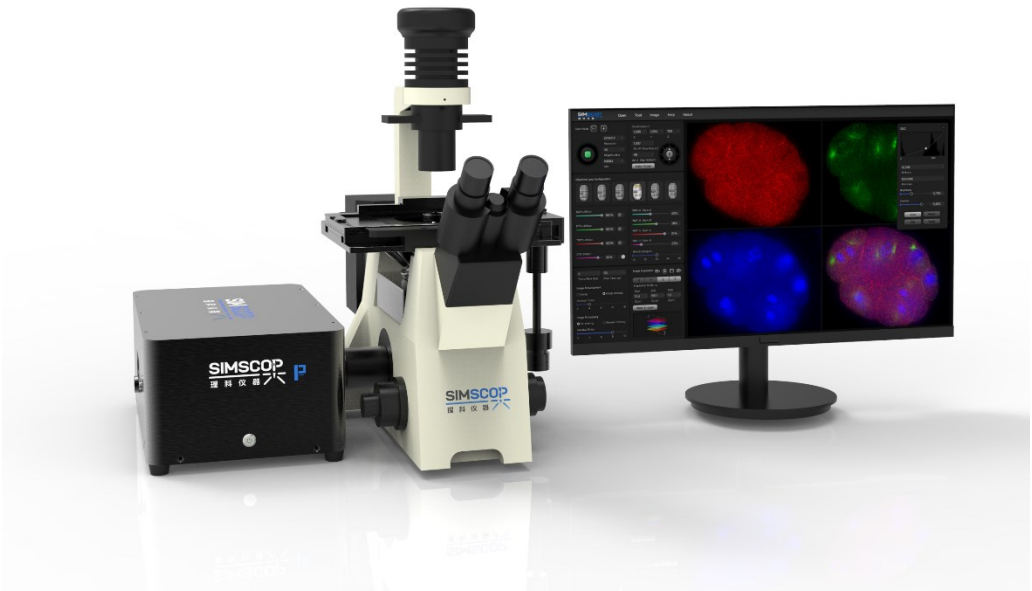
SIMTRUM

Laser Scanning Confocal Microscope

SIMSCOP P Series



2022 V3

For customized projects please Contact us:

info@simtrum.com

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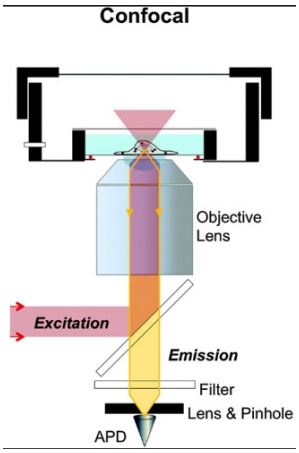
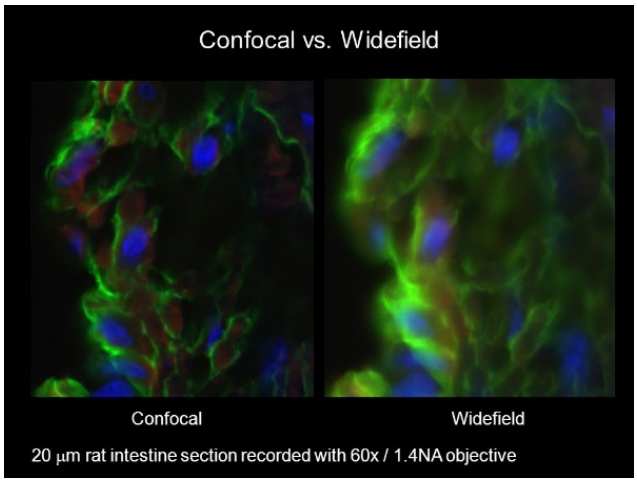
Principle of Laser Scanning Confocal Microscope

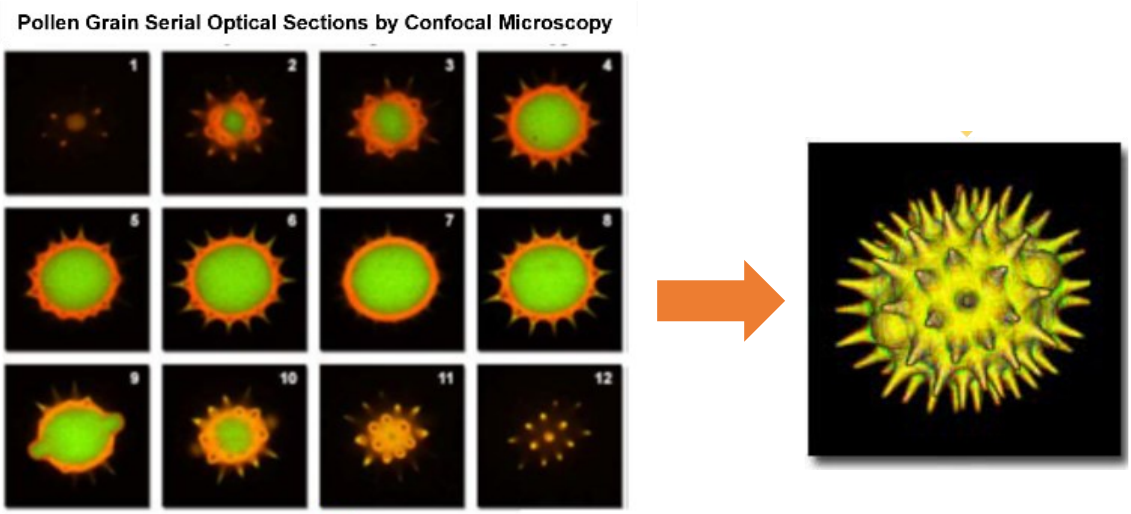
- The specimen is imaged one pixel at a time
- Excitation light is focused into a PSF-sized spot in the sample
- This is then scanned across the sample by a galvo scan mirror
- A pinhole at the focal point rejects out-of-focus emission light





Confocal Microscopy offers several advantages over conventional Widefield Optical Microscopy

- Control the depth of focus to reduce background information from the focal plane
- Imaging the depth of the thick specimen
- Spatial filtering techniques to eliminate out-of-focus light or glare in specimens
- …



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SIMSCOP Series Laser Scanning Confocal Microscope

Confocal Microscopy is an optical imaging technique for increasing the Optical Resolution and Contrast of a Micrograph by using a Spatial Pinhole to block out-of-focus light in image formation. Capturing multiple two-dimensional images at different depths in a specimen enables the reconstruction of three-dimensional imaging.

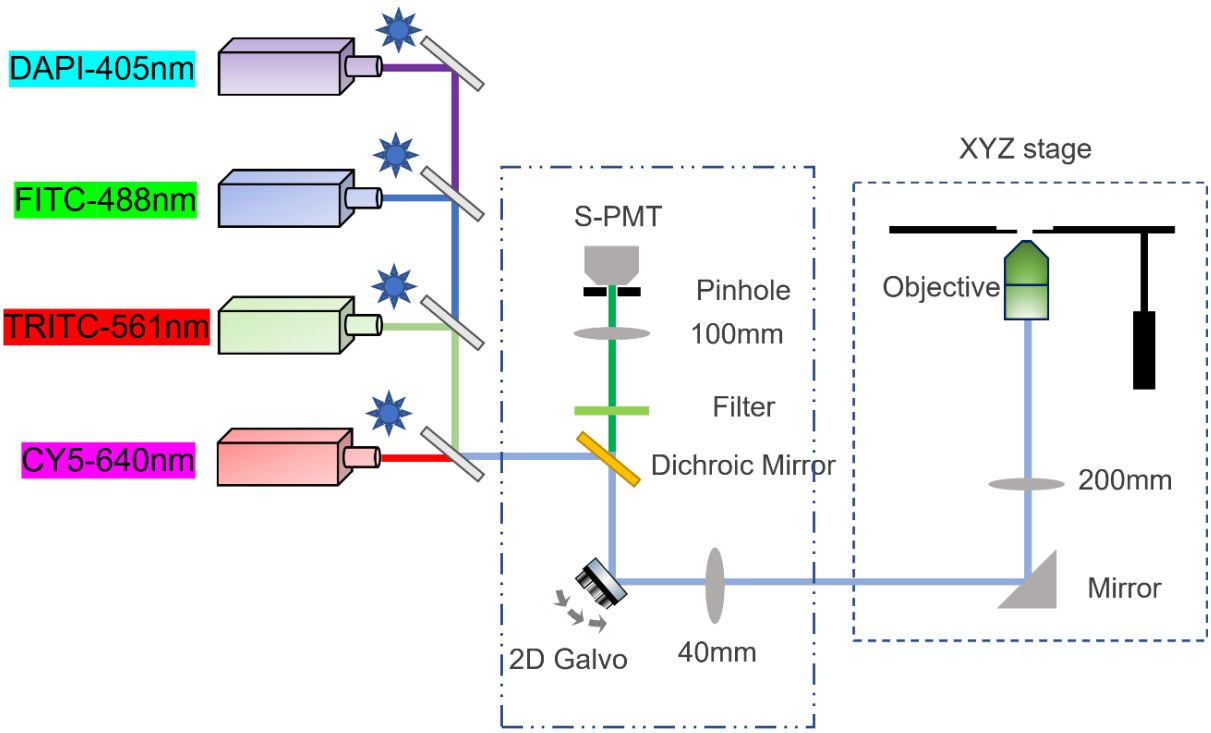
This technology is widely adopted in scientific and industrial, for life science, material, or semiconductor inspection. However, the cost of the mature commercialized system is usually very high.

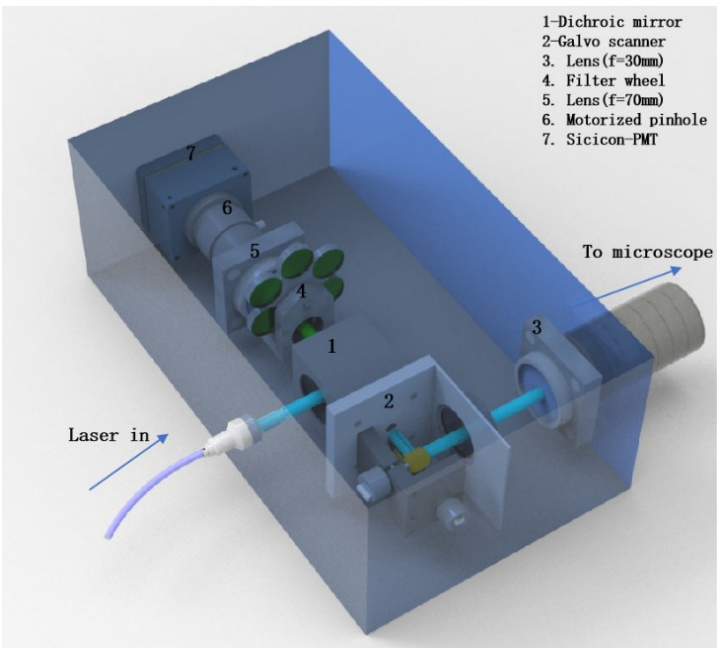
SIMTRUM sees the needs of the customer to have a robust confocal microscope system with reasonable cost, Our SIMSCOP Series offers a great balance between functionality, cost, and flexibility.

Key Advantage

- Professional software UI with great features for imaging analysis
- Single or Multi laser Channel, laser power control accuracy up to 0.01%,
- Silicon PMT detector enabling higher photon dynamic range and less noise.
- Support high-speed scanning: 30fps@512x512 Pixels(Resonant scanner)
- Compact Modular design, able to adapt to most microscope system
- Multiple upgrade options for future capability expansion with low cost

Confocal Optical Layout





Confocal Unit Optical Layout

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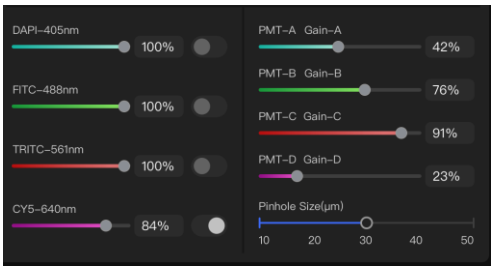
Professional Software UI Design

SIMSCOP P Series Confocal Microscope Software Key Features

Functional GUI Panel



Easy-to-recognize display for setting lasers, detectors, etc.

Camera parameter settings

Image processing & deconvolution

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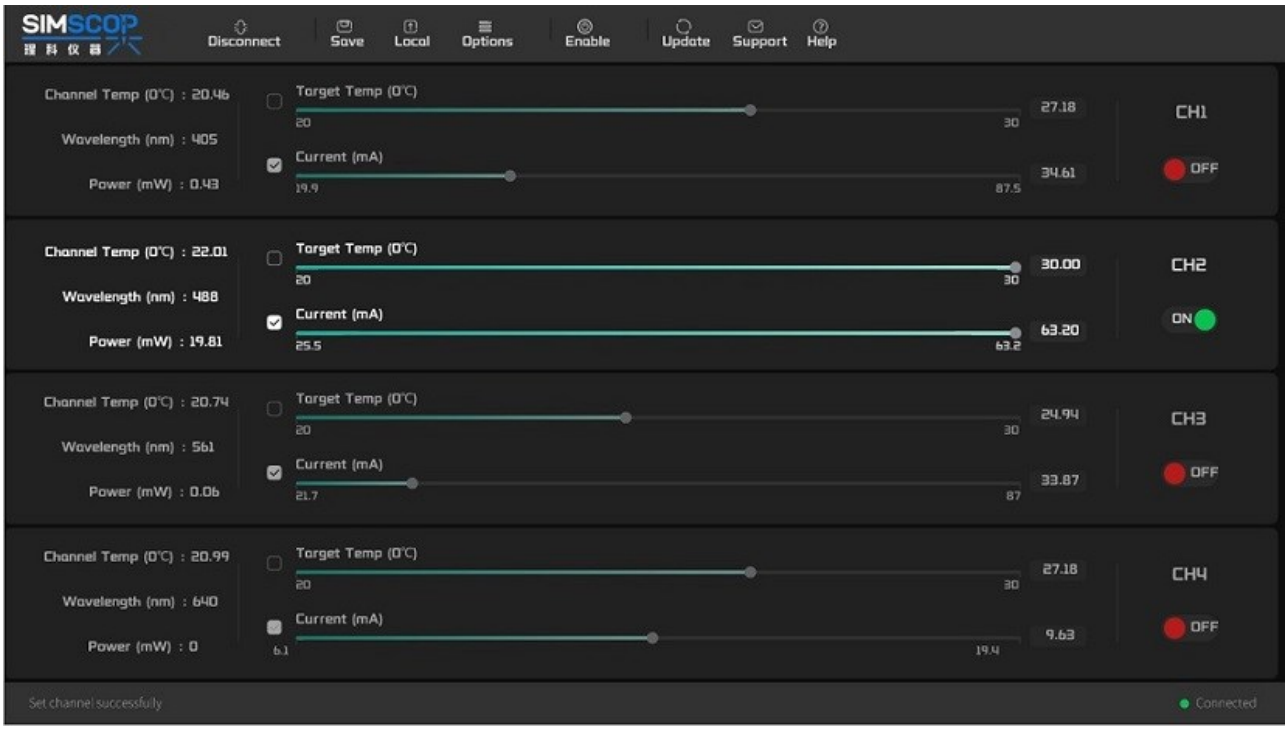
Professional Software UI Design

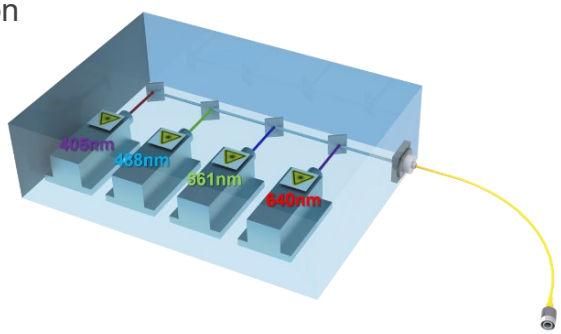


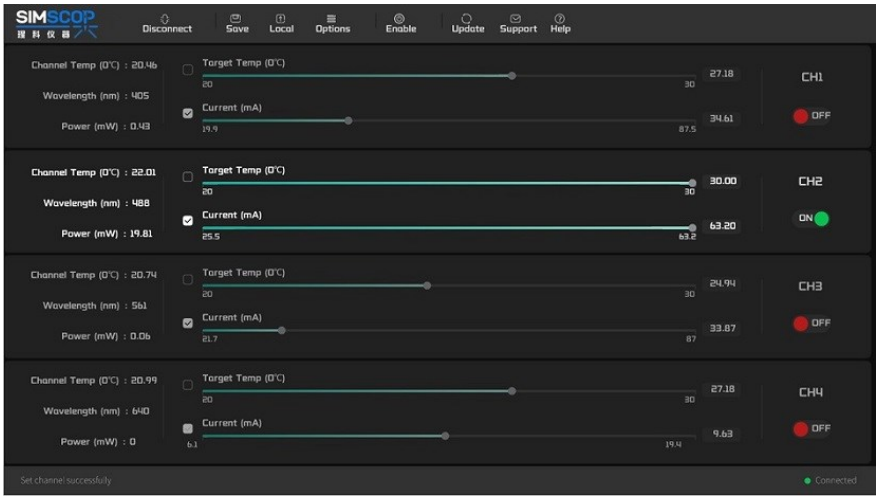
Laser Control Panel

Image Processing & Deconvolution

High Sensitivity Four Channel Laser + Control System

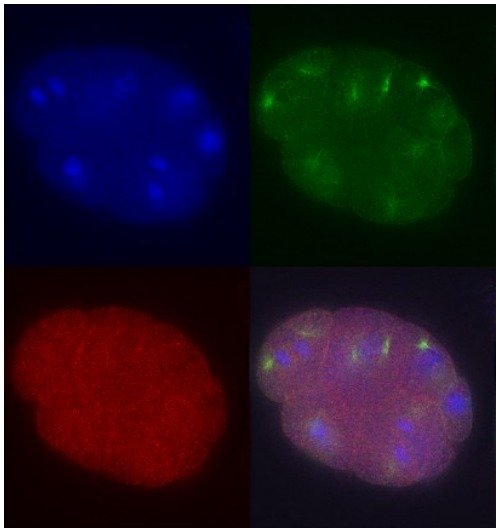
- Equipped with a 4-Channel diode laser and control PCB board to realize the **High-speed Low-cost** independent adjustment of each laser channel,
- Laser intensity adjustment accuracy of 0.01%.
- TTL / Analog modulation





High-Speed Imaging

- Simultaneous preview of multiple fluorescent channels



C. Elegans embryo images with three channels
(DAPI: 477nm; FITC: 542nm, CY3: 654nm)

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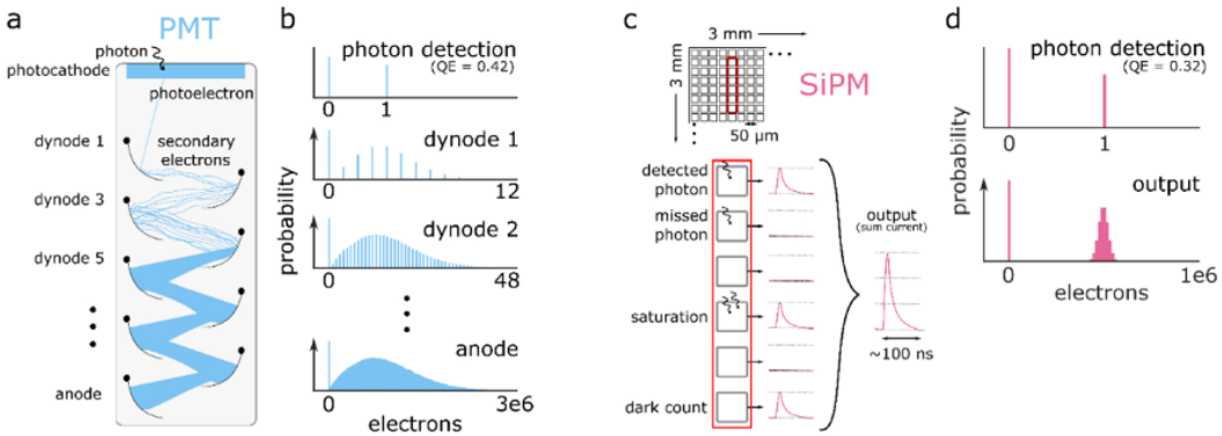
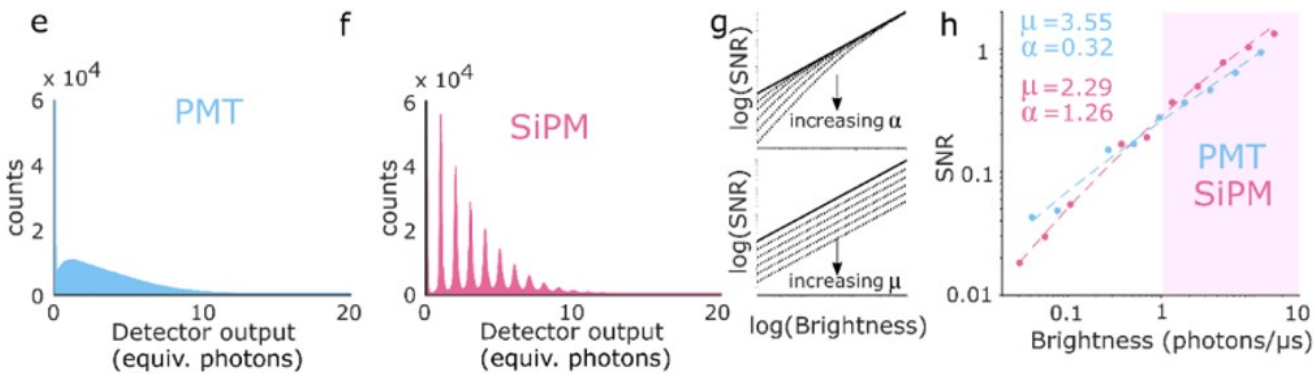
Silicon PMT Detector Enabling Higher QE and Less Noise

SIMSCOP CM Series confocal microscope equipment with SiPM Detector

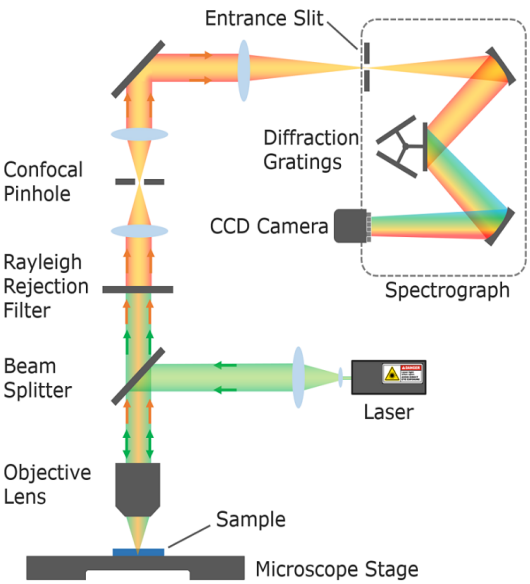
- Low-voltage operation
- Long operating life,
- Wider dynamic range
- Insensitivity to magnetic field
- Suitable for High-speed and High-SNR imaging

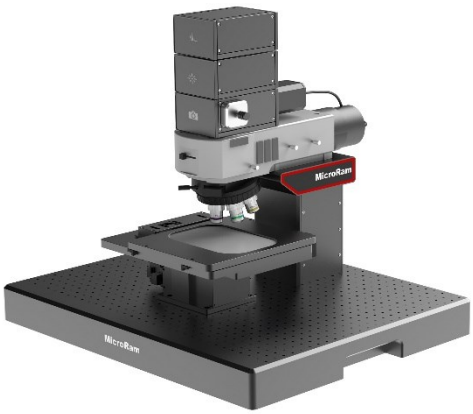


Silicon photomultipliers (SiPMs) consist of an array of SPADs fabricated on a shared substrate, with outputs into a shared readout channel (c). Each element acts as an all-or-none photon detector that produces a pulse of stereotypic height with low variability (d). Pulses from all elements sum to form the SiPM output. A large number of elements in the array (>1000) allows many photons to be detected simultaneously without saturation and enable large active areas compatible with large-etendue objectives.



System Upgrade Options



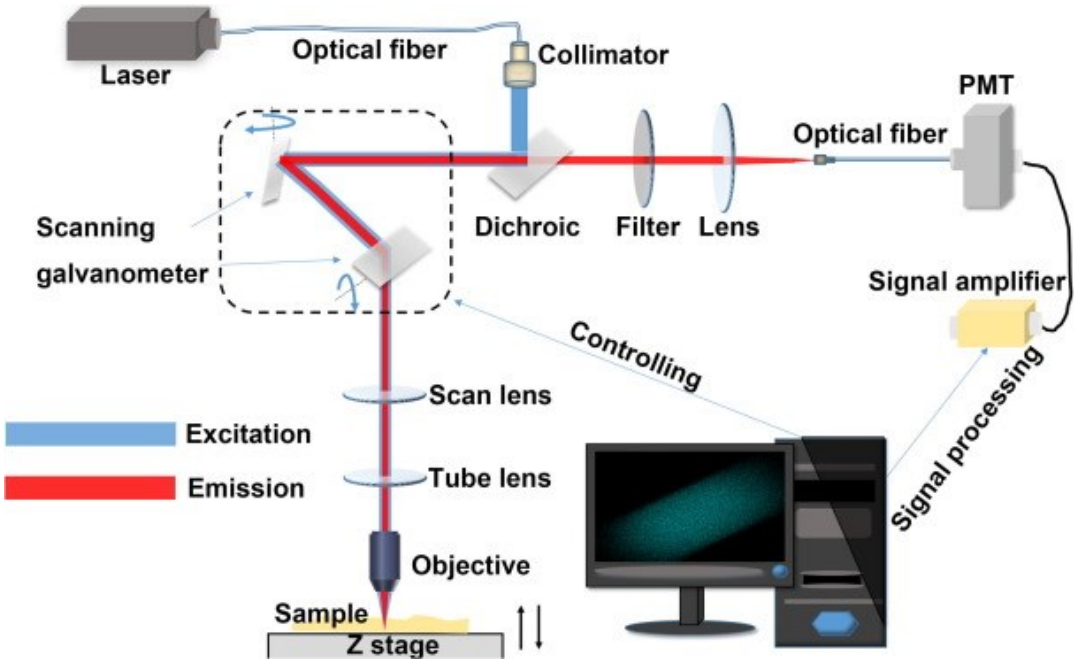


Upgrade to Confocal Raman Microscope

- 532,785,1064 Raman
- Upright Microscope setup
- High Resolution with Raman image mapping

Upgrade to Confocal Spectral Microscope (NIR I/II confocal)

- Wavelength Range UV to NIR (200nm-2.5nm)
- Spectral resolution up to 0.2nm
- Large NA setup for high-sensitivity application



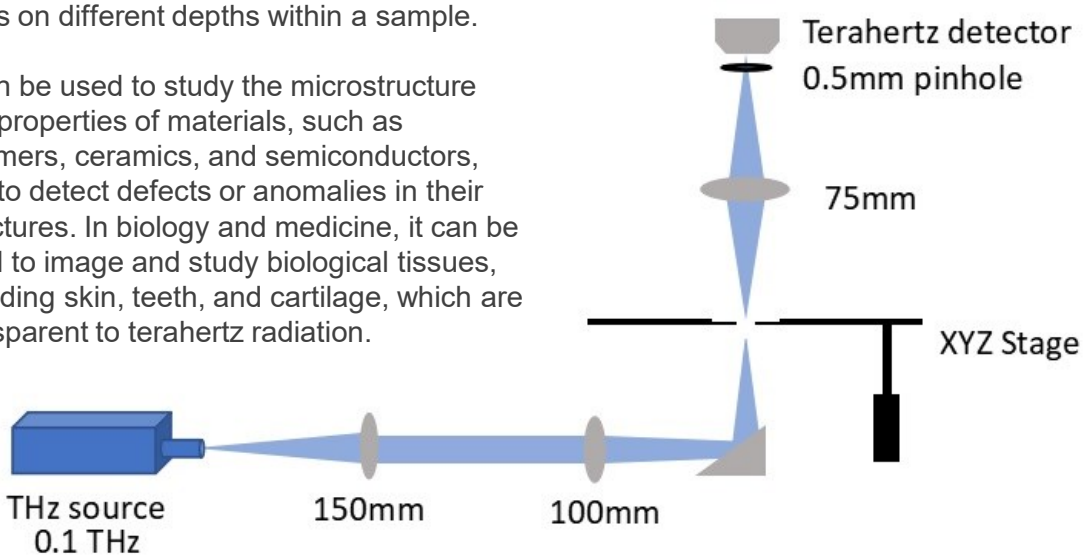
System Upgrade Options

Upgrade to Terahertz Confocal Microscope System

- 100GHz, output power: 80mW
- Spatial resolution 150-200um

The terahertz confocal microscope uses a focused beam of terahertz radiation to scan the sample being analyzed. This beam is then reflected back and collected by a detector, which creates an image of the sample based on the intensity of the reflected radiation. By using a confocal design, this microscope can achieve high resolution and can selectively focus on different depths within a sample.

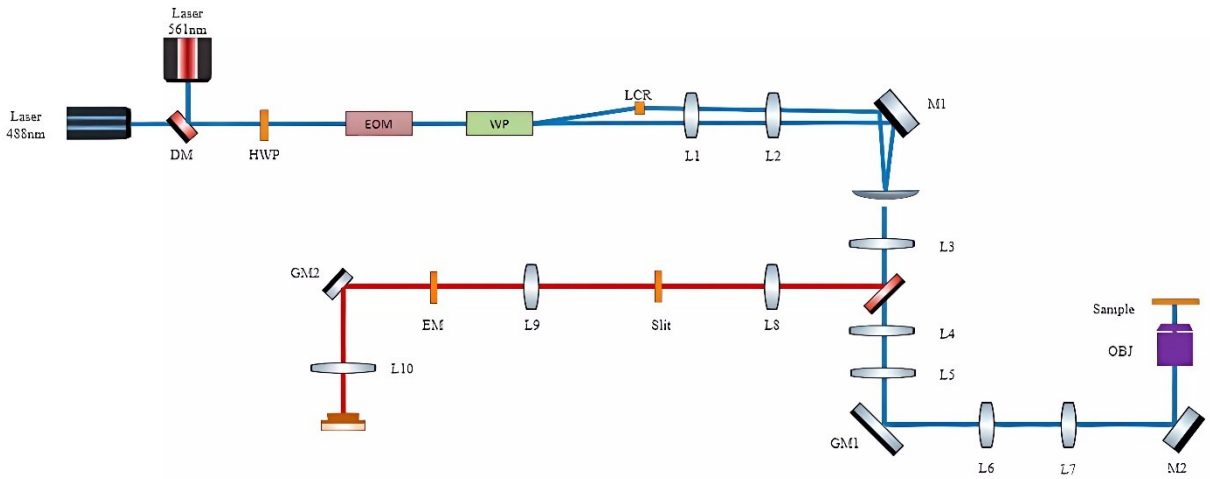
It can be used to study the microstructure and properties of materials, such as polymers, ceramics, and semiconductors, and to detect defects or anomalies in their structures. In biology and medicine, it can be used to image and study biological tissues, including skin, teeth, and cartilage, which are transparent to terahertz radiation.



Upgrade to Super Resolution Re-scan Structure Illumination Microscope

A "re-scan" confocal microscope is a type of confocal microscope that uses a rapidly moving mirror or scanner to scan the laser beam across the sample multiple times, producing even higher resolution and better contrast images than standard confocal microscopes.

Overall, re-scan confocal microscopes are very powerful tools for studying biological tissues, cells, and other samples, and are widely used in research labs, medical facilities, and other scientific settings.

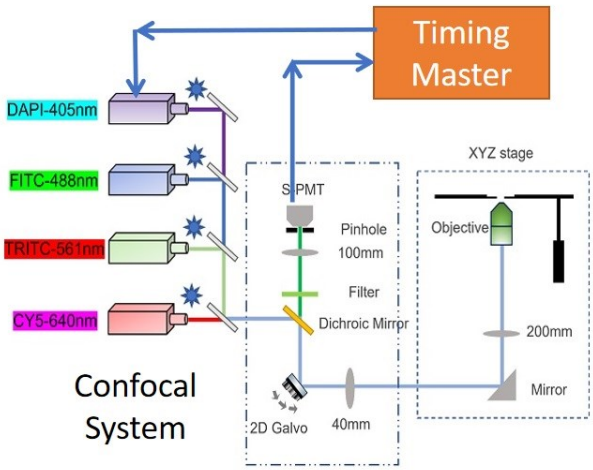


System Upgrade Options

Upgrade to Fluorescence Lifetime Imaging Microscopy (FLIM)

FLIM is a type of microscopy that allows for the visualization and analysis of biological samples based on the fluorescence lifetime of the fluorophore being used. FLIM measures the time between the excitation and emission of photons in a sample, which can provide information about the properties of the fluorophore and the environment in which it is located.

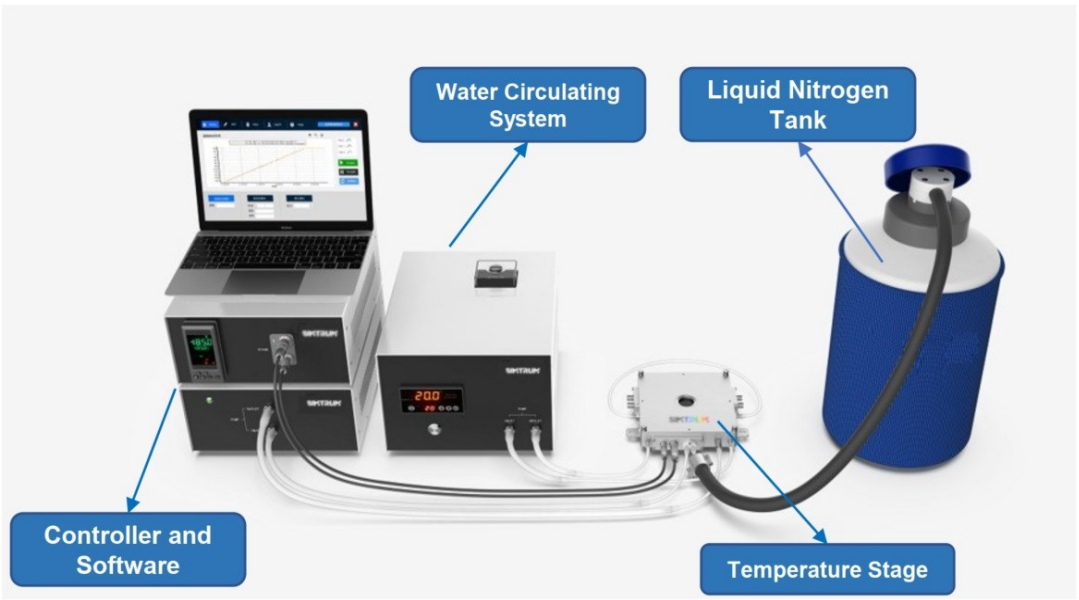
FLIM can be used to study a wide range of biological processes, including protein-protein interactions, enzyme activity, and ion concentration changes. It is often used in combination with other imaging techniques, such as confocal microscopy, to provide more detailed information about the sample.



Upgrade to Terahertz Confocal Microscope System

Compatible with SIMTRUM Cryostat to perform Low-temperature Raman measurements -190 to 600 degrees

- 8 probe arm able to upgrade to adjustable probe arm
- Reflection or transmission mode available

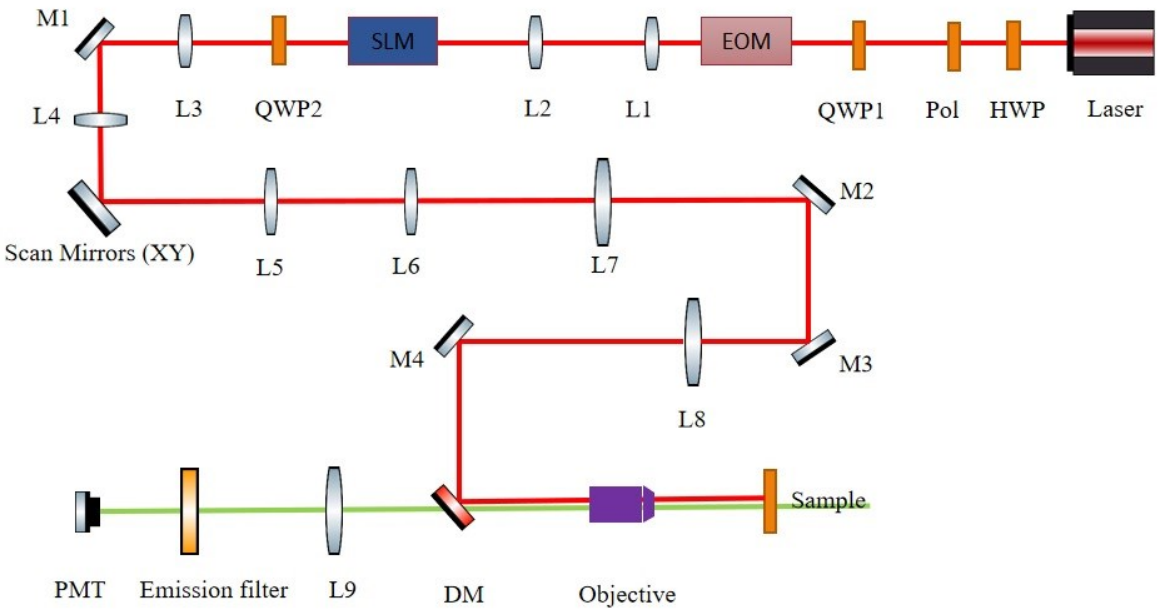


System Upgrade Options

Upgrade to Fluorescence Lifetime Imaging Microscopy (FLIM)

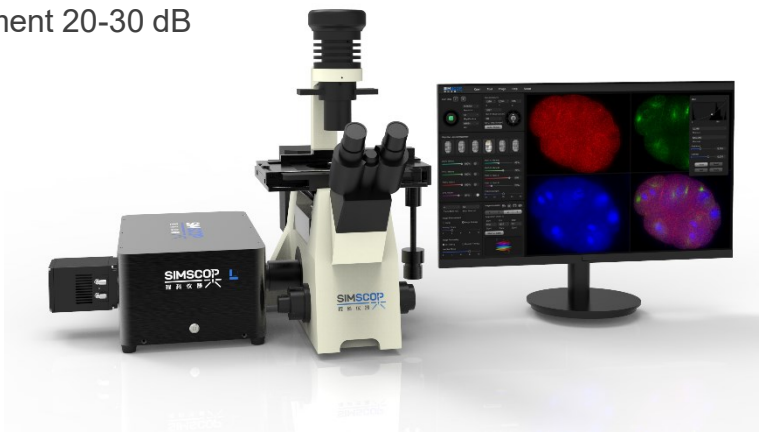
In two-photon microscope, a laser emits light at a specific wavelength that is absorbed by the fluorescent molecules in the sample. When two photons of this light are absorbed simultaneously, they provide enough energy to excite the fluorescent molecule and cause it to emit light at a longer wavelength, which can be detected by the microscope. Because two photons are required to excite the molecule, the probability of fluorescence emission is low and only occurs at the focal point of the microscope, allowing for high-resolution imaging and greater depth than conventional microscopes.

Two-photon microscopy has a number of applications in neuroscience, biology, and biomedical imaging. For example, it has been used to study the activity of individual neurons in the brain, visualize the structure and function of blood vessels, and track the behavior of cells in living tissues.



Upgrade to Lines Scan Confocal Microscope

- Frame Rate 210fps
- Resolution: 150 nm over the optical diffraction limit
- Imaging Depth of 500 to 1000 microns
- Image Contract enhancement 20-30 dB



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Product Specifications

SIMSCOP - P Series Laser Scanning Confocal Microscope	
Laser Light Source	Standard wavelength:405±5 nm; 488nm±5nm; 561nm±1nm; 640nm±5nm Output mode:single-mode polarization-maintaining fiber (TEM00) Single wavelength output power: >20mW; Power stability: <1% Spectral linewidth: <3nm TTL modulation, 1kHz Accuracy of laser power adjustment: 0.1%; Multi-wavelength AOTF power adjustment Optional wavelengths include 375nm/ 445nm/473nm/ 515nm/525nm /532nm/633nm /660nm/ 685nm/785nm/808nm
Detectors	SiPM，Wavelength：250-950nmQE > 25%@420nm GaAs PMT, 300-740nm45%@520nm
Scan Module	Scanning pixels 128x128 ~ 4096x4096 Pixel time 0.5 μs -100 μs Maximum scanning speed: up to 4fps (512 x 512)
XY Resolution	230nm@100x Oil objective
Image Depth	< 100um
FOV	5X:1.44mmx1.44mm, 10x:0.72mmx0.72mm 20x:0.36mmx0.36mm 40x:0.18mmx0.18mm 60x:120umx120um 100x:72umx72um
Filter Unit	DAPI EM 445nm/50nm,　FITC EM 530nm/50nm TRITC EM 605nm/60nm,　Cy5 EM 695nm/40nm
Pinhole	16 photoetching pinholes; Pinhole diameter range:Ø25 μm to Ø2 mm
Eyepiece	WF10X/23 wide field eyepiece,; High eye point; Centering telescope
Eyepiece Tube	45°inclined,50–75mm adjustable interpupillary distance; Adjustable diopter
Objective Converter	Converter with five-hole internal positioning ; Ball bearing for internal positioning
Stage	Manual: 240mm x 260mm fixed stage; Range of movement:135mm x 85mm Motorized: Minimum step size:50nm; Repeatability +/- 0.1 μm Maximum speed：≥100mm/s; Stage size:≥270x170mm Stroke : X:110mm,Y:75mm; Maximum load capacity >1KG (Horizontal)
Z Driver	Focusing resolution/minimum step size: 0.05μm; Repeatability: +/-0.2μm; Maximum stroke:10mm
Focusing Mechanism	Coaxial coarse/ fine adjustment with limit and locking devices, Low level coaxial focusing handwheel ; Handwheel graduations of fine adjustment:1μm
Transmitted Illumination System	Warm LED light, continuously adjustable brightness Brightness adjuster with LED rotation Condenser:72mm ultra-long working distance,NA=0.30; Equipped with a three-hole phase contrast annular plate
Epi-fluorescence Illumination System	Multi-band LED light source MG-100 6-hole fluorescence module UV(U)EX:375/30nm;　DM:415；EM:460/50nm Blue(B)EX:475/30nm;　DM:505；EM:530/40nm Yellow(Y)EX:540/25nm;　DM:565；EM:605/55nm Red(R)EX:620/50nm;　DM:655；EM:692/45nm
Software Feature	Multi-color fluorescence localization processing; Z-stack data processing; Large image stitching; Image analysis; Imaging data management; 3D imaging constrution

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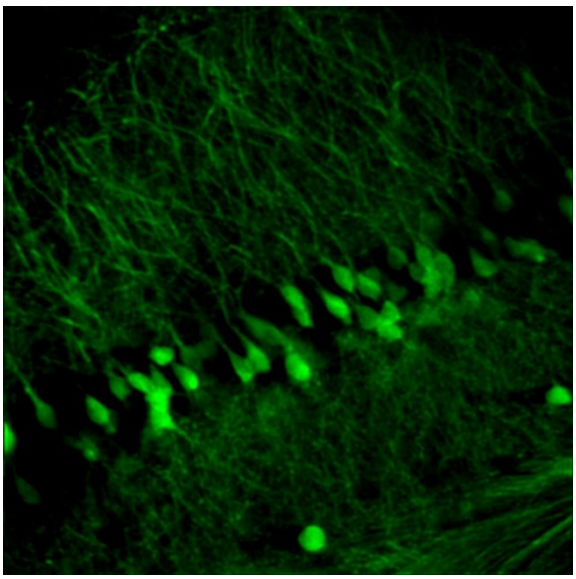
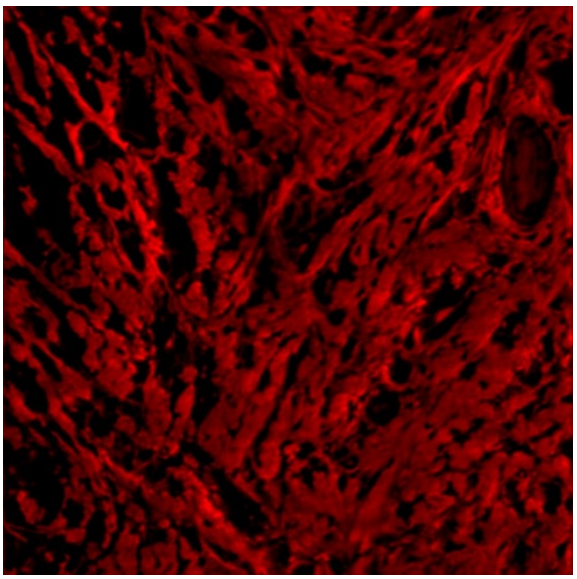
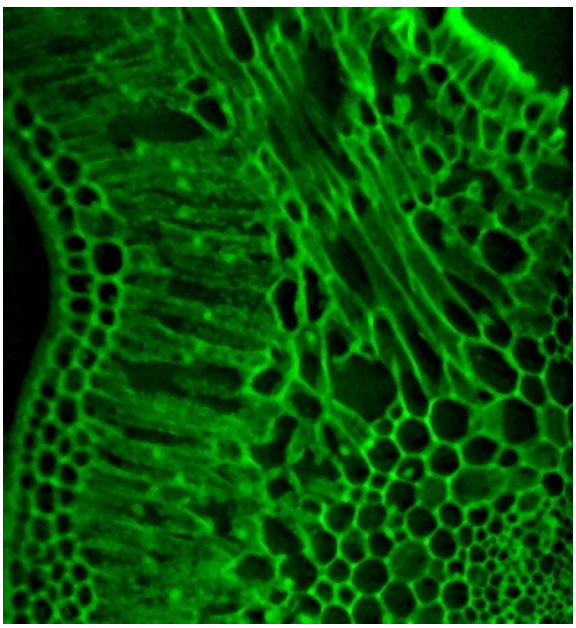
P series Confocal Microscope Acquistion Atlas



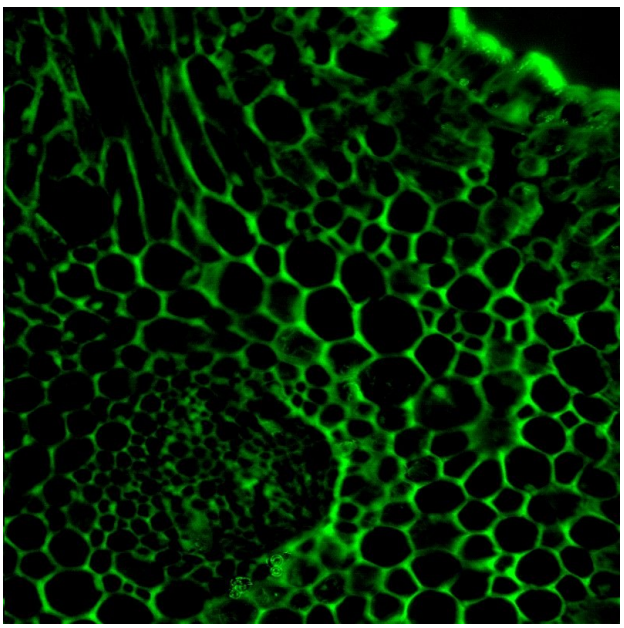
Mouse nerve, SIMSCOP Pseries,
20X objective lens
Detector SIPM (Original Image)



Fibrous connective tissue section, SIMSCOP
P Series, 10X objective lens_1000x1000,
Detector SIPM (Original Image)



Sago palm leaf, SIMSCOP P series, 10X
objective lens_500x500
Detector SIPM (Original Image)



Sago palm leaf, SIMSCOP P series, 10X
objective lens_800x800
Detector SIPM (Original Image)

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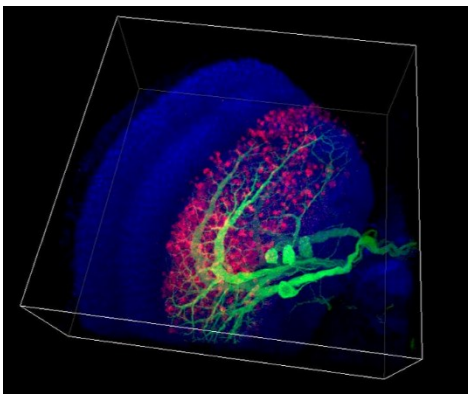
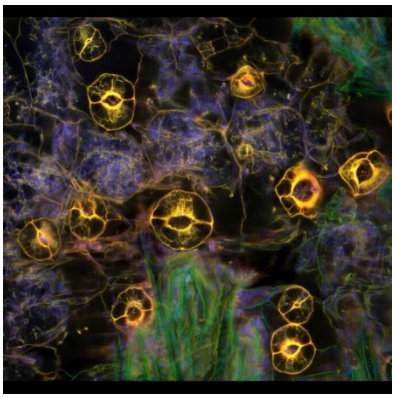
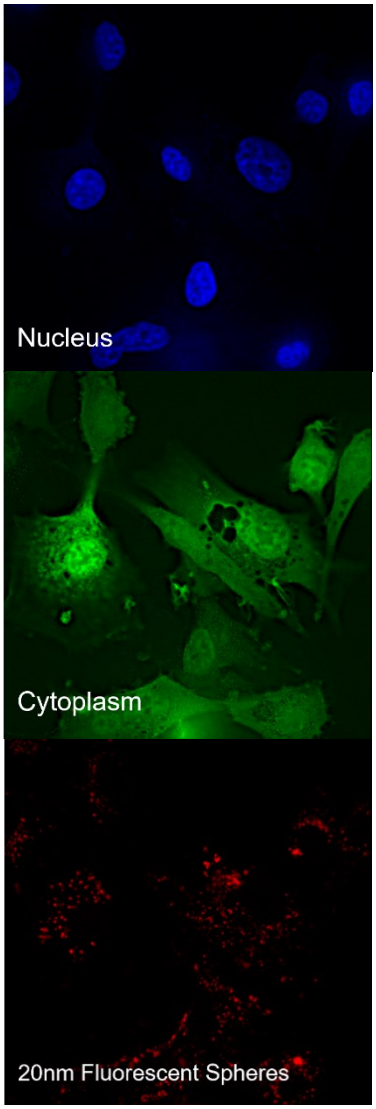
Confocal Imaging Applications

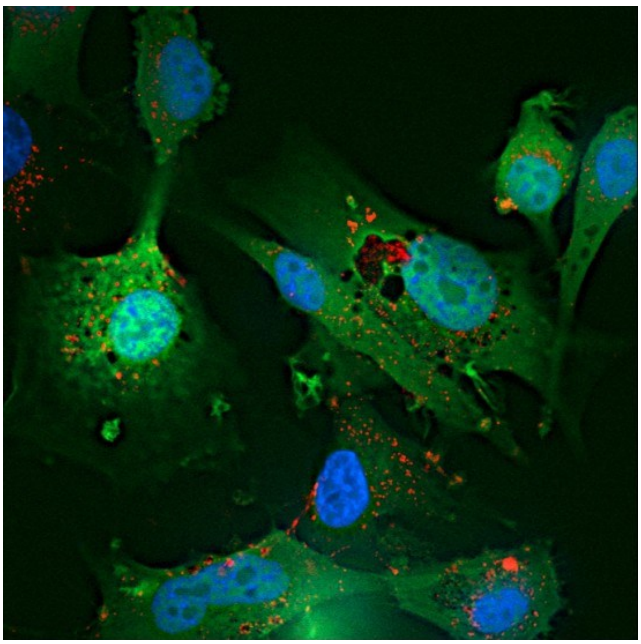


Drosophila brain; triple antibody staining:
Alexa 488, Alexa 568 and Alexa 633



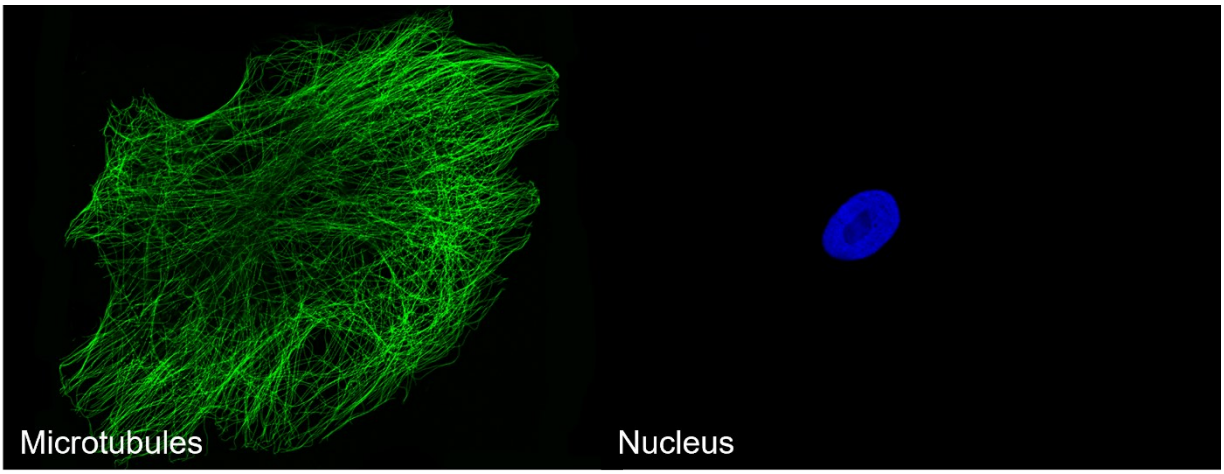
Confocal micrograph of Arabidopsis thaliana (thale cress)
Seeding leaf with stomata(yellow moth-like structures)
And parenchyma cells.

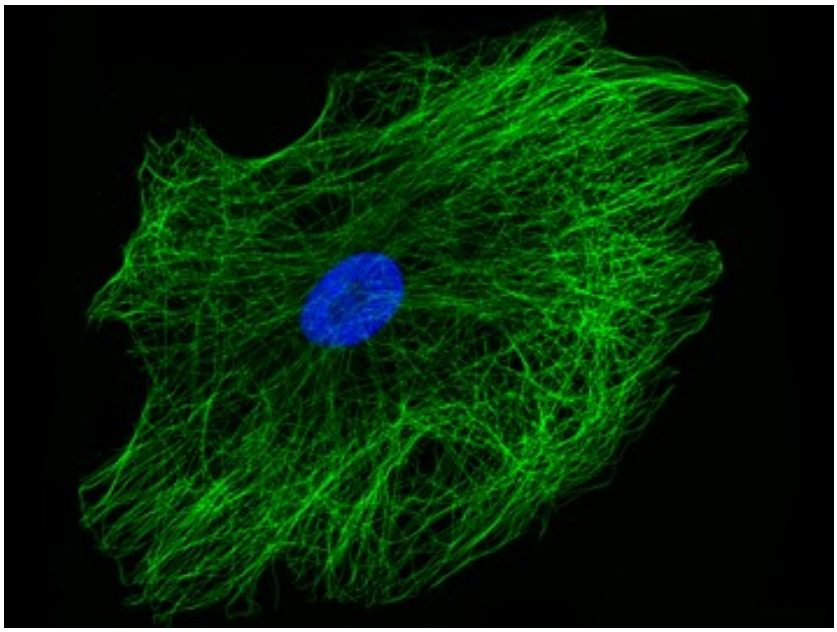




Glioblastoma cells in culture transfected with a green fluorescent protein. The nuclei are stained blue with DAPI. The red spots are 0.02-micron fluorescent spheres that have been taken up into the cells by endocytosis. These cells have no endogenous P10 protein; P10 is a tumor suppressor gene that is mutated in many different types of cancer. The absence of the P10 protein is thought to increase cell mobility and possibly contribute to metastasis.

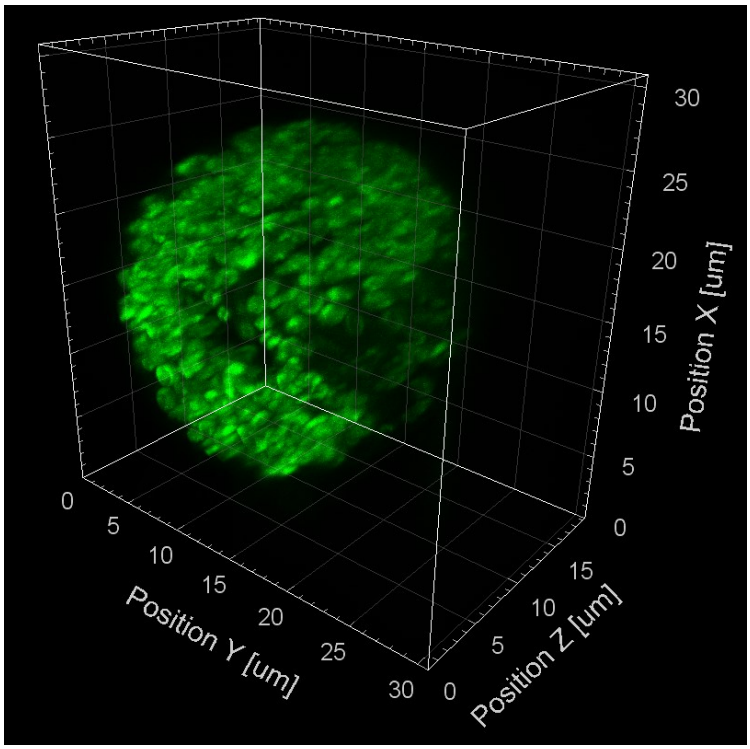
Confocal Imaging Applications



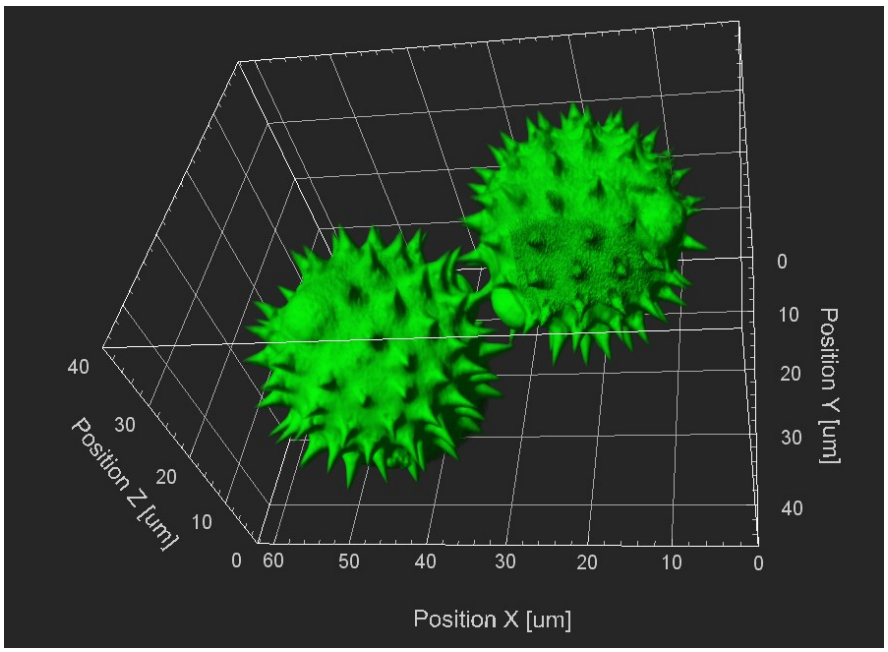


Shown is a confocal microscope image of a human gingival fibroblast in culture. Interphase microtubules (green) are labeled with alpha/beta-tubulin primary antibodies. FITC conjugated secondary antibody was applied afterward. Nuclear DNA (blue) was stained with Hoechst33242.

Confocal Imaging Applications



Live mitotic HeLa cell treated with epsin1 siRNA, DiOC6(3)to label mitotic membranes (green). Confocal images were taken at 0.118 μm steps along the Z-axis.



Pollen grain-3D

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