

OLYMPUS

Your Vision, Our Future

Digital Life Science Imaging

cell*

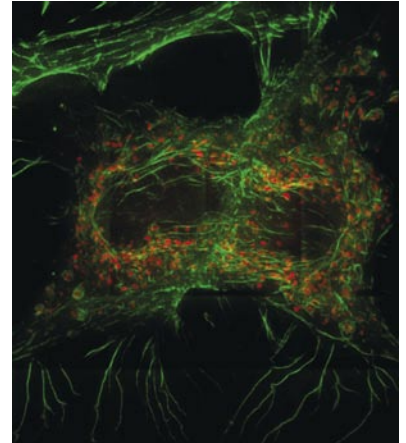
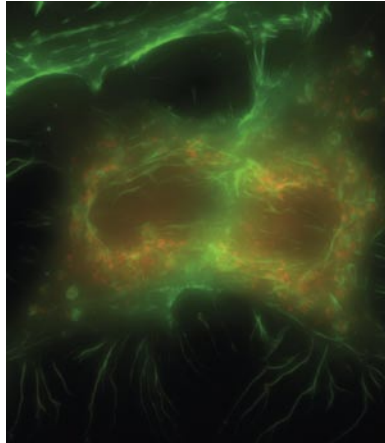
A family of imaging systems

analySIS^B / analySIS^D - Imaging Systems for Life Science



Olympus imaging stations: the **cell*** family

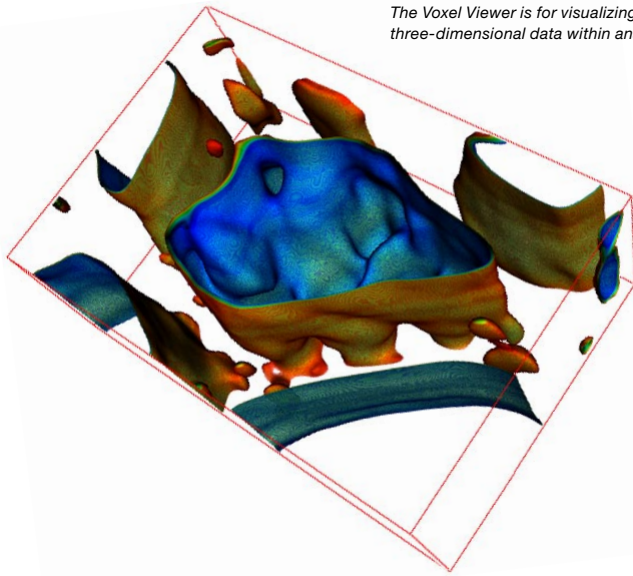
The deconvolution tool removes glare, distortion and blur from fluorescence and bright field microscopy images, thus ensuring higher resolution and greater detail.



Modern bio-medical cell imaging calls for a wide range of microscopic applications. Today's demands cannot be satisfied by one single system. It is Olympus' philosophy to address differing requirements by offering a family of system solutions, each one targeting different purposes: **analySIS^B**, the solid entry-level system, **analySIS^D** for automated processes, **cell^M**, dedicated to live cell imaging, and **cell^R**, the real-time controlled high-end station capable to resolve fast dynamic processes.

Because we provide a complete range of products and services from one source, you save time and expense. From expert consultation and development of system solutions customized for your specific needs, to personal onsite service, we offer a comprehensive package that is second to none.

While others merely talk about it, Olympus has it: flexible integrated systems to meet your individual requirements.



The Voxel Viewer is for visualizing and animating three-dimensional data within *analySIS^B* and *analySIS^D*.



Perfectly attuned and well harmonised

The imaging systems of the Olympus' *cell** family are highly modular and offer a variety of additional options to tune the applicative possibilities to the needs of each user. High-tech optics and opto-mechanics, innovative electronics and hardware control as well as cutting edge software are so skilfully integrated that the final result is equal to far more than just the sum of its parts.

***analySIS^B* – a solid, comprehensive entry-level imaging system for biological microscopy**

analySIS^B including microscope and camera is the basic system for image acquisition and archiving of microscopic images. The *analySIS^B* software controls all hardware, contains all standard image processing and measurement functions as well as a structured database and a comfortable tool for the generation of standardized protocols.

***analySIS^D* – Imaging system for automated processes**

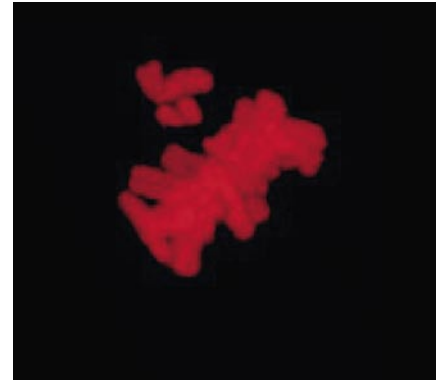
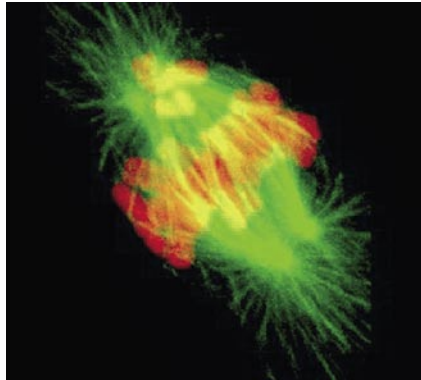
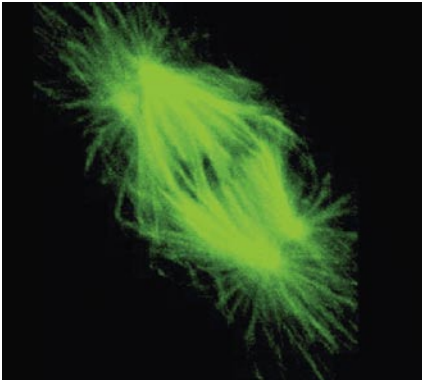
analySIS^D features – in addition to all *analySIS^B* functions – slow time-lapse imaging, automated motorized stage control with multi-well plate screening, out-of-focus haze removal, 3-D image visualization as well as spectral unmixing for enhanced spectral resolution.

Options

Additional software modules further enhance the possibilities of the systems: detection and analysis of morphological changes, tracking of moving objects and 3-D blind deconvolution for high-resolution imaging.

Acquisition

Well-equipped digital microscopes nowadays contain a host of motorized parts in addition to highly sensitive cameras. *analySIS^B* and *analySIS^D* fully control the entire set-up during the experiment to ensure ease-of-use and enable the user to concentrate exclusively on the resulting images.



analySIS^B and *analySIS^D* support the acquisition, display, processing and further analysis of multicoloured fluorescence images.

Convenient and intuitive: microscope and stage control

The scientific Olympus microscopes of the upright BX series and inverted IX series are fully controlled so that all motorized parts such as the objective revolver, fluorescence turret and shutters are smoothly embedded into the experiment workflow. Additional experiment comfort is offered by an auto-focus function. Sharp images are guaranteed.

Perfect images at a click: camera control

A variety of newest-generation high resolution colour cameras as well as highly sensitive monochrome cameras, especially for multi-fluorescence imaging, are supported to allow the perfect match for different types of applications. Numerous online functions and an integrated and automatic exposure control are provided during image acquisition.

***analySIS^D*: Automated stage control**

The integration of motorized stages into automated processes with an intuitive user interface allows the imaging of multi-well plates or of entire cell-cultures far beyond the field-of-view of the camera.

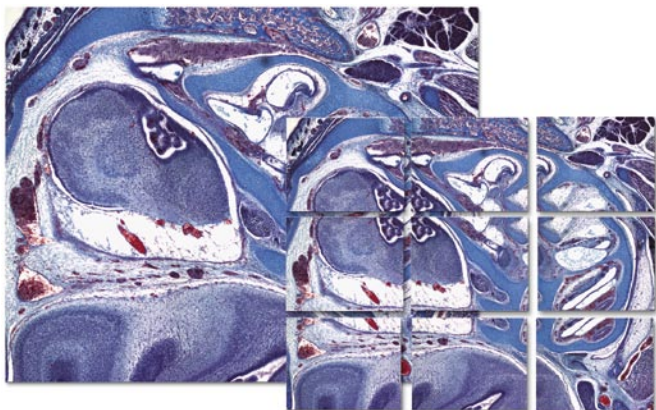
***analySIS^D*: Observation of dynamic processes**

When using time-lapse to help analyse dynamic processes, it is necessary to automate the entire experiment flow, from the interplay of all microscope parts to image acquisition and data archiving. *analySIS^D* makes it possible to create image sequences in multiple dimensions (X, Y, Z, time, multi-channel fluorescence).

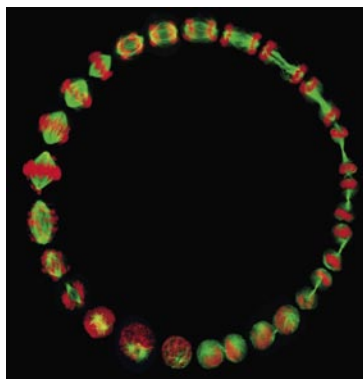
Processing

The *analySIS^B* and *analySIS^D* software packages offer a comprehensive collection of image processing functions for post-acquisitive optimisation of the images.

analySIS^B and *analySIS^D* makes it possible to acquire and montage panorama images in one step.



analySIS^D provides new ways of observing, acquiring, documenting and analysing dynamic processes (slow time-lapse acquisition).



States of mitosis:
Red: DNA with propidium iodide;
Green: microtubules with anti-alpha-tubulin antibody conjugated with Alexa488.

Courtesy of Per Holmfeldt, Martin Gullberg Laboratory, Dept. Molecular Biology, Umea, Sweden.

Nice view

Raw images need a little touching up for optimised display. *analySIS^B* and *analySIS^D* offer routines such as auto-scaling, contrast and brightness adjustment, background and shading correction, filters, false colour display and more.

Coloured beauties: multi-colour fluorescence images

The software is not limited to the red, green and blue channels of standard RGB images. Any number of fluorescence channels can be combined into multi-colour images while access to each individual channel is always maintained. The multi-colour images can additionally be superimposed with transmission images to visualize additional cellular structures.

Panorama views: multiple image alignment (mia)

Especially with high magnification objectives, groups of cells or even single cells may be larger than the field-of-view of the camera. Instead of having to drop back to lower magnification with reduced resolution *analySIS^B* and *analySIS^D* provide "multiple image alignment" to generate large-scale panorama images. Images taken at neighbouring positions with overlapping edges can be stitched together automatically using pattern recognition. This can be done very elegantly with a microscope equipped with a motorized stage.

Sharpness in the Z dimension: extended focal imaging (efi)

analySIS^B and *analySIS^D* circumvent the limited depth of focus of high-magnification microscopy. The software acquires images at different focal levels and extracts the sharpest details from each level and then reassembles all the focused image information into one single, crystal clear image. The specimen surface can be reconstructed in three dimensions.

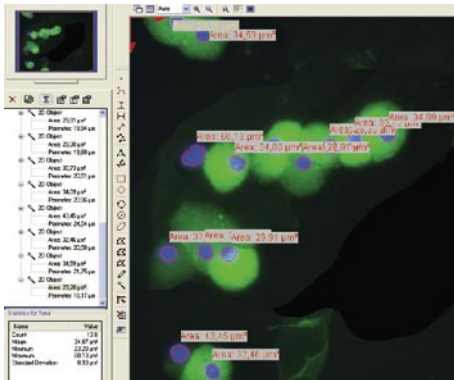
analySIS^D: 3-D Visualisation

Z-sectioning, the acquisition of images at different focal position, is used to image three-dimensional specimens. The *analySIS^D* Slice Viewer generates XZ and YZ slices through the resulting image stacks at interactively variable positions. The Voxel Viewer renders three-dimensional images and iso-surfaces that can be rotated freely. The rotation can be animated as well.

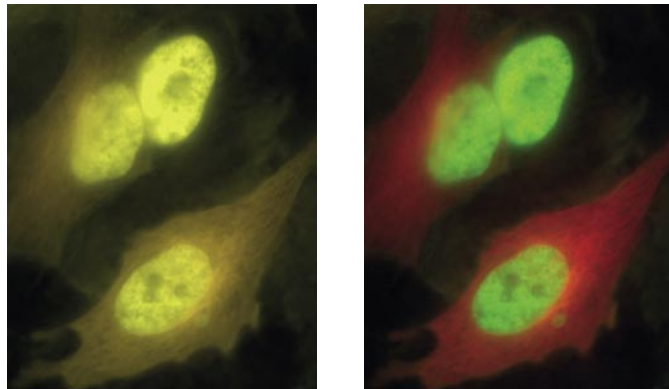
Analysis and refinement

Experimental microscopy goes beyond the acquisition of high-quality images. The analysis tools of *analySIS^B* and *analySIS^D* deliver quantitative results quickly and easily – there is no need to be an image-processing expert. Routine procedures can be automated via macros without the need for any programming knowledge.

The measurement interface provides users with everything they require for measuring various elements within image(s).



Cells with GFP-H2B histone protein and YFP-tubulin before and after spectral unmixing.



Courtesy of Paulo Magalhaes, Tullio Pozzan laboratory, University of Padua, Italy.

How many, how long, how large? Measuring, dimensioning, evaluating

analySIS^B and *analySIS^D* feature a unique measurement environment suitable for interactive measurement tasks and dimensioning. Measurement results can be presented as graphs or sheets and directly screened with regard to mean values, extremes or standard deviation. *analySIS^D* additionally offers *interCept*, a tool for quantitative analyses of the populations of image objects.

Revealing the “impossible“: spectral unmixing – a feature of *analySIS^D*

Overlapping spectral characteristics and fluorescence “bleed-through“ into the “wrong“ colour channel limit the full exploitation of all the numerous fluorescent dyes and ever increasing family of fluorescent proteins in multi-labelled specimens. Linear spectral unmixing results in enhanced chromatic resolution and allows the simultaneous imaging of previously hardly useful fluorochrome

combinations: for example GFP along-side YFP. The spectral redistribution maintains the overall intensity and facilitates quantitative analyses, for example in co-localisation and FRET studies.

Haze removal: deblurring

The spatial resolution of widefield microscopy is limited by out-of-focus blur. The algorithms (no neighbour, nearest neighbour and inverse filter) – implemented in *analySIS^D*, optional for *analySIS^B* – remove stray light from unfocused areas above and below the focus plane and yield images of higher clarity.

Enhanced spatial resolution: 3-D blind deconvolution option

This iterative method redistributes unavoidable out-of-focus information in 3-D image stacks to the layer of origin. The results are clear images with greatly improved resolution and increased contrast: perfect sources for analysis and 3-D reconstruction.

3-D reconstruction option

Biological samples are three-dimensional objects which can be monitored via Z-stack acquisition. The reconstruction tool offers all functions for processing, display and evaluation of three-dimensional images.

Particle analysis option

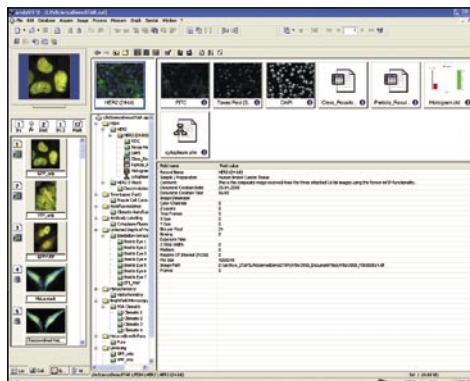
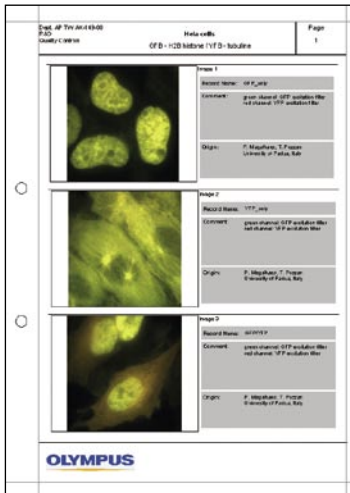
Intensity threshold-based evaluation of image particle provides: particle detection, particle-specific measurements (area, size, shape, location, density and intensity) and evaluation of regions of interest or object classes.

trackIT! option

Time-lapse imaging reveals the mobility of vesicles or entire cells. Moving objects can be detected automatically and tracked over the course of time. The results are presented as movies of object tracks, charts and histograms with characteristics of velocity, indication of direction, path length measurements and distances.

Data handling

In times of digital imaging a single experimental session can easily generate dozens or even hundreds of images and, with automated analyses processes available, a myriad of analytical data with an overall storage demand that may easily move into the Gigabyte range. **analySIS^B** and **analySIS^D** offer quick, systematic and thorough documenting, book keeping and reporting.



One decisive advantage of storing images and other data in a well-structured way and the reporting of results digitally is the tremendous time savings.

Multi-dimensional image handling

All series of acquisitions are saved together with all experimental parameters in a multi-dimensional image format. This means that a single image file can consist of multiple images taken at different points in time at different Z positions, acquired with different excitation wavelengths. Users no longer have to sort through large numbers of individual single images. Navigation through time and Z is intuitive and can be animated well.

Don't seek, find: the structured database

The powerful, integrated image archiving system handles images and all data generated during image processing and documentation: images can be stored along with texts, tables and other graphics as records, which completely document tasks and processing steps. In addition, all routine tasks – from image acquisition to archiving – can be automated via macros.

Perfect presentation: the report generator

The report generator makes creating standard-compliant reports convenient, quick and easy. All elements of the database such as images, sheets and graphs can be inserted into a report automatically or by dragging&dropping following your personal layout design. Completed reports can be exported to MS Word with RTF Export.

Macro Recording

The macro recorder collects all manually performed processing steps in a text document and allows later repetition of all steps at a click of a button. With the embedded text editor these macros can be changed and extended at any time.

analySIS^D: Imaging C

The programming language Imaging C offers advanced users a complete, integrated development environment. This includes a programming library with unrestricted access to the wide range of image acquisition and processing functions. Imaging C consists of a compiler, an interpreter, a macro recorder, a multiple-document (MDI) text editor, a symbol and function browser, and an interactive debugger with single-step processing, conditional breakpoints and a browser for variables and constants.

analySIS^B features

- Motorized microscope control: intuitive software interface
- Cameras: support of various monochrome and colour CCD cameras with automated exposure optimisation (intelligent exposure)
- Automated acquisition and processing of multi-channel fluorescence images
- Multiple image alignment (mia): automated acquisition of large-scale panorama images
- Enhanced focal imaging (efi): depth-of-focus over entire Z-stacks
- Image processing: auto-scaling, false-colour display, filters, arithmetic functions, background and shading correction
- Unique measurement environment that stores results automatically with the images: number, length, angle, area, magic wand etc.
- Archiving: structured database for multi-dimensional data handling (XYZ, time, colour,...); analysis data, statistics, graphs are stored together with the images
- Reporting: flexible generation of standard-compliant reports
- Macro recorder for customized applications and automated functions

analySIS^D features

- All features of analySIS^B, plus
- Stage: intuitive interface for automated processes including standard screening applications using microtiter plates, optionally available for analySIS^B
 - Multi-colour time-lapse imaging (with change of fluorescence filters), optionally available for analySIS^B
 - 3-D time-lapse acquisition, optionally available for analySIS^B
 - Acquisition of movies at full camera speed (no intra-experimental switch of settings possible), optionally available for analySIS^B
 - Deblurring: removal of out-of-focus haze, optionally available for analySIS^B
 - Spectral unmixing for enhanced colour resolution
 - 3-D reconstruction: Slice Viewer and Voxel Viewer for Z-stacks
 - interCept: quantitative analyses of the average image object size
 - Imaging C: a complete, integrated development environment

Optional features

- Particle and object analysis: complete solution for automated particle analysis and classification
- trackIT!: motion analysis software solution for automatically detected objects (analySIS^D only)
- 3-D blind deconvolution: spatial resolution enhancement
- 3-D Reconstruction: processing, display and evaluation of three-dimensional images