

Invitation

to the Physiology Seminar

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<https://www.umg.eu/anatomy/>



Super-resolution structure-function analysis of brain microanatomy

Progress in microscopy has historically driven major advances in neuroscience. STED microscopy, renowned for breaking the diffraction barrier of light microscopy, is a prime example. It enables visualization of anatomical structures and nanoscale dynamics that are beyond the reach of conventional light microscopy - from the intricate architecture of neurons and glial cells to the organelles and molecules within them. Similarly, light-sheet microscopy has proven invaluable for high-speed imaging with minimal phototoxicity, capturing rapid or transient events with high sensitivity, contrast, and spatial resolution.

I will review our contributions to the development of live-tissue STED imaging and its application to brain extracellular space and astrocytes. Specifically, we combined super-resolution morphological imaging with confocal calcium imaging in living organotypic mouse hippocampal slices. This approach enabled us to uncover the structural basis of astrocytic calcium signals at tripartite synapses, characterized by nanoscale morphological specializations - namely, nodes and shafts.

Next, I will present unpublished work using lattice light-sheet microscopy, which allowed us to capture spontaneous and evoked calcium activity in these structures with unprecedented temporal spatial resolution. Notably, we observed that calcium signals propagated in a saltatory manner from node to node, with occasional failures at branch points, giving glimpses of a digital signaling code that astrocytes may use for information processing.

Date: **16th of December 2025**

Place: **Lecture Hall N**

Building: **I01-01-1120**

Scheduled at: **16:15**

Guests are welcome!

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