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How to Buy...
Microscopy Equipment

ZEISS LSM 880 with Airyscan

ZEISS Microscopy

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How to Buy Microscopy Equipment

If you are looking to invest in microscopy equipment, this essential guide provides you with all the information needed to make the right purchasing decisions. Learn about key factors and application considerations and read impartial user reviews to help you buy with confidence.

Contents

Basic Overview

Microscopy is used across most life sciences disciplines and in academic, clinical and commercial settings. Beyond life sciences, microscopy is a firmly established analysis tool in materials, formulation and information technology.

Microscopy technologies and applications are diverse and progressive. This guide provides an overview of the current techniques involved in microscopy, key features and considerations. However, infrared and FTIR microscopy are not included in this guide, as it is focused primarily on life sciences rather than materials science or IT manufacturing.

Application Considerations

The main consideration for all types of microscopy is the application and what it will involve. Some general considerations may include:

- What samples will you be using and how will you prepare them? Will you be using live cells or fixed cells, whole tissue sections or bacterial cultures? For example, cells can be harvested and then mounted on slides or viewed as a two-dimensional layer of cells across the bottom of a microplate well.
- How often are you going to need to use your microscope and how long will you be using it in each session? This may affect your choice of illumination.
- How many samples are you going to be generating? Pathology labs need a high throughput machine to handle many samples coming in for analysis every day, whereas a research group may need lower throughput and higher specifications.
- What level of detail do you require? Are you going to look at tissue morphology or localization of staining within a cell, or counting yeast or bacteria? If you are looking at bacteria or localization of features/staining within a cell, you will require a much higher magnification than if you are looking at overall tissue morphology.
- Will your samples be unlabeled or labeled? Are you planning to use fluorescent labels?
- Image capture – how many images will you want to generate, do you want to do this digitally? How do you want to use your images – for display and publication only, or do you want to use them for quantitative analysis?

Light Microscopy

Light microscopes are essential analytical laboratory tools that allow scientific investigators to view objects to as much as a thousand times their original size. In its simplest form, the light microscope is composed of a clear lens that magnifies the sample and a light source to illuminate it. However, most light microscopes are much more complex and house numerous fine-tuned lenses with tightly controlled dimensions, all within the body of the microscope itself and in components such as the objectives and eyepieces. See **Table 1** for a summary of the main types of light microscopy instrumentation and technology.

Widefield Microscopy

Stereomicroscopes provide the lowest magnification, particularly useful for whole specimen observation. A good example is the Leica EZ4 HD. For higher magnification and analysis of slide mounted specimens, a standard widefield microscope such as the Olympus SZX16 stereomicroscope, is cost-efficient for more detailed sample information. Most widefield microscopes will offer brightfield as well as darkfield and phase contrast viewing, which offers different contrasts and views of your images.

Unlabeled cells generally provide limited contrast from the background, so good illumination is important. LEDs are now used in the latest models and offer the advantages of no sample heating, low energy consumption and long lifetime.

Table 1: Summary of the main light microscopy instrumentation and technology.

Sub-Category	Techniques	Uses
Transmitted Light	Brightfield	Simple microscopy. Allows limited visualization of unstained samples. Most appropriate for stained samples.
	Darkfield	Well suited for uses involving live and unstained biological samples.
	Phase Contrast	Ideal for the research of unstained living cells during processes such as cell division.
	VAREL Contrast (Variable Relief Contrast)	Ideal for examination of living cells in culture vessels.
	Polarization Contrast	View birefringent crystalline structures without staining. Ideal for plant research.
	Differential Interference Contrast (DIC) (Nomarski)	As an extension of polarization contrast, this is used to enhance the contrast in unstained, transparent samples.
Confocal	Confocal Laser Scanning (CLSM)	Small slices from microscopic samples are generated. Widely used in life sciences.
	True Confocal Scanning (TCS)	One diffraction limited spot is illuminated and observed. Widely used in life sciences.
	Coherent Anti-Stokes Raman Spectroscopy (CARS)	Dye-free method. Images structured by rapid vibrational imaging of living cells.
Fluorescence (uses reflected light)	Super-Resolution Imaging	Fluorescent proteins (e.g. GFP) are used to fluorescence living material.
	Total Internal Reflection Fluorescence (TIRFM)	Sensitive technique which allows for functional investigation in living cells.
	Fluorescence-Lifetime Imaging (FLIM)	Measures the decay rate of fluorescence to give a 'lifetime' signal as opposed to one based on intensity. Used for receptor signaling.
	Fluorescence Correlation Spectroscopy (FCS)	Used to examine the dynamics and concentration of fluorescent molecules in solution.
	Fluorescence Cross-Correlation Spectroscopy (FCCS)	Two independently labeled fluorescent probes are detected

		by two different laser light sources.
	Fluorescence Energy Transfer (FET)	The study of the interaction of chromophores to fluorochrome.
	Fluorescence Recovery After Photobleaching (FRAP)	Observing fluorescence recovery dynamics of a molecule after photobleaching.
	Fluorescence and DIC Combination Microscopy	Helps to minimize the effects of photobleaching by locating a specific area of interest in a specimen using DIC.
	Fluorescence and Phase Contrast Combination Microscopy	This technique limits photobleaching by locating the specific area of interest in a specimen using the technique (phase) then, without relocating the specimen, switching the microscope to fluorescence mode.

Confocal Microscopy

Confocal microscopy, in particular using fluorescent imaging, is now a leading technology for life science microscopy applications. It is an adaptation of light microscopy that offers improved resolution over widefield microscopy. The key to this is the restricted manner in which light reaches the photomultiplier through a pinhole. This restricts the amount of unfocused light that is captured from the sample, increasing the contrast and dramatically increasing the resolution of what you are looking at. There are several different types of confocal microscopy:

- **Fluorescence Confocal Imaging** – used for live cell imaging.
- **Laser Scanning Confocal Microscopy (LSCM)** allows optical sectioning – imaging of thin optical slices down to 500 nanometers from thicker specimens (up to 100 micrometers).
- Advanced confocal imaging techniques include **FLIM**, **FRET**, **FRAP** and **FLIP**, and can be used in association with **TIRF imaging**.

Confocal microscopy offers the ability to control depth of field, elimination or reduction of background information, and the capability to collect sections from specimens that thicker. The signal-to-noise ratio is significantly improved over widefield microscopy, and it can be used with both live and fixed specimens, allowing the possibility to produce 3D images of cellular structures.

Upright vs. Inverted Microscope?

More inverted microscopes are being developed and made available in the marketplace as applications become more advanced. Uprights are still the best choice for some applications, such as analyzing zebrafish embryos or stained tissue sections but for most existing and emerging cellular imaging applications, the inverted microscope is favored.

Fluorescence Imaging

The trade-off for improving resolution by restricting the light detection is a reduction in sample brightness. Therefore, with confocal microscopy, one or more fluorescent labels are typically employed to highlight structures of interest and improve contrast within a specimen. Even greater contrast and differentiation can be achieved when multiple fluorescent labels are used for different structures.

The use of fluorescence in microscopy enables more specific analysis of a specimen. Cells and tissues can be stained or labeled with one or more dyes, to allow complex visualization of structures, such as nuclei or proteins. For example, DRAQ5™ is a selective nuclear stain, while DRAQ7™ selectively stains dead, dying and apoptotic cells, see **Figure 1** for further details. GFP (Green Fluorescent Protein) or firefly luciferase can be expressed within cells, fused to a protein of interest, giving ready labeled specimens for imaging. Likewise, immunofluorescence uses fluorescently labeled antibodies to target structures of interest.

Figure 1: Learn more about DRAQ5 and DRAQ7 cell labeling in this video

A wide range of dyes are available for fluorescence imaging. The key to each is what filter or activation is required to visualize the dye and how many filters and channels are available on your microscope. Excitation and emission spectra of the fluorescent label must be matched with the light source; the correct excitation and emission filters and dichroic mirrors are required to get a good signal from your samples.

Fluorescent labels vary in signal strength and in the amount of background fluorescence. If a sample is to be viewed for a long time, e.g. for live imaging and tracking of cellular events, photobleaching of the fluorophore needs to be addressed; this may affect your label choice. Consider your application too, for live cell assays, fluorescent probes need to be cell membrane permeable to assess structure and function within the cell.

Multiple labels can be used to label the same sample, often co-localizing on the same part of the sample. You need to make sure you select a microscope that allows you to visualize your palette of labels. You need to consider how many labels you are going to want to use and make sure the microscope can accommodate any current dyes you are using and any you plan to make use of in the future.

The key for microscope selection here, is making sure your instrument carries the necessary filters and number of channels to detect whichever dyes you plan to use. Some microscopes are limited to one or two detection channels, more and more are now offering five, ten or more.

Active Illumination (AL) solutions can be used alongside particular microscopy techniques, such as fluorescence microscopy. They are used in photoactivation (e.g. with fluorescent proteins), FRAP and marking, among other uses. Spinning disk and Sweptfield confocal systems are ideal for the imaging of high-speed intracellular events such as calcium ion dynamics.

Confocal Laser Scanning Microscopy

A confocal laser scanning microscope scans a sample sequentially point by point or multiple points at once. The pixel information is assembled into an image. This follows on from confocal microscopy to allow the user to acquire sophisticated 3D images of their sample, or individual structures within their sample. At any one focal position, a confocal laser scanning microscope can acquire multiple images over a selection of different depths and then combine these to make a 3D composite image, a technique called optical sectioning

Figure 2: Learn more about the ZEISS LSM 880 with Airyscan in this video

The LSM 880 with Airyscan from ZEISS enables fast, sensitive, superresolution confocal imaging of live or fixed samples, to enable imaging of the smallest structures, the weakest signals or tracking of fast processes, see **Figure 2** for more information. Read this interview with Dr Ben Prosser to discover how the LSM 880 with Airyscan enabled him to image beating heart cells, in real-time. The Airyscan module allows more photons to be captured by imaging on to a specially shaped array of 32 optimally arranged single detector elements, from which the signals are reassembled, creating an overall image with increased signal-to-noise ratio and resolution. The addition of the new Fast Acquisition mode, described in this free download, enables even faster imaging and is ideal for imaging transient events.

Other excellent examples of LSCM units are the Leica TCS SP8, the Nikon A1R MP+ Multiphoton Confocal Microscope and the new Olympus FV3000 LSCM.

Live Cell Imaging

Live cell imaging allows groundbreaking studies to be carried out, producing images and real-time tracking of even the most subtle of cellular process and changes. Microscopy with live cell imaging is now a commonplace technology for many life sciences applications, including signaling studies, cell culturing and developmental biology; many fluorescence and confocal microscopes now offer live cell imaging capabilities.

In live cell imaging, the primary considerations are signal-to-noise, image acquisition speed and specimen viability. You require the right environmental conditions, such as temperature and CO_2/O_2, for your samples so they remain viable for imaging.

Long periods of exposure will negatively affect the viability of live samples (phototoxicity) and can also cause photobleaching. For live cell imaging applications, a low power illumination is desirable. The BioTek Cytation™ 5, winner of the Scientists' Choice Award® for Best New Life Sciences Product of 2015, is designed for live cell imaging. As well as a standard system for live cell imaging (CO_2/O_2 control, shaking incubation to 65 °C for cell-based and other assays), the Cytation™ 5 combines high resolution digital fluorescence microscopy with a plate reader in a single instrument, which simultaneously enables high-quality cellular imaging with well-based quantitative data collection, see **Figure 3** for more information.

Figure 3: Learn more about the Cytation™ 5 in this video

Live cell imaging systems are particularly suited to the analysis of 3D cell cultures. Other live cell imaging platforms include the new CellASIC® ONIX2 Microfluidic system from MilliporeSigma and the IncuCyte ZOOM™ from Essen BioScience.

Total Internal Reflection Fluorescence Microscopy (TIRFM)

This highly sensitive technique allows you to perform functional investigations in living cells. It only images structures within a very thin layer as it uses total internal reflection to illuminate cells contacting a surface and only produces a very narrow excitation depth.

Because the illumination is so focused, TIRFM allows very high resolution 2D images, down to less than 200 nm. This is therefore not a high-throughput technique but one for analyzing very specific, small cellular events at the surface. TIRFM is the method of choice to visualize single molecules in living cells, in particular fluorescent molecules located at cell adhesion sites, cell membranes and membrane proximal cytoplasmic organelles. TIRF microscopy systems are now commercially available from many microscope suppliers, including ZEISS, Leica and Olympus.

Electron Microscopy

Table 2: Electron and Scanning Microscopy Categories

Category	Sub-Category	Description
Transmission Electron Microscopy (TEM)		Passes energetic electrons through the sample. Electron beam passes through thin slice of specimen. Resolution limit approx 0.05 nanometers. Able to distinguish surface features, shape, size and structure.
Scanning Electron Microscopy (SEM)		Investigates the surface of bulk objects by scanning the surface with a fine electron beam. A 3D view is obtained giving surface detail of specimens. Resolution limit is approx 0.4 nanometers. The preparation of samples can result in the production of artifacts.
Reflection Electron Microscopy (REM)		A combination of imaging, diffraction, and spectroscopy techniques. Applicable to metal, semiconductor, and ceramic surfaces.
Scanning Probe Microscopy (SPM)		Scans several images of interactions simultaneously using various probes. The resolution varies depending upon the probe and technique used. Some high resolution techniques have resolution to a precise atomic level.
	Atomic Force Microscopy (AFM)	High resolution type of SPM. Resolution is in the nanometer range. Ideal for imaging, measuring and manipulation at the nanoscale. There are many types: - Contact AFM - Non-Contact AFM - Dynamic Contact AFM - Tapping AFM
	Scanning Tunneling Microscopy (STM)	Images surfaces at the atomic scale. Can be used in ultra-high vacuum, air, water, and other liquid or gas ambient states.
	Ultrasonic Force Microscopy (UFM)	Gives detail and image contrast of flat areas of interest.
	Photonic Force Microscopy (PFM)	High precision technique measuring scattered light and orientation of a particle.

Other less common types of SPM include:
Ballistic Electron Emission Microscopy (BEEM), Chemical Force Microscopy (CFM), Conductive Atomic Force Microscopy (C-AFM), Electrochemical Scanning Tunneling Microscope (ECSTM), Electrostatic Force Microscopy (EFM), Fluidic Force Microscope (FluidFM), Force Modulation Microscopy (FMM), Feature-Oriented Scanning Probe Microscopy (FOSPM), Kelvin Probe Force Microscopy (KPFM), Magnetic Force Microscopy (MFM), Magnetic Resonance Force Microscopy (MRFM), Near-field Scanning Optical Microscopy (NSOM or Scanning Near-field Optical Microscopy, SNOM), Piezoresponse Force Microscopy (PFM), Photothermal Microspectroscopy/Microscopy (PTMS), Scanning Capacitance Microscopy (SCM), Scanning Electrochemical Microscopy (SECM), Scanning Gate Microscopy (SGM), Scanning Hall Probe Microscopy (SHPM), Scanning Ion-Conductance Microscopy (SICM), Spin Polarized Scanning Tunneling Microscopy (SPSM), Scanning Spreading Resistance Microscopy (SSRM), Scanning Thermal Microscopy (SThM), Scanning Tunneling Potentiometry (STP), Scanning Voltage Microscopy (SVM), Synchrotron X-ray Scanning Tunneling Microscopy (SXSTM).

Transmission Electron Microscopy (TEM)
Transmission Electron Microscopy (TEM) produces high quality and detailed images by passing electrons though a thin section of sample; for instance, it can be used to view details of mitochondria in cells. TEM can also provide information on element and compound structure. **Figure 4** shows the structure of a TEM.

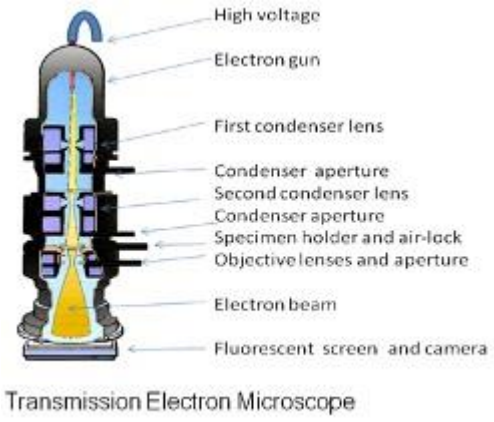


Figure 4: Structure of a transmission electron microscope

Electron microscopes can be coupled with standard imaging equipment such as CCD and EMCCD. Software correction of spherical aberration in TEM has allowed the production of images with sufficient resolution to show carbon atoms in diamond separated by only 0.089 nm, and atoms in silicon at 0.078 nm at magnifications of 50 million times. The ability to determine the positions of atoms within materials has made the TEM an indispensable tool for nano-technologies research and development in many fields, including heterogeneous catalysis and the development of semiconductor devices for electronics and photonics. Within life sciences, it is still mainly the specimen preparation that limits the resolution of what we can see in the electron microscope, rather than the microscope itself.

Sample preparation can be quite time consuming, with risks of introducing artifacts. CryoSEM avoids complex preparation and can be useful when studying samples containing water/moisture, such as botanicals and food stuffs. However, it has limitations such as sample shrinkage. Consider the different

brands, as each one has a different mechanism, varying accessories (add-ons) and optics. Also consider the microscope's capability to be automatically controlled using included software, rather than by manual control of functionality such as zooming, which often requires a specialist. The Titan™ - Transmission Electron Microscope by FEI is a good example of a versatile scanning/transmission electron microscope (S/TEM).

Scanning Electron Microscopy (SEM)

SEM produces 3D images that give information on morphological and topographical details and basic surface characterization, such as surface study of plant pollen, stem and root systems. A focused ion beam system (FIB) is a tool that has a high degree of accuracy and can be used to reveal artifacts below the surface in materials and devices. DualBeam (FIB/SEM) systems are the preferred solution for 3D microscopy.

Nikon's JCM-6000 Neoscope™ Scanning Electron Microscope is an affordable benchtop SEM, ideal for advanced and versatile imaging. The non-destructive nature of X-Ray Microscopy (XRM) allows for multi-length scale or multi-modal imaging of the same sample for vital analysis of hierarchical structures. 3D imaging can be achieved through high contrast and submicron resolution imaging, even for relatively large samples. The capability of excited X-ray fluorescence can be integrated into an existing SEM system such as in the ZEISS EVO 18 SEM (**Figure 5**).

Figure 5: ZEISS EVO 18 Scanning Electron Microscope

Atomic Force Microscopy (AFM)

AFM is a method of scanning that can see details at the fraction of a nanometer level. Using a combination of AFM with synchrotron radiation microscopy and AFM, scientists in Italy have been able to map vital elements in a single cancer cell. This multimodal approach provides molar concentration, cell density, mass and volume of carbon, nitrogen, oxygen, sodium and magnesium.

Electron Detectors

The capabilities of an electron microscope are dependent upon which detectors it accommodates. Most electron microscopes can house a variety of detectors. For instance, SEM detectors are designed to detect secondary electrons that are emitted from the sample surface as a result of excitation from the primary beam. If you want a multi-purpose electron microscope, ensure the detector is suitable for multiple applications or easily changeable as required.

A Low kV Performance

How does the microscope's electron optical performance operate at low voltages? Some electron microscopes have a high resolution at as little as 1 kV. However, high resolution at low voltages may not be important. Surface sensitive imaging with high material contrast is better guaranteed with lower voltages of acceleration. The lower voltage prevents beam penetration into the sample.

Electron Microscope Placement

The room space and environment of the room is of great consideration in electron microscopy, especially for a TEM. Room considerations and requirements are:

- Vibration dampening
- Dimming lights
- High voltage access
- Electromagnetic shielding
- Air movement control and cleanliness, using aircon and vacuum pumps
- Separate sample preparation room

Often a company engineer will make a site visit to assess a room's suitability.

Correlative Light and Electron Microscopy

Recently there has been a drive to combine the best parts of light and electron microscopy. Here are some examples of these technologies combined into one piece of equipment:

- The AFM and Raman Imaging Combination alpha300 RA from WITEC allows the acquisition of Raman images from chemical investigations to be linked to the AFM topographic information from the same sample area.
- A combination of focused ion beam system (FIB) and a mass spectrometer (secondary ion mass spectrometer) has recently been developed by TESCAN. This allows the chemistry of surfaces to be analyzed as the FIB removes material.
- ZEISS ZEN Correlative Array Tomography is a software module that enables automatic imaging of hundreds of sections across length scales and combines them into one single correlative volume data set, for light & electron microscopy, see **Figure 6**.

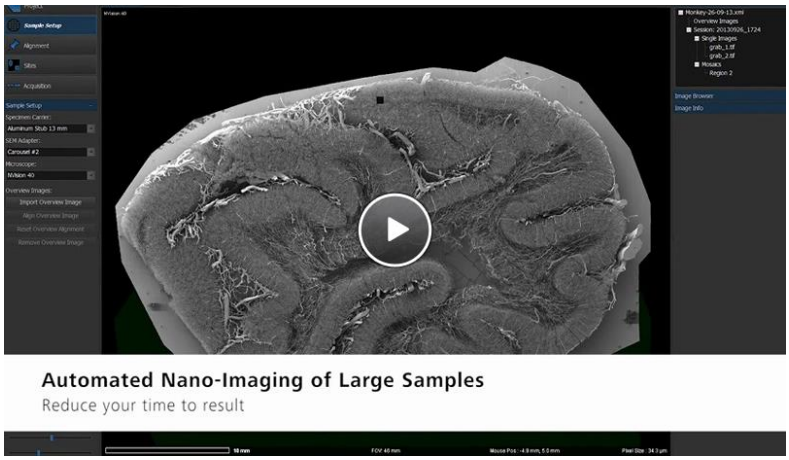


Figure 6: Watch the video to find out more about correlative microscopy with ZEISS ZEN

Watch this presentation to hear Dr Peter O'Toole, Director of the Bioscience Technology Facility, Head of Imaging and Cytometry Laboratory at the University of York, discuss the benefits of microscopy for biologists. Dr O'Toole discusses innovations in and applications of superresolution microscopy, 3D imaging and correlative microscopy.

Imaging and Analysis

Digital image capture and analysis has now largely overtaken earlier imaging methods. Digital cameras and imagers enable the user to take images or videos of the substance or structure being analyzed direct from the microscope. Cameras for microscopy, namely CCD and EMCCD and CMOS, are available. There is a wide range of such cameras available and further details can be found in the SelectScience Microscopy Camera section, with independent user reviews to help you compare and select the best camera for your needs.

For digital microscopy, it is important to consider what data you want to get from your sample. Whether you require only qualitative images for display or more detailed images for quantitation will determine the imaging and software specifications that you need. Digital microscopy and sophisticated imaging software are available that enable image stitching and 3D image stacking, which can be used to make montages and composite images.

Microscope analysis software is available from many manufacturers and again will vary depending on the application. Check that any software you obtain is compatible with the instrument(s) you are using. You can find a great deal of information about software products in the SelectScience Microscopy Software, again featuring independent reviews to guide you.

Consider where you will be publishing your photomicrographs, if at all: will they be used in high quality publications or posters? If not, does your laboratory actually require the large file size and image detail of some high performance cameras? The number of megapixels on a camera generally equates to how big you can enlarge the image without losing quality; if you will not be using large images then perhaps the quality and size of the camera sensor may be of higher importance to you.

Note: Cost has not been covered in this guide. However, in every laboratory it is an important consideration. Do negotiate on cost, extra features/equipment/software or after sales service/training. Also, do approach more than one manufacturer for quotes.

The Future of Microscopy

Light Sheet Fluorescence Microscopy

Ten years of development in light-sheet microscopy have led to spectacular demonstrations of its capabilities. The technology is ready for mainstream use to help biologists in tackling scientific problems. Its key features are low phototoxicity and high speed imaging, allowing gentle imaging of biological samples with high resolution in 3D and over long periods of time. Instead of illuminating or scanning the whole sample through the imaging objective, as in wide-field or confocal microscopy, one illuminates the sample from the side with a thin (practically 2D) plane or sheet of light. The emitted fluorescence is then detected from above or below the sample, along an axis perpendicular to the light sheet. Light-sheet fluorescence microscopy has recently been used to image living hearts and functioning brains and to track moving cells within developing embryos. The ZEISS Lightsheet Z.1 brings light sheet fluorescent technology to the marketplace.

Advanced Imaging and Analysis Software

The evolution of more powerful imaging and analysis software will bring the biggest advances in microscopic research in the short term. Microscopes now have the capability to produce thousands of images of incredible spatio-temporal resolution and complexity, with a massive increase in the

quality and mount of data that can be detected and elucidated the challenge is to interpret as much out of it as possible. Software to handle all the images and tracking are also now needed to detect patterns and sequences from huge numbers of images. Organizing and making sense of spatio-temporal images and data is the next biggest challenge, as researchers push to track and observe activity and development not just within cells but multicellular structures, model organisms such as zebrafish and nematodes.

Extending the Spectrum of Fluorescent Labeling

Brainbow is a genetic cell-labeling technique where hundreds of different hues can be generated by stochastic and combinatorial expression of a few spectrally distinct fluorescent proteins. Unique color profiles can be used as cellular identification tags for multiple applications such as tracing axons through the nervous system, following individual cells during development, or analyzing cell lineage. In recent years, Brainbow and other combinatorial expression strategies have expanded from the mouse nervous system to other model organisms and a wide variety of tissues.

***In Vivo* Imaging of Tumors**

This allows researchers to understand the subtleties of aberrant cell division using quantitative intravital microscopy. Currently, this is being achieved by researchers by manual annotation of select image events. It is now possible to combine image analysis with machine learning methods for automated 3D segmentation and cell cycle monitoring of individual cell nuclei within complex tumor environments.

Optical Projection Tomography at the UCL Centre for Advanced Biomedical Imaging (CABI)

Optical Projection Tomography (OPT) is a new technique for 3D imaging large biological samples (of the order of 1 cubic centimeter). OPT is a novel and exciting technology and represents the next generation of optical microscopy. It is particularly suited to study fundamental biological processes using light emitted from inside the organ, via optical fluorescence. The main advantage of this new imaging modality is that it avoids the need to physically section the sample. Furthermore, OPT is able to take advantage of fluorescent dyes, and three different wavelength channels can be used. This allows the observation of the autofluorescence of the tissue (to inform on tissue structure), alongside the mapping of gene and protein expression. The principle aim of the group is to use the OPT scanner installed in CABI for cancer research, using particular fluorophores to stain tumors and study their vasculature.

Quantum Entanglement

Shigeki Takeuchi and his team in Japan have created a microscope that uses quantum entanglement to increase its sensitivity. In their Nature Communications paper, they describe how they generated ‘entangled’ photons by converting a laser beam and special nonlinear crystals to achieve the superposition of the photons’ polarization states. The polarization states in this case were horizontal and vertical and were considered as ‘entangled’, and an action on one of them should affect the other, regardless of the distance between them. This new research is especially important for applications in the investigation of transparent samples such as biological tissues and, in particular, living cells.

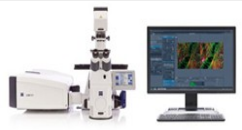
Summary

There are many different types of microscopy instruments on the market and finding the correct one for your application may seem daunting but by applying a few simple considerations, selecting the right microscopy tool for your research can be made an easier task.

Microscopy equipment will continue to develop and new technologies will emerge. Visit the SelectScience product directory to find out about the latest microscopy instruments from leading manufacturers and read user reviews. Use the SelectScience application note library to keep up-to-date with the latest methods.

Editor's Picks

ZEISS LSM 880 with Airyscan (ZEISS Microscopy)



“Perfect resolution, high quality, correct price and good sales care.”

Christian Turato,
University of Padova

View online

Cytation 5 Cell Imaging Multi-Mode Reader (BioTek Instruments, Inc.)

"Excellent instrument, cannot go back without it.”

Preeti Bharaj,
University of Texas Medical Branch, Galveston

View online

IncuCyte ZOOM™ Continuous Live-Cell Imaging System (Essen BioScience)

"Varied applications, reproducible results and great customer support!"

Neetha Parameswaran,
Case Western Reserve University

View online

Leica DMi8 (Leica Microsystems)

"Clear imaging capability with reliable results.”

Melvin Rouse,
UC San Diego

View online

JCM-6000 Neoscope™ Scanning Electron Microscope (Nikon Instruments Europe)

“Can't do work without this! It is phenomenal.”

Rob Marmion,
Rutgers University

View online

SZX16 Stereo Microscope (OLYMPUS EUROPA SE & CO. KG)

“No other scope setup gives this high quality of wide-field + high resolution views.”

Katherine Davoli,
University of Pittsburgh

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