

ZEISS Lightfield 4D for instant volumetric high-speed imaging

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Capturing physiological and neuronal processes in 3D

- **High-speed fluorescence imaging of physiological and neuronal processes**
- **Gentle long-term observation of living organisms**
- **Accelerated data collection on large samples**

ZEISS announces the launch of Lightfield 4D, a new microscopy technology based on the light-field principle. As a new imaging mode integrated into the new ZEISS LSM 910 and LSM 990 confocal microscope systems, ZEISS Lightfield 4D redefines the way researchers observe living organisms, especially in the neurosciences, cancer research, developmental biology, and plant sciences. It enables instant volumetric high-speed imaging, allowing researchers to image the dynamic processes of life in complete samples with unprecedented temporal resolution.

The new technology addresses the critical need for 4D imaging – combining volume and time to truly understand biological processes. Traditional optical sectioning techniques that rely on sequential image acquisition to create Z-stack images have long struggled with the limitations of sequential image acquisition, which introduces time delays and compromises the spatiotemporal accuracy of data. ZEISS Lightfield 4D overcomes these challenges by imaging entire 3D data sets at a precise moment in time, eliminating time delays within a captured volume.

Accelerating microscopic imaging: One snap, one volume

Utilizing a micro lens array, ZEISS Lightfield 4D generates 37 individual images simultaneously, capturing comprehensive 3D information in real-time. This innovative approach allows for the creation of Z-stacks through advanced deconvolution-based processing, achieving an impressive rate of up to 80 volume Z-stacks per second, providing insights into rapid biological events such as physiological and neuronal processes.

Improving biological insight with speed and gentleness

A complete Z-stack is captured in one illumination event. This reduces light exposure and phototoxic effects. It allows for long-term imaging of entire living organisms at high temporal density, following biological processes over long periods of time. The unmatched speed of ZEISS Lightfield 4D facilitates the capture of multi-color volumes of large samples, enhancing productivity of experiments across various applications.

“Combining volume and time to enhance our understanding of complex biological processes, ZEISS Lightfield 4D represents a leap forward in 4D imaging,” says Dr. Bernhard Zimmermann, Head of Life Sciences Microscopy at ZEISS. “We believe that Lightfield 4D will redefine the imaging landscape. This innovative system empowers researchers to capture biological processes in real-time, providing unprecedented insights into the dynamic nature of life.”

New LSM platforms

The combination of the remarkable imaging flexibility of laser scanning microscopes (LSMs) and the gentle and instant volume imaging capabilities of ZEISS Lightfield 4D enables previously impossible experiments and pushes scientific research to new frontiers.

In conjunction with the launch of Lightfield 4D, ZEISS introduces enhanced versions of its LSM platforms:

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ZEISS LSM 910 and LSM 990. These upgraded systems feature new high-bandwidth electronics that support beampath technology for exceptional light preservation, visualization of high dynamic ranges, and a broad wavelength bandwidth. Additionally, image quality improvements with ZEISS Airyscan jDCV are now available for all Airyscan Multiplex modes. With the help of the Microscopy Copilot, a personal AI assistant, researchers can interactively explore new possibilities for their imaging experiments.

For more information, please visit: <https://zeiss.ly/nw-lightfield-4d>

Press contact

ZEISS Research Microscopy Solutions

Vybhav Sinha

Email: press.microscopy@zeiss.com

Company Contact:

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news aktuell

E. desk@newsaktuell.de

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