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## Opening talk: Photon-Resolved Microscopy: a New Microscopy Paradigm for Life-Science Research

*Thursday, 16 May 2024 09:10 (50 minutes)*

Fluorescence optical microscopy has long been a valuable and minimally invasive tool for visualizing biological structures and functions at the cellular level and beyond.

However, understanding many fundamental biological processes crucial to human health and disease remains beyond the capabilities of conventional optical microscopy.

Super-resolved microscopy, which shifts our perspective from considering fluorophores as mere passive markers to active participants in image formation, has significantly expanded the capabilities of optical microscopy, marking a new era for life sciences. Inspired by the transformative potential of shifting perspectives, we introduce the innovative concept of photon-resolved microscopy. By examining fluorescent light in terms of its most elemental components—the photons—we unveil even greater potential for fluorescence microscopy. Our exploration begins by illustrating how this fresh approach can reinvigorate one of the most widely used and traditional microscopy architectures: the confocal laser-scanning microscope. Subsequently, we reveal the synergies between photon-resolved microscopy and more advanced techniques, including super-resolved microscopy.

This change in perspective holds the promise of not only enhancing the capabilities of fluorescence microscopy but also unlocking new horizons in studying intricate biological processes.

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