

MICROSCOPY

Tech Pulse



October 2020

Microscopy Tech Pulse is a special edition newsletter from Photonics Media and Toptica Photonics covering key developments in microscopy technology. Manage your Photonics Media membership at [Photonics.com/subscribe](https://www.photonics.com/subscribe).

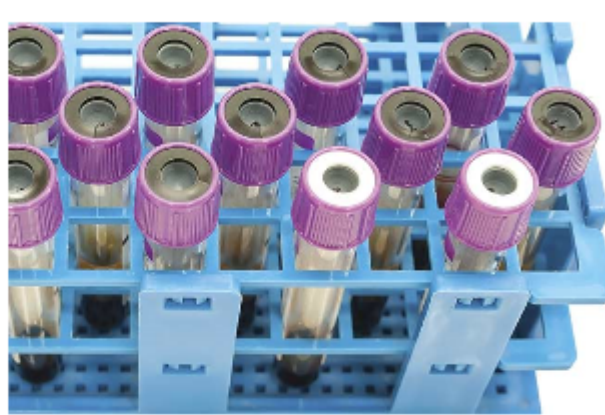
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Powerful Femtosecond Fiber Laser
Ideal for Multiphoton Microscopy

Achieving Improved Signal-to-Noise Ratio in Flow Cytometry

Flow cytometry explores, analyzes, counts, and sorts small particles. With the increasing demands for higher data quality from researchers, clinicians, and manufacturers, component builders for these systems are being driven to increase the signal-to-noise ratio (SNR), rather than just the signal. SNR is a widely applicable engineering term referring to the relative size of the real signal (or signal variations) compared to random errors (noise) in the observed signal.

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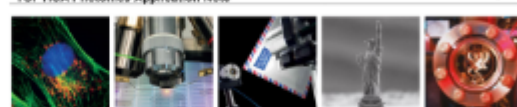


TOPTICA Photonics Inc. Next Generation Two-photon Microscopy using the FemtoFiber Ultra 920 Fiber Laser

Two-photon fluorescence microscopy has become a key technology in biological imaging enabling three-dimensional, noninvasive studies of biological tissue on the submicron scale. To boost the usability of this method and to provide an ultracompact, turn-key laser source, TOPTICA Photonics is proud to introduce the new FemtoFiber ultra 920, the latest member of their successful femtosecond fiber laser family. With its robust and compact design, the FemtoFiber ultra 920 is an easy to operate and maintenance-free laser system. The novel concept of the laser features a pulse duration <100 fs with a center wavelength of 920 nm and 1.5 Watt of average power (18.5 nJ at 80 MHz repetition rate). The unmatched temporal and spatial beam characteristics of the laser are fully tailored for deep-tissue nonlinear microscopy, providing excellent optical contrast and signal-to-noise.

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TOPTICA Photonics Application Note



Next generation two-photon microscopy using the FemtoFiber ultra 920 fiber laser

M. Staud and B. Wolfrum, TOPTICA Photonics AG

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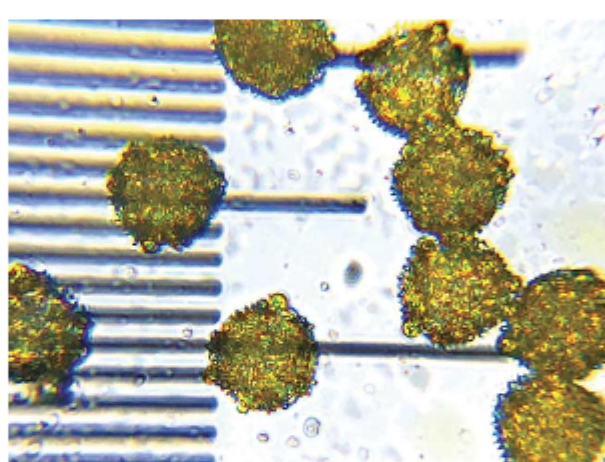
Figure 1: Picture of the new FemtoFiber ultra 920. The control and supply unit is integrated into a 19" type standard rack which is connected via a fiber optic line to the laser head for straightforward CO2 integration. The laser system and its unique characteristics is the perfect choice for nonlinear microscopy the inevitable evolution of fluorescence microscopy.

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Portable Microscopy Leverages Advancements in Electronics and Computing

Conventional bright-field microscopy is not the only modality becoming increasingly available thanks to miniaturization: Techniques such as dark-field and holographic imaging, which provide detailed structural information in a label-free manner, are also making inroads — into the palms of users' hands.

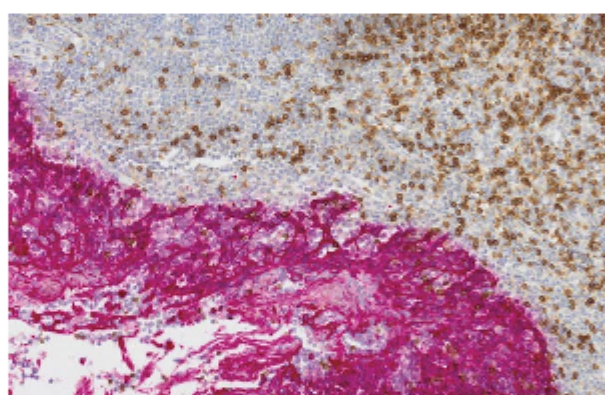
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Microscopic Methods Reveal Holistic Picture of Sample

Whole slide imaging is a method principally employed when scientists need to image a large, relatively two-dimensional sample that expands beyond a single microscope field of view. Typical applications include imaging of histological tissues that have been cut into thin slices and placed on a glass slide.

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A Laser Points Toward Disease Diagnosis

A critical starting point in reducing the incidence of chronic disease involves detecting, locating, and accurately evaluating disease in its initial stages. One important step in tackling these challenges will be developing light-based technologies such as near-infrared (NIR) and mid-infrared (MIR) spectroscopy.

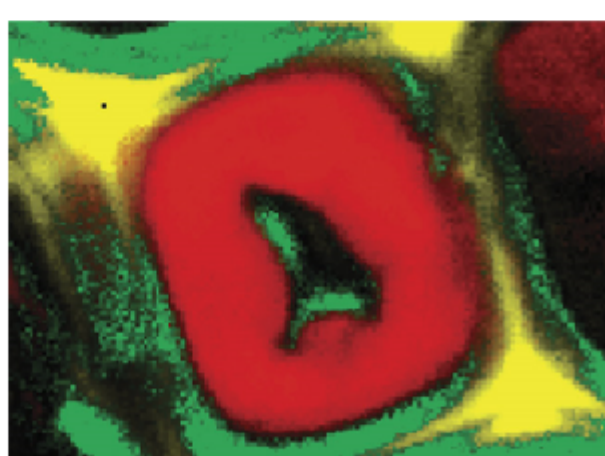
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Raman Imaging Opens View to Diagnosis and Discovery

By revealing the chemical composition of samples, Raman microscopy has proved to be useful in many fields, including medical diagnosis, materials science, cosmetics, and food science. It is a nondestructive method and requires no staining or other specialized sample preparation.

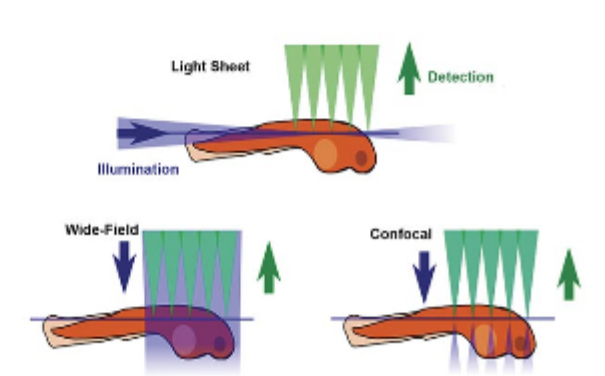
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Light Sheet Microscopy: Transforming 3D Fluorescence Imaging

Light sheet fluorescence microscopy (LSFM) is a fast and efficient imaging technique that combines the speed of wide-field imaging with optical sectioning and low photobleaching. LSFM has become an important fluorescence imaging modality, especially for volumetric imaging. Prominent applications include developmental biology, cleared tissue imaging, cell biology, and neuroscience.

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