheel
- **BX-URA2-5** BX reflected-light condenser
- **U-RSL6** Six-position filter slider
- **U-RSL6EM** Six-position filter slider
- Connecting part
- MIRROR UNITS*4
- **U-AN** Analyser for reflected light
- **U-25ND6, U-25ND25, U-25ND50** Neutral-density filters
- **U-EXBABG** Excitation balancer BG
- **U-EXBAUB** Excitation balancer UB
- **U-EXBAUG** Excitation balancer UG
- **BX-RFA-1-5** BX fluorescence condenser
- **BX-RFAA-1-5/ BX-RFAA8** Motorised fluorescence illuminator
- **U-FWR-1-5** Reflected filter wheel
- **U-RFSS** Rectangular field stop
- **BX-RFSPOT** Rectangular field stop
- **Confocal systems FluoView and DSU*5**
- **OptiGrid M** Grid confocal system
- **U-DULHA** Double lamphouse adapter
- **U-LH75XEAPO-1-6** Apo lamphouse for 75 W xenon arc lamp
- Power supply for 75 W xenon arc lamp
- **LH100HGAPO-1-5** Apo lamphouse for 100 W mercury arc lamp
- **U-LH100HG-1-5** Lamphouse for 100 W mercury arc lamp
- Power supply for 100 W mercury arc lamp
- **X-Cite 120 X-Cite exacte** Metal halide illumination sytem
- **precisExcite** LED illumination system
- **MT-CON*6** Illumination coupling
- **MT_FIB/2m** Single quartz light fibre
- **MT10, MT10D MT20*6** Illumination system
- **MT-CON*6** Illumination coupling
- **MT_FIB/2m** Single quartz light fibre
- **Polychromator V*6** Illumination system

6 Observation tubes and intermediate tubes

- **U-TTBI-1-2** Ergonomic binocular tube with tilting eyepieces
- **U-ETBI-1-2** Erect-image ergonomic binocular tube with tilting eyepieces
- **U-TBI-3*1** Ergonomic binocular tube
- **U-BI30-2-2** Binocular tube
- **U-ETR-4*2** Erect-image trinocular tube
- **U-SWETR** Erect-image widefield trinocular tube
- **U-SWTR-3-2** Trinocular widefield tube
- **U-TR30-2-2** Trinocular tube
- **U-TR30NIR** Trinocular tube

- **U-ECA** Magnification changer 2x
- **U-ECA1.6X** Magnification changer 1.6x
- **U-ANT** Analyser for transmitted light
- **U-KPA** Intermediate tube for simple polarisation
- **U-CA** Magnification changer
- **U-DP*2** Beam splitter
- **U-APT-1-5** Arrow pointer
- **U-EPA2** Eyepiece adjuster
- **U-TRU-1-2*2** Intermediate tube with camera port
- **U-TRUS*2** Intermediate tube with camera side port
- **U-DAL10X** 10x lens for U-DA
- **U-DA** Drawing attachment

5 Group observation attachments

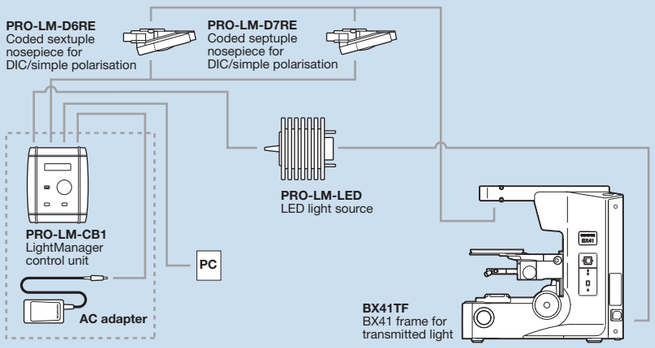
- **U-DO3-5** Dual-observation attachment
- **U-SDO3-5** Side-by-side dual-observation attachment
- **U-MDOB3-5** Multi-observation beam splitter body
- **U-MDOSV-2-5*3** Multi-observation side viewer stand
- **U-MDO10B3-5** Multi-observation beam splitter body for 10 persons
- **U-MDO10R3-5*3** Rear multi-observation body for 10 persons
- **U-CPA** Intermediate attachment for conoscopic observation
- **U-AN360P-2** Rotatable analyser
- **U-OPA** Intermediate attachment for orthoscopic observation
- Stand*3

A B Camera adapters

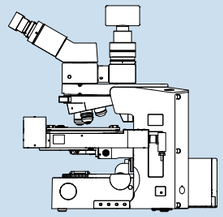
- **U-FMT** F-mount adapter
- **U-TMAD** T-mount adapter
- **U-SMAD** Sony mount adapter
- **U-BMAD** Bayonet mount adapter
- **U-CMAD3-2** C-mount adapter
- **U-PMTV** Video port 0.3x
- **U-PMTV1x** Video port tube
- **U-PMTVC2XIR** **U-PMTVC4XIR** C-mount video port
- **U-CMDPTS** C-mount adapter for U-DPTS
- **U-PMDPTS** PM-mount adapter for U-DPTS
- **U-DPTS** Multi-adapter
- **U-TVZ** Zoom-camera adapter
- **U-TV1X-2-2** Camera intermediate tube
- **U-DPT-2** Photo and video tube
- **U-SPT** Photo tube
- **Cameras**
- **U-TV1X-2-2** **U-TV0.25XC** **U-TV0.35XC-2-2** **U-TV0.5XC-3-2** **U-TV0.63XC-1-2** **U-TVZ**
- **U-DP1XC** C-mount adapter for U-DP
- **U-TV0.25XC** C-mount camera adapter 0.25x
- **U-TV0.35XC-2-2** C-mount camera adapter 0.35x
- **U-TV0.5XC-3-2** C-mount camera adapter 0.5x
- **TV0.63C-1-2** C-mount camera adapter 0.63x

*1 May show slight vignetting at the margins of the field of view when used in combination with an additional intermediate attachment.
*2 May show slight vignetting at the margins of the field of view when used in combination with a fluorescence condenser.
*3 The stand comes with U-MDOSV-2-5 and U-MDO10R3-5 as standard.
*4 No mirror units for BX-RFAA8 because fluorescence filters are mounted directly in the BX-RFAA8 filter turret.
*5 For further information on confocal systems, please contact your local sales representative.
*6 For further information on illumination systems, please contact your local sales representative.

7 LightManager system diagram



8 VS110-S1/VS110-S5

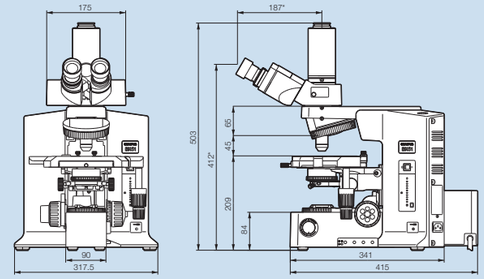


BX51/61 specifications

		BX51	BX61
Microscope frame	Optical system	UIS2 optical system	
	Focus	Vertical stage movement: 25 mm	Motorised focus/vertical stage movement: 25 mm
		Stage stroke with coarse adjustment limit stopper	0.01 µm increments, maximum speed: 3 mm/s
		Torque adjustment for coarse adjustment knobs	coarse/fine changeover button, stage shunting button
		Stage mounting position variable	and stage up/down button
		High sensitivity fine-focusing knob	
		(minimum adjustment increments: 1 µm)	
Revolving nosepiece		Interchangeable reversed quintuple/sextuple/septuple nosepiece	
		Motorised sextuple revolving nosepiece with slider slot for DIC	
		Septuple revolving nosepiece for DIC/simple POL	
Observation tube	Widefield	Widefield binocular, inclined 30°, widefield tilting binocular, inclined 5°–35°,	
	(FN 22)	widefield trinocular, inclined 30°, widefield tilting/telescoping binocular, inclined 0°–25°, telescoping 0–45 mm	
	Super widefield	Super widefield trinocular, inclined 24°	
	(FN 26.5)		
Stage		Ceramic-coated coaxial stage with left or right-hand low drive control:	
		with rotating mechanism and torque adjustment mechanism, optional rubber grips available	
		(Non-stick grooved coaxial, plain, rotatable stages are also available)	
Condenser		Abbe (NA 1.1), for 4x–100x, swing-out achromatic (NA 0.9), for 1.25x–100x (swing-out: 1.25x–4x)	
		Achromatic aplanatic (NA 1.4), for 10x–100x	
		Universal (NA 1.4/0.9), for 2x–100x (swing-out: 2x–4x, with oil top lens: 20x–100x)	
Motorised fluorescence illuminator*3		Motorised reflected fluorescence, 6-position mirror turret unit, motorised shutter changeover speed:	
		shutter speed: 0.1 s	
Motorised universal condenser*3		8-position with motorised AS, turret and top lens swing-out mechanism (NA 1.4—0.9), for 1.25x*1*2–100x	
Motorised transmitted filter wheel*3		To be mounted on light exit, 6 positions, Ø 32, filter thickness: up to 6 mm	
Motorised reflected filter wheel*3		To be mounted between the lamphouse and the frame, 6 positions, Ø 25/Ø 32, filter thickness: up to 6 mm	
Motorised observation filter wheel*3		To be mounted between the frame and the observation tube, 6 positions, Ø 25/Ø 32, filter thickness: up to 6 mm	
Hand switch *3		Control of septuple revolving nosepiece, 6-position mirror turret illumination unit and 8-position condenser	
Control box *3		Serial interface RS-232C, built-in transmitted/reflected halogen power supply	

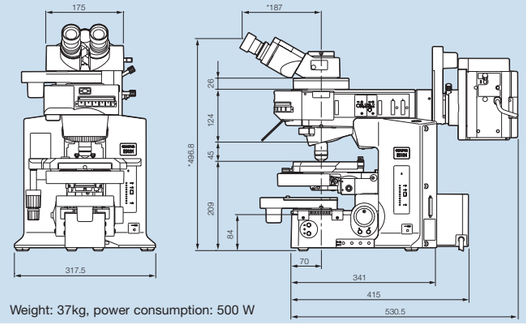
*1 Slight vignetting may occur in the periphery of the field due to the top lens. This occurs in observation only.
*2 U-FWCO 1.25x should be mounted on U-FWT
*3 Optional

BX51 dimensions (in mm)



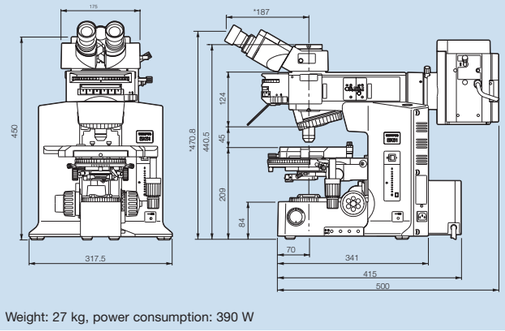
Weight: 18 kg, power consumption: 140 W

BX61 dimensions (in mm)



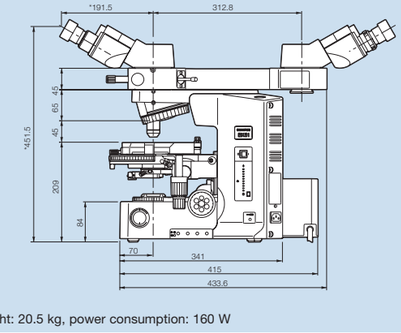
Weight: 37kg, power consumption: 500 W

BX51 + BX-RFA dimensions (in mm)



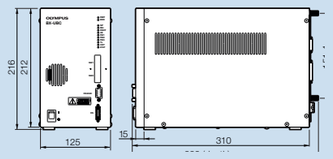
Weight: 27 kg, power consumption: 390 W

BX51 + U-DO3 dimensions (in mm)



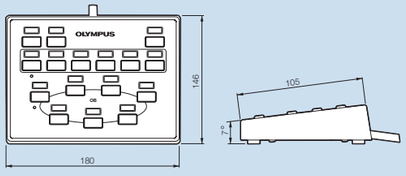
Weight: 20.5 kg, power consumption: 160 W

BX51 + BX-RFA dimensions (in mm)



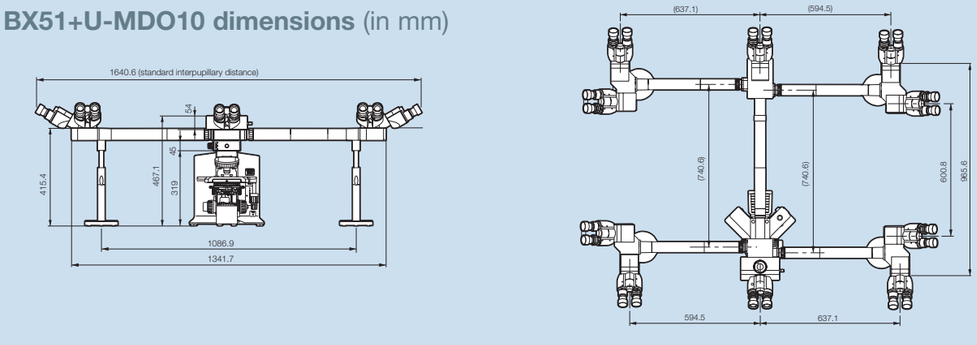
Weight: 5 kg, power consumption: 250 W

BX51 + BX-RFA dimensions (in mm)



Weight: 5 kg, power consumption: 250 W

BX51+U-MDO10 dimensions (in mm)



* This measurement may vary according to the interpupillary distance. The measurements given pertain to a distance of 62 mm.

The manufacturer reserves the right to make technical changes without prior notice.

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