

Physikalisches Kolloquium
Einladung**Physics Colloquium**
Invitation**Monday, 19 October 2026**

Lecture Hall O25/H2, at 16:15

Coffee and cookies will be served in front of the lecture hall from 16:00

**New super-resolution Microscopy Developments to
Image Molecules in the 3D Context of Cells and
Tissues****Prof. Dr. Joerg Bewersdorf**

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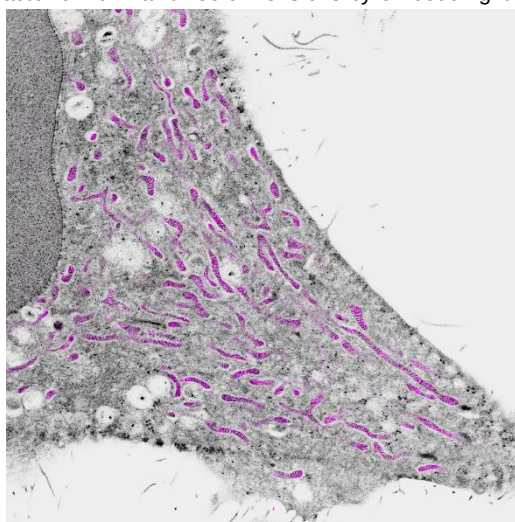
The fundamental resolution limit of ~200 nm in far-field optical microscopy has been a major barrier to understanding how the molecular machinery of life operates on 10-100x smaller scales. Super-resolution microscopy has broken this barrier, but another challenge remains: the complexity of this machinery requires reading out many molecular species simultaneously and visualizing them in the structural context of the cellular environment that itself is organized at the sub-diffraction level. I will present two physical approaches my lab has developed to address this: the multiplexed single-molecule localization microscopy technique FLASH-PAINT and pan-Expansion Microscopy (pan-ExM).

FLASH-PAINT is a variant of DNA-PAINT that breaks the diffraction limit by taking advantage of the stochastic binding kinetics of single molecules. FLASH-PAINT introduces transiently binding adapters which allow for spectrally unlimited multiplexed imaging in a rapid and highly efficient way. Super-resolution imaging of more than 10 labels in the same sample can now easily be achieved.

pan-ExM physically expands a fixed cell or tissue sample by about a factor of 20 in all three dimensions by embedding it in a swellable polymer matrix. This coordinate transformation is equivalent to reducing the microscope's point-spread function in size by the same factor. Structures that previously were well below the diffraction limit in size are now resolvable with standard light microscopy. Labeling proteins and other cellular components in bulk reveals the cell's nanoarchitecture and provides ultrastructural context to specifically labeled proteins. Pan-ExM thereby presents an all-optical imaging alternative to the complex approach of correlative light/electron microscopy.

I will present an overview of the underlying technologies my group has developed and will show our latest progress in resolving and quantifying sub-organellar features in cells and tissue at the examples of the 3D organization of the Golgi Apparatus, neuronal connectivity in the mouse brain, and mitochondria cristae organization in mouse kidney.

Financial Interest Disclosure: J.B. is co-founder of panluminate, Inc., a startup company in the super-resolution microscopy space.



Host: Prof. Dr. Jens Michaelis, Institute of Biophysics

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